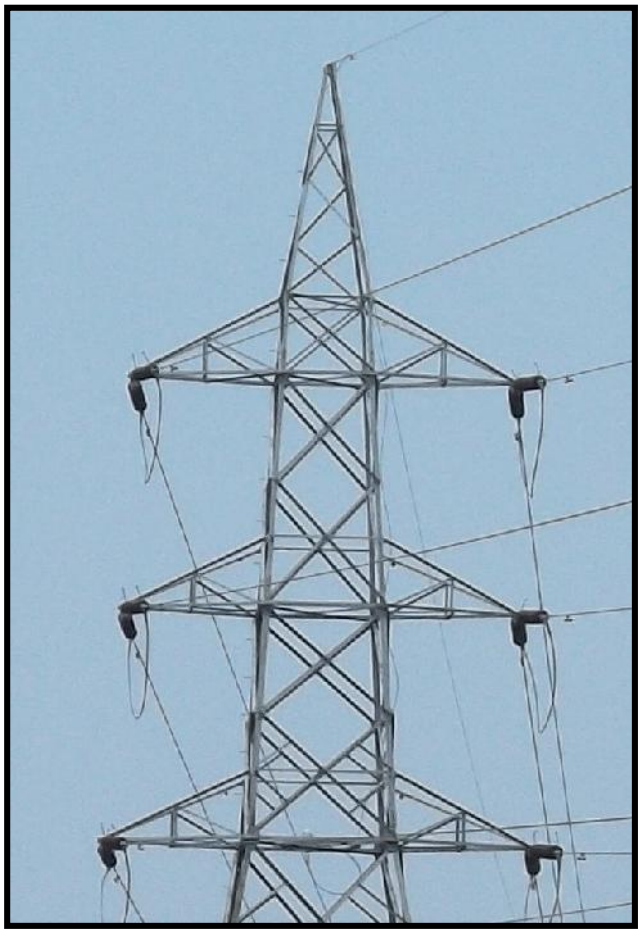
Nepal Electricity Authority

INITIAL ENVIRONMENTAL EXAMINATION (IEE) REPORT

OF

Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project



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Through

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Abbreviations and Acronyms

BS	-	Bikram Sambat (Nepali official era)
CBS	-	Central Bureau of Statistics
CF	-	Community Forest
CFUG	-	Community Forest Users' Group
CITES	-	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DDC	:	District Development Committee
DoED	-	Department of Electricity Development
EIA	-	Environmental Impact Assessment
EPA	-	Environment Protection Act, 1997
EPR	-	Environment Protection Rules, 1997
ESSD	-	Environment and Social Studies Department
GoN	-	Government of Nepal
ha	-	Hectare
HEP	-	Hydroelectric Project
IEE	-	Initial Environmental Examination
ILO	-	International Labor Organization
INGO	-	International Non Governmental Organization
km	-	Kilometer
kV	-	Kilovolt
m	-	Meter
masl	-	Meter above sea level
MoE	-	Ministry of Energy
MT	-	Metric Ton
MVA	-	Mega Volt Ampere
MW	-	Megawatt
NEA	-	Nepal Electricity Authority
NGO	-	Non Governmental Organization
NTFP	-	Non Timber Forest Products
PAF	-	Project Affected Family
RoW	-	Right of Way
NRs.	-	Rupees (Nepalese currency)
ToR	-	Terms of Reference
VDC	-	Village Development Committee

Executive Summary

1. Project proponent and Organizations Responsible for the IEE Study

The project proponent is the Nepal Electricity Authority (NEA). NEA is a public undertaking of the Government of Nepal and was established in August 16, 1985 (Bhadra 1, 2042 BS) under the Nepal Electricity Authority Act, 2042. Environmental and Social Studies Department (ESSD) is responsible for conducting the IEE study of this project. The Ministry of Energy (MoE) has granted a survey license for the feasibility and environmental study of Samundratar-Trishuli 3B Hub 132 kV TL Project to NEA on BS 2070/04/20 (August 4, 2013) with validity till BS 2072/04/19 (August 4, 2015).

2. Project Description

For construction and extension of national transmission line, GoN has added construction of 29 numbers of new 132/220/400 kV transmission lines with total line length of 2,255 km. Among them, Samundratar-Trishuli 3B Hub 132 kV TL Project has been proposed for the power evacuation from the planned HEPs in Tadi Khola, Chandrawati Khola and others in the north-east part of Nuwakot district. Total length of the proposed transmission line is 26.6 km. The RoW will be 18 m (9 m either side from center line). A new 132 kV substation will be also constructed under this project. The proposed TL line passes through 11 VDCs of Nuwakot district, which are namely Samundratar, Balkumari, Sundara Devi, Raluka Devi, Kharanitar, Narjamandap, Lachyang, Bageshwori, Gerkhu, Tupche and Manakamana. The project construction period is 2 years.

3. Study Methodology

This IEE report has been prepared following Environment Protection Act, Environment Protection Rules, 1997 (with amendment) and National EIA Guidelines, 1993. This IEE is prepared in accordance with the legal requirements of GoN, based on field studies and consultation with local people and officials. A public notice has been published in Gorkhapatra Daily on 19th Jeth, 2071.

4. Existing environmental Acts, Rules/Regulations, Policies, Guidelines, and Conventions

The proponent will be responsible for fulfilling the provisions of all relevant acts, rules/regulations policies, guidelines and conventions while implementing the project. Water Resources Act (1992), Electricity Act (1992), Water Resource Regulations (1993), Electricity Regulation (1993), Hydropower Development Policy (1992), Land Acquisition Act 1977, Forest Act (1993), and Forest Rules (1995), Local Self Governance Act (1999), Forest Produce, Collection and Sales Distribution Guidelines (2000), etc were also extensively reviewed while preparing the report.

5 Existing Environmental Condition

5.1 Physical Environment

The proposed 132 kV transmission line runs down along the Tadi River through flat terrain of Tadi river valley. From Kharanitar, the proposed transmission line alignment turns north-west

and runs uphill crossing over undulated mountain terrains, ridges and cliffs. From Gerkhu, it runs downhill and crosses Trishuli River nearby Betrawati bazaar. The altitudinal variation through which the transmission line passes is 605 to 1479 masl. The main land use pattern of the project area is cultivated land, forest and barren land. The alignment avoids densely populated areas, major structures, protected areas and dense forests.

5.2 Biological Environment

The natural vegetation and forest ecosystem in the project area consist of mainly Pine and Sal mixes forest and sub-tropical mixed hardwood forests. Total number of community forests in Nuwakot district is 277, out of which there are 9 different units of community forest along the RoW. The project site does not fall in national park, wildlife sanctuary area, buffer zone, conservation area and environmentally sensitive area. Mammals such as barking deer, jackal, porcupine, Rhesus monkey, malsapro, squirrel etc. are reported in the project affected area. Common myna, house swift, house crow, spotted dove, house sparrow, koili, jungle fowl etc are reported bird species in the project area. Listed plant species in the project area are Sal and Simal. Similarly, Rhesus monkey, common langur and leopard are the listed wild animals found in the area.

5.3 Socio–economic and Cultural Environment

According to Census 2011, the total population of the project affected district is 277,471 with 132,787 male and 144,684 female. There are 59,215 households and the average household size is 4.69. Similarly, the average literacy rate of the (Population of five years and above) project district is 60%. Similarly, the total population of the project VDCs is 42,856 with 20,543 male and 22,313 female. The total number of households is 9,198 with average household size 4.66 in the project affected VDCs. The major settlements in the project area Naubise, Gairikhet, Bhyangle, Satbise, Dabade Danda, Pahire, Moriya, Bohore Bhayanjyang, Maharthum, Furketar, Chokade, Chhaptar, Kaule, Sholebazar, Archale and Pahirebesi. Agriculture is the major occupation of the people in the project area. The rest of the people are engaged in foreign employment, business, government service, labor, agro-based industries, livestock and poultry farming, etc.

