CHAPTER-1: INTRODUCTION

1.1 Background

Nepal Electricity Authority (NEA) is constructing a 220 kV transmission line between Bharatpur and Bardaghat to strengthen the power transmission network of Integrated Nepal Power System (INPS) thereby increasing the capacity of power flow from the west where the major generating stations exist or planned to the east where demand is high. The line particularly enhances the existing Bharatpur- Bardghat sector which is of single circuit configuration only and has been constructed with limited capacity in early seventies when the power system was in nascent stage. The project also aims to form a part of the envisaged 220 kV grid which the Power System has recommended. This will eventually help enhance the power exchange with India.

The proposed alignment passes through Bharatpur Municipality of Chitwan district and 14 VDCs of Nawalparasi district. The estimated length of the transmission line is 73.5 Km. Right of Way (RoW) of the transmission line is 30m (15m on each side of centerline) and each tower will require an area of 12.5mx15.5m.

The Environmental Management Action Plan (EMAP) has been prepared as an integral part of Bharatpur- Bardghat 200 kV Transmission Line Project to set out the procedural framework to ensure the implementation of mitigation measures, monitoring and auditing requirements. The plan specifies the environmental responsibilities of all parties involved in the project, and detail the environmental management requirements of the project during the pre-construction, construction and operation phases. The plan also specifies the coordination mechanism with various line agencies, non-project participants and schedule. The monitoring component likewise defines the monitoring mechanism, reporting etc. Similarly, impact audit define the auditing parameters and responsibility. The project proponent will be responsible for the implementation of the EMAP.

1.2 Objectives of the Study

The EMAP is an environmental operations manual for use by management and staff employed on the project, and will serve as an advisory document to regulatory authorities such as Ministry of Energy, Ministry of Environment and Ministry of Forest & Soil Conservation.

The EMAP has four primary objectives, namely to:

- define environmental management principles and guidelines for the design, construction and operation of the project;
- establish the roles and responsibilities of all parties involved in project environmental management;
- describe mitigation measures that shall be implemented to avoid or mitigate adverse environmental impacts;
- formulate environment management framework to ensure the implementation of mitigation measures and monitoring programs; and
- establish a supervision, monitoring, auditing and reporting framework.

1.3 Scope of the Study

The Scope of Services for this assignment is to prepare updated Environmental Management Action Plan of the Project for the smooth and timely implementation of the EIA, SIA, RAP and VCDP recommendations and to document the changes occurred over the period of time in the form of plan. The Scope of Services includes but not limited to the following:

- Update the environmental and social baseline information considering the changes in the transmission line alignment and changes that has taken place since EIA time (with particular focus on the environmental and social areas in which impacts are likely from the project activities)
- Conduct further stakeholder consultations to document the changes over the period of time as well as to disseminate and obtain feedback on the identified impacts, and proposed mitigations and enhancement measures;
- Based on the updated baseline information and fresh stakeholders consultations, update the mitigation and enhancement measures with due consideration to check survey of the line conducted by the Project contractor (the Contractor); ;
- Building on the EIA information, identify and describe the risky project activities, and define the minimum standards for the workers OHS for the risky type of works and define minimum standards for the labor camps including sanitation standards as well as elaborate the ways to protect community health from the project or project induced activities.
- Develop one site- –specific plan for the nursery establishment and plantation work to be conducted by the Project;
- Elaborate the mitigation and enhancement program and present action plan along with schedule for their implementation;
- Review the environmental and social clauses included in the bid/contract document and incorporate them in EMP, and suggest ways to implement mitigations that are not covered by the bid/contract documents.

- Develop compliance monitoring procedure along with format, enforcement mechanism and role of different project partners;
- Elaborate the impact monitoring procedure;
- Provide plan of consultation to be conducted at different phases of project implementation

1.4 EMAP Preparation

The EMAP has been prepared based on the review of EIA, SIA, RAP and VCDP documents prepared for the project. In addition, review of tender document and, forest inventory conducted by the District Forest Offices of Chitwan and Nawalparasi districts, walkover survey along the alignment and consultation with the affected households and Community Forest Users Group has also been carried out for the preparation of EMAP. The geological study of the tower pad has been conducted in order to update the baseline condition and to determine the protection requirement for the tower pads. Extensive consultation has been made with the Community Forest Users Group to discuss the plantation sites, species to be planted possible nursery sites and major concerns of the CFUGs. The details of the consultation is given in Appendix-1.

At the end of each discussion with CFUGs, the plantation sites and nursery sites that were proposed from the community were visited in-situ. The availability of road access, water resources and security concerns were observed in the field. Further discussions were taken place with Kawaswoti Ilaka forest office, Arun Khola Ilaka Forest office and district forest offices of the project district.

1.5 Layout of the Report

This EMAP contains 6 chapters. Chapter 2 contains project description, Chapter 3 outlines the project impacts and mitigation measures, Chapter 4 describe the environmental management activities and organizational setup, Chapter 5 elaborates the action plan and responsibility and chapter 6 outlines the required budget and source of funding.

CHAPTER-2: PROJECT DESCRIPTION

2. PROJECT DESCRIPTION

2.1 Project Location

The proposed project is located in Chitwan and Nawalparasi districts of Nepal (Fig. 2.1). Physiographically, the proposed transmission line falls under the *Inner Terai* (the *Dun Valleys*), the *Sub-Himalaya* (the *Siwaliks* or the *Churiya Hills*), and the *Indo-Gangetic Plain* (the actual *Terai Plain*) of the Central and the Western Development Region of Nepal. East-West Highway is the main access to the project area. Some part of the alignment is accessible through existing feeder roads of concerned districts. Airline service is available at Bharatpur of Chitwan district.

2.2 Transmission Line Route

The proposed 220 kV Bharatpur- Bardaghat Transmission Line is 73.5 km in length. The TL starts from the proposed New Bharatpur substation located at Aanptari, Bharatpur Municipality, Chitwan district and terminates at existing Bardghat substation located at Makar VDC in Nawalparasi district (Fig-2.2). The project covers one municipality of Chitwan district and 14 VDCs of Nawalparasi district. The major portion of the transmission line alignment crosses the forest area (79.19%) followed by cultivated land (18.38%) and rivers, roads & rocky areas (2.43%). While selecting the transmission line alignment, due consideration has been given to avoid the settlement areas, inbuilt structures, religious places, schools and other community infrastructures as far as possible.

2.3 Project Features

The proposed transmission line will be double circuit. Each line circuit will have three phases, each phase comprising two Aluminum Conductor Steel Reinforced (ACSR) sub-conductors. Double circuit towers with vertical formation will typically have an average height of 45 m and the typical tower base dimensions will be 12.5 m x 12.5 m. Steel tower leg and body extensions will be utilized to reduce foundation excavation on slopes and provide greater tower foundation structural security. The design span between tower structures is 350 m.

Right of Way (RoW) width of the transmission line is 30m (15m on each side of centerline). The transmission line design features are given below.

Salient Features

Project**:**	Bharatpur-Bardghat 220kV Transmission Line Project
District**:**	Chitwan and Nawalparasi
VDC/ Municipality**:**	Bharatpur Municipality; Amarapuri, Devchuli, Dhaubadi, Dibyapuri, Dumkibas, Gaindakot, Makar, Mukundapur, Nayabolan, Rajahar, Shiva Mandir, Tamsariya, Parsauni and Deurali VDCs
Line Length**:**	73.5 kilometers
Span**:**	350 meters
No. of Tower**:**	256 (out of which 43 are located in cultivated land)
Private land to be acquired for Tower: 0.673 ha	
Voltage level**:**	220 kV
RoW**:**	30 meters
Minimum ground clearance of wires: 7.5 meters	
Tower type**:**	Steel Lattice Structure, self supported
Tower Height (typical)**:**	42.45 meters
Circuit**:**	Double
Conductor**:**	ACSR BISON, Duplex
Insulator:	Cap and Pin type
Earthwire**:**	in double peaks (EHS 7/3.35 and OPGW)
Foundation Type**:**	Pad and Chimney
Foundation Area**:**	12.50 x 12.50 meters (Typical approximate per tower)
Project Cost:	-USD19 million
Funding Agency:	GoN/NEA/World Bank

2.3.1 Line Towers

Line towers shall be of double circuit configuration, i.e., having place for two separate sets of electrical conductors, to enhance the long-term reliability and capacity of the transmission line that will be carrying large chunks power over long distances.

The transmission line shall be constructed with self-supported lattice galvanized steel towers. The types of towers as per the anchoring requirements will be four, i.e., suspension, tension, angle and dead-end.

2.4 Construction Planning

The Construction works of the Project will essentially consist of the following activities:

a. Foundation works

b. Erection of transmission towers.

c. Wire stringing

e. Testing and commissioning.

2.4.1 Concrete Foundation

Excavation for tower foundations will be made to the size and depth required by design. Concreting for the foundations will be performed after proper placement of reinforcing bars. After necessary curing, the foundations will be backfilled with suitable material. Suitable protection to the tower foundations, such as gabion walls, will be provided where required.

2.4.2 Erection of Galvanized Steel Towers

Galvanized steel lattice towers will be manufactured in the factory and transported to the individual tower locations from the nearest road points. After foundation is complete and minimum days allowed for strength gaining, towers are erected. Erection will be done manually by employing pulleys, wenches, etc.

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2.4.3 Insulator Fittings, Conductor and Ground Wire Stringing

Conductors, ground wires, insulators and necessary accessories will be carried manually to the tower locations from the nearest road heads. Stringing of ground conductors will be carried out manually. Conductors will be strung mostly by using machines.

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2.4.4 Construction Personnel

During the initial stages of the construction of the transmission line, only a small number of construction personnel will be required. Altogether 250 people will be deployed during the construction of the project, which includes 170 unskilled, 60 semi skilled and 20 skilled manpower. Most of the unskilled manpower will be hired local.

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2.4.5 Transportation

Primary site access for the project construction will be gained from the East-West Highway. No permanent access roads will be constructed to tower sites from existing road. Existing feeder roads and tracks will be used for construction and maintenance as per need. The construction material up to the nearest road head will be carried out through vehicle and latter it will be transported manually up to the individual tower location.

2.4.6 Spoil Dumping Site

Since the construction of transmission line towers requires clearing and excavation of fairly small areas at tower locations, construction work will not require spoil dumping sites. The spoil will be filled up and compacted in the tower base area.

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2.4.7 Construction Materials

The materials required for civil construction works related to the transmission line and substation will be:

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a. Steel reinforcement
b. Cement
c. Coarse aggregate
d. Fine aggregates (sand)

Steel reinforcing bars and cement will be purchased from local manufacturers or imported as per the supply situation. Coarse aggregates will be produced at site from excavated materials or purchased

from the nearby market. Likewise, fine aggregates will be collected from major quarries along riverbanks, the excavated foundation material can be used as a backfill material required for the foundation construction.

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2.4.8 Project Duration

The estimated duration of the project is 2 years. The construction work of transmission line will primarily be carried out during the dry season when ground conditions are essentially dry and river flows low to allow easy movement of materials and construction of towers. Construction activities during the monsoon season will primarily be restricted to stringing of conductors, although this activity may also be restricted by the weather.

CHAPTER-3: PROJECT IMPACTS AND MITIGATION MEASURES

3.1 General

This Chapter addresses the potential impacts likely to accrue as a result of the implementation of the proposed project, measures to mitigate the potential adverse impacts of the project and enhance the positive impacts, which involve changes to the baseline conditions. Environmental impacts of the proposed project have been identified for the project structures and facilities covering the physical, biological, and socioeconomic and cultural environments. The major positive and adverse impacts identified due to construction and operation of the project is given below:

3.2 Impacts

3.2.1 Positive Impacts

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Altogether 250 people will be deployed during the construction of the project, which includes 1570 unskilled, 60 semi skilled and 420 skilled manpower. In addition, forest clearance will also provide some employment opportunity to Community Forest Users Group and local people. The project will require people for operation and maintenance of the transmission line and some of them will be hired locally. This will provide long term employment opportunity to the local people.

