

# Initial Environmental Examination – Main Report

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Project No. 41155-013  
April 2016

## NEP: Electricity Transmission Expansion and Supply Improvement Project

### Main Report – Chapter 7-10

Prepared by Nepal Electricity Authority for the Asian Development Bank.

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## 7 ALTERNATIVE ANALYSIS

### 7.1 Introduction

A key aspect of good environmental practice is the evaluation of potential alternatives. In order to achieve this goal the environmental and social considerations need to be brought into the planning from the very early stages. In case of this project, a range of route alternatives was investigated and the lowest and highest impacts on engineering, environmental and land use of these routes were determined to select the best route.

A number of alternatives were considered from the Desk study for the selection of TL route. The alternative alignments of the proposed TL were selected taking into consideration the following criteria:

- Right-of-way which have minimal environmental impact
- Improvement of reliability of the power system
- Provide the shortest straight route as far as possible with minimum number of Angle points.
- Minimum number of structure crossings
- Avoid build up swampy and unstable areas
- Provide easy access for construction and maintenance works
- Avoid settlements as far as possible
- Proximity of road etc.

### 7.2 Alternatives Considered

Some of the major alternatives considered during the feasibility and IEE studies were:

1. Route alternatives;
2. Design alternative;
3. Construction alternatives in terms of technology, procedures, schedule and raw materials to be used and
4. No forest Option
5. No project Option

#### 7.2.1 Route Alternatives

Three alternative routes for this alignment were considered for Khimti-Barhabise and Barhabise-Kathmandu, out of which the alignment with 43 km and 56 km were selected respectively. Comparative studies for the feasibility of the different routes were done on the basis of the following guidelines:

- Access facility
- Located on geologically stable ground
- Total length of the line
- Minimum number of Angle Towers
- Avoid highly productive land or expensive Right of Way
- Minimum number of river crossing, national highways, and overhead power line and telecommunication lines
- Avoid settlements areas or densely populated area ; Minimum number of affected households



- Avoid forest crossing, protected area and wildlife sanctuaries

Table 7-1: Alternative Analysis for Khimti-Barhabise Section

S.No.	Item	Khimti-Barhabise Alignment		
		Route-I	Route-II	Route-III
1	Total length (km)	43	42	45
2	Number of AP	65	45	74
3	Access facility	Access road is close to the alignment	Access facility is quite far from most of the section	Access facility is quite far from few section
4	Crossing of existing lines (HT and LT)	132 kV, 66 kV, 33 kV and 11 kV line	132 kV, 66 kV, 33 kV and 11 kV line	132 kV, 66 kV, 33 kV and 11 kV line
5	Number of stream crossing	Chandrawati River and Sunkoshi River	Milti River and Sunkoshi River	Tamakoshi River and Sunkoshi River
6	Number of settlement crossing	3	5	4
7	Number of road crossing	5	4	4
8	Forest area	13 km	15 km	19 km
9	Marshy and unstable area	Not seen	3	Not seen
10	Any other impact	None	None	None
11	Any other permanent structure	Bridge at Barhabise	None	None
12	Advantages	Shorter route with good access facility	Shorter route with few settlement	Minimum settlement crossing with good access facility
13	Disadvantages	Alignment runs parallel to road settlement	Alignment passes over major settlement area	Existing route is quite far from the route
14	Order of Priority	1	3	2

Based on the exercise carried out in this study and comparison made within the identified alternatives, it is fair to recommend that the best route for Khimti-Barhabise is Route-I.

Table 7-2: Alternative Analysis for Barhabise-Kathmandu Section

S.No	Item	Barhabise-Kathmandu Alignment		
		Route-I	Route-II	Route-III
1	Total length (km)	65	56	66
2	Number of angle points	64	64	65
3	Access facility	Access facility is quite far from most of the section	Access road is close to the alignment	Access facility is quite far from few section
4	Crossing of existing lines (HT and LT)	132 kV, 66 kV, 33 kV and 11 kV line	132 kV, 66 kV, 33 kV and 11 kV line	132 kV, 66 kV, 33 kV and 11 kV line
5	Number of stream crossing	Bhotekhosi River, Balephi River and Indrawati River	Bhotekhosi River, Balephi River and Indrawati River	Bhotekhosi River, Balephi River and Indrawati River
6	Number of settlement crossing	5	2	6
7	Number of road crossing	8	6	8
8	Forest area	17 km	9 km	13 km
9	Marshy and unstable area	2	Not seen	Not seen
10	Any other impact	None	None	None
11	Any other permanent structure	None	None	Bridge at Barhabise
12	Advantages	Shorter route with few settlement	Shorter route with good access facility	Minimum settlement crossing with good access facility
13	Disadvantages	Existing route is quite far from the route	Alignment runs parallel to road settlement	Alignment passes over major settlement area
14	Order of Priority	3	1	2

Based on the exercise carried out in this study and comparison made within the identified alternatives, it is fair to recommend that the best route for Barhabise-Kathmandu is Route-II.

### 7.2.2 Design Alternatives

Different design alternatives for tower structure, tower foundation and its protection, ruling span and voltage level have been also carried out during the feasibility and the IEE study. In order to simplify the erection procedures and make the project cost-effective Lattice type of tower has been selected. Lattice type of towers is appropriate for the terrain and conditions of Nepal since they do not require large flat surface.

In the rocky area along the route alignment, rock bolt foundation is preferred to normal concrete foundation due to its less excavation, drilling advantage and low environmental impact. Conventional pad and chimney type concrete foundation will be constructed.





The design of the tower and foundation design are very much dependent on the selection of ruling span. The number of tower will be minimized by increasing the ruling span but it leads to heavier and higher tower structures to maintain the necessary ground clearances whereas shorter ruling span means increased number of towers which will further lead to increase land acquisition. Therefore, optimum standard ruling span of 330 m has been adopted.

### 7.2.3 Construction Alternatives

Manual excavation will be adopted since it provides opportunity for the local employment and will have less impact on topography, low disturbance to surrounding areas and does not require wider access road. Mechanical excavation requires motorable access roads and cause more impact to environment including air and noise pollution. However, concreting will be done using mixer and vibrator in order to maintain the quality.

Erection will be done manually. Helicopter stringing is an alternative but such method would be costly. Moreover, use of helicopter will create noise pollution and may disturb the fauna of the area. Internationally accepted standard technology will be applied for the installation and procurement of the goods and equipment.

Since 400 kV TL require strong and durable poles self-supporting galvanized steel towers will be used. Wooden poles will not be used because tremendous amount of forest needs to be cut which will create environmental problem even in the global level.

The construction activity shall be planned in off-season (dry period) to minimize the unnecessary damage and disturbances. This will reduce the project impact on physical, biological and socioeconomic resources of the area. Construction in rainy season will cause soil erosion problem, blockage of drain and difficulty to crossing of river and excavation of tower foundation and hence delay the project progress due to other disturbances. The indoor works of substation may be carried out in rainy season. However, the indoor works of substation may be carried out in rainy season.

### 7.2.4 No Forest Option

Although practically it is not possible to avoid forest, no forest option was also studied. The proposed alignment has been routed nose to nose, valleys and at ridges so as to avoid forest clearance to the extent possibility. Furthermore, the locations for the Angle Points have been also selected at elevated spots to avoid felling of the trees and trimming. Efforts to avoid the dense forest area have been made.

The compensatory plantation in the ratio 1:2 trees will be carried out in the project areas to mitigate the loss of trees with due consideration with District Forest Office (DFO) and the Forest User Groups of the concerned district. The implementation of the project will be done by following the existing forest acts, rules and regulations.

### 7.2.5 No Project Option

The unprecedented growth in power consumption has led to severe imbalance in demand and supply of electricity power in the country which has resulted in load shedding in Nepal since last

few years and will be continued in the country in the years to come. This load shedding has resulted loss to the country.

If the proposed project is not implemented then there will be no project induced loss/effect on vegetation, cultivated area and other environmental and socio-economic impacts. But such 'No Action' alternative would result in heavy deficit of power and energy in western part of the country. Besides, the construction of the proposed project will also reduce system loss and provide reliable power to the load centers of Nepal. This project will also be helpful for the expansion of rural electrification program. The likely increase in electricity supply to local people will help to switch energy consumption trend and pressure on local vegetation will be minimum. Socio-economic conditions of the local people are likely to be increased through employment opportunities and income generation activities.

Since, the construction of this TL will play a major role not only solving the power crisis in the country but also in improving the socio-economic status of the people, the construction of Barhabise-Kathmandu 400 kV TL is essential.



## 8 MITIGATION AND ENHANCEMENT MEASURES

The mitigation and enhancement measures outlined in this chapter have been proposed to curtail potential adverse impacts and enhance beneficial impacts identified during the study. Those adverse and beneficial impacts not identified or predetermined during the study if later discovered during the construction phases will be explicitly mitigated or enhanced by the project. The discussion is organized into three categories of physical, biological, and socio-economic and cultural aspects, and has been split into construction and operation phases in an equivalent manner as for Chapter 6— Impact Assessment.

Nepal Electricity Authority as the project proponent will implement all the proposed mitigation measures and enhancement measures, monitoring plans described in the respective chapters as NEA's prime responsibility. In addition, the project will take responsibility of compensating as per the prevailing law for any losses or damage caused to lives and property during construction and operation phases.

### 8.1 Physical Environment

Minimization of land-take and soil disturbances wherever feasible will be the primary mitigation measures of the project.

#### 8.1.1 Watershed and Drainage Condition

##### a. Construction Phase

Proper management of the muck volume will be done. The muck generated during the excavation of tower pads and substation will be used for backfilling and the area will be restored.

The following mitigation measures will be anticipated during the construction phase:

- Vegetation clearing and ground disturbances will be confined within the foundation and required RoW.
- Proper compaction of the excavated soil will be done. After compaction 10% of the remaining soil will be disposed properly in the vicinity so as not to disturb the natural drainage.
- Adequate surface and sub-surface drainage will be provided at all the Angle Tower area and at substation area to drain away the excess water and prevent water logging.
- Excavation will be done in phases with higher number of laborers so that the required target stretch is completed on time.
- Restoration of the area around the tower pad for cultivation and regeneration of vegetation will be done.
- Erection of pole and stringing of line will be carried out in dry season if possible.
- Pile foundation or matt foundation will be used for Lattice towers at river crossings.

##### b. Operation Phase

Proper inspection and maintenance of tower pad areas will be done to reduce the risk of soil erosion. The annual costs for such site verifications will be borne by the project developer and thus included in operation and maintenance budget. If the amount of this title is included in the main project cost this amount can be reduced from the cost of environmental mitigation measures. No mitigation measures on the watershed and natural drainage is needed during the operation and maintenance period.