The construction of project will affect 59 households. Among them, survey of 46 households has been conducted. The total population of the sample household is 305 and average household size 6.63. The major ethnic groups in the project affected households are Brahmin followed by Tamang, Newar, Dalit, Ghale, Magar and Chhetri. From the household's survey, it is revealed that 79.79% of the surveyed populations are literate. The household's survey shows all of the affected households have their own land for cultivation. Average land holding size of the surveyed households is estimated to be 0.780 ha (15 Ropani). Average annual income of the surveyed households is NRs. 2,10,135.

6 Impact Assessment

6.1 Physical Impacts

The construction activities may cause the land interference at the substation site. Except that, no other change in topography is envisaged due to the project construction. The project will

require 47.336 ha (930 Ropani) land for the placement of substation, tower foundations, access road and RoW. Out of this 2.562 ha land will be permanently acquired and 44.774 ha will be temporarily acquired. Soil disturbances due to construction activities of tower pads, the generation of solid wastes and chemicals such as cement slurry, construction materials and human wastes may deteriorate the water quality of nearby river and streams

6.2 Biological Environment

The total estimated forest area falling under the transmission line alignment is 10.751 ha (actual forest/vegetation cover is 7.07 ha, the rest is degraded lands too). The proposed transmission line passes through 9 different community forests and little part through government managed forest. 17 towers are located in the forestland, which will require 0.17 ha forest area (each tower pad requires 10 X 10 sq. m). Based on the forest sampling, 2868 trees (mostly poles) are estimated to be felled for the RoW. Since there will be small number of outsider work force involved in the project construction, collection and sale of NTFPs by workers will be negligible. The wildlife habitat will be disturbed to some extent due to the forest/vegetation clearance along the RoW. Pylons and cables of the transmission line will pose obstruction for flying of birds.

6.3 Socio-economic and Cultural Environment

The project shall affect about 59 households due to the location of different project components such as tower pad, structure falls under RoW, access road and substation. 3 structures (house and sheds) and 31.878 ha of cultivated land will be affected. Out of that, 2.332 ha of land shall be permanently acquired. Out of total 90 towers, 67 towers will be located in cultivated land. The permanent acquisition of 2.332 ha land will result crop production loss of 9.2 MT annually. The prevailing market value of that is NRs. 3,01,700.

7. Alternative Analysis

During the feasibility and IEE study, alternative analysis was carried out to minimize environmental and social impacts considering different aspects like transmission line route/location, technical design, construction schedule, no forest option etc.

8. Mitigation & Enhancement

8.1 Physical Environment

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 stability of the tower locations will be examined before excavation and special foundation design will be selected for the susceptible locations. As far possible, 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. Waste materials will be properly managed.

8.2 Biological Environment

Tree felling will be minimized adopting selective felling along the RoW. Wood logs will be

handed over to respective owners or community forest users groups or District Forest Office. Compensatory plantation program will be carried out in 1:2 ratio and plantation sites will be handed over to concerned stakeholder agencies after 5 years conservation on cost of of the project proponent. The project workers will strictly be prevented from poaching and any other kind of illegal activities related to forest and wildlife. Informative and warning sign will be placed at relevant construction sites. The project proponent will implement awareness program to aware local people and forest users about the importance of forest and wildlife conservation.

8.3 Socio-economic and Cultural Environment

The land will be acquired according to the Land Acquisition Act, 2034 BS and as per the rate fixed by Compensation Fixation Committee, cash compensation will be provided to respective land owners. The total compensation for the land is estimated to be NRs. 8,01,69,390. Similarly, the total compensation for the crop loss along the RoW is estimated to be NRs. 22,22,060 only. Temporarily acquired land will be returned to land owner after completion of the project construction. As per Electricity Act 2049, it will be restricted to build up any structures and tall growing trees under the RoW. Employment opportunity will be given to local during the project construction. An awareness program will be conducted in the project affected area. Different skill development trainings will be provided to members of the project affected families. A sum of budget has been allocated for community development program in the project affected area.

9. Environment Monitoring

In order to mitigate likely environmental impacts on environment due to the proposed project, implement the mitigation program effectively and environmental monitoring, an Environmental Unit will be established at the project site during the project construction period. The Unit will consist of experts from ESSD and other qualified personnel.

10. Conclusion

Major impacts of the proposed project are land acquisition and tree felling for the forest clearance. The project will require 47.336 ha in total, out of that 31.878 ha of cultivated land will be required for the project construction. There will be loss of 2868 trees for the RoW clearance belonging to 9 different community forests. In terms of the loss of land and assets, 59 households will be affected due to the implementation of the project. Various environmental mitigation and enhancement measures have been proposed during the construction and operation phase of the project. The total environmental cost of the proposed project is proposed NRs.10,09,36,810; (10.16% of the total project cost). The IEE study concludes that construction of the proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project is environmentally and socially feasible if the proposed mitigation measures and monitoring plans are implemented.

कार्यकारी साराँश

१. आयोजनाको प्रस्तावक र प्रारम्भिक वातावरणीय परीक्षण अध्ययन गर्ने निकाय

प्रस्तावित समुन्द्रटार-त्रिशुली ३बि हब १३२ के.भी. प्रसारण लाइन आयोजनाको प्रस्तावक नेपाल विद्युत प्राधिकरण हो । नेपाल विद्युत प्राधिकरण ऐन २०४२ अन्तर्गत वि.स. २०४२ साल भाद्र १ (सन १९८५ अगष्ट १६) मा नेपाल विद्युत प्राधिकरणको स्थापना भएको हो । जुन नेपाल सरकारको पूर्ण स्वामित्वमा रहेको एक संगठित संस्था हो । प्रस्तावित प्रसारण लाइन आयोजनाको प्रारम्भिक वातावरणीय परीक्षण अध्ययन कार्य नेपाल विद्युत प्राधिकरण अन्तर्गत स्थापित वातावरण तथा सामाजिक अध्ययन विभागले गरिरहेको छ । श्री ऊर्जा मंत्रालयबाट यस आयोजनाको संभाव्यता तथा वातावरणीय अध्ययन गर्न मिति २०७०।०४।२० मा सर्वेक्षण अनुमति पत्र प्रदान गरिएको छ । अनुमति पत्रको म्याद २०७२।०४।१९ सम्म रहेको छ ।

२. आयोजनाको विवरण

राष्ट्रिय प्रसारण प्रसारण लाइनको निर्माण तथा बिस्तार गर्न नेपाल सरकारले १३२/२२०/४०० के.भी. क्षमताका कुल लम्बाई २,२५५ कि.मी.को २९ वटा नयाँ प्रसारण लाइन आयोजनाहरु अघि बढाएको छ । त्यस मध्ये, नुवाकोट जिल्लाको उत्तर–पूर्वी क्षेत्रमा तादी, चन्द्रावती लगायतका नदीहरुबाट उत्पादन हुने विद्युत शक्तिलाई केन्द्रिय विद्युत प्रसारण लाइनमा जोड्न समुन्द्रटार-त्रिशुली ३ बि हब १३२ के.भी. प्रसारण लाइन आयोजना प्रस्ताव गरिएको छ । यसको कुल लम्बाइ २६.६ कि.मी. रहेको छ । प्रसारण लाइनको राइट अफ वे (आधिकारिक मार्ग) १८ मिटर (केन्द्रिय रेखा देखि दाँयाबाँया ९/९ मिटर) रहने छ । यस आयोजना अन्तर्गत समुन्द्रटारमा एउटा १३२ के.भी. क्षमताको नयाँ सबस्टेशन समेत निर्माण गरिनेछ । प्रस्तावित प्रसारण लाइन मार्गमा नुवाकोट जिल्लाको ११ वटा गा.वि.स.हरु पर्दछन् । जसमा समुन्द्रटार, बालकुमारी, सुन्दरादेबी, रालुकादेबी, खरानीटार, नर्जामण्डप, लच्याङ्ग, बागेश्वरी, गेर्खु, तुप्चे र मनकामना पर्दछन् । आयोजना निर्माण अवधि २ वर्ष रहेको छ ।