The project will also provide skill to local people in the area of erection of towers, stringing of line, driving and transportation of equipment.

The employment opportunity, income from shops, house rental, increase demand for food grains, fresh vegetable, meat and other local consumption goods and rental/lease of land are the areas of income during construction period. The increase in trade and business will enhance the economic status of local people.

The transmission line project will evacuate the energy produced from Kali Gandaki HEP and other big hydro projects planned in the west and provide reliable power supply in various load centers in the country. The proposed transmission line will open the door for expansion of distribution networks through substations of Bharatpur of Chitwan district and Bardghat of Nawalparasi district.

3.2.2 Adverse Impacts

3.2.1.1 Physical Environment

The expected adverse impact of the project implementation and operation on the topograpy, drainage, air quality, water quality, noise levels are unlikely to cause significant implications to the physical environment. Similarly, the construction spoils generated in the tower foundation areas are also minimum given the nature and extent of the required excavation. Approximately 220.5 ha land which consist 193 ha forest- land, 22 ha cultivate land and 5.36 ha other land--use falls in 73.5

km alignment. The land use change due to permanet land acqusition of the tower pads, and land use restriction along RoW, however, will impart moderate impacts to the site specific and local landuse adversely.

The Sub-Himalaya (Siwaliks or the Churiya Hills) being the youngest mountain range in the Himalayan Region is highly fragile and prone to landslides and erosion. Deeply dissected gullies and steep escarpments exhibits abundant erosion scars all along the Churiya range. Thus, every year a vast amount of sediment is contributed to the rivers originating from the Siwaliks. The abundant rill erosion, gulley erosion and sheet erosion are prominent throughout the Siwalik range. The Narayani River and its major tributaries originating in the Siwaliks or beyond the Mahabharat Range is the best example of highly sediment laden river that encounters along the 220kV transmission line corridor. The Deusat Khola, the Keranga Khola, the Gadar Khola, the Gajara Khola, the Arun Khola, and the Binai Khola are the major tributaries of the Narayani River in this stretch. Several other tributaries to the major Kholas are equally important contributors of sediments in this zone.

It is obvious that the Terai region is main sediment deposition zone of the country. The eroded sediments from the Himalayan region are directly contributed to the Terai through the major rivers. The rivers originating mainly from the Mahabharat range and the Siwaliks contributes a vast amount sediments first to the Bhabhar Zone and then to the mainland Terai. Recent activities of sediment mining from the foot hill of Siwaliks along the Bhabhar Zone, the areas being extensively ~~desertifying~~decertifying. The excavation of sediments is also spreading highly in the mainland Terai throughout the country.

Though there is several erosion scars met along the transmission line route while crossing the Siwalik range between Dumkibas and Bardaghat area in Nawalparasi district, such places is already avoided during final alignment layout. In some cases, where the tower foundation lies over such erosion scars, a small change was made in the angle points or short span towers has been arranged in the alignment to overcome the problem. Except this Siwalik range, there is almost constant topographic as well as geomorphic terrain throughout the TRL alignment. The crossings over the major rivers/Kholas have been properly managed, where the transmission line may encounter some marshy land and a wide zone of sedimentation. Special type of tower foundation, preferably mat foundation with friction piling, is required around the wide river crossings, e.g. across the Keranga Khola, the Gajara Khola, the Arun Khola, and the Binai Khola, etc. After crossing the Narayani River and its periphery, the alignment runs in gentle plain of the middle Terai where there is no major zone of sedimentation, except around the Arun Khola and the Binai Khola. The western embankment of the Narayani River is susceptible to the outburst during high flood.

The chosen tower foundations, especially the angle towers, are placed over more or less stable ground, except those located above the Siwalik range and over the wide river crossings.

Beside the Siwalik, there is almost constant and uniform topographic as well as geomorphic terrain throughout the TRL alignment except over the crossing of major rivers/Kholas, especially the Keranga Khola, the Gajara Khola, the Arun Khola, and the Binai Khola crossings, where the transmission line may encounters some marshy land and a wide zone of sedimentation. The overall ground condition of the TRL tower foundations are more or less stable. The towers that may require special attention to the tower pad foundations which were observed along the transmission line corridor during the recent field visit are given in the Table-3.1.

Table-3.1: Geomorphological and Geological Description of the Tower foundation and Recommended Mitigation Measures.

SN	Angle Towers and stretch between them	Geological Region	Major River Basin	Ground Stability	Factors Causing Instabilities	Recommendation
1	**Z417 (Suspension Tower)**	Foothill of Siwalik	Narayan Khola, a tributary of the Narayani River	Stable to moderately stable.	Being located at the steep slope of the foothill of Siwalik at the right bank of the Narayan Khola at Ranital Village, the tower foundation may damage by slope failure.	Extended tower footings with dry stone masonry or gabion wall for the protection of foundation.
2	**Z440 (Suspension Tower)**	Bhabhar zone	Narayani River basin	Stable to moderately stable.	Being located very close (about 5 to 10m) to the local stream at Bhaisakhori village, near Bhedabari and about 1km north of Kotihom village at the East-West Highway,	Recommended to apply gabion wall for the embankment protection for the possible bank undercutting.
3	**J27**	Foothill of Siwalik	Deusat Khola, a tributary of the Narayani River.	Stable to moderately stable.	Being a critical angle tower and located over a moderately steep hill slope at the foothill of Siwalik nearby the Deusat Khola, there is possibility of slope failure.	Extended tower footings with dry stone masonry or gabion wall for the protection of foundation.

4	**Z543 (Suspension Tower)**	Bhabhar zone	Keranga Khola, a tributary of the Narayani River.	Stable, but need protection.	Since the tower is located on the flood plain of the Keranga Khola, north from Kailapani village (Shivamandir VDC ward no. 8), about 5km north from Kawasoti village at the East-West Highway, there is potential inundation problem of the tower foundation during the monsoon and high flood.	The tower foundation level should be raised by at least 2m from the existing surface elevation and a combined mat foundation along with the friction piling and some river bank protection work is recommended.
5	**Z597 (Suspension Tower)**	Bhabhar zone	Arun Khola, a major tributary of the Narayani River Basin.	Stable to moderately stable.	The tower being located very close to the river bank and over the flood plain of the Arun Khola, north from Arun Khola village (Naya Belhani VDC), about 500m north from Arun Khola Bazaar at the East-West Highway, it is highly susceptible for the bank undercutting and inundation.	The tower foundation level should be raised from the existing surface level and a combined mat foundation along with the river bank protection work is recommended.
6	**Z617 and Z618 (Suspension Towers)**	Bhabhar zone	Binai Khola, a major tributary of the Narayani River Basin.	Stable, but need some protection.	The tower being located very close to the river bank, hardly15m from Ratmata Khola, about 2km northeast of Dumkibas village, it is highly susceptible for the bank undercutting.	Recommended to apply gabion wall for the embankment protection for the possible bank undercutting.
7	**J43**	Bhabhar zone	Binai Khola, a major tributary of the Narayani River Basin.	Stable, but need some protection.	The tower is located at about 1km northwest from the East-West Highway and at about 1.5km north of Dumkibas Bazaar, close to the left bank (about 50m) of the Binai Khola (flood plain, alluvial fan).	Though the tower foundation seems to be stable, it is recommended to apply some protection work against inundation.
8	**Z620 & Z620+1 (Suspension Towers)**	Bhabhar zone	Binai Khola, a major tributary of the Narayani River Basin.	Moderately stable.	The towers being located at the alluvial flood plain (fan) of the Binai Khola near Dumkibas village, there may be possibility of inundation and stability problem during monsoon and high flood.	The tower foundation level should be raised by at least 2m from the existing surface elevation and a combined mat foundation along with the friction piling and some river bank protection work is recommended.

9	**Z628-10 (Suspension Tower)**	Lower Siwalik	Binai Khola, a major tributary of the Narayani River Basin.	Moderately stable.	Being located at the ridge over the Siwalik with somewhat steep escarpment and remarkable scars of small landslides towards the East-West Highway, the tower foundation is prone to the soil erosion and consequent slope failure.	Recommended to apply stone masonry or gabion wall protection at all the sides along with the applicable plantation and jute netting (Bioengineering) to protect the tower foundation from soil erosion and slope failure.
10	**J45+1**	Lower Siwalik	Binai Khola, a major tributary of the Narayani River Basin.	Moderately stable.	Being located at the ridge over the Siwalik with somewhat steep escarpment and remarkable scars of small landslides towards the East-West Highway, the tower foundation is prone to the soil erosion and consequent slope failure.	Recommended to apply stone masonry or gabion wall protection at all the sides along with the applicable plantation and jute netting (Bioengineering) to protect the tower foundation from soil erosion and slope failure.
11	**Z629 to Z631 (Suspension Towers)**	Lower Siwalik	Binai Khola, a major tributary of the Narayani River Basin.	Stable to Moderately stable.	Being located at the ridge over the Siwalik with somewhat steep escarpment and remarkable scars of small landslides towards the East-West Highway, the tower foundation is prone to the soil erosion and consequent slope failure.	Recommended to apply stone masonry or gabion wall protection at all the sides along with the applicable plantation and jute netting (Bioengineering) to protect the tower foundation from soil erosion and slope failure.
12	**J46**	Lower Siwalik	Binai Khola, a major tributary of the Narayani River Basin.	Moderately stable.	Being located at the ridge over the Siwalik with somewhat steep escarpment and remarkable scars of small landslides towards the East-West Highway, the tower foundation is prone to the soil erosion and consequent slope failure.	Recommended to apply stone masonry or gabion wall protection at all the sides along with the applicable plantation and jute netting (Bioengineering) to protect the tower foundation from soil erosion and slope failure.
13	**Z632 to Z645 (Suspension Towers)**	Lower Siwalik	Local streams joining the Binai Khola on its way towards the Narayani River Basin.	Stable to Moderately stable.	Being located at the ridge over the Siwalik with somewhat steep escarpment and remarkable scars of small landslides towards the East-West Highway, the tower foundation is prone to the soil erosion and consequent slope failure.	Recommended to apply stone masonry or gabion wall protection at all the sides along with the applicable plantation and jute netting (Bioengineering) to protect the tower foundation from soil erosion and slope failure.
14	**J48-2**	Middle Terai	Local streams joining the Potana Nala on its way towards the Narayani River Basin.	Stable, but requires protection.	The tower foundation is located at a cultivated land, a paddy field in a swampy and marshy land. The place may be inundated during monsoon and hence may suffer from differential settlement.	Friction piling and combined mat foundation with little increment in the tower height is recommended to avoid the problem against inundation.

3.2.1.2 Biological Environment

Forest and vegetation

Of the total ~~–~~affected land use 193 ha is forest area. A total of 16257 trees (including the pole sized) from 2 districts~~, (~~, (679 from Chitwan district and 15578 from Nawalparasi district) will be felled down due to implementation of the project. This includes ~~9644~~10112 tre~~es~~s are from government managed forest and~~,~~ ~~5794~~ 6155 numbers from 2~~2~~4 ~~c~~Community/Religious ~~f~~Forests ~~and 819 from 2 religious forests~~ (including 819 from two religious forests: Lohase Dhara and Daune Devi). Among the affected trees, Sal is the highly affected species contributing more than 75% of the total loss.

Though the loss of trees is high in terms of numbers and species count (protected and otherwise), from the floral diversity perspective the loss is only of low to moderate magnitude because of the prevalence of the species in the adjoining forests and throughout the Terai forest areas of Nepal.

Workforce exploitation of the forest resources, timber, fuelwood and NTFP, is an issue of concern during construction phase. Since the construction at any one place is limited to less than one month and the number of workforce at one location is small, expected impacts are considered to be of low magnitude only.

The operation phase impacts are mainly associated with RoW~~–~~ encraochment for settlment by landless people and possibilities of invasion by new species such as weeds with implications on the existing floral diveristy. This could potentially be a significant impact if not addressed in time by the project developers.