### 8.1.2 Topography, Land Use and Land Take

#### a. Construction Phase

- The natural slope disturbances will be minimized during the construction of tower pads.
- The stability of the tower locations will be examined before excavation and special foundation design will be selected for the susceptible locations.
- Erection of tower foundation in the unstable land and/or in steep slopes will be avoided.
- Re-vegetation and slope maintenance will be carried out in the disturbed areas to avoid erosion. Bio-engineering with combination of retaining structures will be done as per the requirement.
- Proper landscaping will be done at each tower site.

The permanent land use changes due to tower pad construction cannot be mitigated. However, the land under the RoW will not be restricted for the current use except that the construction of any type structure will be prohibited. The construction area will be reinstated to the present condition after the construction is over. Land for temporary facilities will be rehabilitated to original status to minimize the land use impacts. The camp sites are proposed mostly in barren land to minimize the impact on land use pattern of cultivated land. The private land required for the project will be compensated through rental in agreement with the land and property owners.

The following measures are proposed for the construction and operation phase.

- The natural slope disturbances will be minimized during the construction of tower pads.
- In order to avoid the land fragmentation the tower will be located at the RoW of road and at the edge of the land parcel as far as possible.
- In order to avoid the hindrance to agricultural activities the construction activities will be done during the period of less agro- activities.
- Land acquiring will also be limited to the requisite.

#### b. Operation Phase

The impact on the land use changes under the RoW and permanent land-take for the towers will remain forever. The restriction for the erection of any type of structure of land under the RoW and plantation of trees of tall species cannot be mitigated. However, cultivation will be allowed. All temporary land acquired will be converted to its original use or agreed new uses towards the end of the construction period and handed over to their owners.

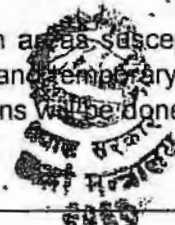
### 8.1.3 Air Quality

The construction and operation of the TL will not have significant impact on the air quality of the project impact area.

#### a. Construction Phase

The project will not lead to a significant deterioration in air quality except in much localized instances and localized areas during the construction phase. Vehicle utilized for construction will be complied with GoN mass emissions standards. Regular checkup, up keeping and maintenance of the equipment will be carried out as per the Manufacturer's Specifications to meet the emission standards. Proper maintenance of all vehicles and construction machinery will be done regularly.

Helmets and air mask will be provided to labor force working in areas susceptible to dust pollution. The working hours will be limited near the settlements and temporary relocation of particularly vulnerable people (old/sick, etc.) to acceptable locations will be done if required.





**b. Operation Phase**

There is no significant impact on air quality during the operation and maintenance period.

**8.1.4 Noise and Vibrations****a. Construction Phase**

No construction work will be carried out during the night time so as to minimize the noise and vibrations. Ear muffers will be provided to labor force working in the areas susceptible to noise pollution.

**b. Operation Phase**

The impacts due to corona effect cannot be mitigated.

**8.1.5 Water Quality****a. Construction Phase**

The waste generated from the mixing concrete will be disposed in pits and filled with soil. Such pits will be made in barren land at approximately 500 m distance from the water bodies. Dykes are proposed around the storage tanks to avoid water pollution. Toilets will be provided to the workforce. Care will be taken to locate the temporary construction worker sheds away from the water bodies. Garbage and solid wastes generated by the workforce will be dumped safely away from water bodies.

Good construction practices and site management will be adopted to avoid impacting soil and ground water, and pollution of water bodies from accidental spills from fuels and lubricants etc. All waste oils and chemicals will be collected and stored in suitable storage tanks and disposed through incineration.

**b. Operation Phase**

Since the impact on water quality during the operation period is expected to be minimal, no mitigation measure is proposed.

**8.1.6 Waste and Spoil Disposal****Construction Phase**

The domestic waste will primarily consist of organic food waste. Because this is easily biodegradable and non-hazardous. It will be managed by burying in pits at reasonable distance from water bodies and subsequently covering with soil.

Waste generated from construction activities are usually inert material which are non-biodegradable e.g. empty cement bags and containers, rejected material, plastic, wooden planks. These waste materials will be stored out and kept separated instead of throwing haphazardly elsewhere. Some of these items (cement bag, plastic drum etc.) can be sold in the markets in order to be re-used or recycled. The contractor will be responsible for the establishment of the waste management system at the construction and camp areas.

**8.1.7 Storage of Construction material****Construction Phase**

The area for the substations will be used as the storage of construction materials in order to mitigate the land degradation. The locations for the temporary camps will be selected at degraded or the lower value lands. The area proposed for storage will be taken on lease at the prevailing market price based on the production loss. The temporary yards will be fenced

properly. Cement will be stored in private storage facilities taken on rent. The other materials will be stored properly at the designated storage site. The detail of storage of construction material has been presented in section 6.1.8.

### 8.1.8 Crossing of Other Utilities and Interference

#### Operation Phase

All crossings of existing transmission and distribution lines will be designed with standard safe vertical and horizontal clearances for 400kV lines. Design clearances for communication lines will be maintained. For this, the standards referred by the Electricity Regulation 1993 (Rule 48, 49, 50 and 55) shall be followed. In case of Air traffic, Marker Ball of Red and White strip will be placed at high elevated alignment (as per CAAN opinion).

### 8.1.9 Use of Coolant Oil in the Transformer (Poly Chlorinated Biphenyls; PCB)

#### Operation Phase

Prior to 1995 PCB as a coolant in the transformer were used in Nepal. Since 1995 this type of oil is now prohibited legally in Nepal. The transformer oil used in Nepal now conforms to the international standards. However, to ensure that the PCBs are not used as the coolant oil in transformer a chemical certificate of the oil used will be provided by the supplier of the transformer prior to the installation of the transformer from an internationally accredited laboratory. A provision of oil filter on the drainage outlet of the substation will be installed to avoid leakage of oil from the substation. Timely maintenance and monitoring of the transformers will be done. During procurement process quality of the transformers will be ensured.

### 8.1.10 Summary of Mitigation Cost for Physical Environment

The total cost of the project is 1 billion. Detail of mitigation cost for physical environment is presented in table below.

Table 8-1: Detail of Cost Break Down

S.N	Description	Cost (NRs)
1	River Training Structures	20,00,000
2	Religious Place (Temples) Support	20,00,000
3	Construction of Physical Structure (Aqueduct, Temporary Bridge, Fencing, Sheds etc.) for social support	50,00,000
4	Soil Conservation Program (Land Protection Works)	15,00,000
5	Miscellaneous	15,00,000
Total		1,20,00,000

The detail of cost of physical environment along the different headings has been discussed below:

#### a. River Training Structures:

Along khimti-barhabise section, river training structures are needed below AP 14 due to the erosion of bank near river. Major landslides along with major cracks are observed near AP 29 due to the earthquake of Baisakh 12 so river training structures are needed just below landslide to prevent more erosion. Along Barhabise-Kathmandu section, heavy river training structures are needed along the stretches between AP 10 and AP 11 because of the massive Jure landslides.

#### b. Religious Place:

Temples are damaged by earthquake so the maintenance and reconstruction works need to be carried out for one temple near AP 22, AP 34 and three temples between AP 58 and AP 59



along Khimti-Barhabise section. Similarly, the maintenance/ reconstruction works need to be carried out for one temple near AP 20 along Barhabise-Kathmandu Section.

**c. Construction of Physical Structure:**

Fencing should be done around the temples which are damaged by earthquake and also sheds need to be provided just near temples. Likewise, fencing along the school area of the project affected VDCs are of high priority. Temporary bridges (Hume Pipe bridges) are to be constructed where the feeder roads are swayed by the river and at some places causeways can be constructed as per public demand and necessity.

**d. Soil Conservation Program:**

Land protection works need to be done below AP 29 of Khimti-Barhabise section where landslides has swayed large agricultural land and also cracks has formed at long distance up to the village area. In order to protect more soil erosion, bio-engineering practice is must at that section. And along Barhabise-Kathmandu section above AP 34, land retention work need to be done so as to protect the feeder road.

**e. Miscellaneous:**

Other structure which may be necessary during the construction phase will be stated under miscellaneous section.

## **8.2 Biological Environment**

### **8.2.1 Enhancement Measures**

#### **8.2.1.1 Assistance to Community Forest Users Group**

Forest management training will be provided to the community forest users groups (CFUGs) affected by the proposed project. The program basically includes capacity building training, forest management training etc.

#### **8.2.1.2 Non Timber Forest Products**

Workers will be prohibited illegal collection of non-timber forest products (NTFPs). Informative and warning sign boards at each construction sites located in and around the forest area will be erected. Training for cultivation of NTFPs especially medicinal plants and agro forestry will be given to CFUGs. The members from the affected CFUGs will be encouraged for the plantation of NTFPs and other plants having economic values along the RoW of the line falling under community forests. This will provide them with the opportunities of long term income source as well as maintaining the vegetation cover under RoW. Seedling support will be provided to the concerned CFUG after giving them training. The detail of training program will be developed in consultation with concerned CFUGs and DFO.

#### **8.2.1.3 Conservation Awareness Raising**

Awareness raising program will be conducted for local people, workers and CFUG members of the project area about the importance of biodiversity, forest, wildlife and bird conservation, plantation and economic importance of forest and its role in rural livelihood improvement, existing rule regulations etc. The program will be implemented in close coordination with local NGOs, CBOs, District Forest Office and other concerned government organizations. Hoarding boards with slogan about various aspects of nature conservation will be displayed in public places and along the project area.

#### **8.2.1.4 Forest based Income Generation and Entrepreneurship Training**

Forest based income generation activities with entrepreneurship development will also be promoted. Since Dolakha, Sindhupalchowk, Kavrepalanchowk districts are pioneer in the



development of community based natural resource management like, community forestry, leasehold forestry and promotion of forest based industries like Nepali handmade paper making from lokta and argeli, chirayito cultivation and collection and processing of various types of NTFPs including medicinal herbs. Therefore, income generation activities and entrepreneurship development training will be provided to the community groups.

#### 8.2.1.5 Orientation Workshop to Concerned DFO Staff

To maintain the close coordination with concerned forestry staff for the management of forests along the TL, orientation workshops will be conducted in each district. The main focus will be mutual understanding about environmental safeguard issues and their roles and responsibilities in addressing them.