३. अध्ययन विधि

यस आयोजनाको प्रारम्भिक वातावरणीय परीक्षण सम्वन्धि अध्ययन वातावरण संरक्षण ऐन २०५३, वातावरण संरक्षण नियमावली, २०५४ (हालसम्मको संसोधित) र वातावरणीय प्रभाव मूल्यांकन सम्वन्धि राष्ट्रिय दिग्दर्शन २०४९ मा निर्देशित निश्चित मापदण्डहरुलाई अवलम्वन गरी तयार गरिएको छ । साथै, प्रतिवेदन तयार गर्ने क्रममा नेपाल सरकारद्वारा निर्दिष्ट गरिएका कानूनी प्रावधानहरुलाई समेत अवलम्वन गरिएको छ । प्रस्तुत प्रारम्भिक वातावरणीय परीक्षण सम्वन्धि कार्य स्थलगत अध्ययन, प्रभावित परिवारसंग छलफल र स्थानीयस्तरका सरकारी तथा गैर-सरकारी संस्थाहरु र अन्य स्थानीय सरोकारवालाहरुसंग छलफल गरी सम्पन्न गरिएको छ । यसै सिलसिलामा मिति २०७१ जेठ १९ गते गोरखापत्र दैनिकमा सार्वजनिक सूचना प्रकाशन गरिएको थियो ।

४. वातावरण संरक्षण सम्वन्धि विद्यमान वातावरणीय ऐन, नियम तथा निर्देशिकाहरु

प्रस्तावकले आयोजना कार्यान्वयन गर्दा वातावरण संरक्षणसंग सम्वन्धित विद्यमान निति, नियम,ऐन, कानुन तथा निर्देशिकाहरुमा तोकिएका मापदण्डहरुलाई बिशेष रुपमा ध्यान दिइएकोछ । प्रस्तुत आयोजना अध्ययनको क्रममा विद्युत तथा जलश्रोतसंग सम्वन्धित निति, ऐन, नियमावली, तथा निर्देशिकाहरु जस्तो जलविद्युत विकास निति २०५८, विद्युत ऐन २०४८, जलश्रोत नियमावली २०४९, विद्युत नियमावली २०५० आदिको पुनरावलोकन गरिएको थियो । त्यसैगरी वातावरण संरक्षण ऐन २०५३, वातावरण संरक्षण नियमावली २०५४ (हालसम्मको संसोधित) जग्गा प्राप्ति ऐन २०३४, वन ऐन २०४९, वन नियमावली २०५१, स्थानीय स्वायत्त शासन ऐन २०५५, स्थानीय स्वायत्त शासन नियमावली २०५६, वातावरणीय प्रभाव मूल्याङ्कन सम्वन्धि राष्ट्रिय निर्देशिका २०४९, वन पैदावर संकलन तथा वितरण निर्देशिका २०५७ आदि जस्ता महत्वपुर्ण ऐन, नियमहरु यस प्रतिवेदन तयार गर्ने क्रममा पुनरावलोकन गरिएको थियो ।

५. आयोजना क्षेत्रको विद्यमान वातावरणीय अवस्था

५.१ भौतिक वातावरण

प्रस्तावित समुन्द्रटार-त्रिशुली ३ वि हब १३२ के.भी. प्रसारण लाइन तादी नदी उपत्यकाको समतल इलाका हुदैं गएको छ । खरानीटारबाट प्रस्तावित लाइन उत्तर पश्चिम हुदैं डाँडा, भिरपाखा भएर जान्छ । गेर्खुबाट फेरि बेत्रावती बजार नजीक हुँदै त्रिशुली नदी किनार भएर प्रसारण लाइन गएको छ । प्रसारण लाइन समुन्द्र सतहबाट ६०५ मिटर देखि १४७९ मिटरको उचाईको भूभाग हुँदै जान्छ । आयोजना क्षेत्रमा मुख्यत आवादी जमिन, जंगल र भिरपाखा रहेको छ । प्रसारण लाइन घना बस्ती, मुख्य भौतिक संरचना, संरक्षित क्षेत्र र घना जंगल बाहिरबाट लाने गरि प्रस्ताव गरिएको छ ।

५.२ जैविक वातावरण

प्रसारण लाइनमा मिश्रित वन, साल र सल्लाका वनहरु पर्दछ । नुवाकोट जिल्लामा कुल सामुदायिक वनहरुको सँख्या २७७ रहेको छ, त्यस मध्ये प्रस्तावित प्रसारण लाइन ९ वटा सामुदायिक वन क्षेत्र भएर जान्छ । आयोजना क्षेत्र कुनै पनि राष्ट्रिय निकुन्ज, वन्यजन्तु आरक्ष, मध्यवर्ती क्षेत्र, संरक्षण क्षेत्र वा वातावरणीय दृष्टिकोणले संवेदनशील भनी घोषित क्षेत्रमा पर्दैन । अध्ययनका क्रममा प्रस्तावित प्रसारण लाइन आयोजना क्षेत्रमा मृग, स्याल, दुम्सी, बाँदर, मलसाप्रो, लोखर्के आदि स्तनधारी वन्यजन्तु पाइएको छ । चराका मुख्य प्रजातिहरुमा मैना, भँगेरा, काग, ढुकुर, कोइली आदि हुन् । बाँदर, लंगुर र चितुवा संरक्षित सूचीमा पर्ने वन्यजन्तुहरु समेत आयोजना क्षेत्र पाइन्छन् ।

५.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

जनगणना २०११ अनुसार यस आयोजनाबाट प्रभावित नुवाकोट जिल्लाको कुल जनसंख्या २,७७,४७१ रहेको छ । जसमध्ये पुरुषको जनसंख्या १,३२,७८७ र महिलाको १४४,६८४ रहेको छ । कुल घरधुरी ५९,२१५ छ भने औसत् परीवार संख्या ४.६९ रहेको छ । आयोजना प्रभावित जिल्लाको साक्षरता दर ६० प्रतिशत रहेको छ । यस आयोजनाबाट प्रभावित गा.वि.स.हरुको कुल जनसंख्या ४२,८५६ रहेको छ । जसमध्ये पुरुषको जनसंख्या २०,५४३ र महिलाको २२,३१३ रहेको छ । आयोजना प्रभावित गा.वि.स. क्षेत्रमा कुल घरधुरी ९,१९८ छ भने औसत् परीवार संख्या ४.६६ रहेको छ । आयोजना क्षेत्रका मुख्य बस्तीहरुमा नौबिसे, गैरीखेत, सातबिसे, डाबडे डाँडा, पहिरे, मोरया, बोहरे, महरथुम, फुर्केटार, चोकदे, छापटार, काउले, सोलेबजार, अर्चले र पहिरेबेंसी रहेका छन । आयोजना क्षेत्रमा स्थानीय बासिन्दाको मुख्य पेशा कृषि हो । त्यस बाहेक मानिसहरु वैदेशिक रोजगार, व्यापार व्यवसाय, सरकारी नोकरी, मजदुरी, पशुपालन र कुखुरापालनमा संग्लन छन् ।

आयोजना प्रसारण लाइन कार्यान्वयन गर्दा ५९ घर परिवारहरु प्रभावित हुनेछन् । जसमध्ये ४६ घरधुरीको सर्वेक्षण फाराम भरी सामाजिक, आर्थिक तथा सांस्कृतिक अवस्था बारे विश्लेषण गरिएको छ । ती ४६ घरपरिवारको जनसंख्या ३०५ र औसत परिवार सदस्य संख्या ६.६३ रहेको देखिन्छ । आयोजनाबाट प्रभावित परिवारहरुमा ब्राम्हाण, त्यस पछि तामाङ्ग, नेवार, दलित, घले, मगर र क्षेत्री रहेको छन् । त्यसैगरी साक्षरता दर ७९.७९ प्रतिशत रहेको पाइयो । सबै प्रभावित घरपरिवारको आफनै स्वामित्वमा धेरथोर जमिन रहेको छ । प्रति प्रभावित परिवारको औसत जमिन ०.७८० हेक्टर (१५ रोपनी) र वार्षिक आम्दानी रु. २१०,१३५/– रहेको अध्ययनबाट देखिएको छ ।