Wildlife

Transmission line construction will involve the felling of trees and poles in 193 ha forest land from the RoW, with the conversion of this area to low growing trees (less than 3 m height), shrub land and grassland. The removal of vegetation though has limited fragmentation of the core forest habitat, nevertheless, will reduce the habitat area available to mammals and birds. The loss of tall trees will adversely impact monkeys and Langurs as they prefer continuous forest canopy for easy movement. On the other hand, clearance of the forest also provides new niche area for a number of prey species. A number of mature trees will be cleared from the ROW, since such mature trees are abundant in the adjacent RoW area the impact on dependent birds will not have to bear the pressure of forest clearance.

All mammals identified in the project area are mobile, and have a natural range far greater than RoW area. Furthermore none of the sites are identified as core region for the wild fauna along the route. Considering the location of the forest habitat that the transmission line will cross and the

limited extent of RoW clearance, the magnitude of the impact on wildlife caused by habitat loss is considered low.

Impacts related to construction noise, hunting and poaching by labour force, are also considered to be of –low magnitude because of the limited and low noise construction activities at tower foundation sites, small number of the construction workforce at any one location during construction.

In the operation phase, the envisaged impacts are related to the migratory birds in Chitwan area. Though records of bird hits in Nepal are not available, the impacts of birds collision could not be ruled out.

The change in habitat due to forest clearance at R~~O~~oW will have minimum impact to a majority of mammals during operation phase.~~,~~ ~~n~~Nevertheless, the mortality and morbidity affects of the charged transmission line is ~~highly~~ likely to arboreal mammals such as monkeys and Langurs passing across the transmission line corridors.

3.2.1.3 Socioeconomic Environment

Employment to 250 people, increase in local skill and economic opportunity, expansion of rural electrification and increase in national revenue are the main positive impacts of the project. The implementation of the project will affect 108 households which consist 46 ~~from~~ due to tower locations~~s~~ and 62 ~~from~~ due to ~~the~~ structures fall~~s~~ing in RoW. The ~~household~~ survey of 105 households (which consists 43 ~~from~~ due to tower locations and 62 ~~from~~ due to structures fall~~s~~ing in RoW) was conducted for the social study of the project. The remaining 3 households affected by tower pads were missing during survey period hence not covered in report.

Out of total 233 towers, 43 are located in private cultivated land. Due to the implementation of the project 0.673 ha private cultivated land will be acquired permanently for the construction of the towers.

Out of the total 43 affected households due to land acquisition, 39 households (90.70%) will loss less than 10% of their total land holding where~~-~~as 4 households (9.30%) will loss 10% to less than 25% of their total land holding. Of the affected households, female headed~~s~~ are 13.95% and male headed~~s~~ are 86.05% ~~households~~. The magnitude of impact due to land acquisition is considered low, extent is local and of long duration.

Construction of the project will involve removal of 62 houses and 41 cowsheds owned by 62 households. Of the affected households due to acquisition of structures 1 is highly marginalized, 3 are marginalized, 21 are disadvantage group, 26 are advanced group and –11 are Dalits. Of the total affected houses, 29 (46.77%) are Kachchi (~~T~~temporarily residential structures), 22 (35.48%) are semi-pakki and 11 (17.74%) houses are pakki (~~P~~permanent residential structures)**.** Of the affected houses, 37 houses are single floored, 25 houses are of double floored. The total area of the affected houses and cowsheds are 72,437 sq feet and 13,463 sq feet respectively. The average area covered

by houses and cow sheds are 1168 sq. ft and 328.37 sq. ft. respectively. In addition, the project will also acquire 30 nos. of toilets covering an area of 971 sq.ft. and, 15 kitchens having an area of 2406 sq.ft.

Altogether, 102 trees (including 30 fruit trees, 64 fodder trees, and 8 timber size trees) owned by 37 households will be lost due to the implementation of the project.

The implementation of the project will also affect football ground, resting place (Chautari) and Senchen Chhyoling Gumba located at Shiva Mandir VDC ward no 8 (Z-541 to Z-542) and Basundhara Devi Mandir located at Mukundapur VDC ward no 5 (Z-441 to Z-442) of Nawalparasi district. Similarly, a resting place located at Amarapuri VDC ward no 3 (Z-495 to Z-496) and two private temples located at Dhaubadi VDC ward no 7 also falls in the Row.

The other socioeconomic impacts of the project are health and sanitation, law and order, impact on livelihood, market growth centers/urbanization, land fragmentation, reduction in agriculture production, withdrawal of economic opportunity and electricity hazard & electromagnetic effects.

3.3 Mitigation measures

The following mitigation measures are proposed to minimize the likely impacts of the proposed project on physical, biological and socioeconomic and cultural environment of the area.

3.3.1 Enhancement Measures and Social Support program

- Priority will be given to employ local people in construction and other project activities as per their skill and qualification. Hiring preference will be given as per the degree of impact
- The project will provide small scale assistance for ~~H~~health post support program, school support program, small scale drinking water and irrigation assistance and assistance for the renovation and development of religious and recreational places. In addition, capacity

building program for local institution (VDCs, NGOs, CBOs and clubs) working in community will also be conducted.

- The field survey shows that almost all VDCs affected by the project are partially electrified with remaining few wards. The project will provide necessary fund to concern district offices of Distribution and Consumer Services to expedite the electrification program in the affected VDCs.

3.3.2 Mitigation Measures

Physical Environment

- Revegetation and slope maintenance will be carried out in the disturbed areas to avoid erosion and land degradation. The waste generated from the mixing concrete will be disposed in pits and filled with soil away from the water bodies.
- Implementation of water quality protection measures and awareness program.
- The temporary land occupied for project facilities such as storage area, temporary camp etc will be rehabilitated before handing over to the concerned land owner. The temporary yards will be fenced properly.
- Toilet facilities will be provided at work sites and camp.
- Extended tower footings with dry stone masonry or gabion wall for the protection of foundation are recommended. The detail of the mitigation measures proposed for the tower pads where protection is required is given in Table -1.

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Biological Environment

- The cost of harvesting, logging and transporting in community or national forest will be provided as per the district norms to the concerned agency following the provision made in Article 65 of Forest Regulations, 2051.
- Forest land will be acquired as per the Rules of Government of Nepal. The proponent will plant 279376 saplings @ of 1600 samplings/ha for the acquisition of ~~174.61~~193 ha forest land.
- The project will plant 25 saplings for the loss of one tree and manage the planted site for 5 years as per the provision made in Procedural Guideline for the Use of Forest Land 2063. Altogether 389450 saplings will be planted by the project for the loss of ~~15578~~16267 trees.
- Compensation will be provided to the owners of trees to be felled by the project in farmland.
- Wood and other forest products extracted as part of the site clearance from the Government managed forest will be utilized as per the Forestry Regulations while the products of community forest that arise from the site clearance activities will be handed over to the concerned CFUG.

- Alternative sources of fuel wood such as kerosene or LP gas will be provided.
- The project workers will be restrictedly banned for hunting and poaching and any other kind of illegal activities related to hunting and poaching. The construction work in forest area will be coordinated through DFO and Forest Users Group (FuGs). Informative and warning sign will be placed at each construction site.
- Implementation of forest and wildlife conservation awareness program at key localities of the project area.
- Herbicides will not be used for vegetation clearance.
- Training programs will be conducted for Non Timber Forest Products (NTFP) especially medicinal aromatic plants and other herbs and condiments and agro forestry to two members of each CFUGC. In order to increase the income level of the affected Community Forest Users Group 25000 saplings (1000-1200 saplings to each affected CFUGs) of non-timber forest species will be planted in the area.

Socioeconomic and Cultural Environment

- The private assets (land, structures, trees) acquired by the project will be compensated as per the rate fixed by the Compensation Determination Committee.
- The land required for temporary facilities will be leased by negotiation with the landowners. A land lease agreement will be signed with the landowners and payment will be given in advance for each calendar year.
- Agricultural assistance, livelihood assistance and livestock training and assistance will be implemented for the 10 project affected families losing above 10% of their total land.
- The structures acquired by the project will be compensated at replacement cost at the prevailing market rate. This will include compensation for land occupied by the structure and cost of the structure.
- A house rent allowances for 6 months, dislocation allowance and transportation allowance will be paid to the 53 households who will lose their house. In addition, the affected households (53) will also receive skill development training in the areas of plumbing, house wiring, driving and repair and maintenance of mechanical and electrical equipments.
- The project will compensate the loss of agricultural production in the RoW based on the actual loss.
- Weaving training and assistance to 11 vulnerable households ~~which~~ consisting 6 women headed and 5 Dalit households. In addition, gender and social equity training is also proposed to 19 women headed households.
- Mobile repair training and livestock training will be given to affected vulnerable households. In addition furniture training will be given to 4 vulnerable households.
- Football ground, resting place (Chautari), Senchen Chhyoling Gumba, Basundhara Devi Mandir and two private temples affected by the project will be relocated in consultation with local people.
- First aid kits will be maintained, for preliminary treatment in emergencies. For serious injuries especial arrangement will be made to send the injured person to nearest hospitals. Health check-

up of workers and documentation of health status will be made periodically.

- Social awareness program will be implemented in project area to aware the people about the proper use of money, nature of job, prevention against AIDS, project activity and its role in local economy etc.
- A training program on improved agricultural farming for 10 people will be conducted for the affected people, which will provide opportunities for increasing agricultural production in their farm lands.
- Toilets will be constructed in temporary camps at the rate of approximately 8 people in each toilet and drinking facilities will be installed prior to occupancy. Drinking water available for the camps will be tested and necessary treatment will be made to make safe drinking water. Three days health sanitation awareness training will be implemented for the project workers living in camps in coordination with local NGOs.

CHAPTER-4: ENVIRONMENT MANAGEMENT ACTIVITIES AND ORGANIZATIONAL SETUP

This environmental management plan has two components; the environmental management activities and the activities implementing organ.

4.1 Environmental Management Actions

The environmental management activity is a synthesized plan incorporating the elements of environmental mitigation and enhancement measures. The environmental mitigation and enhancement measures are bundled in a series of activities in the project life cycle.

The environmental management actions for the project is broadly described in the following headings; Permits and Approval Plan; Resettlement and Rehabilitation Plan; Terrestrial Ecology Management Plan, Erosion Abatement and Muck/spoil Management Plan, Public Health and Occupational Safety Management Plan, Grievance Redress Plan and Public Disclosure Plan. The elements stipulated in the above plans go hand in hand throughout the project life cycle.

4.1.1 Permits and Approval Plan

The objective of permits and approvals is to comply with the government legislative mechanism and to keep cordial relationships with the project stakeholders. There are a number of legislative provisions which require prior permits and approvals from the concerned government agencies to commence the work. As per Environmental Protection Rules, 1997 the project proponent will have prime responsibility for the implementation of EMAP. The EPA and EPR made provisions for the compliance of EIA report. The implementation of EMAP will be guided by GON policies and legal framework and World Bank Environment and Social Safeguard Policies. Land Acquisition Act, 1977 regulates the land acquisition and compensation determination process. Likewise, Forest Act and Regulation, 1993 regulates forest clearance required for the project. There are other Acts, Rules and Policies which directly or indirectly regulate the environmental activities of the project.

Besides, some activities would require general consensus of the project area communities or individuals for smooth operation of certain activities of construction and operation without hindrance. In these cases, project management should take prior permits and approvals or consensus of the people or individuals before the start of the activities. The project should ensure that all the permits and approval or consensus of the general public is taken before the start of the activities. The permits and approval or consensus required for the project are presented in Table 4.1.