### 8.2.2 Mitigation Measures

#### 8.2.2.1 Minimizing the Forest Clearance

##### a. Construction Phase

During the project implementation, all the trees in the AP will be felled. However, trees along the RoW of TL will be selectively felled to minimize the forest loss in gully and valley subject to enough vertical clearance from the ground. In such areas, it is proposed that the minimum forest clearance that need for the laying and stringing of conductor will be maintained and remaining trees of the RoW will be kept intact. Vegetation clearance along TL-RoW will be carried out manually. Transmission alignment has been fixed to avoid the forest vegetation as far as practicable. In addition, Angle Towers and Suspension Towers will be placed in ridges to avoid the forest clearance to the extent possible.

#### 8.2.2.2 Forestry Clearance and Compensatory Plantation

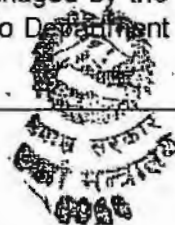
##### a. Construction Phase

The Project will ensure compliance to provisions of all acts, rules, regulations and directives as applicable to the forest. Forestry clearance and tree cutting approval will be obtained according to Forest Act 2049, Forest Regulations 2051, Government of Nepal: **Work Procedure for Providing Forest Land for Other Use, 2063** (February 2007) and **Standard for Removing Trees from Government Forest, 2071**. Land needed for the construction of angle towers and substation in the forest area will be obtained from the cabinet decision of the Government Nepal for the priority one projects (P-1) and tree cutting approval from the Ministry of Forest and Soil Conservation (MoFSC).

As a compensatory measure for the loss of trees due to the site clearance, plantation in 1:2 ratio plants plus equivalent to forest area cleared (1600 plants/ha) in the CFs, LHF and Government forests will be carried out in the area provided by the District Forest Offices/CFUGs/LHFGs according to new provision made in **Action Plan for the Improvement of Governance and Economic Development, 2069 BS** (it was at the ratio of 1:25 before).

Separate Plantation Action Plan will be prepared before implementing the plantation program. The Action Plan will figure out the potential plantation sites, seedling production and availability, plant species and mode of plantation program in consultation with affected CFUGs/LHFGs and District Forest Office.

DFO nurseries could be used in the project site to meet the seedling requirement for the compensatory plantation. As per the Government of Nepal: **Work Procedure for Providing Forest Land for Other Use 2063**, plantation site shall be managed by the proponent for five years or required cost for such management must be paid to Department of Forest. So, the



compensatory plantation and protection cost (fencing provision) has been estimated according to MoFSC Norms and will be provided to concerned CFUGs/LHFGs through DFO.

#### **8.2.2.3 Harvesting Costs**

##### **a. Construction Phase**

The cost of harvesting, logging and transporting of the forest products in the forests will be provided as per the MoFSC Norms (revised), 2070 following the provision made in Article 65 of Forest Regulations 2051. The compensation cost for the harvesting, logging and transportation of forest is part of construction work and included in construction cost hence not estimated separate in this IEE Report.

#### **8.2.2.4 Utilization of Forest Products**

##### **a. Construction Phase**

Trees will be harvested with the proper forest techniques by involving technical staffs from the District Forest Office of the concerned district in presence of CFUGs and LHFGs. Timber and other forest products extracted as part of the site clearance from the forest will be utilized as per the procedures as mentioned in the Forest Rules, Guidelines and Directives. From CFs/LHFs, forest products will be utilized according to operational plan provisions of CFUGs/LHFGs.

#### **8.2.2.5 Supply of Alternative Fuel**

##### **a. Construction Phase**

The construction contractors will be abided by tender clause to provide kerosene/LPG to the project workers to minimize the loss of forest. For the construction of temporary camps, pole size timber felled by the project can be used with following due forestry procedures.

#### **8.2.2.6 Management of the Plantation Sites**

##### **a. Operation Phase**

The plantation sites will be managed by the concerned CFUGs/LHFGs in community and leasehold forest plantation area. Replacement plantation will be conducted after one year based on the survival counts and cost for such sites will be borne by the project.

#### **8.2.2.7 Clearance of Vegetation**

##### **a. Operation Phase**

All type of growing trees within the RoW will be trimmed regularly in every alternate year. The project will use Electricity Regulation, 1993 for the minimum clearance required for the transmission and distribution lines, which is generally 46 meter (23 meter on either side of the center line).

#### **8.2.2.8 Wildlife Disturbance and Restriction on Hunting and Poaching**

##### **a. Construction Phase**

The clearing of trees will be done manually causing less impact on adjoining vegetation. As far as possible construction work will be labor based. The project proponent will be responsible to avoid unnecessary machinery disturbances and lighting. The construction work in community forest area will be coordinated through DFO and CFUGs. In addition, informative and warning sign boards will be placed at relevant construction sites. The workers will strictly be prevented from hunting and poaching.

##### **b. Operation Phase**

Installation of screens to prevent monkeys and other arboreal mammals from climbing towers will be considered in the design.

#### **8.2.2.9 Avian Hazards**

Measures to minimize bird injury and death associated with the TL will be considered in line

design. Markers such as colour balls will be attached to conductors to improve line visibility for bird, if felt necessary. Required cost for it will be included in the contractor's cost.

**a. Operation Phase**

A monitoring program will be undertaken to determine the occurrence of fauna deaths during line operation, with additional measures implemented as necessary.

**8.2.3 Biological Mitigation and Enhancement Cost**

The total biological mitigation and enhancement cost is estimated to be NRs. 32,746,432.20 (Mitigation cost NRs.28,096,431.20 and Enhancement cost NRs. 4,650,000.00) as given in Table 8-2 and Table 8-3. Training programs will be provided to the selected users and members of the affected CFUGs/LHFGs. The number of training programs to be conducted will be determined depending upon the number of participants, demand from communities and availability of resource persons. Technical resource persons and experts shall be deployed for the training programs from DFOs and other relevant offices.



Table 8-2: Benefit Enhancement Cost (NRs)

Benefit Augmentation Measures															
SN	Augmentation Measures	Unit rate	Districts												Total (NRs)
			Bhaktapur		Kathmandu		Kavre Palanchok		Sindhupalchok		Dolakha				
			Event	Cost	Event	Cost	Event	Cost	Event	Cost	Event	Cost	Event	Cost	
1	Forest management training to CFUGs	100000	1	100,000	1	100,000	2	200,000	2	200,000	2	200,000	2	200,000	800,000
2	NTFPs cultivation training and seedling support under TL	200000	1	200,000	1	200,000	2	400,000	2	400,000	2	400,000	2	400,000	1,600,000
3	Conservation Awareness Raising training (Biodiversity, wildlife and bird conservation)	100000	1	100,000	1	100,000	2	200,000	2	200,000	2	200,000	2	200,000	800,000
4	Forest based income generation and entrepreneurship training	150000	1	150,000	1	150,000	2	300,000	2	300,000	2	300,000	2	300,000	1,200,000
5	Orientation workshop to concerned DFO staff	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
	Total		5	600,000	5	600,000	9	1,150,000	9	1,150,000	9	1,150,000	9	1,150,000	4,650,000

Note: Since there is no any forest area affected by the project in Ramechhap district, training programs are not proposed.

Table 8-3: Mitigation Measures Cost (NRs)

SN	District/Activities	Compensatory plantation in forest including protection						Total cost (NRs)	Signboard cost	Cost for trees in private land	Total cost (NRs)
		No. of trees	No. of trees to be planted	Area affected (ha)	No. of plants to be planted	Total plants for plantation +10% for replacement	Per plant cost				
1	Bhaktapur	152	304	1.012	1619.2	2085	110	229363.2	50000	15000	294363.2
2	Kathmandu	1100	2200	5.75	9200	12320	110	1355200	50000	20000	1425200
3	Kavre Palanchok	1163	2326	7.42	11872	15385	110	1692372	75000	40000	1807372
4	Sindhupatchok	16847	33694	60.95	97520	116998	110	12869780	75000	70000	13014780
5	Dolakha	6799	13598	51.26	82016	103816	110	11419716	75000	60000	11554716
	Total	26061	52122	126.392	202227.2	250604		27566431	325000	205000	28096431.2

### 8.3 Socio-economic and Cultural Environment

#### 8.3.1 Acquisition of Land and Structure

##### a. Construction Phase

##### • Compensation for Permanently Acquired Land

The project will acquire 308.4467 ha of cultivated land. Out of total, 203.7875 ha is permanent land (land required for angle tower, suspension towers and substation area) and 284.6592 ha is RoW.

However, compensation cost for 8.713 ha land of 172 surveyed households of 84 AP has been calculated for the study purpose. Hence, mitigation cost for 8.713 ha of land is estimated to be NRs. 17,57,35,560. Based on this cost, using prediction method, cost for 23.7875 ha of permanently acquired land will be NRs. 37,92,85,480. The detail of the cost of permanently acquired land is given in Table below.

**Table 8-4: Cost for Calculation of Permanently Acquired Private Land**

S. No.	Project Component	Description	Total HHs				Surveyed HHs			
			No. of Tower	Area (ha)	Rate (NRs./ha)	Amount (NRs.)	No. of Tower	Area (ha)	Rate (NRs./ha)	Amount (NRs.)
1	Angle Tower	AP0-AP62 (Khimti-Karthali)	106	2.388	4900000	11701200	40	0.900	4900000	44,10,000
		AP63-AP64-AP10 (Barhabise-Ramche)	28	0.625	11760000	7350000	10	0.225	11760000	26,46,000
		AP11-AP41 (Mankha-Chandani)	63	1.421	5880000	8355480	22	0.495	5880000	29,10,600
		AP42-AP62 (Mahadevsthan-Shankharapur)	38	0.853	19600000	16718800	12	0.27	19600000	52,92,000
2	Substation	Barhabise		8	23,520,000	188160000		6.823	23,520,000	160476960
		Lapsipedi (Bajini)		7.5	7,840,000	58800000				
		Chagunarayan		3	29,400,000	88200000				
		<b>Total</b>	<b>235</b>	<b>23.787</b>		<b>379285480</b>	<b>84</b>	<b>8.713</b>		<b>175735560</b>

##### • Compensation for Restricted Land (RoW)

The land used for TL and camp sites is considered as restricted land. The total cultivated land to be restricted for use during project period is 284.6592ha. On the basis of the surveyed households, the average price of the compensation cost of 284.6592 ha of land is calculated as NRs. 2,96,78,82,046. As per NEA practice, project will provide only 10% of the total land value for land use restriction (RoW). However, in recent practice, project will provide maximum amount to the land in accordance with their use and local market price. Here, 20% of total cost is preferred to compensate for two section which are near to market and high land value and 10% is preferred for other section which are in rural area. Therefore, the compensation cost for the land to be restricted to use is NRs. 48,60,76,577

Table 8-5: Cost for Calculation of Land Restriction (RoW)

S. No.	Project Components	Area (ha)	Rate (NRs.)	Total Cost (NRs.)	10% of Cost (NRs.)	20% of Cost (NRs.)
1	AP0-AP62 (Khimti-Karthali)	92.737	4900000	454411284	45441128	
2	AP63-AP64-AP10 (Barhabise-Ramche)	27.727	11760000	326064778		65212956
3	AP11-AP41 (Mankha-Chandeni)	75.133	5880000	441783387	44178339	
4	AP42-AP62 (Mahadevsthan-Shankharapur)	89.062	19600000	1745622597		349124519
Total		284.6592	284.659	2967882046	48,60,76,577	

- **Total Compensation for Land**

Hence, the total compensation of land to be acquired permanently and temporarily used is NRs 8653,62,057.