६. प्रभाव मूल्यांकन

६.१ भौतिक वातावरण

प्रस्तावित आयोजनाको समुन्द्रटारस्थित सबस्टेशन निर्माणस्थलमा जमिनको भू–स्वरुपमा परिवर्तन आउने छ । त्यस बाहेक अन्य ठाउँमा भू–स्वरुपमा परिवर्तन आउने छैन । आयोजना निर्माणको लागि जम्मा ४७. ३३६ हेक्टर (५३० रोपनी) जमिनको आवश्यकता पर्नेछ । जसमध्ये टावरको जग, सबस्टेशन र प्रवेश मार्ग निर्माणको लागि

स्थायी रुपमा २.५६२ हेक्टर र प्रसारण लाइनको (राइट अफ वे) को लागि ४४.७७४ हेक्टर अस्थाई रुपमा प्रयोग गरिने छ । टावरको जग निर्माण गर्दा भूक्षय हुनसक्ने, निर्माण कार्यबाट निस्कने सिमेन्टको मिश्रण, विभिन्न वस्तु तथा निर्माण मजदूरबाट निस्कने मानवजन्य फोहोरबाट नजीकका पानीका श्रोतहरु प्रदूषित हुन सक्नेछ ।

६.२ जैविक वातावरण

प्रस्तावित आयोजनाको कार्यान्वयनबाट प्रसारण लाइन मार्गमा पर्ने १०.७५१ हेक्टर वन क्षेत्रमा असर गर्नेछ (वास्तविक वन वनस्पतिले ढाकेको ७ हेक्टर मात्र, बाँकी अन्य नाङ्गो पाखा समेत रहेको) । प्रस्तावित प्रसारण लाइनको अधिकाँश भाग ९ वटा विभिन्न सामुदायिक वनहरुबाट जान्छ भने थोरे सरकारी वन पनि पर्दछ । १७ वटा टावरहरु वन क्षेत्र भित्र पर्नेछ, जसको लागि ०.१७ हेक्टर जमिन आवश्यक पर्छ (प्रति टावरको लागि १० मि. x १० मि.) । वनको नमूना अध्ययन अनुसार, राइट अफ वे को लागि २८६८ वटा रुखहरु (अधिकाँश पोल) काटनु पर्नेछ । आयोजना निर्माणमा थोरे सँख्यामा जिल्ला बाहिरका कामदार संग्लन हुने हुनाले वरपरको वन क्षेत्रको वनस्पति र वन्यजन्तु चोरीनिकासी हुने सम्भावना न्यून छ । आयोजनाको निर्माण चरणमा प्रसारण लाइन मार्गमा पर्ने रूखविरुवाहरू कटान गर्दा वन्यजन्तुहरुको हिंड्डुल तथा वासस्थानमा बाधा पर्नेछ । प्रसारण लाइनको टावर र तारहरु चराहरुलाई उडन प्रतिकूल हुनेछ ।

६.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

प्रस्तावित १३२ के.भी. प्रसारण लाइन कार्यान्वयन गर्दा ५९ घर परिवारहरु प्रभावित हुनेछन् । ३ वटा संरचना (घर तथा गोठ) र ३२ हेक्टर कृषियोग्य भूमि प्रभावित हुनेछ । त्यसमध्ये २.३ हेक्टर कृषियोग्य भूमि स्थायी रुपमा अधिग्रहण गर्नु पर्नेछ । ९० वटा टावरहरु मध्ये ६७ वटा टावर आवादी जग्गामा परेको छ । स्थायी रुप अधिग्रहण गरिने २.३ हेक्टर जमिनबाट वार्षिक रुपमा ९ मेट्रिक टन अन्नबाली उत्पादन नोक्शान हुने अनुमान छ । जसको प्रचलित बजार मूल्य रु. ३,०१,७००/– रहेको छ ।

७. वैकल्पिक विश्लेषण

प्रस्तावित १३२ के.भी. प्रसारण लाइन आयोजनाको संभाव्यता तथा वातावरणीय अध्ययनको क्रममा वातावरणीय तथा सामाजिक असरहरुलाई न्यूनिकरण गर्न वैकल्पिक विश्लेषण गरिएको थियो । जसमा प्रसारण मार्ग, स्थान, प्राविधिक डिजाइन, निर्माणको समयतालिका र वन क्षेत्र नपर्ने विकल्प माथि विचार गरिएको थियो ।

८. वातारणीय प्रभाव न्यूनीकरणका उपायहरु

८.१ भौतिक वातावरण

सबस्टेशन तथा प्रसारण लाइनको टावर निर्माण गर्दा निस्कने माटोको उचित व्यवस्थापन गरिने छ । माटोलाई ब्याकफिलिङ्ग गर्न प्रयोग गरिने छ र निर्माणस्थललाई पूर्व अवस्था ल्याइने छ । टावर रहने स्थान खन्नु भन्दा अगाडि त्यस स्थानको मजबूती जाँचिने छ । कमजोर स्थानमा टावर राख्नु पर्ने भए त्यसै अनुसार विशेष प्राविधिक डिजाइन गरिने छ । सकेसम्म त्यस्ता कमजोर ठाउँमा टावर राखिने छैन । भूक्षय रोक्नको लागि भिरालो ठाउँमा विरुवा लगाउने र त्यसको व्यवस्थापन गरिने छ । बायोइन्जिनियरिङ्ग सँगै टेवा पर्खाल लगाउने काम समेत गरिने छ । आयोजना निर्माणको क्रममा निस्कने फोहरलाई उचित व्यवस्थापन गरिनेछ ।

८.२ जैविक वातावरण

प्रसारण लाइन मार्गमा सकेसम्म न्यून रुखहरु कटान हुनेछन् । कटान हुने रुखहरु सम्बन्धित धनी वा सामुदायिक वन वा जिल्ला वनलाई हस्तान्तरण गरिनेछ । आयोजना प्रस्तावकको आफ्नो खर्चमा १ रुख कटान गरे बापत २ बिरुवा वृक्षारोपण गरी ५ वर्ष सम्म संरक्षण गरेर सम्बन्धित सरोकारवाला निकायलाई हस्तान्तरण गर्ने छ । निर्माण कार्यमा संग्लन कामदारहरुलाई शिकार गर्न र वन तथा वन्यजन्तु सम्बन्धी कुनै पनि गैरकानूनी नगर्न विशेष निगरानी गरिने छ । आयोजनाले वन तथा वन्यजन्तु संरक्षण सम्बन्धी स्थानीय मानिस र वन उपभोक्ताहरुमा सतेचना तालिम कार्यक्रम संचालन गर्ने छ ।

८.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

जग्गा प्राप्ति ऐन २०३४ अनुसार आयोजनाको लागि जग्गा प्राप्त गरिने छ तथा क्षतिपूर्ति निर्धारण समितिले तोके बमोजिम सम्वन्धित जग्गाधनीलाई नगद रकम मुआब्जा उपलव्ध गराईने छ। जसको लागि जम्मा करिब ८ करोड रुपैंया लाग्ने अनुमान गरिएको छ। त्यसैगरी, प्रसारण लाइन मार्गमा पर्ने बालीनाली क्षति भए बापत करिब रु. २२ लाख क्षतिपूर्ति आयोजनाले दिनु पर्ने अनुमान छ। अस्थायी रुपमा प्रयोग गरिएको जग्गा आयोजना निर्माण पश्चात सम्वन्धित जग्गाधनीलाई फिर्ता दिइनेछ । विद्युत ऐन, २०४९ अनुसार प्रसारण लाइन मार्गमा जग्गाधनीलाई कुनै पनि घरटहरा निर्माण गर्न वा अग्ला बोटविरुवा लगाउन भने निषेध गरिने छ । स्थानीयबासीहरुलाई आयोजना निर्माणको दौरान उत्पन्न रोजगारीको अवसरमा पहिलो प्राथमिकता दिइने छ । आयोजना प्रभावित क्षेत्रमा जनचेतनामूलक कार्यक्रम संचालन गरिने छ । प्रभावित परिवारका सदस्यहरुलाई विभिन्न सिपमूलक तालिमहरु प्रदान गरिने छ। आयोजना प्रभावित क्षेत्रमा सामुदायिक विकास कार्यक्रमको लागि रकम छुटयाइने छ।