Table 4.1: Permits and Approval Plan

SN	Required Permits and Approval	Agency from where permits and approval or consensus required	Implementation Time in project lifecycle	Responsibility
1	Tree clearing from community forest	District Forest office and Ministry of Forests and Soil Conservation	Pre-construction	Project/NEA
2	Permanent land acquisition	Land owners	Pre-construction	Project/NEA
3	Land lease agreement for temporary facilities	Land owners	Pre-construction	Project/Contractor/ LA-RU
4	Entry to private land and property , if required	Land owners	Construction	Contractor

LA RU: Land Acquisition and Rehabilitation– Unit

4.1.2 Resettlement and Rehabilitation Plan

The objective of this plan is to ensure that the effects of acquiring land and property and its impact on the livelihood of the affected parties and individuals are addressed adequately and in time prior to the start of the project construction in an amicable and conducive environment with mutual consensus and agreement. Any grievances of the affected parties will be handled to the satisfaction of the affected parties or individuals through proper information sharing. The main elements of the Resettlement and Rehabilitation Plan are presented in Table 4.2.

Table 4.2: Resettlement and Rehabilitation Plan

SN	Actions	Timing of Action	Responsibility
1	Identification of the household or parties traditionally using land without land certificates in case of acquisition /lease of such land	Pre-construction	Project/ LA RU
2	Verify and publish the list of land owners affected by the project	Pre-construction	Project/CDC
3	Meeting of CDC to discuss on the land acquisition and compensation issues	Pre-construction	Project/CDC
4	Compensation Determination Committee decides the rates of land to be acquired	Pre-construction	Project/CDC
5	Payment of compensation to PAFs	Pre-construction	Project/ LARU
6	Implementation of resettlement and rehabilitation (R& R) packages as per the approved EIA, SIA, RAP and VCDP documents.	Pre-construction and construction (initial phase)	Project/ LARU/ESSD
7	Evacuation of the owners from the structures affected by the project.	Pre-construction (At least 2 months will be given to the affected parties to remove their belongings if any)	Project/ LARU
8	Handling of grievances of the affected parties and individuals (formalities of Grievance Redress Mechanism)	Pre-construction and construction	Project/ LA RU

9	Monitoring of the implementation of R&R	Pre-construction and construction	EMU / Central Line Agencies/ Panel of Expert

Abbreviation: *LCF: Local Consultative Forum*
EMU- Environmental Monitoring Unit

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4.1.3 Pollution Abatement Plan

The objective of the pollution abatement plan is to avoid or minimize the pollution streams (liquid, and solid) from the project activities during pre-construction, construction and operation periods of the project. Table 4.3 highlights the key features of the pollution abatement plan.

Table 4.3: Pollution Abatement Plan

SN	Activities	Timing of Actions	Location	Responsibilities
1	The occupational workers at the construction sites, engineers and supervisors will be provided with PPE (air masks, helmets and safety goggles, shoes as per the standard guideline)	Pre-construction, Construction period	All construction sites	Contractor
2	Provisioning of adequate toilet facilities will be made in the camps and active construction sites. The toilet waste of the camps will be managed adequately.	Pre-construction, Construction period	All camps and active construction sites	Contractor
3	Open defecation will be prohibited in and around the construction sites, camp sites. Hoarding sign boards will be placed in the construction camps, and active construction sites.	Pre-construction, Construction period	In areas surrounding the construction sites	Contractor/ESSD

SN	Activities	Timing of Actions	Location	Responsibilities
4	Garbage containers of adequate size will be placed at critical places in the construction related camps and construction sites. The collected garbage will be disposed safely.	Pre-construction, Construction /operation	All camps and active construction sites/Operation camp	Contractor /Operation Manager
5	Stockpiling and storage of the construction materials in designated sites only away from the water paths. Prohibition on the stockpiling of construction materials in other areas.	Pre-construction, Construction period	All camps and active construction sites	Contractor
6	Additional muck will be disposed in nearby areas with minimum impacts.	Construction period	All camps and active construction sites	Contractor
7	Monitoring of the above activities activities	Construction /Operation	All above sites	EMU/ Operation Manager

4.1.4 Terrestrial Ecology Management Plan

The objective of terrestrial ecology management plan is to ensure that the terrestrial resources such as forests/vegetation, and wildlife of the project site and surroundings are not impacted and conserved to the extent possible by the project construction and operation activities. The activities of the terrestrial ecology management plan are presented in Table 4.4.

Table 4.4: Terrestrial Ecology Management Plan

SN	Activities	Timing of Actions	Location	Responsibilities
1	Preference to the local for project employment as mentioned in mitigation section	Preconstruction, construction and operation	All project works	Project Management/contractor /Operation Manager
2	Provision of kerosene to the outside workforce for cooking	Preconstruction, construction	Construction workers of all project sites	Contractor
3	Provision for camp lodging to the outside workforce with a common LPG cooking facility	Preconstruction, construction	All outside construction workers	Contractor
4	Prohibition on the sale and purchase of the local NTFP in the camps	Preconstruction, construction and operation	All project locations	Contractor /Operation Manager
5	Prohibition in roaming in the local forest area by the outside workforce	Preconstruction, construction and operation	Surrounding areas of project site	Contractor
6	Leasing of 193 ha forest land falling in RoW • Signing of the lease agreement to Department of Forest and payment of leased amount. • Plantation of 2,79,—376 saplings @ 1600/ha of leased land • Pay the required cost for the plantation and five years	Preconstruction/construction /operation Construction/Operation	Kathmandu Project area or the designed site(s)Project	Project Management/ Operation Manager Project Management

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SN	Activities	Timing of Actions	Location	Responsibilities
	management to the Department of Forest/ESSD to implement the compensatory plantation program	Construction/Operation	area or the designed site(s)	Project Management
7	Compensatory afforestation as per the Procedural Guideline for the Use of Forest Land (2063 BS) • Plantation of 3,89,450 samplings for the loss of 15,578 trees @ of 25 saplings for loss of one tree. • Pay the required cost for the plantation and five years management to the Department of Forest/ESSD to implement the compensatory plantation program • Assist the District Forest office/ESSD to explore the area of plantation • Mobilize the Community Forest Users Group for implementation of program in coordination with district Forest Office	Construction and Operation	Areas as designated by the District Forest Office	Project Management
8	Clearing of the forest vegetation and stockpiling the vegetation products before handover:	Construction	All permanently occupied forest areas	Contractor/EMU
9	Implementation of training, NTFP and other forest related programs	Construction	Project affected community forest	ESSD

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SN	Activities	Timing of Actions	Location	Responsibilities
10	Hoarding boards will be placed at critical location on the preventive actions to control the forest fire	Construction	Surrounding areas of the project site	ESSD
11	Public awareness programs will be launched to prevent the forest fires in the local area	Construction	Surrounding areas of the project site	ESSD
12	Compliance and impact monitoring of the related activities	Construction/ operation	All sites as designated	Environmental Monitoring Unit

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Potential Plantation Area

Field survey was conducted to explore the possible site for plantation, suitable nursery area and views of the Community Forest Users Group regarding the compensatory plantation and their preferred species for plantation. Considering 1600 ~~ha~~ saplings plantation pet ha altogether 418 ha area is required to conduct compensatory plantation work. The study shows that single and large area for plantation is not available in/around the project site. Altogether 14 potential sites having an area of 422 ha are identified in consultation with the affected Community Forest Users Group. The available sites are mostly 30-40 ha belonging to both community and government land. Out of 2~~2~~4 community/religious forests, 10 are comparatively more affected. The consultation with 12 community forests and 2 religious forests reveals that most of the community forests have available land for plantation in patches.

Table- 4.5: Compensatory Plantation Site in Project Area

S.N.	Community	Plantation site	Physical	Type of	Management	Remarks

	forest	Name	Location	Distance from road	Approximate area (in Hectare)	condition	land	issues	
1	Jwalamai Community Forest	Refugee settlement	Land encroached by refugee	0 Km	10	Encroached land	Community forest	Land is currently used for livestock grazing	Consultation with community is required
		Flood plain of Narayani	River bank in Devghat	0 Km	30	Grassland along ~~side~~ the river side	Government land	Open land, livestock grazing	Fencing needed
2	Ghumaure Community Forest	Thulo Ghumaure	Along the river bank (proposed picnic spot)	0.2 Km	25	Grassland	Community forest	Grazing problem	Wire fencing referred
3	Namuna Maheela Community Forest	Sano Ghumaure, Chiple	Western boarder of CF	1 Km	20	Shrub land	Community forest	Weed management	
4	Ekata Community Forest	Baulaha River bank	South eastern side of CF	0.2 Km	40	Barren land	Community forest	Grazing problem	Good perception of people
5	Sundari Community Forest				0				Alternative livelihood options
6	Dhuseri Community Forest				0				
7	Amar Community Forest	Aap raha Kholso, Goththari pakho	Along the intermittent rivulet	1 Km	40	Sloppy land, landslide prone area	Community forest	Slope instability,	Access problem
8	Shankhadev Hasaura Community Forest				0				Alternative Livelihood options
9	Maula Kalika Community Forest	Lete Tadi	N27^{0}44.090’ E084^{0}25.334’	0 Km	16	Grassland within forest	Community forest		Perennial water source at 500m
10	Nandan Community Forest	Dhapaha	N27^{0}42.464’ E084^{0}21.319’	1.5 Km	14	Open land within forest	Community forest	Grazing problem	
		Tharal Tandi	N27^{0}42.913’ E084^{0}22.453’	0 Km	45	Grassland	Community forest	Grazing problem	
		Narayani river bank	On the river bank of Narayani	0 Km	50	River bank	Public land	Grazing and human intrusion	Could potentially save riverbank cutting
11	Lotse Dhara Religious Forest		N27^{0}37.687’ E084^{0}00.124’	0 Km	25	Open space in the roadside	Community forest	Grazing	Fencing is required
12	Dawanne Devi Religious Forest	Along the road side	landslide prone areas along highway	0 Km	30	Sloppy land	Community forest	Grazing and landslide	Help to prevent landslide

13	Gheu Khola Community Forest	Kumal Tar	N27^{0}35.276' E083^{0}51.038'	1 Km	35	Grassland	Community forest	Grazing problem	Some other patches of areas available
14	Arun Khola CF	Ghasbari	N27^{0}37.084' E083^{0}56.995'	0 Km	42	Grassland	Community forest	Grazing problem	Fencing exist
	Total				**422**				

Potential Sites for Nursery

For growing such a large number of seedlings (836000 considering 25% mortality in nursery), nursery of suitable size and in suitable number needs to be established. Large area with gentle slope and easy water supply is preferred for nursery establishment. The nurseries should be established in such areas so that the transportation of seedlings to the plantation can be transported with minimum effort and cost.

In the project area some of the sites were identified with the potential for nursery establishment.

Table -4.6: Potential Nursery Site and Coverage Area

Site	Community forest	Location	Road accessibility	Water resource	Land area	Potential coverage	Remarks
Tharal Tandi	Nandan CF	N27^{0}42.913' E084^{0}22.453'	Less than 100 meters from highway	Have to pump from stream running nearby, could be brought from distance in pipeline	4.5 ha	Maula ~~k~~Kalika CF, Nandan CF, Sundari CF, Jwalamai CF	
Thulo Ghumaure	Ghumaure CF	Along the river bank (proposed picnic spot)	Poor gravel road exists 200 m from the site, 4 Km from the highway	Perennial rivulet running from the site	2 ha	Ghumaure CF, Namuna Maheela, Ekata CF, Amar CF, Dhuseri CF	Locals are willing to establish, potential to sustain for long term

Gheu Khola	Gheu Khola CF	N27^{0}34.811' E083^{0}51.662'	Gravel road available to site, 200 m from highway	Perennial water from Gheu ~~k~~Khola available	3 ha	Lotsedhara CF, Dwanne CF, Ghewkhola CF, Arun Khola CF	Grassland just below the 132 kV T/L
Lotse dhara School compound	Lotse Dhara Religious Forest	West of Lohaseshwor Mahadev temple, within school compound	1.5 Km North of highway, gravel road available	Perennial spring source of water	2 ha	Lotsedhara CF, Dwanne CF, Ghewkhola CF, Arun Khola CF	Alternative to ~~Gheukhola~~Gheu Khola Nursery site
Kawaswoti Ilaka Forest office		Kawaswoti	Highway passes through	Tube well water	1 ha	Most of the CF of forest office working CF	Nursery was established at this site earlier therefore good infrastructure is available
Salbaas	Tilakpur	1 Km North of highway in Bhutaha	Road available	Roar pump/ tube well	5 ha	For the national level nursery preparation	For large scale nursery establishment,

Preferred Plant Species

The common findings from the discussion series with the CFUG functionaries is that high value/income generating plants are preferred. Besides, the erosion/landslides controlling species are also preferred by some CFs in the landslide/erosion prone areas. Majority of the preferred species include fodder, fuel wood and cash crop species. User groups express the importance of the maximum utilization of the RoW by planting species like *Asparagus racemosus, Musa sapientum, Curcuma domestica, Zingiber officinale, Thysanolanea maxima, Eulaliposis binata, Eulaliposis binata* so that they could use the land that could not be productive otherwise.