- **Compensation for Structures**

Compensation will be provided for 30 structures (house=20 and cowshed/shed=10). Compensation cost for structures has been calculated classifying into two categories i.e. cost for plinth area of the structures and construction cost of the structures.

- **Compensation Cost for Land occupied by Structures (Plinth area)**

Since 11 structures (8 houses and 3 cowsheds) are located in the proposed Barhabise substation site and area occupied by structure is included in substation components so additional amount for plinth area (i.e. 360 sq.ft) occupied by these structures will not be required. However, the total compensation for 19 structure i.e. 6296 sq.ft (4931 sq. ft. area occupied by 12 houses and 1365 sq.ft. area occupied by 7 cowsheds) is estimated to be Rs. 38,61,200.

Table 8-6: Compensation Cost for Land Occupied by Structures

Type of structures	No.	Plinth area (sq. ft.)	Rate (NRs./sq.ft.)	Amount (NRs.)
House	12	4931	500	2465500
Cowshed	7	1365	200	273000
Total	19	6296		3861200

- **Compensation of Structures Based on Construction Cost**

The total compensation of 30 structures based on the construction cost is estimated to be NRs.1,98,00,000. Out of which compensation for 20 houses and 10 cowsheds are NRs. 1,92,60,000 and Rs. 5,40,000 respectively.





Table 8-7: Estimation of Construction Cost of Structures

Description	Type of structure	No.	Area, (sq. ft)	Rate (NRs./sq.ft.)	Amount (NRs.)
A. House	Pakki	3	3840	1800	6912000
	Semi-pakki	2	540	1600	864000
	Kachchi	15	9570	1200	11484000
	<b>Sub-total</b>	<b>20</b>	<b>13950</b>		<b>1,92,60,000</b>
B. Other Structures					
Cowshed	Kachchi	10	1800	300	540000
<b>Total (A+B)</b>		<b>30</b>	<b>15750</b>		<b>1,98,00,000</b>

Hence, the total compensation (compensation for plinth area of structures and construction cost) of structures is estimated to be Rs. 2,31,21,200.

#### • Compensation for Private Infrastructure

There is one fish pond under the RoW near to AP45 in Barhabise-Kathmandu Section. However there is no provision to give compensation for such structure, as there is no any significant impact on fish pond under RoW.

### 8.3.2 Compensation for Loss of Standing Crops

#### 8.3.2.1 Production Loss in Permanent Land

The total compensation of the project affected HHs for production loss of 109.44MT is estimated to be Rs. 38,92,767. The value of total loss of crops is estimated based on their yield, production, and local market rate. The crop wise value with area is shown in Table 8-8. Similarly, individual's crop production loss is given in Appendix E-IV.

Table 8-8: Value of Total Loss of Agriculture Production due to Land Acquisition

S. No.	Crop types	Surveyed HHs				Total affected HHs	
		Production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Amount (NRs)	Production Loss (MT)	Amount (NRs)
1	Paddy	7.186	21.99	3.06	769650	50.64	1772614
2	Wheat	4.969	9.54	1.92	381600	21.97	878817.2
3	Millet	5.043	5.9	1.17	236000	13.59	543484.2
4	Potato	1.326	10.09	7.61	302700	23.24	697851.1
<b>Total</b>			<b>47.52</b>		<b>1689950</b>	<b>109.44</b>	<b>38,92,767</b>

Source: Household Survey, 2015

#### 8.3.2.2 Production loss in Temporary Land

The project requires 287.8542 ha of cultivated land for RoW. The total loss of cereal crops produced in this land is estimated as 738.45 MT which value is estimated to be NRs. 2,62,65,654 for one year. The crop wise area allocation, production and value is shown in Table 8-9.



Table 8-9: Value of Total Loss of Agriculture Production due to Land Utilization (RoW)

S.No.	Crop Type	Cultivated land (ha)	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Amount (NRs.)
1	Paddy	287.8542	111.667	341.7011	3.06	11960355
2	Wheat	287.8542	77.216	148.2545	1.92	5929640
3	Millet	287.8542	78.366	91.68803	1.17	3667049
4	Potato	287.8542	20.605	156.8072	7.61	4708609
Total				738.4509		2,62,65,654

Source: Field Survey 2015

### 8.3.3 Health, Water and Sanitation

#### Construction Phase

The project proponent will keep the project area clean and hygienic to ensure the project activities will not cause the spread of communicable diseases. The labor camp will be provided with simple dry pit toilet constructed on hard ground and far from water sources. Toilets will be made in temporary camps at the rate of approximately a single toilet for 6 people. First aid kits will be maintained for preliminary treatment in emergencies. The domestic solid waste generated in the project area will be either buried in designed landfill areas or converted in to compost.

A joint awareness program on health and sanitation will be launched in association with the existing NGOs and other local communities during the construction phase. Health check-up of workers and documentation of health status will be made periodically. Priority will be given to the local people in project works to minimize the impacts on health and sanitation.

The project must ensure adequate safety gears for workers (Personal Protective Equipment, accommodation, First Aid box, etc.). It must arrange the training for contractors and workers. It should provide temporary security fencing surrounding the construction site and safety signboard at all sites in Nepali languages should be put.

To minimize the impact on water supply at least one drinking water supply system will be installed at each camp site to cope the demand of the drinking water supply for the labors and technicians. The water supply of the project area will be strengthened by installation of new pipe lines, keeping taps at a regular interval, and by improving the storage of water at the source. The quantity of drinking water will be increased by distributing the water of existing perennial stream. This water supply system will be handed to the local community after the project is over.

#### Operation Phase

No mitigation measures are required during this phase.

### 8.3.4 Occupational Hazards and Safety

#### a. Construction Phase

The construction area will be cleared up and all the necessary precaution and warning signs will be placed at construction site. This area will be restricted for the entry of unauthorized people. The contractor will provide safety helmet, eye glass, safety boot, safety belt, caution signals and other safety equipment as required at particular site or work area.

Safety training will be implemented and any loss of life or injury will also be compensated as per prevailing rules. The safety training for the project workers will be conducted prior to the construction work. Community safety awareness program about the TL and potential risks associated with TL construction will also be implemented in nearby settlements and school area. Hoarding board will be placed in the sensitive area (school and other public places). Project will fence the towers in the sensitive area through civil work. The project workers involved in construction work will also be trained for health and occupational measures.

#### **b. Operation Phase**

Safety equipment required for the operation of the TL will be provided. During the maintenance, the construction area will be restricted for entry of unauthorized person to avoid disturbances and risk. Safety helmet and glass, safety boot, ear plugs, good electric light system, good earthing devices, fire-fighting accessories, caution signals, safety belt and other safety equipment as required at particular site and working area will be provided. The 46m RoW shall be strictly maintained to minimize the likely risks of conductor breakage, induced voltages, etc. Appropriate protection system and equipment will be installed at the substation to ensure the automatic isolation of the line in case of abnormal conditions.

### **8.3.5 House, Settlements and Social Infrastructures**

#### **a. Operation phase**

Altogether 8 number of the proposed APs are found within the range of 30 m to 100 m from the existing house, settlements, and social infrastructures. Protection measures will be applied in around the tower pads and construction area after the consultation with local people/stakeholders. Fencing, sign and other appropriate tools of public awareness will be adopted to reduce the likely impact on people, their property and public infrastructures.

Furthermore, following points will be considered:

- Design criteria
- RoW maintenance
- Fencing of tower area in critical location

### **8.3.6 Crossing of Power Cables; Communication Lines, Foot Trails, Roads/ Highways.**

#### **a. Operation Phase**

The proposed TL crosses inter-connected gravel road /earthen road /foot trails number of times. Similarly, the alignment crosses 11 kV, 66kV, 132 kV and 400/220V distribution lines. The TL also crosses irrigation canals and communication lines. Hence, there will be impact due to crossing over of power cables, communication lines, foot trails and road/highways on local infrastructures and facilities. As mitigation measures following points will be considered:

- Maintenance of ground clearance;
- Avoidance of infrastructures as far as possible;
- Placement of signboard where necessary
- Public awareness program at critical location will be conducted.





### 8.3.7 Communal Resources

#### a. Construction Phase

The TL does not pass through communal resources/private properties. However, it passes close to the structures like suspension bridge over Tamakoshi River, Charnawati River, cremation sites, Chautara and other private properties. Such structures will be impacted due to the construction activities of the project. Protection measures like placement of signboard, fencing of structures, and community awareness program will be carried out during construction period. There are no recreation area and places of public congregation that lies under the proposed TL and close to it. Hence, no mitigation measures required.

### 8.3.8 Impact on PAFs due to Alteration of Land and Property Value

#### a. Construction Phase

Land fragmentation will be minimized as far as possible. Remaining portion of land that will not be significant for agriculture purpose will be acquired for tower foundation. Compensation for permanently acquired and temporarily used lands will be provided. The temporarily used land will be returned to respective land owner as in the previous condition.

### 8.3.9 Impact due to Restriction of Future Landuse Development near to Settlement

#### a. Construction Phase

Coordination with the project affected households, VDCs/Municipality/DDC authority and concern stakeholders will be done during to construction phase. Land Use Policy-2068 will be followed while designing of the project.

### 8.3.10 Gender and Vulnerable Group

#### a. Construction Phase

The project will ensure not to discriminate the local people based on their gender, caste, color and place of origin. Similarly, priority for jobs will be given to the vulnerable group as per their ability and skills and willingness to work in the project area. Child labor will be prohibited in the project area. The project proponent will consult and assist the local NGO working for the welfare of the women and children to monitor and control Child Labor Act, 2049 will be effectively implemented during construction period.