९ . वातावरणीय व्यवस्थापन तथा अनुगमन

प्रस्तावित आयोजनाबाट वातावरणमा पर्नसक्ने प्रभावहरुलाई निराकरण गर्न, न्यूनीकरणका कार्यक्रमहरुलाई प्रभावकारी रुपमा कार्यान्वयन गर्न र वातावरणीय अनुगमन गर्न आयोजनास्थलमा कार्यरत रहने गरी आयोजना निर्माणकाल एउटा वातावरणीय इकाई गठन गरिने छ । यस वातावरणीय इकाईमा नेपाल विद्युत प्राधिकरण, वातावरण तथा सामाजिक अध्ययन विभागका विषेशज्ञहरु एवं अन्य योग्य व्यक्ति एवं विज्ञहरुलाई समावेश गरिने छ।

१०. निष्कर्ष

यस आयोजनाको मुख्य प्रभाव रुपमा जग्गा अधिग्रहण र वन क्षेत्र भित्र रुखविरुवा कटान हुनेछ। यस आयोजनाको लागि जम्मा ४७.३३६ हेक्टर जमिन आवश्यक पर्छ। जसमध्ये ३१.८७८ हेक्टर आवादी कृषि भूमि रहेको छ। प्रसारण लाइन मार्गमा विभिन्न ९ वटा सामुदायिक वनहरुको २८६८ वटा रुखहरुहरु कटान गर्नु पर्ने हुन्छ । । प्रस्तावित प्रसारण लाइन निर्माणबाट जग्गा तथा भौतिक संरचनामा क्षति पुग्ने भएकोले ५९ घरपरिवार आयोजना निर्माणबाट प्रभावित हुनसक्ने छन्। आयोजनाको निर्माण तथा संचालन अवधिमा विभिन्न वातावरणीय न्यूनिकरण तथा प्रवर्द्धनका उपायहरु गरिने छ। आयोजनाको वातावरणीय कार्यको लागि करिब १० करोड ९ लाख रुपैंया प्रस्ताव गरिएको छ, जुन आयोजनाको कुल लागतको १० प्रतिशत रहेको छ। प्रस्तावित न्यूनिकरणका उपायहरु र वातावरणीय अनुगमन गरिएको खण्डमा यस प्रस्तावित समुन्द्रटार – त्रिशुली ३ बी हब १३२ के.भी. प्रसारण लाइन आयोजना सामाजिक र वातावरणीय दृष्टिकोणले संभाव्य रहेको प्रारंरिम्भक वातावरणीय परिक्षण अध्ययनको निष्कर्ष छ।

CHAPTER-I

NAME AND ADDRESS OF THE INDIVIDUAL/INSTITUTION PREPARING THE REPORT

1.1 Project Proponent

Nepal Electricity Authority (NEA) is the proponent of Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project. The primary objective of NEA is to generate, transmit and distribute adequate, reliable and affordable power by planning, constructing, operating and maintaining all generation, transmission and distribution facilities in Nepal's power system. NEA is Government of Nepal (GoN) undertaking utility organization established in BS 2042 (1985). GoN's current policies emphasize the need of environmentally sound and financially sustainable development of power project in the country.

The Ministry of Energy (MoE) has granted a survey license for the feasibility and environmental study of Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project to NEA. NEA has received survey license for Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project from Ministry of Energy on BS 2070/04/20 (August 4, 2013). The license is valid up to BS 2072/04/19 (August 4, 2015). A copy of the survey license is attached in Annex-I.

Address of the Project Proponent

Nepal Electricity Authority
Durbar Marg, Kathmandu
Tel/Fax: 01-4153194
P.O.B. 10020, Kathmandu, Nepal

The survey license granted on BS 2070/04/2 included 10 VDCs in the project area (namely Manakamana, Gerkhu, Bageshwori, Halde Kalika, Narjamandap, Kharanitar, Thaprek, Bal Kumari, Tupche and Samundratar of Nuwakot district). However, the proposed TL alignment finally passes through more VDCs namely Lachyang, Ralukadevi and Sundaradevi. Therefore, the survey license has been amended accordingly including those three VDCs. A copy of the amendment letter is also attached in Annex-I.

1.2 Institution Responsible for preparation of IEE

NEA has assigned its Environment and Social Studies Department (ESSD) to carry out the IEE study to the proposed Trishuli 3B Hub substation project. As an environmental wing of NEA, ESSD is conducting Environmental Impact Assessment (EIA), Initial Environmental Examination (IEE), monitoring and implementing mitigation measures for hydropower, and transmission line projects. ESSD is familiar with legal requirements and procedures for environmental studies and its approval as pre Environmental Protection Act (EPA), 1997 and Environmental Protection Rules (EPA) 1997 (and its subsequent amendments) of Nepal. The contact address of the organization responsible for the preparation of this IEE report is;

Environment and Social Studies Department
Nepal Electricity Authority
Kharipati, Bhaktapur, Nepal
Tel: 01- 6-611580,, Fax: 01-6611590
Email: neaessd@ wlink.com.np

1.3 Rationality for Conducting IEE

Schedule -1 of Environment Protection Rules, 1997 lists proposal requiring an IEE. As per the EPR, 1997 and the latest amendment, an IEE is required for 132 kV or above voltage level transmission line project. The project area does not lie in the national park, wildlife reserve, buffer Zone, conservation Area, wetlands, historically and archaeologically important sites and or environmentally sensitive/ fragile areas.

1.4 Objectives of the IEE Study

The general objective of the study is to prepare an IEE report in order to implement the proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project in an environmentally sound manner. The specific objectives of the study are:

- to establish the physical, biological and socioeconomic & cultural baseline conditions of the project area;
- to identify beneficial and adverse environmental impacts of the project during construction and operation phases;
- to analyze the impacts in terms of the magnitude, extent and duration;
- to suggest mitigation measures for the adverse impacts and enhancement measures for beneficial impacts;
- to prepare environmental management plan;
- to involve public in the decision-making process related to the environment; and
- to provide information to the decision makers regarding further action and about the environmental implications due to the development of the proposed project.

1.5 Structure of the Report

The IEE report is prepared into two volumes. Volume-I is the main report and volume two consist appendices. The Volume-I is divided into ten chapters. Chapter-1 states about introduction of the proponent, survey license and objectives of the IEE study. Chapter-2 contains a brief description of the project, salient features, construction planning and project area delineation. Chapter-3 discusses about the data requirement and the methodology adopted for the collection of data on physical, biological, socioeconomic and cultural environment of the area. This chapter also highlights the techniques used for data analysis and impact assessment. Chapter-4 deals with the national acts, policies, rules and guidelines referred while preparing the report.

The existing environmental conditions of the project area with respect to physical, biological and socioeconomic and cultural environment is given in Chapter-5. Chapter-6 highlights the positive and adverse impacts likely to occur due to implementation of the project. Alternative assessment for the substation presented in Chapter-7. The mitigation and enhancement measures are presented in Chapter-8. Chapter-9 deals with the environmental management plan, Chapter-10 conclusion of the study.

CHAPTER-II
GENERAL INTRODUCTION OF THE PROJECT AND ITS RELAVANCY

2.1 Background

Nepal possess tremendous amount of hydropower potentials which has to be exploited for economic growth of the country. Development of proper power evacuation scheme and network is necessary for upcoming hydroelectric projects. NEA is the responsible utility for expansion and reinforcement of the networks of Integrated National Power System (INPS). NEA had conducted several evacuation studies considering upcoming hydroelectric projects (HEPs) in the country.