Arunddinaria falcate, A. Hookeriana, Dendrocalamus hamiltonii, Dendrocalamus strictus are the preferred species for slope stability and erosion control. Some of the preferred plants species by the CFUGs are shown in Table 4.7.

Table 4.7: Preferred Plant Species by the CFUGs

S.N.	Local name	Scientific name	Habit	Remarks
1	Aduwa	*Zingiber officinale*	Herb	Cash crop

2	Alaichi	*Amamum subulatum*	Herb	Medicinal, cash crops
3	Amala	*Phyllanthus emblica*	Tree	Fruits, fuel wood
4	Amriso	*Thysanolanea maxima*	Herb	Fodder and cash crop
5	Asana	*Terminalia alata*	Tree	Fuel wood
6	Babiyo	*Eulaliposis binata*	Herb	Construction
7	Badahar	*Artocarpus lakoocha*	Tree	Fodder, timber
8	Bakaino	*Melia azedarach*	Tree	Fodder species
9	Bamboo	*Dendrocalamus strictus*	Herb	Construction
10	Banana	*Musa sapientum*	Herb	Cash crop
11	Barro	*Terminalia bellirica*	Tree	Fuel wood, timber
12	Besar	*Curcuma domestica*	Herb	Cash crop
13	Chiraito	*Swertia angustifolia*	Shrub	Medicinal use
14	Chiuri	*Bassica butyracea*	Shrub	Fodder, fuel wood
15	Choya Bans	*Dendrocalamus hamiltonii*	Herb	Decorative crafting
16	Dabdabe	*Garuga pinnata*	Tree	Fodder species
17	Dalchini	*Cinnamonum zeylanicum*	Tree	Medicinal
18	Gheu kumara	*Aloe vera*	Herb	Medicinal
19	Harro	*Terminalia chebula*	Tree	Medicinal, fuel wood
20	Ipil-ipil	*Leucaena leucocephala*	Tree	Fodder, fuel wood
21	Kadam	*Anthocephalus chinensis*	Tree	Edible
22	Kavro	*Ficus lacor*	Tree	Fodder, fuel wood
23	Khair	*Acacia catechu*	Tree	Timber, fuel wood
24	Khaniyo	*Ficus semicordata*	Tree	Timber, fodder
25	Khasru	*Quercus semecarpifolia*	Tree	fodder and fuel wood
26	Kurilo	*Asparagus racemosus*	Herb	Medicinal value
27	Lemon grass	*Cymbopogon martini, C. Flexuosus*	Herb	Aromatic, cash crop
28	Masala	*Eucalyptus camadulensis*	Tree	Timber
29	Mentha	*Mentha arvensis*	Herb	Aromatic, cash crop
30	Neem	*Azadirachta indica*	Tree	Medicinal, fodder, fuel wood
31	Nigalo	*Arunddinaria falcate, A. hookeriana*	Herb	Decorative crafting

32	Sajiban	*Jatropha curacas*	Shrub	Cash crop
33	Simal	*Bombax ceiba*	Tree	Local species of Simal preferred
34	Siris	*Albizia libbek*	Tree	Timber
35	Sisso	*Dalbergia sisso*	Tree	Timber, fuel wood
36	Strawberry	*Fragaria ananassa*	Herb	Cash crop
37	Teak	*Tectona grandis*	Tree	Fuel wood, timber
38	Tejpath	*Cinnamonum tamala*	Tree	Medicinal

4.1.5 Public Health and Occupational Safety Management Plan

The project development sites are areas of high human concentration. Apart from this, people from different places and with different diseases come in the area as project workers or economic opportunity seekers. They may also act as carriers of the transmission of diseases alien to the existing population. ~~Table 4.8 highlight~~Table 4.8 highlights the key features of the Plan.

Table- 4.8: Public Health and Occupational Safety Management Plan

SN	Activities	Timing of Actions	Location	Responsibilities
1	Construction plan for construction camps (contractor, labor force, mechanical yards, long term storage facilities etc)	Pre-construction	Project camps	Contractor
2	Provision of First aid facilities	Construction	All active construction sites and residential and non residential camps	Contractor

SN	Activities	Timing of Actions	Location	Responsibilities
			and yards	
3	Water supply facility without hampering water supply of local villagers	Construction	All project camps	Contractor
4	Fencing of the construction sites and restriction on entry to the outsiders others than authorized person	Construction	Tower pad site located close to settlement, Storage area and camps	Contractor
5	Appropriate danger signs in all active construction sites work areas as to the degree of risk in the site	Construction	The construction site located close to settlement	Contractor
6	Provision of Personal Protective Equipments (such as boots, gloves, masks, ear plugs, helmets, safety goggles etc) to the construction workers as to the requirement and risk of the working area and implement the use effectively	Construction	All construction workers	Contractor
7	Provision of stabilizing equipments and facilities to the injured before he could be moved to the nearest hospital.	Construction	Sickbays	Contractor

SN	Activities	Timing of Actions	Location	Responsibilities
8	Provision of medical stock particularly for water borne diseases to tackle the epidemic in the camp or in the villages surrounding the project site	Construction	Sickbays	Contractor
9	Monitoring or compliance and impact related to the above mentioned	Pre-construction	Areas as designated	Environmental Monitoring Unit
10	Insurance of workers	Pre-construction	All workers	Contractor

4.1.6 Grievance Redress Plan

Grievance redress mechanism will be established to allow project affected persons/households (PAPs/Hhs), community or other stakeholder to appeal any disagreeable decisions, practices and activities arising from compensation for land and assets, environmental and community concerns related to project. The PAPs/Hhs/community will be made fully aware of their rights and the procedures.

There is the potentiality for three types of grievances: grievances related to land acquisition, compensation and rehabilitation, community issues and environmental problems. The PAPs/HHs will have access to both locally constructed grievances redress committee, i.e., local consultative forum, and Ministry of Home Affairs. With regard to the compensation made for the land acquired for tower pads, every PAP/Hhs can appeal to the Ministry of Home Affair if they feel that they are not compensated appropriately. They may appeal to the Ministry of Home Affair within 35 days of the public notice given to them. For other community and environmental issues they can appeal to the court or Ministry of Environment.

Special project grievance mechanisms such as on site provision of complain hearings allows project affected persons/HHs and communities to interface and get fair treatment on time. The project authority will ensure that funds are delivered on time to CDC and the implementing partners for timely preparation and implementation of social activities, as applicable. The compensation issues and rehabilitation measures for the private land affected due to tower pads will be completed before civil work starts.

The Land Acquisition and Rehabilitation Unit (LARU) will establish a compliant desk to be manned by administrative officer assisted by support staff. All complaints/concerns shall be received at this desk and resolved immediately by chief of LARU, if minor ones involving procedural/policies and guidelines only. Likewise, the Project Manager Office (PMO) shall refer to the concerned office/group for all other issues, which cannot be resolved at the complain desk.

The following procedure will be observed in the settlement of conflicts/concerns:

- PAF, local people or community can lodge their complaints to LARU. The section chief, through its staffs, verifies the issues and give their decision within 7 days of compliant register in the office. If the issue is settled the process ends.
- If the party is not satisfied with the decision of LARU, the issues will be forwarded to PMO. The PMO verify the issues and discus with the representative of the complaining community/individual and Environment and Social Monitoring Unit to resolve the issue. The PMO will provide their decision within 10 days of complain received in his/her office. The PMO may consult legal advisor or NEA, Central Office, if required. If the issue is settled the process ends.
- If the issue is not solved to the satisfaction, the concern will be forwarded to LCF from PMO. The LCF will visit the site, verify the issues and call meeting to solve the problem. The LCF will provide its decision on the concerned issues within 15 days of complain received. If the issue is related to compensation rates the PMO will discuss the concerns with CDC along with recommendation of LCF. The CDC will review the grievances and provide decision within 7 days. If the issue is settled the process ends.

If the concern remains unresolved, and community/individual is still not satisfied, this is elevated to the Ministry of Home Affairs in case of Compensation. The PMO shall resolve the issues in coordination with the Ministry of Energy. For the other issues related to environmental and social aspects of the project the affected parties may put application to Ministry of Environment or Ministry of Energy showing the problems. The ministry will take necessary action to resolve the issue.

4.1.7 Public Disclosure Plan

The EIA report prepared for the project was disclosed for public review at District dDevelopment Committee Office of the project districts, Central Library of Tribhuvan University and Nepal Electricity Authority Central Office. Likewise, the Resettlement Action Plan, Vulnerable Community Development Plan prepared for the project is disclosed on NEA website.

The quarterly environmental monitoring report and progress report to be prepared by Environment Monitoring Unit, LARU, and ESSD will be disclosed to local people through site based Environment Monitoring Unit. Besides this, regular meeting will be conducted with district level line agencies and local communities at project site to brief them about status of project, ongoing environmental and social activities and problems arises during the implementation. The information

collected at the community level will be passed to the concerned PMO staff to take needed action for effective management of project environmental and social issues.

4.2 Implementation Approach and Mechanism

4.2.1 Project Stakeholders for Environmental Management

Key stakeholders ~~including Bharatpur~~including Bharatpur- Bardghat 220 kV T/L Project to be involved for project environmental management are:

- Ministry of Forest and Soil Conservation (MoFSC);
- Ministry of Energy (MoEN);
- Ministry of Environment (MoE);
- Department of Forest;
- Project proponent, Nepal Electricity Authority;
- Environment and Social Studies Department, NEA;
- Environment and Social Monitoring Unit;
- Land Acquisition and Rehabilitation Unit
- Local Consultative Forum;
- Contractor; and;
- Local level Government and non-government organizations such as District Development Committee, (DDC), District Forest Office (DFO), Village Development Committee (VDC), NGOs and Community based Organizations (CBOs).

4.2.2 Institutional Arrangement and Responsibility

4.2.2.1 Central Level Arrangement

i) Environment and Social Studies Department

ESSD is one of the three departments of Engineering Services Business Group of NEA and executes all the activities related to identifying, conducting and coordinating environmental aspects of project developed by NEA in all stages such as studies, design, construction and operation. This department will be responsible for the overall control of social management

program of the project. This department will also be responsible for the coordination of work of the project at central level management of NEA and central line agencies. It is proposed that ESSD will implement monitoring program and some of the social mitigation work in coordination with concerned line agencies and local NGOs. The mitigation and social support program will be implemented by mobilizing local NGOs, Consulting firm Contractor and line agencies. The Program Coordinator office will be responsible for overall coordination and implementation of the environmental and social mitigation programs. The Program Coordinator will be assisted by environmental and social expert at central and local level.

ii) Central Level Line Agencies

The central level line agencies such as Ministry of Energy and~~,~~ Department of Electricity Development have responsibility for the monitoring of project activities with regards to Environmental and Social Management, Mitigation and Monitoring Plan. ESSD will coordinate with central level line agencies regarding the monitoring work.

As the concerned line agency, Department of Forest is responsible for the implementation of afforestation program as per the Procedural Guideline for the Use of Forest Land 2063. Discussion is ongoing between the Project/NEA and Department of Forest regarding the implementation of the compensatory forestation program in transmission line projects. NEA will pay the required cost for plantation and five years management to Department of Forest and ~~the Department~~the ~~D~~department will implement the work through their district level forest offices. ESSD may also implement the afforestation program if requested by the project.