#### b. Operation Phase

No mitigation measures required during operation phase.

### 8.3.11 Electric and Magnetic Field Effect

#### a. Construction Phase

No mitigation measure is required during the construction phase since the TL will not be charged until the completion of the stringing.

#### b. Operation Phase

In order to reduce the impact of the EMF effect, phase split in either of the circuit will be considered during the Detail Design Stage. Market centers are far from the TL, will itself reduce the impact of EMF to certain extent. However, for the safeguard of the local people, an



awareness program about the concept EMF and the risk of neglecting the maintenance of the RoW will be conducted.

### 8.3.12 Economic Activities

#### a. Construction Phase

To minimize the adverse impacts on local economy and enhance the living standards of the affected households following measures will be implemented:

- Compensation for the hindrance due to use of land for the TL has been done through private negotiation route. Replacement value has been added to the average value of the land to bring it closer to or at par with the prevailing market rate. The disturbance allowances will be provided to the affected households;
- To minimize the impacts of loss of agricultural products due to the land acquisition, and any effect on the occupation will be compensated through appropriate agricultural extension program, livelihood skill training programs, etc.;
- Maximum job opportunities will be provided to the local people in prudential order and assistance to local communities into the planning through coordination with district level and local government office of the respective district.

#### b. Operation Phase

No mitigation measures required during operation phase.

### 8.3.13 Infrastructure and Service Facility

#### a. Construction Phase

To minimize the impacts on the existing institutions and service facilities following measures will be implemented:

- Provision of water supply,
- Separate communication facilities other than the existing facilities through extension
- Provision of health and support program;
- Provision of additional support police force (if required) through coordination with the District Administration Office, and District Police Office, etc.

#### b. Operation Phase

No mitigation measures are required during this phase.

### 8.3.14 Social and Cultural Practice

#### a. Construction Phase

The impacts on social structures and practices in the project area are related mostly with the influx of construction workforce and their number. Besides, to minimize the impacts on local communities, following code of conduct will be enforced to the outside construction workers:

- The labour force will be instructed about the conducts and manners to be maintained while working along the TL. No discrimination in terms of salary or nature of job among local and migrant workers will be allowed.
- Respecting the rights, properties and practices of local people;
- Prohibiting all the outside labours to live outside construction camps;
- Prohibiting the use of alcohol in the project site, camp and nearby villages.

- Management of the short term influx of the labours during construction and stringing phases will include communication about the technical aspect of the construction and operations, and to allay fears about any apprehensions of perceived accidents during the operational phase of the project.
- The project proponent will demonstrate its concerns about the health and safety of the workers as well as the community through awareness programmes and grievance redressed.
- The workers will be briefed about the health risk of communicable diseases due to unhygienic environment as well as sexually transmitted diseases.
- No child labour or the forced labour would be engaged by the project proponent.

#### b. Operation Phase

Employment in the substations and RoW maintenance will be given to the local people to reduce tension and potential conflicts with local residents.

### 8.3.15 Law and Order

#### a. Construction Phase

During the construction of the TL, labor from different places with different religions and faiths with their own norms and values will be employed by the project contractor and there may conflict of interest between locals and the outsiders affecting law and order situation in the project area. Local employment, wage/ labor rate, working hours, use of local resources by the project workers, etc. are the major factors that may create conflict in the project area which may pose threat to law and order situation. The proponent will implement a strict code of conduct for the workforces. In case any worker is found as a drunkard or soliciting prostitution and gambling etc. will be penalized and terminated too. The existing facilities of GoN from Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu districts will be used to maintain the law and order situation as when required basis. The proposed awareness program will also minimize this impact to some extent.

#### b. Operation Phase

No mitigation measures.

### 8.3.16 Resettlement and Rehabilitation Plan (RRP)

Household whose house needs to be relocated will receive a housing rehabilitation allowance. From the field observation, it is observed that majority of the SPAF don't want to resettle voluntarily. The reasons behind unwillingness for resettlement are nearby market service centers facility, possible loss of business and service, adaptation problem in new society and good neighborhood in current place. Resettlement and rehabilitation issue will be addressed by Resettlement Action Plan (RAP) supplementary report and it will be submitted to MoEn: -

#### • Relocation of House

20 houses of 18 HHs are affected by the project. Out of the total 20, 13 houses of 13 households will be relocated as these households do not have any other houses. They lose their place of residence.

#### • Applicable Policy and Legislation

Land Acquisition Act 2034 (1977) will be the main legislative system for land and other physical asset acquisition. The procedure defined in the Act will be followed for the acquisition;





Compensation Fixation Committee (CFC) will determine the compensation rates of each unit at replacement cost. Project proponent is the responsible for the implementation of RRP.

- **Entitlement Framework**

The entitlement framework accordingly specifies compensation and /or rehabilitation measures for two units of entitlement individuals including affected individuals and their households, and groups. Loss of private assets will be valued and compensated based on entitlement policy matrix (Table 8-19).

- **Government Property**

Government infrastructures and facilities affected by the project will be repaired or replaced in consultation with the relevant department authorities. Government forest land will be acquired by getting approval from MoFSC.

- **Displacement Allowance**

In addition to the compensation for asset losses, households who are losing houses will qualify for the displacement allowances. Households, which required to be relocated, will receive a housing displacement allowance equal to per capita income (per capita income is taken as \$640 which is equivalent to NRs.64,160 (@ 1\$= NRs.100.25) of six month based on the calculation for a household. Hence, the total displacement allowance for 13 houses (13 households) is estimated to be NRs. 50,04,480. The customary practice in Nepal to pay allowances or related benefit is based on average household's size. Titleholders, tenants in own accommodation and squatters will be entitled to this allowance, to be paid at the time of compensation payment.

- **Transportation Allowance**

Though 13 houses will be relocated as these houses do not have any other place of residence, the total 20 project affected houses will get transportation allowance. A total of NRs. 10,00,000 (@ NRs 50,000 per HH) has been allocated as transportation allowances.

### **Summary of Social Mitigation Cost**

The total socio-economic mitigation cost is calculated to be NRs. 95,35,76,587. The detailed cost analysis is shown in Table 8-10.

**Table 8-10: Summary of Mitigation Cost**

Description	Amount (NRs.)
Land acquisition (23.7875 ha)	37,92,85,480
Land restriction(284.6592 ha)	48,60,76,577
Compensation for house and structures (30)	2,31,21,200
Compensation for loss of crops	
• Permanent loss of crops in acquisition land=129.74MT	46,13,950
• Permanent loss of crops in land restriction=1531.79MT	5,44,74,900
Displacement and Transportation Cost	60,04,480
<b>Total</b>	<b>95,35,76,587</b>

### 8.3.17 Enhancement Measures

#### 8.3.17.1 Vegetable Farming

The proposed project will itself provide the local communities and the region with numerous opportunities for socio-economic development. As more than 65% of the TL traverses through the cultivated land and agriculture farming is the major occupation of these areas, the environment team after the extensive field investigation has concluded that the project area will benefit from the training program on improved agricultural farming system.

Kavrepalanchowk district is the pocket area for agriculture farming. To increase the agricultural production in the area, improved techniques and methods need to be introduced. A training program on improved seasonal, off-seasonal vegetable farming, mushroom farming program will be conducted for the local affected farmers, which will provide opportunities for increasing agricultural production in their farmlands. This program is especially focused for those households who lose their land 10 – 50% in the assumption that they can improve production and productivity by applying new methods and techniques. The proposed training programs are: fruits cultivation, use of organic fertilizer, irrigation techniques, appropriate cropping patterns, and methods of harvesting, processing and storage. Such training programs will be conducted in coordination with District Agriculture Development Office, District Livestock Office, District Forest Office and District Development Committee of the corresponding VDCs. Since the TL route is very long, such vegetable farming programs should be done in 3 different places. The total cost allocated for training programs regarding agriculture is NRs 16,35,000 (including cost for trainee's allowance, expert hiring, training materials, logistic support, etc.)

**Table 8-11: Cost for Vegetable Farming and Mushroom Farming**

S.N.	Particulars	No. of persons	No. of days	Unit cost (daily allowance)	Total Cost (NRs)
1	Training Coordinator	1	5	5000	25,000
2	Local Farmers /participants	20	5	700	70,000
3	Agronomist/Horticulturist/trainer	4	5	2500	50,000
4	Distribution of seed/ improved materials			LS	2,00,000
5	Training Materials and Logistics			LS	2,00,000
<b>Total Cost</b>					<b>5,45,000</b>
<b>Total Vegetable Farming Cost (3 places)</b>					<b>16,35,000</b>

*\*Out of three places, seasonal and off-seasonal vegetable farming program will be conducted 2 places and in one mushroom farming program will be done.*

#### 8.3.17.2 Livestock and Fishery Program

Animal husbandry is mainstay and it plays significant role in cash income generation for the people of the project affected area. To increase the livestock production in the area, improved techniques and methods need to be introduced. A training program on improved livestock will be conducted for the local farmers, which will provide opportunities for increasing production. This program is especially focused for those households who lose their assets in the assumption that they can improve livestock production by applying new methods and techniques. In the same way, a special fishery training program shall be conducted targeting the Majhi community residing near AP 40 of Barhabise-Kathmandu Section.

The cost allocated for one livestock training program is NRs. 8,27,500 (including cost for trainee's allowance, expert hiring, training materials, logistic support, etc.). Along the TL route, such program on livestock training shall be done in 3 different places. Thus, the total cost for livestock training is NRs. 24,82,500; whereas the fishery training will be done only in one place for specific community and the total cost is NRs. 5,00,000.