Under the program for construction and extension of national transmission line, GoN has added construction of 29 numbers of new 132/220/400 kV transmission lines with total line length of 2,255 km. Among them, Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project has been proposed for the power evacuation from the planned HEPs in Tadi Khola, Chandrawati Khola and others in the north-east part of Nuwakot district. Current policies of Government of Nepal emphasize the need of environmentally sound and socially sustainable development of power projects in the country.

2.2 Project Location

The proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project is located in Nuwakot district of Bagmati zone in central development region of Nepal. Similarly, the transmission line alignment traverses in the route are listed in the Salient Features (Table 2.1). The proposed Samundratar substation is located at Naubise village, ward no. 3 of Samundratar Village Development Committee (VDC) of Nuwakot district. The 132 kV transmission line shall terminate at the proposed Trishuli 3B Hub substation located at Pairebensi, ward no. 9 of Manakamana VDC of same district. The project location map is shown in Fig 1.

2.3 Project Accessibility

Samundratar is a market center of the north-east part of Nuwakot district. Samundratar bazar is linked by a road (partially black topped and partially gravel) to Bidur, the headquarters of Nuwakot district. The proposed Samundratar substation site is about one km ahead of Samundratar bazar. The proposed Samundratar substation can be accessed by Pasang Lhamu highway from Kathmandu to Gangate (3 km ahead of Bidur) and then, a district road starting from Gangate, passing through Samundratar.

Various points of the proposed 132 kV transmission line are accessible by the highway, district road and rural road. The terminating point, Trishuli 3B Hub is located along the access road to Trishuli 3A HEP. However, in recent years, there are also other alternative roads from Kathmandu to Trishuli bazar as well Samundratar. Road distances of different locations are as followings:

Kathmandu - Trishuli (via Balaju): 70 km
Kathmandu - Gangate (Pasang Lhamu highway): 67 km
Gangate - Naubise (Proposed Samundratar s/s site): 29 km

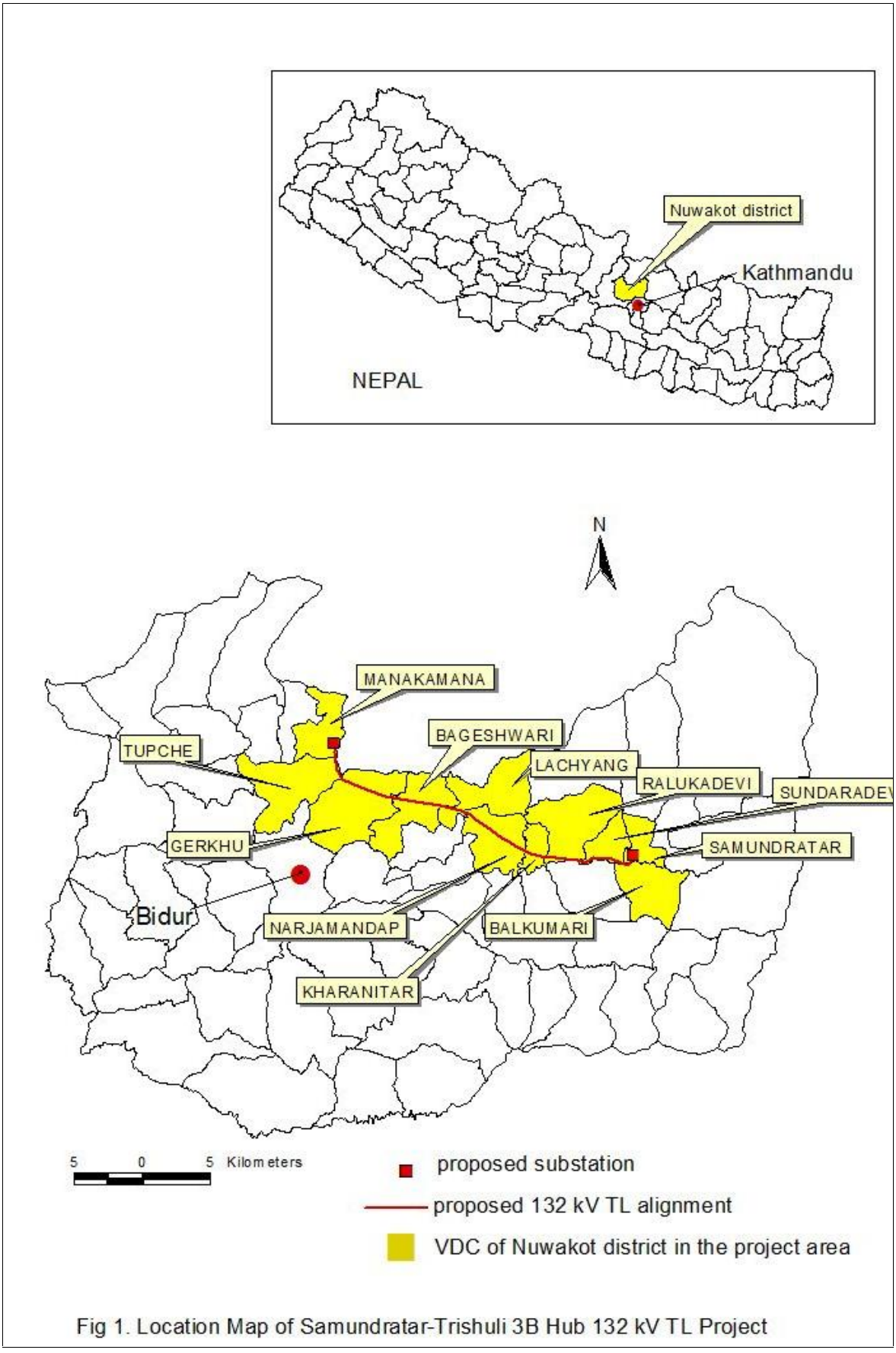

Fig 1. Location Map of Samundratar-Trishuli 3B Hub 132 kV TL Project

2.4 Transmission Line Route

The proposed route, which is 26.6 km in length starts from the substation proposed at Naubise of Samundratar VDC and terminate at proposed Trishuli 3B Hub substation at Pahirebesi of Manakamand VDC.

The proposed Samundratar Trishuli 132 kV Transmission Line Project has been selected avoiding the settlement areas, inbuilt structures, religious, historical places, schools and other community infrastructures wherever possible. Refer to Figure 2 for the TL route alignment map. The description of the proposed route has been discussed below considering three sections:

- **Section AP-0 to AP16 (From Trishuli 3B Hub substation to Betrawati)**

The alignment starts from AP-0 which is placed within proposed Trishuli 3B Hub substation and the alignment passes through cultivated and forest land along the existing Trishuli-Mailung road. The alignment of this section runs along the right bank of Trishuli river upto Betrawati.

The alignment from AP-2 to AP 4 passes through forest. The alignment from AP-4 runs right with $11^0$51'10" deflection angle and goes up at cultivated land. The alignment from AP-4 to AP-7 passes through forest and slope land mostly. From AP-7, the alignment turns right with $8^0$41'33" deflection angle and passes plain cultivated and barren land along the tight edge of Trishuli River. AP-11 is located on the right bank of Trishuli river and it crosses Salankhu Khola. AP- 12 is placed on the confluence of Trishuli and Salankhu river near Sole Bazaar on cultivated land.

AP-13 is located on the right bank of Trishuli river, near suspension bridge and then the alignment turns left with $21^0$0'9" deflection angle and passes along the right adge of Trishuli river through cultivated land. AP-15 is placed on cultivated land which is situated at about 250 m south from Shole Bazaar.

From AP-15 the alignment runs through cultivated land of Shole Bazaar along the roghe edge of Trishuli River. AP-16 is placed on cultivated land on the right bank of Trishuli river and opposite to Betrawati Bazaar.

- **Section AP-19 to AP-47 (Betriwati to Kharinitar)**

From AP-16, the alignment crosses Trishuli River and Trishuli-Rasuwa Pashang lahmu highway.AP-17 is placed Tallo Syale on cultivated land. It turns to left with $42^0$27'7" deflection angle and runs along Satebise Kholsi up to AP-25. There is a rock cliff between AP-26 and AP-27. From AP-27, the alignment runs through the cultivated land up to AP-31. AP-31 is placed at the top nose existing road is passing down. From AP-31, the alignment runs along the road and the moderate terrain upto AP-37. The alignment goes down from AP-37 upto Dorkhu Khola and passes through cultivated land. As per comments and suggestion, AP-35A is added between AP-35 to AP- 36 to avoid houses on right of way.