4.2.2.2 Project Level Arrangement

i) Project Manager

The BBTL Project Manager Office will be established under the organizational setup of NEA. The Project Manager will have overall responsibility regarding the implementation of EMAP including others. He will be also responsible for acquiring necessary permits for forest clearance from Ministry of Forest and Soil Conservation, land acquisition and compensation etc. The Project Manager will be responsible to make sure the allocation of necessary budget for the implementation of EMAP.

He will be responsible for establishment of Compensation Determination Committee (CDC), Local Consultative Forum (LCF) and Environment ~~and~~ & Social Monitoring Unit. He will be responsible for the overall coordination of the work and make final decision on environmental, social and public concern issues.

Under the Project Manager Office, a Land Acquisition and Rehabilitation Unit (LARU) will be established. The in-charge of unit will be responsible for the acquisition of land and house, asset valuation and verification, implementation of compensation and rehabilitation grant (house rent, transportation and dislocation allowances) and coordination of the work with District and Central level agencies with regard to acquisition of private property. The officer in-charge of the unit will also work as member of secretary of the CDC and member of LCF-.

ii) Bharatpur- Bardghat Environment and Social Monitoring Unit (HBTL-ESMU)

HBTL Environment and Social Monitoring Unit will be established at site for day-to-day environmental and social monitoring of the project and coordination of work with VDCs, DDCs and district level line agencies. The unit will have site office along with staffs for day to day monitoring of the social and environmental impacts. The unit will implement environmental and social monitoring works directly through mobilizing of its site based staff.

iii) Compensation Determination Committee

A Compensation Determination Committee (CDC) will be formed to fix compensation for loss of land and private property. The CDC will comprise of Chief District Officer, District Land Revenue Officer, DDC Representative, BBTL Project Representative and PAP/HH Representative. The main functions of the CDC will be confirmation of entitled process, assessment/Identification of PAP/HHs, compensation determination for land and private property and grievance resolution.

iv) Local Consultative Forums (LCF)

Local Consultative Forums (LCFs) will be established to address the social issues associated with the project. The objectives of this LCFs will be to: (a) ensure ongoing dissemination of project information to affected households, (b) structure, regulate and strengthen communication between affected households/communities, (c) involve affected households/communities and local government structures in social impact management, grievance resolution and monitoring.

v) Construction Contractor

The construction contractor will be responsible for implementation of some of the social mitigation measures specified in his part and compliance with the tender clauses. He will be responsible for implementation of construction related mitigation measures such as occupational safety, recruitment of local labor, health and sanitation measures etc.

vi) District Level Line Agencies

The district level line agencies such as District Administrative Office, Land Revenue Office, District Development Committee Office, Agriculture Office, Forest Office and Education Office will be consulted regarding the implementation of EMAP.

4.2.2.3 **Donor Agency**

Donor agency (s) will have specific responsible for the monitoring of compliance of loan agreement. The experts from donor agency will review the project plan and program, and make direct observation at site to make sure the implementation mechanism is going smoothly and public concerns are well considered.

4.3 Reporting

Bharatpur–Bardghat Environment Monitoring Unit will be responsible for the preparation of Environmental Management Reports whereas LARU and Program Coordinator office will prepare quarterly progress report regarding the implementation of mitigation and enhancement program. The Project Manager Office (PMO) will be responsible for the distribution of report to the concerned agencies. The EMU will prepare the following reports.

4.3.1 Construction Phase Environmental Report

The construction phase environmental and social management report will be prepared on quarterly basis and annual report will be prepared at the end of each calendar year. A final environmental and social management report will be prepared after the completion of the construction work. EMU will be responsible for the preparation of report.

The report will be distributed to Ministry of Environment, Ministry of Energy, Ministry of Forest and Soil Conservation, Department of Electricity Development and district level line agencies.

4.3.2 Operation and Maintenance Phase Environmental Report

Operation and maintenance phase environmental and social management report will be prepared for one year following the construction. EMU will prepare this report for project. The report will describe mitigation measures, problems and recommended solution. The report shall clearly identify where operational mitigation measures are not being met or where mitigation efforts are inadequate to protect natural and socioeconomic resources. Unanticipated deleterious impacts of the projects will be clearly identified. Measures to solve problem will be proposed and be funded under the project annual operating budget. The environmental audit report will be prepared by MoEN as per EPR 97.

4.4 Environmental Monitoring

4.4.1 Rational for Environmental Monitoring

Monitoring is an essential aspect of environmental and social management. It includes~~consist~~ collection of data to measure environmental changes associated with construction and operation of the project. Ministry of Energy is the responsible organization for the environmental and social monitoring of energy sector projects as per EPR 97. Likewise rule 12 of the ~~a~~Act defines that proponent shall comply with the matters mentioned in EIA report. Manuals and Guideline prepared by line ministries are available which define the monitoring mechanism. The Manual for preparing Environment Management Plan for Hydropower Projects (DoED 2002) and "A Guide to Environmental Monitoring of Hydropower Project" (MoEST 2006) was considered during the preparation of the monitoring plan.

4.4.2 Objectives of Monitoring

Environmental monitoring is required to ensure compliance of the mitigation and enhancement program, tender clauses related to environment and social issues and to assess the actual impacts of these measures as well as the emerging impacts during different phases of the project. The objectives of the monitoring will be as follows:

- to comprehend the environmental condition in the project area prior to implementation of the project;
- to ensure the compliance status of the implementation of mitigation measures and regulatory standards;
- to ensure the effective compliance of tender clauses as per contract document;
- to check the effectiveness of mitigation and enhancement measures implemented by different project parties; and
- to verify the accuracy of EIA predictions and assess the emerging and cumulative environmental problems.

4.4.3 Site Inspections

EMU will conduct site inspection prior to construction, during construction and at the end of construction. The inspection will be coordinated with Contractor (s).

Initial Inspection

The initial inspection conducted during pre construction will document the site condition just before start of construction work. Necessary standards for construction and required environmental control based on the available national and international practices will be established. Visual documentation of the site and photographs will be taken during the inspection.

Progress Inspection

The progress inspection during construction will document the compliance and impact monitoring at particular site. The purpose of inspection will be early identification of environmental and social problems and propose suitable remedial measures. The monitoring will be conducted daily, weekly and monthly basis for the parameters like vegetation clearance, spoil disposal, health & sanitation and safety. The contractor will be formally notified through letter of Project Manager for remedial action if any deficiency is noted during monitoring.

Final Inspection

The final inspection will be conducted at the end of construction phase to document the contractors compliance of tender clauses related to environment. The Contractor will be given written notice if cases of non- -compliance or partially compliance are found during inspection.

4.4.4 Monitoring Types

4.4.4.1 Pre-Construction Monitoring

Since there is some changes in transmission line alignment after check survey by the Contractor, baseline covering major parameters of physical, biological and socioeconomic parameters are updated. –The baseline update was conducted by walkover survey along the alignment by the concerned experts, consultation with the stakeholders and household survey of the PAFs.

Physical Environment

The proposed transmission line passes mainly through Siwalik and plains of Terai. Altogether 220.5 ha -land which consist ~~174.61~~193 ha forest land ~~40~~22.~~53~~14 ha cultivate land and 5.36 ha other land uses falls in 73.5 km alignment.

-The proposed 220kV Transmission Line ~~Project~~ starts from the *Chitawan Dun Valley* at Bharatpur Substation, ~~near~~ at Aanptari~~Ramnagar of~~ in Chitawan District. The transmission line crosses the Narayani River and passes mainly along the Bhabhar zone and along the foothill of the Siwalik throughout the region south-westerly across the Narayani River until it reaches Dumkibas area. Then, the transmission line runs over the Lower Siwalik before reaching Bardaghat Substation in the Middle Terai. The Lower Siwalik in this area is represented by finely laminated siltstone and fewer bands of mudstones and sandstones. The Chitawan Dun Valley includes Chitawan, Gaindakot and surrounding area up to Dumkibas of Nawalparasi. This Dun Valley was actually formed by the flood plain deposits of the Narayani River and its major tributaries like East Rapti, Arun Khola and Binai Khola.

Erosion and Sedimentation

The Sub-Himalaya (Siwaliks or the Churiya Hills) being the youngest mountain range in the Himalayan Region, it is highly fragile and prone to landslides and erosion. Deeply dissected gullies and steep escarpments exhibits abundant erosion scars all along the Churiya range. Thus, every year a vast amount of sediment is contributed to the rivers originating from the Siwaliks. The abundant rill erosion, gulley erosion and sheet erosion are prominent throughout the Siwalik range. The Narayani River and its major tributaries originating in the Siwaliks or beyond the Mahabharat Range is the best example of highly sediment laden river that encounters along the ~~400~~220 kV transmission line corridor. The Deusat Khola, the Keranga Khola, the Gadar Khola, the Gajara Khola, the Arun Khola, and the Binai Khola are the major tributaries of the Narayani River in this stretch. Several other tributaries joining to the major Kholas are equally important contributors of sediments in this zone.

It is obvious that the Terai region is main sediment deposition zone of the country. The eroded sediments from the Himalayan region are directly contributed to the Terai through the major rivers. The rivers originating mainly from the Mahabharat range and the Siwaliks contributes a vast amount sediments first to the Bhabhar Zone and then to the mainland Terai. Recent activities of sediment mining from the foot hill of Siwaliks along the Bhabhar Zone, the areas being extensively ~~desertifying~~decertifying. The excavation of sediments is also spreading highly in the mainland Terai throughout the country.

Though there is several erosion scars met along the transmission line route while crossing the Siwalik range between Dumkibas and Bardaghat area in Nawalparasi District, such places is already avoided during final alignment layout. In some cases, where the tower foundation was laid over such erosion scars, a small change was made in the angle points or short span towers has been arranged in the alignment to overcome the problem. Except this Siwalik range, there is almost constant topographic as well as geomorphic terrain throughout the TRL alignment. The crossings over the major rivers/Kholas have been properly managed, where the transmission line may encounter some marshy land and a wide zone of sedimentation. Special type of tower foundation, preferably mat foundation with friction piling, is required around the wide river crossings, e.g. across the Keranga Khola, the Gajara Khola, the Arun Khola, and the Binai Khola, etc. After crossing the Narayani River and its periphery, the alignment runs in gentle plain of the middle Terai where there is no major zone of sedimentation, except the around Arun Khola and the Binai Khola. The western embankment of the Narayani River is susceptible to the outburst during high flood.

Biological Environment

The transmission line alignment of Nawalparasi district is mostly characterized by the matured Sal forest. In this district, the alignment crosses both community and national forests. Sal *(Shorea robusta)* is the dominant forest type ~~through out~~throughout the alignment from the Bharatpur to Bardghat. The transmission line crosses 2~~2~~4 community forests of two districts. Out of this 10 are highly affected whereas other has minimum impacts with respect to forest loss. The number of community forest affected by the project in Nawalparasi district has ~~been~~ increased from 11 (EIA) to 2~~1~~4 ~~(present~~(present survey). The Nava Durga Community Forest, Baisekulo Community Forest ~~and Amarapuri~~and Amarapuri Community Forest identified to be affected by the project during EIA ~~will~~ will be not be affected in revised alignment survey.

Table 4.8: Name of Community Forest and Number of Trees to be Felled

S.No	District	Name of Community Forest	No of trees to be Felled
1	**Chitwan District**	Jaldevi	~~500~~600
		Ghumaure	169
2		Namuna Mahila	75
3		Janchetana	16
4		Sitaram	5
5		Deusat Khola	56
6		Ekta	62
7		Sundari	402
8		Shital	35
9		Dhaurahi	5
10		Chautari	110
11		Bartandi	33
12		Dhuseri	466
13		Amar	453
14		Sankdeo Hasaura	325
15		Maula Kali	462
16		Jaya Shree	212
17		Nandan	908
18		Mukund Sen	586
19		Bhendabari	31
20		Pahele Bhitta	67
21		Ghi~~w~~ua Khola	5~~0~~18
22	**Nawalparasi District**	Arun Khola	308
23		Lohasedhara	251
24		Daunnedevi Ahinsabadi	568
		Sub Total	**~~5794~~6155**

Besides the above mentioned community forests, major portion of the alignment passes through government managed forest and some section of the religious forest. ~~The~~ Lohase Dhara (151 numbers) and Daune Devi Aahinsabadi (668 numbers) are the\~~community~~ religious forests ~~falls~~ along the alignment.