Table 8-12: Cost for Livestock Training Program

S. No.	Particulars	No. of persons	No. of days	Unit cost (daily allowance)	Total Cost (NRs)
<b>A. Livestock Training</b>					
1	Training Coordinator	1	5	5000	25,000
1	Local Farmers /participants	15	5	700	52,500
2	Agronomist/Horticulturist/trainer	4	5	2500	50,000
3	Distribution of Livestock			LS	5,00,000
4	Training Materials and Logistics			LS	2,00,000
	Sub-total Cost (one place)				8,27,500
	A. Sub-total cost (three place)				24,82,500
B.	Fishery training			LS	5,00,000
	Total-Cost (A+B)				29,82,500

### 8.3.17.3 Micro Enterprise Creation Training

Micro Enterprise Creation Training program will be provided to the project affected families. Altogether 15 participants will be trained. The main objective of training is

- To motivate the women group of PAF create/start their own business
- To develop entrepreneurship competency
- To identify and select viable business of their own
- To help for preparation of their own business plan

Table 8-13: Cost for Micro Enterprise Creation Training

S.N o.	Particulars	No. of person	No. of days	Unit cost (daily allowance)	Total Cost (NRs)
1	Local Participants	15	5	700	1,05,000
2	Trainer	4	5	2500	50,000
3	Distribution of Materials			LS	4,00,000
4	Training Materials and Logistics			LS	2,00,000
Total Cost					9,55,000

### 8.3.17.4 Social Awareness (Health, Sanitation and Safety) Program

An awareness program will be conducted in the project area to alert local people to the potential dangers related to health, sanitation and safety. This program will be targeted to the people residing in and around the vicinity of the corridor. It is envisaged that the influx of construction crew will increase the pressure on the existing health facilities of the area. The project proponent will be responsible for providing mobile health and sanitation facilities to its work force and this will ease the pressure on the existing facilities. The project proponent will provide technical assistance and materials for building low-cost squatting type toilets. Priority will be given to relocates. In addition, awareness program on construction-related safety issues and electrocution will also be conducted for the labor force and local residents. A joint program on health and sanitation can be launched in association with the existing NGOs of the project area



and other local communities during the construction phase. After the devastating earthquake, almost all the toilets of the project area as well as the nearby area were collapsed. Thus, the project shall allocate NRs.10,00,000 for awareness program.

### 8.3.17.5 Skill Development Program

Construction related training programs such as electrical wiring, driving, masonry (with focus on earthquake resistant structure) and automobile maintenance and repairing training will be conducted for the affected people (special focus for those households who lose land more than 50% and households who lose their residential structure) to tackle the adverse impact of the project. Duration of training will be 2 months (390 hrs) and it aims to expertise them.

**Table 8-14: Cost for Skill Development Training**

Expenses	Quantity	Unit Price/Month	Amount for 2 months (NRs)
<b>1. Electrical Wiring</b>			
<b>Competitive Cost</b>			
Coordinator	1 Person	15,000	30,000
Trainer-1	1 person	20,000	40,000
Trainer-2	1 person	18,000	36,000
<b>Sub Total A</b>			<b>106,000</b>
Communication costs	1 month	2000	2,000
Reproduction of reports		LS	4,000
Rent of Training Venues, Equipment Hire, Water and Electricity	1 month	10000	10,000
Training Materials	15 persons	8000	120,000
Food and Accommodation	450 days (15 persons for 30 days)	700	630,000
<b>Sub Total B</b>			<b>766,000</b>
<b>Non Competitive Cost</b>			
Skills Test Costs	15	5,500.00	82,500
<b>Sub Total C</b>			<b>82,500</b>
<b>Total (A+B+C)</b>			<b>954,500</b>
<b>2. Driving*</b>			<b>9,54,500</b>
<b>3. Automobile repairing*</b>			<b>9,54,500</b>
<b>4. Masonry*</b>			<b>9,54,500</b>
<b>Grand-Total</b>			<b>38,18,000</b>

\*Duration of wiring training and number of participants are also same so cost for this training is also NRs. 9,54,500. Hence total cost for skill development training is NRs. 38,18,000.

### 8.3.17.6 Summary of Enhancement Measures

The total enhancement measure cost for the socio-economic and cultural environment is NRs.1,03,90,500.

**Table 8-15: Summary of Enhancement Measure Cost**

S. No.	Description	Amount (NRs)
1.	Agriculture and Mushroom	16,35,000
1	Livestock and Fishery Training	29,82,500
2	Micro-Enterprises Training	9,55,000
4	Skill Development Training	38,18,000
5	Social awareness program	10,00,000
<b>Total</b>		<b>1,03,90,500</b>



### 8.3.18 Corporate Social Responsibility (CSR)

As a corporate responsibility the proponent has allocated some money for the betterment of local people. Money on different programs sectors like education, health, infrastructure, service facility and religious sites has been allocated. Following are the sectors covering as CSR:

#### 8.3.18.1 Education Support Program

Schools which are located within 500 m from the proposed TL alignment will be supported through educational support program. Support will be provided for purchase of computer, library establishment, drinking water facility, ladies toilet construction, construction activities and extra curriculum activities. After the earthquake, almost all the schools with their physical facilities are destroyed. Thus additional supports for reestablishing these schools are needed. For this provision, the total amount recommended is NRs. 50,00,000. The following schools shall be benefitted by this program.

**Table 8-16: List of Schools benefitted by Education Support Program**

S.No.	Name of School	Address	Remarks
1	Kamala devi Lower Sec. School	Karthali-8	within 300m
2	Sunkoshi Higher Sec. School	Karthali	
3	Nandala Devi Primary School	Chokati-7	within 500m
4	Shree Janata Primary School	Piskar-2	
5	Shree Shurke Higher Sec. School	Lakuridada	within 100m
6	Shree Shyamtar Primary School	Melung-1	within 40m
7	Shree Saraswati Sec. School	Ramche-6	within 300m
8	Kalidevi Lower Sec. School	Mankha-1	within 80m
9	Shree Bal Jyoti Primary School	Mankha-6	within 100m
10	Setidevi Primary School	Irkhu-3	within 120m
11	Suryodaya Primary School	Bhotasipa-9	120m
12	Shree Mahakali Higher Sec. School	Nayagau-1	500m

Source: field survey 2015

#### 8.3.18.2 Drinking Water Supply

Households of the affected area will be benefitted by drinking water scheme. Schools, Temples and other social infrastructures of the affected VDCs will be preferred to support for the effective management of drinking water supply, construction of water tanks in the area. The total cost for this scheme is NRs. 25,00,000.

#### 8.3.18.3 Infrastructure and Service Facility

Project also aims to support to people/stakeholders of each project affected VDCs in the infrastructures and service facility sector. Support will be provided for renovation of community building centers for study, furniture purchasing for community forest office buildings, renovation of the play-ground for the community, strengthening public meeting place in VDCs office, etc. For this NRs. 60,00,000 has been allocated.

#### 8.3.18.4 Additional Support Allowance

Income generation and skill orient training program are needed to the severely project affected households and vulnerable families. According to baseline report, altogether 9.49% population of project affected VDCs falls under the category of vulnerable community (Dalit and Highly marginalized group), whereas 4.57% of surveyed households are of this group. From the field study, it is also observed that the highly marginalized caste group Thami and Majhi community

is residing very close to TL corridor. In this case some additional support allowance will be provided for the betterment of their present living conditions. A total of NRs 5,00,000 has been allocated as additional support allowance.

#### **Total CSR Cost**

The total CSR cost is estimated to be NRs. 1,40,00,000. The breakdown cost of each sector is shown in Table 8-17.

*Table 8-17 : Summary of CSR cost*

S. No.	Description	Amount (NRs.)
1.	Education	50,00,000
2.	Drinking water supply	25,00,000
3.	Infrastructure and service facility	60,00,000
4.	Additional Support Allowance	5,00,000
<b>Total</b>		<b>1,40,00,000</b>

#### **8.3.19 Socio-economic Cost**

The mitigation cost, enhancement cost, and CSR cost for implementing the socio-economic and cultural environmental aspect described in this sub-chapter is estimated to be NRs. 97,79,67,087. Listing of the elements and a breakdown of the costs is given in Table 8-18 below.

*Table 8-18: Total socio-economic cost*

S. No.	Description	Amount (NRs.)
1.	Mitigation Cost	95,35,76,587
2.	Enhancement Cost	1,03,90,500
3.	Corporate Social Responsibility (CSR) Cost	1,40,00,000
<b>Total</b>		<b>97,79,67,087</b>





Table 8-19: Entitlement Policy Matrix

Type of loss	Entitlement unit	Description of entitlements	Implementation Measures
<b>1. House and other structures</b>			
Loss of own house and residential plot	<ul style="list-style-type: none"> <li>Titleholders</li> <li>Tenant</li> <li>Squatter on public land</li> </ul>	Cash compensation for full or partial loss of house at replacement cost, according to house type	<ul style="list-style-type: none"> <li>Land valuation undertaken by CDC, house and other structure valuation by project authorities, compensation rate established by CDC</li> <li>Material may be salvaged with no deduction from compensation</li> <li>Displaced HHs will receive a housing displacement allowance</li> <li>Notice to vacate will be served at least 35 days prior to acquisition date</li> <li>An appropriate compensation advance and housing displacement allowance to be paid at time of notice to vacate, balance payable prior to possession of property</li> <li>Compensation for partial losses payable prior to acquisition</li> <li>To ensure fair compensation, determination of rates will be done not more than one year prior to property acquisition</li> <li>All transfer costs and taxes will be responsibility of project</li> <li>Formal resettlement planning will be undertaken where more than 10 HHs from one settlements/ residential area are displaced</li> <li>Compensation determination, notice to vacate and compensation payment</li> <li>Owners of displaced commercial establishments will receive a business displacement allowance</li> </ul>
	Titleholder	Where displaced, cash compensation (at replacement value) for residential plot, or provision of suitable replacement residential plot in the vicinity, if available.	
	Tenant	Assistance with identification of alternative residential land	
Loss of commercial establishment	Titleholder	<ul style="list-style-type: none"> <li>Cash compensation for full or partial loss at replacement cost, according to building type</li> <li>Where displaced, cash compensation for plot or provision of suitable replacement plot in the vicinity if available</li> <li>Assistance with identification of alternative business</li> </ul>	
Loss of other privately owned structures	Titleholders, Tenant	<ul style="list-style-type: none"> <li>Cash compensation for full or partial loss at replacement cost, according to building type</li> <li>Cash compensation for damages to structures resulting from temporary occupation of land</li> </ul>	<ul style="list-style-type: none"> <li>Other structures includes: sheds, water tank, etc.</li> <li>Loss of structures other than houses and commercial establishment does not entail payment or a displacement allowances</li> <li>Compensation determination, notice to vacate</li> </ul>