- **Section AP-47 to AP-58 (From Kharinitar to Samundratar)**

From AP-47, the alignment turns left with $5^0$37'17" of deflection angle and it goes down and passes along the Tadi River from AP-48. The alignment crosses Samundratar-Trishuli road. AP-48 is placed on right bank of Tadi River and it passes along the Tadi River through

cultivated land. Proposed Samundratar substation is located at Naubise village of Samundratar VDC-3. Cultivated land with flat tarrain beside the Tadi River (on the right side) is the topographic feature of this proposed substation. Existing road passes about 100 m north from the proposed substation.

2.5 Project Features

Individual Power Producers (IPP) have acquired survey license for developing hydropower plants in Tadi Khola, Chandrawati Khola and others. The planned HEP are far from the existing INPS. For the evacuation of the electrical power generated by the planned HEP in the vicinity of Samundratar, 132/33/11kV Substation should be constructed at Samundratar and is to be linked with 220/132/33kV Trishuli 3B Hub Substation.

The route survey has revealed the proposed 132 kV transmission line starting from the Samundratar substation terminating at the Trishuli 3B Hub is approximately 26.6 km in total length. The proposed TL alignment route map is given in Fig 2.

A Typical Double Circuit 132 kV Transmission Line

The 132 kV transmission line requires 18 m (9 m either side from center line) as right of way (RoW). About 3 hectare of land shall be permanently required for the proposed Samundratar substation site. The substation site will consist of line bays, transformers, control buildings and office cum quarter buildings.

The proposed 132 kV transmission line shall have 59 angle points (APs). Angle towers will be erected on the angle points. Between the angle towers, suspension towers will be erected. Number of suspension towers depends on span between towers and specific site condition for tower footing. Towers will be self supporting lattice type made of steel. Design of each tower will be specific depending upon span, angle and other conditions such as road/river crossing, wind, soil etc. The tower foundation will require about 3 *aana* (10 m x 10 m) of land in average per tower. Furthermore, camp site and construction yard will require temporarily some area of land at interval of certain distance of transmission line alignment.

2.6 Project Salient Features

Detail design study of the proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project is not completed yet. However, general salient features of the project are presented below:

Table 2.1. General Salient Features

Features	**Description**
Development Region	Central Development Region
Zone	Bagmati
Project District/VDC	Nuwakot District- Samundratar (समुन्द्रटार), Balkumari (बालकुमारी), Sundaradevi (सुन्दरादेबी), Ralukadevi (रालुकादेबी), Kharanitar (खरानीटार), Narjamandap (नर्जामण्डप), Lachyang (लच्याङ्ग), Bageshwori (बागेश्वरी), Gerkhu (गेर्खु), Tupche (तुप्चे) and Manakamana (मनकामना) VDCs.
System nominal voltage kV	132 kV
System nominal frequency	50
Circuit	Double
Total Line Length	25.671 km
Conductor type	AAAC, "UPAS"
Transmission Capacity	Max- 328MVA (262MW)
Shielding	With OPGW -Optical fiber based communication system
Number of highway/road crossing	10
Number of river crossing and Kholsi	14
Number of Angle Point	59
Number of towers	90 (including angle towes)
Type of tower	Self supporting lattice steel structure
Minimum ground Clearance	7 m
Ground clearance over highway	8 m
Normal span	330 m
Right of way	18 m (9 m on each side)
Foundation area	10 m x 10 m (typical approximate per tower)
Substation	
Purpose	To evacuate power from HEPs in the Tadi Khola Corridor to the INPS.
Location	Naubise, Ward No.3, Samundratar VDC of Nuwakot
Area and Type of Land	1.549 ha (30.43 Ropani), Agricultural land
Capacity of Substation (Transformer and Line Bay)	• 2x30MVA (Three Phase), 132/33kV Transformer with bays • 2 X 132 kV line Bay to Trishuli 3B Hub • Double Busbar scheme with 1 X 132kV Bus Coupler Bay • 33/11kV, 2x6/8MVA Transformers with 33kVBay and 11kV Switchgears

Extension facility	• Space for One number of 132kV Line Bay and space for extension of 33kV Line Bays (12 Bays)
Project Cost	USD 11.68 million

2.7 Project Area Delineation

The term Project indicates proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project. Similarly, the Project Area includes the “core project area”, "surrounding area" and the “outlying area” on the basis of proximity and magnitude of the impacts due to construction and operation of the proposed project. The term “project area” is also referred to as the study area for the IEE.

Core Project Area

The core project area implies the area required for the proposed substation site and 18 m right of way along the proposed 132 kV transmission line alignment. The core project area is considered to be high and direct impact area.

Surrounding Project Area

The surrounding project area implies the area within 250 m away from the proposed substation site and RoW of the proposed 132 kV transmission line alignment. The surrounding area is considered as moderate and direct/indirect impact area.

Outlying Area

The outlying area implies the area outside 250 m from the proposed substation site and RoW within the project affected VDCs. The outlying area is considered as low and indirect impact area.

2.8 Construction Planning

The implementation of the proposed project comprises construction of a new sub-station at Samundratar and transmission line of 26.6 km. It comprised of construction of office cum staff quarter buildings, control builidngs, gantry, installation of transformers and equipments, their testing etc. The estimated years of project completion is two years.

2.8.1 Construction Method

- **Preliminary Works**

Preliminary works for the proposed transmission line consist of detailed route survey, spotting the tower locations, preparation of longitudinal profiles, geological field test and laboratory testing. To achieve effective tower footing resistance, earth resistance will also be measured at each tower site.

Geo-technical field tests will consist of Standard Penetration Test (SPT) and auger boring, typically up to a depth of 3 m at locations of suspension tower and up to 6m at locations of tension and angle towers and at geologically changed locations. Detailed geo-technical field tests by SPT and auger boring will be done for towers located at river crossings during detailed design stage.

- **Concrete Foundations**

Excavation for tower foundations will be made to the size and depth required by design. Concreting for the foundations will be performed after proper placement of reinforcing bars.

After necessary curing, the foundations will be backfilled with suitable materials and spoil. Appropriate protection to the tower foundation, such as gabion wall, toe wall shall be provided where required.

- **Erection of Galvanized Steel Towers**

Galvanized steel lattice towers members will be manufactured in the factory and transported to the individual tower locations from the nearest road points. After foundation is completed and minimum days allowed for strength gaining, towers will be erected. The erection works will be carried out manually by using pulleys, wenches etc.

- **Insulators Fitting, Conductors and Ground Wire Stringing**

The conductors, ground wires, insulators and necessary accessories will be carried out manually at the tower locations from the nearest road point. Stringing of ground conductors will be carried out manually.

- **Conductor Stringing**

After the erection of all towers, conductor stringing will follow. First of all, the pilot wires are pulled and hooked at towers cross-arms manually and then ACSR conductors are pulled with the help of the machines. The civil construction works will be as follows: Steel reinforcement, cement, coarse aggregates and fine aggregates (sand). Explosive will not be used for the project construction.

2.8.2 Construction Materials

The materials required for civil construction works of the substation and tower foundation will be steel reinforcement, cement, coarse aggregate and sand. Steel reinforcing bars and cement can be acquired from local manufacturers or can also be imported. Coarse aggregates will be produced at site from excavated materials or purchased from the nearby market. Likewise, fine aggregates will be collected from major quarries along riverbanks, the excavated foundation material can be used as a backfill material required for the foundation construction.

As per the feasibility study report of the project, estimated volume of coarse aggregate, fine aggregates and reinforcement bars are as given in Table 2.2. Main construction contractor will obtained aggregates and other construction materials from local suppliers. There are already crusher plants in the project area. They do processing of aggregates from Tadi river and supply in Nuwakot district and even to Kathmandu. There are plenty of aggregates along Tadi River course. Possible quarry sites of aggregates required for the project construction are shown in Fig 2.