The major associated tree species with the Sal *(Shorea robusta)* are Botdhero *(Lagerstroemia parviflora~~) Jamun~~)* Jamun *(Syzygium cumini),* Kyamuno (*Syzygium cerasoides)* Sindure (*Mallotus philippnensis)* Teak *(Tectona grandis)* Asna *(Terminalia alata)* Barro *(Terminalia belerica)* Bhalayo (*Semecarpus anacardium)* Karma (*Adina cordifolia*).

Twelve species of mammals are found in the project area which includes Leopard (*Panthera pardus*), Porcupine (*Hystrix indica*), Barking Deer (*Muntiacus muntjac*), Tiger (*Panthera tigris)* and Indian Hare (*Lepus nigricollis*). Jackal (*Canis aureus)* Rhesus Macaque *(Macaca mulatta*), Common Longur (*Presbytis entellus)* are the other animals reported in the project area.

Out of 12 mammal species 6 falls under CITES category, one is protected under National Park and Wildlife Conservation Act and IUCN category (Table 4.9).

Table -4.9: Protected Status of Wildlife Species

S.No.	Scientific Name	English Name	Protection Status		
			NPWC Act 1973	CITES	IUCN
1	*Panthera pardus*	Leopard		I	
2	*Presbytis entellus*	Langur Monkey		I	
3	*Macaca mulatta*	Monkey		II	
4	*Panthera tigris*	Tiger	P	I	E
5	*Canis aureus*	Jackal		III	
6	*Herpestes edwardsi*	Common Mangoose		III	

P= Protected
E= Endangered

Fifty- species of birds are found in the project area. The common bird species are Common Pea Fowl *(Pavo cristatus),* Common Maina *(Acridotheres tristis),* Crow (*Corvus macrorhychos),* parakeet *(Psittacula alexandri),* Indian Cuckoo (*Cuculus micropterus)* and Red Jungle Fowl *(Gallus gallus).*

Chibe *(Dicrurus caerulescens),* Titra *(Francolinus francolinus),* Kaliz *(Lophura leucomelana),* Eurasian Cuckoos (*Cuculus canorus*), Vulture (*Gyps indicus),* Green Woodpecker (*Picus squamatus*) are the other reported species found in project area.

The bird species such as Rose Ringed Parakeet and Giant Horn Bill are falls under CITES I category whereas Blue Rock Pigeon is classified under CITES III. Bird species recorded from the project area are not protected under the NPWC Act 1973.

Socio-economic and Cultural Environment

The proposed alignment traverses through 14 VDCs (Amarapuri, Devchuli, Dhaubadi, Dibyapuri, Dumkibas, Gaindakot, Makar, Mukundapur, Nayabolan, Rajahar, Shiva Mandir, Tamsariya, ~~Parsauni and~~Parsauni and ~~Deurali)~~Deurali) and one municipality (Bharatpur municipality) of two districts. The families whose land or property or both are acquired by the project are defined here as the project affected family (PAFs). Altogether, 108 households will be affected due to the implementation of the proposed project. Out of which 105 households were surveyed to collect socio-economic baseline information and 3 households were missing during field survey.

The total population of the project VDCs/Municipality is 247139 with 48.41 % male and 51.59% female. The total number of households is 49808 with average household size 4.96. The project area is dominated by Hill-Brahmin (33.56%) followed by Magar (16.23%) and Chettri (9.29%).
The total population of 105 surveyed households is 683, consisting of 51.83% males and 48.17% females. The average HH size of the surveyed Households is 6.5 persons. Of the surveyed population aged six years and above, nearly 12.44% is illiterate. The gender gap in literacy is wide. The project area is diverse in caste/ethnicity. Of the surveyed households, about 2.86% households are Tamang (Marginalized Groups), 47.02% ~~Brahamin~~Brahmin/Chettri and 22.86% Disadvantaged Groups (Gurung and Magar). About 40% of surveyed households fall under the category of indigenous and tribal people listed by the Government of Nepal. The listed indigenous and Tribal people found among the PAFs are Tharu, Gurung, Magar, Kumal and Tamang. Nepali (65.7%) is the main spoken language in the family of the surveyed households of the project area. The other spoken languages in the family are Magar (15.2%), Tharu (12.4%) and Gurung (6.7 %).

Agriculture, service (salaried job), wage employment and business/small industry are the main sources of livelihoods of the surveyed households. The project area is food deficit area. Only 48.6 % of the surveyed households could grow enough food for their consumption in a year.

The weighted average annual income of surveyed households is NRs 152, 682. The contribution of off-farm is 87.13%, agriculture 7.32 % and livestock 5.54% to the total household income.

Similarly, the annual weighted average expenditure of the surveyed households is NRs 1, 23,037. Food items form the largest expense category, accounting for 42.65% of total reported expenditure. The average land holding of the affected households is 0.49 ha. Paddy, wheat, maize, oil seeds, pulses and potato are the major food crops and cash crops cultivated by the surveyed households. Livestock ownership is an integral part of agriculture for the surveyed households of the project area. Of the surveyed households, about 83% have livestock. Of the affected households, 60% have positive attitude and 13.33% have negative attitude and 13.33% are neutral regarding the project.
Of the surveyed households, 25.71 % expecting employment, 46.67 % expecting good compensation 20.95% expecting local development.

4.4.4.2 Construction Monitoring

Impact and compliance monitoring will be conducted during this phase of project development.

Impact Monitoring

Impact monitoring will be carried out to assess actual level of impact due to project construction. The impact monitoring includes:

- monitoring of the impacts of the project on physico-chemical, biological and socioeconomic & cultural environment of the area;
- monitoring of the accuracy of the predicted impacts;
- identify the emerging impacts due to project activities or natural process and develop remedial action; and
- monitoring of the effectiveness of mitigation measures

Compliance Monitoring

The compliance monitoring will be conducted to monitor the compliance of the proposed mitigation measures and monitoring activities. The compliance monitoring will mainly focus on;

- compliance of the tender clause;
- compliance of the mitigation measures;
- timely and adequately implementation of Environmental Management Plan; and
- overall environmental and social performance of the project.

The review of the tender document shows that 25 clauses related to environment, social and safety are incorporated in Contractors Bid document. These include 9 Clauses related to environment, 10 related to social and 3 each are general and safety. The details of the tender clauses are presented in Appendix- II.

Different types of compliance form such as daily log, advisory and non compliance incident report has been prepared to conduct compliance monitoring. Environmental Monitors will be deployed in

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project area for day to day monitoring work. The chief of EMU will be responsible for the implementation of compliance monitoring. The monitor will fill environmental log at the construction sites showing the work conducted during the time of monitoring. The monitor will also fill advisory form for the monitored site showing the area of non compliance referring the contract clauses in case of non compliance. If contractor does not improve the non compliances after two advisory forms issued for the same site a non compliance incidence report will be prepared. After preparation of non compliance report the issue of non compliance will be send to Project Manager Office for necessary action. The format of the compliance form is presented in Appendix III.

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4.4.4.3 Operation Monitoring

Both compliance and impact monitoring will be carried out during project operation phase. The compliance monitoring will focus on the compliance of mitigation and enhancement measures and monitoring program are being fully and properly carried out by the project.

4.4.4.4 Monitoring Parameters, Location and Schedule

Land use pattern, forest status, settlement, public health, infrastructure, implementation of the mitigation measures and compliance of the tender clauses are the few areas of monitoring. The schedule of monitoring will be daily, quarterly, half yearly and yearly depending on the parameters and type of monitoring. The detail of monitoring parameters, schedule, method and location for physico- chemical, biological and socioeconomic and cultural environment during construction and operation phases are presented in **Error! Reference source not found.**~~Table~~ 4.10.

Table -4.10: Monitoring Parameters, Indicators, Method and Schedule

Types	Parameters	Indicators	Method	Schedule	Location
A. Impact Monitoring					
A.1 Construction Phase					
Physical Environment	Slopes	Degree of slopes, stability of slopes, changes from the baseline	Site observation	Quarterly and before & after rainy season	Possible unstable slopes
	Waste disposal	Unpleasant odor and visual impact	Observation	Weekly	Temporary camps /Construction sites
Biological Environment	Loss of trees and shrubs	Number of trees removed	Observation and discussion	Daily	Row
	Loss of trees and shrubs from private land	Number of trees removed	Observation and discussion	Daily	Row
	Wildlife	Occurrence of wildlife species	Observation and discussion	Quarterly	Construction area

Socioeconomic and Cultural Environment	Water supply	Chemical and bacteriological parameters such as E. Coli.	Sampling and laboratory analysis	6 months	Temporary camp and ~~near by~~nearby hotels, settlement etc.
	Public health	Types of disease and incidence of disease in the project workers and local community	Meeting and discussion with local health posts and district hospitals	Quarterly	Project affected VDCs
	Land Acquisition	Acquisition of land, lease of land and temporary disturbances in land	Cross checking the list of compensation	Quarterly	Tower pad , RoW and leased area
	House Acquisition	Relocation of house, compensation, use of construction material etc	Observation of new construction area, cross checking the list of compensation etc.	Quarterly	Affected area and relocation sites
	Crop	Actual damage to standing crop or loss of cropping season for the particular area	Observation and discussion	Weekly	Tower pad , RoW and leased area
	Social and Cultural practices	Likely disturbance in traditional cultural ways	Observation and discussion	Quarterly	Project affected VDCs
	Economy	Local employment, rental, sell of consumable goods	Meeting and discussion with local communities	Quarterly	Project affected area
A.2 Operation Phase					
Physical Environment	Slopes	Stability at tower pads	Site observation	Before and after rainy season	Possible unstable slopes
Biological Environment	Vegetation/Forest	Survival of the plantation and RoW clearance, method of clearance	Observation and discussion	Annual	Plantation sites and RoW
	Wildlife	Alteration of habitat	Interview and discussion	Annual	RoW and ~~near by~~nearby areas
Socioeconomic & Cultural Environment	Local employment	Priority for the local employment	Cross checking the list of employment	Annual	Project site
	Economic status	Changes in economic condition of local people due to withdrawal of economic opportunity	Interview and discussion	Annual	Project affected families
B. Compliance Monitoring					
B.1 Construction Phase					**Location**
	Allocation of adequate budget for the implementation of the environment mitigation measures and monitoring	Yes/No	Review, enquiry and consultation	Pre-construction phase	Kathmandu Office

	works				
	Priority of employment	Yes/No	Record review, observation and enquiry	Monthly basis	Site Office
	First Aid	Availability of first Aid	Observation and record review	Periodic as per construction schedule	Project site
	Losing of life and disability	Compensation to losing of life and disability	Interview/observation	periodic	Project site
	Occupational safety	Adequacy of occupational safety measures (helmets, boots, warning signs etc.)	Interview/observation	Periodic as per construction schedule	Project site
	Implementation of compensatory plantation	Plantation work as per the plan	Observation	Periodic	Plantation sites
	Implementation of Resettlement and Rehabilitation Assistance	Resettlement and rehabilitation works as per the RAP and VCDP documents	Observation and discussion	periodic	PAFs and vulnerable households
B.2 Operation Phase					
	Conservation of the planted trees for 5 years	Survival of the saplings	Observation and samplings	Periodic	Plantation sites
	Priority of employment to locals	Yes/No	Record review, observation and enquiry	Periodic	Project site
	Occupational safety	Adequacy of occupational safety measures (helmets, boots, warning signs etc.)	Interview/observation	As required	Project area
	Disposal of construction wastes/spoils	Checking up of the wastes/spoil produced from construction work	Site observation	Once during first year of project operation	Disposal site
	Losing of life and disability	Compensation to losing of life and disability	Interview/observation	Periodic	Construction area

4.5 Environmental Auditing

4.5.1 General

The Environmental Audit (EA) shall be carried out to assess environmental impacts, accuracy of predictions, the effectiveness of mitigation measures and the monitoring plan. It is intended that EA

should relate actual impacts with predicted impacts which help in evaluating the accuracy and adequacy of EIA predictions.