## 2. Cultivable land

Loss of private land	Titleholder	Provide compensation at full replacement cost	A list of affected and entitled persons and the area of land loss is required
		<ul style="list-style-type: none"> <li>Provide full title to land of equal area and productivity acceptable to owner in the vicinity</li> <li>If land is not available elsewhere then provide cash compensation at full replacement cost based on current market rate or government rate whichever is higher</li> <li>Resettlement assistance in lieu of compensation for land occupied (land, other assets, employment) at least restore their livelihoods and standards of living of pre-displacement levels</li> <li>In the case of farm land, the SPAFs will be entitled the cultivation disruption allowance equal one year production</li> </ul>	<ul style="list-style-type: none"> <li>Notice to vacate will be served at least 35 days prior to acquisition date</li> <li>If any owner having significant impacts receives cash compensation for farm land and purchases replacement farmland within 1 year from the date of receiving compensation, all related land registration fees, taxes and duties will be borne by the project</li> <li>Case-wise compensation will be either by cash or by cheque, depending on the owner's preferences</li> <li>To ensure fair compensation, determination of rates will be established not more than one year prior to property acquisition</li> </ul>
Vulnerable social categories	Adults 18 years and older in the vicinity	<ul style="list-style-type: none"> <li>Assistance in reestablishment and improvement of livelihood</li> <li>Training in life skills</li> <li>Preferential employment on project construction and maintenance to the extent possible</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerable social categories actually affected by the project will be identified               <ul style="list-style-type: none"> <li>Dalits</li> <li>Landless households</li> <li>Women headed households</li> </ul> </li> </ul>

## 3. Government property

Loss of infrastructures and facilities	Relevant agency	Facilities will be repaired or replaced	To be undertaken in consultation with the relevant department or ministry
Loss of forest areas	Department of Forest	Mitigation by means of a forestation	<ul style="list-style-type: none"> <li>An assessment of maintaining that kind of vegetation</li> <li>To be undertaken in consultation with DoF</li> </ul>
Loss of government land	Relevant agency	No provision of compensation	<ul style="list-style-type: none"> <li>Consultation with relevant government agencies</li> </ul>

## 4. Other privately owned resources

Building and structures	Local community	Restoration of affected community buildings and structures to at least	Community buildings and structures includes: temples, water tank, irrigation canals trails and bridges
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Building and structures	Local community	<ul style="list-style-type: none"> <li>Restoration of affected community buildings and structures to at least previous conditions, or replacement in areas identified in consultation with affected communities and relevant authorities</li> </ul>	<ul style="list-style-type: none"> <li>Community buildings and structures includes: templos, water tank, irrigation canals trails and bridges</li> </ul>
<b>5. Rehabilitation Assistance</b>			
Displacement of HHs	Titleholders, tenant	<ul style="list-style-type: none"> <li>Housing displacement allowance for loss of own residential accommodation</li> </ul>	<ul style="list-style-type: none"> <li>The housing displacement allowance will be based on two months per capita income. The value of the allowance will be adjusted annually for price escalation</li> <li>Allowance will be paid at the time of serving the notice to vacate</li> <li>Displacement allowances will be paid severely</li> </ul>
<b>6. General counselling</b>			
All project impacts	HHs within RoW or outside the RoW	<ul style="list-style-type: none"> <li>General counseling on project impacts, construction schedules and acquisition dates, valuation compensation and grievance resolution mechanisms, construction employment procedures and local development initiatives</li> </ul>	<ul style="list-style-type: none"> <li>This will be achieved through the periodic distribution of information sheets and consultation with local officials</li> <li>Cooperation with GoN line agencies such as District Agriculture Office, District Forest Office to support effective resource utilization and community development</li> </ul>



## 9 ENVIRONMENTAL MONITORING PLAN

### 9.1 Introduction

This section discusses and outlines the environmental monitoring program of Tamakoshi-Kathmandu 400 kV TL Project. It also assists to ensure compliance with environmental laws and in ameliorating and eliminating adverse impacts. This chapter on monitoring is formulated in accordance with Environmental Protection Rules, 1997 and its amendment.

### 9.2 Requirements for Environmental Monitoring in Nepal

An Environmental Monitoring Plan will be required to define the responsibilities for the monitoring, the parameters that will be monitored, where the monitoring will take place and its frequency. Effective monitoring of the whole project cycle, particularly the resettlement related aspects, will assist in the identification of unexpected problems/outcomes, and facilitate the correction of these. Monitoring of socio-economic impact indicators should wherever possible be participatory, involving local groups assessing their own situations as part of the process. This will assist local communities raise their awareness about their situations and the chain of causality bringing about their situations of relative gain or loss.

Social monitoring will also be incorporated in the scope of work for construction management, so that the local labor recruitment norms and requirements, their operating conditions, rights and penalties can be closely observed in order to avoid inequities and conflicts. Social monitoring is the most effective if local community leadership and administration structures are involved in a process that is participatory, and provides recourse to recognized authority structures. Involving community leaders and local authorities often provides the means to resolve social problems identified in a direct, efficient and effective manner.

The monitoring plan for this project will be prepared directly by Project Proponent during the construction phase. Project proponent will primarily be responsible for the implementation of monitoring program. MoEn, DoED, NGOs, CBOs and local bodies will also be involved during the monitoring.

The environmental monitoring will be carried out at all the project impact areas in a regular or intermittent schedule. Compliance monitoring will be carried out regularly whereas the impact monitoring will be done at the middle and at the end of construction phase or as prescribed in the monitoring plan and schedule. (In general, observation, inspection, review of official records, interview, counting and/or measurements will be used for monitoring. Furthermore, scientific methods will be used for the monitoring requirements, where and whenever necessary.

### 9.3 Environmental Monitoring Unit

An Environmental Monitoring Unit (EMU) will be formed which will consist of experts from ESSD, Ministries, local administrators and other qualified personnel from the local market. EMU will be responsible for day-to-day Environment monitoring works. This Unit will consist of experts including the following:

- Environmentalist
- Sociologist
- Civil Engineer

- Electrical Engineer
- Statistician
- Field technicians
- Public Relation Officer
- Legal Officer

This unit will have two principal functions. The first is to conduct community related mitigation measures on behalf of the project (which are not specifically related to the activities of the construction contractors); while the second is the implementation of mitigation measures. The Unit will work in close co-ordination with the Project Manager/Director and NEA-ESSD. The Unit, in addition of foreseeing mitigation and monitoring will also take care of the community problems arising during project construction. Furthermore, the Unit will use EMP as the guideline for implementing the mitigation specified in IEE, Tender Documents and Technical Specifications such that the deleterious environmental impacts were minimized.

The co-ordination of the compliance monitoring and mitigation program allocated under the contractor will be the responsibility of the project proponent. As already stated, the Environmental Unit will work for the monitoring of compliance issues of construction contractors. The Unit will be responsible for the approval of contractors Environmental Protection Plan (EPP) and Environmental Safety Plans. In addition, the Unit in coordination of Project Manager will have the authority to penalize contractors for violation of environmental tender clauses and non-performances.

## 9.4 Environmental Monitoring Plan

A monitoring program required for the project to evaluate the application and effectiveness of mitigation measures is formulated in three phases.

### 9.4.1 Baseline Monitoring

The primary concern during this phase will be to implement field data collection programs needed to enhance the knowledge of baseline conditions. Focus will be on the gathering of scientific and sociological information needed to verify and update the data provided by this IEE process.

### 9.4.2 Compliance Monitoring

In this monitoring, the GoN licensing entity (MoEn/DoED) oversees and ensures the implementation of the required mitigation measures according to GoN guidelines and approved mitigation plan. The Unit will be delegated the day-to day responsibilities in this respect.

### 9.4.3 Impact Monitoring

Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The monitoring of the proposed 400 kV TL Project will include:

#### 9.4.3.1 Physical Environment

- Watershed monitoring /Land use
- Stability of the area around the tower pads



**9.4.3.2 Biological Environment**

- Vegetation Clearing
- Plantation
- Casualty replacement/ re-vegetation
- Tree management
- Stability along the river crossings

**9.4.3.3 Socio-economic and Cultural Environment**

- Employment monitoring
- Land-use along the RoW
- Economic status of the affected people and relocated people
- Adaptation of resettlement households to their new homes and communities
- Public safety and security monitoring
- Health and sanitation monitoring
- Compensation

**9.5 Grievance Redress Mechanism (GRM)**

The GRM for any infrastructure project provides an effective approach for complaints and resolution of issues made by the affected community in a reliable way. Considering this, a Grievance Redressal Cell (GRC) will be established at the district level to address the social issues associated with the project. The cell will have representation from the project, local administration, civil society and the Project Affected Families. The GRC will look into complaints and concerns about ownership disputes, inheritance of assets, distribution of compensation among heirs, missing affected assets and persons in the census etc. The GRC will seek to resolve the issues quickly in order to expedite the receipt of compensation, without resorting to expensive and time-consuming legal actions. The budget for setting up the grievance cell will be provided by the Project Manager Office itself.

In addition to the above, if there are any grievances related to environmental management issues in the project area, the GR cell will record these grievances and suggestions and pass it on to the relevant authorities for necessary action and follow-up.





Table 9-1: Monitoring Plan and Schedule

SN	Parameter	Indicators	Method	Location	Schedule
<b>A. Baseline Monitoring</b>					
<b>Physical Environment</b>					
1	Land Use	Changes in land use pattern	Site observation	RoW and nearby areas	Once during the construction phase and operation phase
2	Stability	Stability at tower pads	Site observation	Near tower pads	Before and after rainy season prior to construction
<b>Biological Environment</b>					
3	Vegetation/ Forest cover	Observation of Vegetation and maintenance of RoW	Discussions with Users Group, observation, local people and District Forest Office	Under the RoW and in the vicinity of the corridor	Once each during preconstruction, construction and operational phase
4	Wildlife	Wildlife habitat and clearance	Observation, discussion with local people	RoW and near project area	Once each during preconstruction, construction and operational phase
<b>Socio-economic and Cultural Environment</b>					
5	Settlement/ infrastructure	Increase in settlements/infrastructure, migration	Discussion with local people, VDCs, observation	Project affected VDCs	Once each prior to construction and operation
6	Socioeconomic cultural baseline	Update socio-economic/cultural baseline	Discussion with local people, observation, review	Project affected areas	Once prior to construction
<b>B. Impact Monitoring</b>					
<b>Physical Environment</b>					
1	Land use	Stability/ landuse changes from the baseline	Observation	Around the tower pad area	Continuous observation during construction, annually during operation
2	Waste disposal	Unpleasant odour and visual impact	Observation	Temporary camps/ construction sites	Weekly during construction
3	Air Quality/ water quality		observation	Project area	Weekly during construction
<b>Biological Environment</b>					
4	Vegetation Clearance	No. of trees felled, ground cover	Observation of the area, discussion, counting	Under the RoW	During construction
5	Pressure on Forest	Forest Cover	Observation and survey of forest area before and after construction, discussion with local people and FUGs.	Along TL	Regular basis during construction and annually during operation
6	Wildlife	No. of wildlife seen	Observation, keeping records on wildlife, birds and	In the vicinity of the corridor	Regular basis during construction and annually during