An environmental audit provides the snapshot of environmental situation, compliance or impact with documented evidences. Besides fulfilling the formal requirements environmental audit is a good tool to promote environmental best practices and procedure. In general environmental auditing is done with the following aim:

- assessing compliance with formal requirement;
- facilitating management control of environmental practices;
- promoting good environmental management and minimizing the risks; and
- establishing the performance baseline for an environment management system.

4.5.2 Types of Audit

The national EIA guideline 1993 has stated the following types of audit that may be carried out for large scale development project.

Decision Point Auditing: Examines the effectiveness of EIA as a decision making tool.

Implementation Auditing: Ensures that condition of contract has been fulfilled.

Participatory Auditing: Ensure that stakeholder participation and expectation has been met.

Performance Auditing: Studies the work of agencies associated with project management.

Predictive Technique Auditing: Examines environmental changes arising from project implementation.

Environmental Impact Assessment Procedure Auditing: Examines critically the methods and approach adapted during the EIA.

4.5.3 Organizational Responsibility

The National EIA Guidelines specify that environmental impact auditing must be carried out by the government agencies approving the project with the assistance of relevant government agencies and nongovernmental organizations as necessary. The guideline also stated that result obtained from the EA should be made available to the project proponent and concerned agencies. Ministry of Environment will carry out environmental auditing of the proposed Project after two years of completion of the project as per EPR 97.

4.5.4 Auditing Parameters, Location, Method and Schedule

The detail of auditing parameters, schedule, location, method, indicator and agencies to be consulted are presented in **Error! Reference source not found.**~~Table~~ 4.7. The environmental auditing shall include but not be limited to following tasks.

- changes in physico- chemical, biological, socioeconomic and cultural environment baseline condition after the project construction;
- accuracy of the predicted impacts;
- magnitude of the predicted impacts;
- effectiveness of the proposed mitigation measures;
- compliance of the recommendations and findings of EIA report;
- compliance of the tender clauses;
- identification of number and area on non compliance; and
- effectiveness of compliance monitoring system.

Table- 4.11: Environmental Audit Parameters, Indicator, Method and Location

Types	Parameters	Indicator	Method	Location	Sources
Physical Environment	Disposal of construction waste and spoil	Initiated erosion and impact on aesthetic value	Observation and interview	Designated sites	Local people and observation
	Land use	Changes in land use	Observation and interview	Project area	Local people and observation
	Bioengineering	Effectiveness of bioengineering measures to stabilize unstable slopes	Observation	Sites where bioengineering was implemented	Observation and discussion with local people & line agencies
	Erosion and slope stability	Eroded and unstable areas on natural slopes	Observation and measurement	Row	Observation
Biological Environment	Physical condition of the forest	General condition of forest in RoW and ~~near by~~nearby area	Observation	RoW and immediate vicinity	Observation
	Loss of forest	Number of stumps of cut trees	Examination of forest	Forest area near by	Local people and observation
	Plantation	Status of compensatory plantation	Observation	Plantation sites	Observation
	Wildlife	Frequency of the birds and mammals seen in the project area	Observation and interview	Project area	Local people
Socioeconomic and Cultural Environment	Employment opportunity	Number of local people employed in project construction	Analysis of records, interview	Project site	Records from NEA, contractor, consultant and local people
		Number of women in workforce	Analysis of records, interview	Project sites	Records from NEA, contractor, consultant and local people
	Trade and commerce	Rental of houses and land space before, during and after construction	Inquiries and interview	Local area	Local tenants
	Compensation	Use of compensation received	Survey and interview	Project area and out of the area	Local people

	Occupational and safety hazards	Types and number of accidents occurred during construction	Records and interview	Project sites	Records from NEA, contractor, consultant and local people
		Facility of first aid, emergency services provided	Records and interview	Project sites	Records from NEA, contractor, consultant and local people
		Compensation to the loss of life or disability	Records and interview	Project sites	Records from NEA, contractor, consultant and local people
	Damage and Compensation	Cases of communicable diseases as compare to number and type which exist before	Survey, interview and observation	Project sites, health posts and hospitals	Medical records from local health posts
	Coordination and Communication	Coordination among district administration, DDC, VDC, politicians, project management, contractor, labors and local people	Records and interview	District headquarter and project site	District administrative office, VDC, and DDC

4.5.5 Approach and Methodology

Environmental audit program will follow the same methodology and survey sites covered in Environmental Impact Assessment and monitoring report. Review of monitoring report, field visit, checklist survey, meeting, and discussion with local community shall be the main methodology to be adapted for environmental auditing.

4.5.6 Schedule

The Environmental ~~i~~Impact ~~a~~Audit of the proposed Project shall be conducted after two years of completion of the project. The estimated time for the audit study is 6 months from the date of commencement.

5. ACTION PLAN AND RESPONSIBILITY

5.1 Action Plan and Responsibility

The proposed mitigation measures will be implemented in 24 months of the project ~~which~~ consisting of 3 months' pre-construction period, 15 months' construction period and 6 months' project operation. The environmental management plan will be implemented by different stakeholder involved in project management.

The BBTL Project will ensure that funds are delivered on time to CDC and the implementing consultants for timely preparation and implementation of RAP, VCDP, SIA and EIA documents prepared for the project as applicable. The compensation issues and rehabilitation measures will be completed before starting construction work.

Table 5.1 Implementation Schedule and Responsibility

S.No.	Activities	Schedule												Responsibility
		2012				2013				2014				
		1	2	3	4	1	2	3	4	1	2	3	4	
1	Preparation of Environmental Management Action Plan													ESSD
2	Social awareness program													Program Coordinator
3	Forest conservation awareness program													Program Coordinator
4	Wildlife conservation awareness program													Program Coordinator

5	NTEP and agro forestry training													Program Coordinator
6	Implementation of RAP Program													Program Coordinator
7	Implementation of VCDP Program													Program Coordinator
8	Implementation of SIA Program													Program Coordinator
9	Plantation of saplings													Department of Forest/ESSD
10	Environmental Monitoring													Environment and Social Monitoring Unit
11	Environmental Report													Monitoring Unit
a	Baseline monitoring report													Environment and Social Monitoring Unit
b	Construction phase quarterly monitoring report													Environment and Social Monitoring Unit
c	Operation phase half yearly monitoring report													Environment and Social Monitoring Unit
d	Annual report													Environment and Social Monitoring Unit
e	Completion report													Environment and Social Monitoring Unit

6. PROGRAM COST, SOURCE OF FUNDING, BUDGETARY PROCESS AND TIMING OF EXPENDITURE

6.1 Mitigation and Enhancement Measures Cost

The total estimated environment and social management cost for the proposed project is 162.58 million NRs, which is 10.70 % the total project cost. This cost is estimated for the implementation of mitigation and enhancement measures, community support program, and environmental monitoring during construction and operation phases of the project.

The cost required for land acquisition, compensation and rehabilitation measures, Vulnerable Community Development Plan and SIA is covered under the above mentioned cost. In addition this, the cost includes cost required for compensatory plantation and environmental monitoring.

Table 6.1 Environment and Social Management Cost

S.N.	Description	Unit	Quantity (Nos.)	Rate (NRs)	Amount (NRs.)
A.	**Forest Sector Mitigation and Enhancement Cost**				
i	Establishment of nurseries and plantation of saplings of native species	nos.	668826	40	26.75
ii	NTFP and agro forestry training and program implementation				0.84
	Sub Total of -A				**27.59**
B.	**Environmental and Social Mitigation & Enhancement Program as per EIA**				
i	Forest conservation awareness program (4 places)	LS			0.345
ii	Wildlife conservation awareness program ((4 places)	LS			0.253
iii	Social awareness program (10 places)	LS			0.66
	Sub Total of -B				**1.26**
C.	**Cost as per RAP**				
1. Mitigation /Compensation cost					
i	Compensation for land acquisition (tower pads)	Ha	0.673	Ref Table 8.1	8.80
ii	Compensation for residential structures	Nos	62	Ref Table 8.2	19.03
iii	Compensation for cowsheds	Nos	41	25000	1.03

iv	Compensation for land occupied by structures	ha	0.83	Ref Table 8.3	16.51
v	Compensation for loss of private trees	Nos	156	Ref Table 8.4	0.16
	Sub-total -1				**45.51**
2. Resettlement/ Relocation cost					
i	Relocation cost for community and private infrastructures	Nos	8	Ref Table 8.5	1.2
	Sub- total -2				**1.2**
3. Rehabilitation Assistance					
3.1	**Rehabilitation Assistance for HH loosing > 10% land**				
i	Livelihood assistance	Nos	7	15000	0.11
ii	Agriculture training and assistance	Nos		LS	0.30
iii	Agriculture assistance	Nos		LS	0.20
iv	Livestock training	Nos	**7**	LS	0.30
v	Livestock assistance	Nos	**7**	15000	0.11
	Sub- total				1.01
3.2	**Rehabilitation Assistance for HH loosing structures**				0.00
i	House rental allowance	Nos	53	15000	0.80
ii	Dislocation allowance	Nos	53	26671	1.41
iii	Transportation allowance		53	15000	0.80
iv	**Skill development training program**				0.00
a	Driving training	Nos	10	20000	0.20
b	Plumbing training	Nos	10	35000	0.35
c	House wiring training	Nos	23	30000	0.69
e	Repair and maintenance of mechanical and electrical equipments	Nos	10	70000	0.70
	Sub-total- 3				4.94
	Total -C				**52.66**
D.	**Cost as per VCDP**				
1. Assistance Program					
i	Computer training	Nos	7	30000	0.21
ii	Mobile repair training	Nos	6	25000	0.15
iii	Weaving training and assistance	Nos	11	Ref Table 8.5	1.23
iv	Gender and social equity training	Nos	13	Ref Table 8.6	0.25
v	Assistance for Rickshaw	Nos	2	30000	0.06
vi	Livestock training and assistance	Nos	30	Ref Table 8.7	1.25
vii	Furniture training	Nos	4	45000	0.18
	Sub- total -1				**3.32**
2	**Community support program**				
i	Support program for settlement where affected Dalits are found			LS	2
	Total (1+2)				**5.32**
E.	**Cost as per SIA**				
1	**Mitigation Measures**				
	Community safety awareness program	Nos	4	100000	0.4

	Health and sanitation awareness and health checkup	Nos	2	200000	0.4
	Land Use Restriction	ha	40.53	13966667	56.61
	Sub-total -1				**57.41**
2	Community Support Program				
	Rural electrification	LS			5
	Health post and school support program, small scale drinking water and irrigation assistance and assistance for the renovation and development of religious and recreational places and capacity building training to local VDCs	LS			5
	Sub-total -2				**10**
	Total (1+2)				**67.41**
F	Environmental Monitoring (15 months construction and 1 year operation				8.34
G	**Total Environment and Social Management Cost**				**162.58**

6.2 Funding Source

Nepal Electricity Authority will be responsible for the funding and implementation of proposed mitigation and enhancement measures. The cost will be paid under the annual budget head of NEA. However, it is expected that the World Bank will provide funding to support these community support programs, which are generally beyond the capacity of NEA and local partners.

6.3 Budgetary Process and Timing of Expenditure

The expenses required for the activities mentioned above will be made within 3 years of project development with major expenses during construction phase followed by one year project operation. The major component of the mitigation measures is cost for acquisition of land and house, land use restriction cost and compensatory plantation. The compensatory plantation cost covered the plantation and five years management cost.