			reptiles killed		operation
<b>Socio-economic and Cultural Environment</b>					
7	Compensation	Socio-economic parameters like economic status, living conditions etc. of the affected people.	Housing assets, living conditions, income etc.	Affected local people	Regularly for at least three years following land acquisition
8	Land Loss	Acquisition of land, lease of land and temporary disturbances in land	Cross checking the compensation list	Tower pad, RoW and the leased area	Quarterly during construction and once during operation
9	Health issues	Types of Diseases and record of outbreak of diseases	Record of diseases, inspection of camps of camps	Project area and particularly camps	Continuous during construction period
10	Safety	No. of casualties	Records of accidents	Project area	Continuous during construction period/operation phase
11	Employment	No. of local people employed by project	Records kept by management	Project area	Continuous during construction period and annually during operation
12	Impact on Women/Children	Status of women children	Record of women employment; children education; inspection on child labor	Project area	Continuous during construction period
13	Indirect economic benefits	Economic activities in the area	Trade and business revenues	Project affected VDCs	Once a year during construction and once during operation
<b>C Compliance Monitoring</b>					
1	Incorporation of recommendations of IEE into project documents	Yes/No	Review/cross checking of tender and design documents	Kathmandu Office	During and after the project design stage completion of tender documents
2	Incorporation of Environmental considerations mentioned in tender documents in the contractors proposed work plans	Yes/No	Review of proposed work plan submitted by the contractor	Kathmandu Office/site office	During contract negotiations
3	Integration of mitigation measures in the detail design and contract document	Yes/No	Review process	Kathmandu office	During project approval
4	Allocation of adequate budget for implementation of environmental		Review, inquiry and consultation	Kathmandu office	During detail design and contract agreement



	mitigation measures and monitoring works				
5	Clean-up and reinstatement of the project area	Muck disposal, drainage around the tower	Site observation, and inspection	A round tower area, substation area	At the end of construction period
6	Compensatory plantation of native species and conservation of planted seedlings for 5 years	Type of planted Species, survival of seedlings	Site observation/sampling	Corridor inspection, tower area, plantation areas	Periodically during construction and operation
7	Land/property acquisition procedures	Compliance with national legal requirements	Discussions with local people	Affected VDCs/site office	At the time of acquisition
8	Trainings and trainees	Number of trainings and trainees	Survey/observation	Project affected area/VDCs	Periodic during construction and operation

## 9.6 Monitoring Cost

The monitoring costs have been estimated in Table 9-2. The total cost for the monitoring activities (for preconstruction and construction phase) has been estimated as NRs.2,45,61,000/-

Table 9-2: Environmental Monitoring Cost

S.No.	Item	Man-month	Rate/Month(NRs.)	Amount (NRs.)
<b>A. Pre-construction Phase</b>				
1	<b>Manpower</b>			
	Project Coordinator	2	37000	74,000
	Team Leader	3	33000	99,000
	Environmental Expert	2	28000	56,000
	Socio-economist	2	28000	56,000
	Support Staff	4	24000	96,000
	<b>Sub-total</b>			<b>3,81,000</b>
2	<b>Out of Pocket Expenses</b>			
	TA/DA		LS	1,50,000
	Field Assistant		LS	1,00,000
	Transportation		LS	1,00,000
	Report Production		LS	25000
	Miscellaneous		LS	25000
	<b>Sub-total</b>			<b>4,00,000</b>
	<b>Total of Pre-construction Phase</b>			<b>7,81,000</b>
<b>B. Construction Phase</b>				
1	<b>Manpower</b>			
	Project Coordinator	8	37000	2,96,000
	Team Leader	12	33000	3,96,000
	Unit Chief	36	42000	15,12,000
	Civil Engineer	12	28000	3,36,000
	Environmentalist/ Forest Expert	18	28000	5,04,000
	Socio-economist	18	25000	5,04,000



**Tamakoshi-Kathmandu 400 kV TL Project**

**Environmental Monitoring Plan**

	Community Liaison Officer	6	25000	1,50,000
	Supervisor/ Monitors -6	216	25000	54,00,000
	Support Staff site office -3	108	15000	16,20,000
	Support Staff Kathmandu office -1	36	12000	4,32,000
	Cost for line agencies monitoring		LS	2,00,000
	Joint monitoring team		LS	2,00,000
	<b>Sub -total</b>			<b>1,15,50,000</b>
<b>2</b>	<b>Out of Pocket Expenses</b>			
	TA/DA		LS	5,00,000
	Transportation Vehicle purchase - Pickup	1	45,00,000	45,00,000
	Motorcycle- 2 Nos	2	1,50,000	3,00,000
	Fuel and maintenance		LS	10,00,000
	Report Production		LS	1,50,000
	Field Assistant		LS	5,00,000
	Office Rent ( site office)	36x3	10000	10,80,000
	Computer and Printer		LS	5,00,000
	Community Consultation		LS	2,00,000
	Office Accessories and operation cost( site office)		LS	5,00,000
	Miscellaneous		LS	5,00,000
	ESSD Strengthening		LS	25,00,000
	<b>Sub-Total</b>			<b>1,22,30,000</b>
	<b>Total of Construction Phase Monitoring</b>			<b>2,37,80,000</b>
	<b>Grand Total (Pre-construction and construction monitoring)</b>			<b>2,45,61,000</b>

### 9.7 Agencies Responsible for Environmental Monitoring

As per the EPR, Ministry of Energy will be responsible for monitoring. However, the project proponent NEA will have the prime responsibility for carrying out the monitoring activities. ESSD of NEA will be the organization responsible for pre-construction and construction phase monitoring of the proposed project. The Tamakoshi-Kathmandu 400 kV TL Environmental Management Unit comprising the staff from ESSD, among others will be established for the construction phase of monitoring of the project. This Unit will work on behalf of Tamakoshi-Kathmandu 400 kV TL Project. The Unit will be responsible for compliance and impact monitoring works.

### 9.8 Summary of Cost Benefit Assessment

The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs1,04,27,54,118/- which is 9.93% of the total project cost.

The summary of environmental cost benefit analysis is shown in Table 9-3. The proponent has obligation to carry out the mitigation, enhancement and monitoring activities of the project.

**Table 9-3: Environmental Cost Benefit Analysis**

S. No.	Description of Cost	Amount (NRs.)
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**Tamakoshi-Kathmandu 400 kV TL Project****Environmental Monitoring Plan**

1	Cost for environmental mitigation measures	98,91,52,618
2	Cost for enhancement measures	1,50,40,500
3	Cost for other social support program and CSR cost	1,40,00,000
4	Cost for environmental monitoring	2,45,61,000
<b>Total environmental cost including monitoring cost</b>		<b>1,04,27,54,118</b>
<b>Total Project cost</b>		<b>10,50,00,00,000</b>
<b>Percentage of total environmental cost to the total project cost</b>		<b>9.93%</b>

**Implementation of Mitigation Measures, Enhancement Measures, CSR and Monitoring Activity**

The proponent has prime responsible for implementing the proposed mitigation/enhancement measures, CSR and the monitoring activities. Proponent has an obligation to carry out all these activities along with cost.



## 10 CONCLUSION

This chapter sums up the findings and conclusions of the Environmental Team responsible for carrying out the Initial Environmental Examination (IEE) report of the Tamakoshi-Kathmandu 400 kV TL Project. An overall assessment is provided first, followed by sections giving specific conclusions and recommendations.

The total land requirement will be approximately 470.92 ha for tower pads, substation and RoW. Out of that, the project requires 308.4467 ha of cultivated land, 126.3942 ha of forest land and 36.0809 ha of other land. There will be loss of 26061 trees for the RoW clearance belonging to 50 different community forest; four government forest and two leasehold forest.

The environmental issues/impacts identified during the IEE study can be mitigated and manageable. The finding of IEE shows that the adverse impacts on physical, biological, socio economic and cultural environment due to the implementation of the proposed project low/medium, local and short term. Wherever possible, efforts have been made by the project planning team to limit adverse impacts on the environment by selecting environmentally benign design options and otherwise suggesting appropriate mitigation measures. Mitigation measures has been proposed for all identified/predicted adverse impacts and enhancement measures are developed for maximize the project benefits. However, those impacts/issues now not predicted/documented in this IEE report but might appear later, will be also undertaken by Environmental Management Unit during the construction phase.

The proponent NEA will have obligation to carry out the mitigation, enhancement and monitoring activities of the project. The environmental impact mitigation measures will be incorporated in detail design of the substation and so on, contract documents. The project proponent will be primarily responsible for following acts, rules, regulations (legislation and other relevant directive of GoN) while implementing the project.

The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 1,04,27,54,118 which is about 9.93 % of the total project cost. This cost also includes compensation (NRs. 86,53,62,057) to the private land acquired for the proposed project.

In overall, this IEE study concludes that the proposed Tamakoshi-Kathmandu 400 kV TL Project shall not have significant impacts on physical, biological; socio-economic and cultural environment of the project area. Therefore, the proposed project is environmentally and socially feasible, with adoption of suggested mitigation and enhancement measures. The IEE study is adequate and no further study is supposed to be required regarding environmental assessment of the proposed project.





**References**

Annual Progress Report FY 2070/71 BS published by District Forest Office, Bhaktapur, 2071 BS.

Annual Progress Reports FY 2070/71 BS published by District Forest Office, Kavre Palanchok, 2071 BS.

Community Forest Resource Inventory Guidelines (Revised), 2061 published by Community Forestry Division, Department of Forest, Babarmahal, Kathmandu, 2061 BS.

Community Forestry Monitoring and Annual Progress Report FY 2069/70 BS published by District Forest Office, Sindhupalchowk, 2070 BS.

Community Forestry Monitoring and Annual Progress Report FY 2069/70 BS published by District Forest Office, Dolakha 2070 BS.

Community Forestry Monitoring and Annual Progress Reports FY 2070/71 BS published by District Forest Office, Kathmandu, 2071 BS.

Forest and Vegetation Types of Nepal, TISC Document Series No. 105 published by Tree Improvement and Silviculture Component of Department of Forest, 2002 AD.

Government of Nepal - Work Procedure for Providing Forest Land for Other Use, 2063 BS Management Information System (MIS) data base of Community Forestry Division of Department of Forest, 2015.

Nationwide Master Plan Study on Storage Type Hydroelectric Power Development in Nepal, Japan International Cooperation Agency, 2014

Standard for Removing Trees from Government Forest, 2071 – Ministry of Forest and Soil Conservation, 2071 BS.