Table 2.2: Estimated Construction Materials

S.N.	Construction Materials	Quantatity		Total
		for TL	for Substation	
1	Coarse aggregates	1200 cu. m	667 cu. m	1867 cu. m
2	Fine aggregates	1800 cu. m	1000 cu. m	2800 cu. m
3	Cement	600 cu. m	333 cu. m	933 cu. m
4	Reinforcement bars			1.05 Ton per cu.m

The possible quarry sites are located at two different sites along right bank of Trishuli river in Tupche VDC and right bank of Tadi river in Samundratar VDC. The quarry sites are accessible by motorable road.

2.8.3 Requirement of Workforce

Local people those are affected by the project implementation will be encouraged for the employment. Local skilled, semi skilled and unskilled labor will be used for the construction and the transportation of the material as far as possible. Altogether about 80 people will be deployed in the construction of the project, which includes 40 unskilled, 25 semi skilled and 15 skilled human resources.

2.8.4 Project Implementation Schedule

The estimated completion period of the project is 24 months which includes 6 months pre construction phase and 18 months construction and commissioning phase. Construction of the substation can be carried out throughout the year.

2.8.5 Land Take

In total, the project will require about 47.4 ha land for the placement of substation, access road, tower pads and RoW. Out of this, 31.88 ha (approximately 626 ropani) land is private cultivated land. The proposed substation site is located along the right bank of Tadi River. The project construction might require land for temporary camps at certain interval of transmission alignment.

CHAPTER-III
STUDY METHODOLOGY

3.1 General

The IEE process follows the Environment Protection Rules 1997, and its amendments and National EIA Guidelines 1993.This IEE report is prepared in accordance with the legal requirements of GoN, based on approved ToR, field study, consultation with local people/stakeholders and officials. The approved ToR for IEE study of Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project is attached in Annex-II.

3.2 Desk Study and Literature Review

While carrying out the IEE, literature, review on topographic maps, land use maps, CBS publications, project technical reports and other transmission line project related environmental reports have been extensively carried out.

The following documents which were considered to be relevant for the study were reviewed:

- 1:25,000 scale topographical maps prepared by the Department of Survey, GoN.
- Survey Report prepared by Engineering Services, Project Development Department, NEA
- Initial Environmental Examination Report of similar projects
- Regional Geological Maps and previous geological reports of the Nepal
- District Profile of Nepal 2011
- Forest Act, 2049, & Forest Regulation, 2051
- Guidelines for Community Forestry Development Program, 2009
- Google Earth, the online software for verifying the TL alignment.

On the basis of the reviewed information with respect to the project, data gaps were identified and the methodology described in following sections of this chapter was developed to collect other relevant information required for IEE study.

3.3 Data Requirement, collection methods and analysis

3.3.1 Physical Environment

3.3.1.1 Data requirement and collection methods

The following data were collected during the IEE study:

- Meteorological data: Maximum and Minimum Temperature and rainfall of the project area
- Topographical data: Altitude and landscape
- Air, water and noise quality of the project area
- Physical setting: Physiographic location, river system, etc. of the project area
- Geological data: Rock type, soil type, slope stability, erosion, landslides, etc. of the project area
- Spoil materials: Total volume, volume to be used for construction, disposal volume, etc.
- Significant crossings along the alignment
- Land use pattern of the project area.

The following methodology has been used to collect the baseline data on each

environmental domain:

- Collection of secondary data and review
- Field survey and investigation by the team of experts
- Observation
- Expert's judgement
- Checklist and households' survey
- Public/stakeholders consultation through group meetings/key person interview
- Impact assessment

An intensive field investigation from BS 2071/01/25 (May 8th, 2014) to BS 2071/02/2 (May, 16th 2014) along the proposed alignment was conducted to collect information on existing physical environment. During the field visit inspection of site condition of the angle points and other critical areas along the transmission line were done. Documents and other relevant literature were collected and reviewed.

The data on climate (temperature, rainfall, and moisture) was collected through secondary source; District Profile of Nepal, 2011. The data on air, noise and water quality of the area has been collected through observation by subject expert during site visit. Geographic and geological data, such as topography, rock type and soil type, stability of the Angle Tower locations, soil erosion and other key environmental features were investigated and obtained from the Regional Geological Maps and previous geological reports of the Nepal and by general observation. Physical settings, land-use pattern and significant crossings were adopted from topographical maps and detail plan and profile of the alignment.

The type of land use and area calculation has been prepared with reference to the topographical maps, survey report provided by the Survey Department with field verifications. The obtained data of land-use pattern, river system and significant crossings along the alignment from the review of the topographical maps and plan and profile of the alignment has further been verified at site visit. Similarly, the numbers of structures under RoW were determined with the help of the plan and profile of the Final Survey Report with verifications at site.

During the field visit the data on occurrences of slides and other information related to the physical environment were gathered by observation, group discussion and inquiring the local people.

3.3.1.2 Data Analysis

The collected data from the field visit was analyzed by the study team in coordination with the Project Engineers and experts. The beneficial and adverse impacts have been predicted and appropriate mitigation measures proposed to reduce the impacts.

3.3.2 Biological Environment

3.3.2.1 Data Requirement and Collection Methods

Data and information collected on biological environment of project area during field study included occurrence of flora and fauna including avian fauna, wildlife habitat, endangered, threatened or rare species as listed by government of Nepal, plant resource use pattern, etc.

The proposed alignment and the substation were visited by the Environmental and Forestry experts to collect baseline information and for impact prediction. Approximate number and types of plants likely to be affected by the project were identified. Similarly, occurrence and distribution pattern of shrubs and herbs species available in and around the sample plots and along the route alignment were recorded.

Forest Sampling in a forest during the field study

Based on this information, density, relative dominance, basal area, relative basal area, relative dominance and wood volume were calculated. In this report, trees having more than 30 cm diameter at breast height (dbh) are referred as tree sized, trees having 10 to 29.9 cm dbh are referred as pole sized, trees having 4.0 to 9.9 cm dbh are considered as saplings and having less than 4.0 cm dbh are considered as seedlings as per Forest Rule 2051. Diameter at breast height was measured at 1.3 meter from the ground level.

Interaction and Group Discussion with Forest User Groups

Similarly, meetings, interviews and discussions were held with the members of Community Forest User's Groups, local peoples, officials of concerned District Forest Office and Range Posts to collect information on the availability of flora & fauna, dependency of local people on forest resources, availability of Non-Timber Forest Products etc.

During the group meetings and discussions, participants were introduced about the project features, potential impact on the environment, various mitigation and enhancement measures likely to be adopted during construction and operation phase of the project. The issues raised during meetings were discussed and recorded.

3.3.2.2 Data Analysis

The data from forest sampling were quantitatively analyzed for density, basal area, crown coverage and wood volume. These parameters were calculated using the following formulae:

$$\text{Density (D)/hectare} = \frac{\text{No. of individuals of a species}}{\text{Size of the plot} \times \text{Total no. of plots sampled}} \times 10{,}000$$

Basal Area is the trunk cross-sectional area. The basal area of each of trees was calculated on the basis of diameter at breast height.

$$\text{Basal Area (BA)} = \pi\,(\text{dbh}/2)2$$

$$\text{Wood volume of standing tree} = 1/2 \times \text{BA} \times \text{Height}$$

In addition, the biomass of each species is calculated using the general method given in 'Community Forest Resource Inventory Guidelines, 2061'.

Based on the final data and on its analysis the impacts, both positive and negative, were identified and their magnitude predicted.

3.3.3 Socio-economic and Cultural Environment

3.3.3.1 Data requirement and collection method

The following types of data are acquired for IEE study:

- Socio-economic survey of project affected households whose land and house will be permanently acquired. Information on livelihood and property has also conducted
- Demographic characteristics: Population distribution, migration pattern, age group distribution, etc
- Ethnicity and religion
- Education and skill level: literacy rates, skills and skilled, manpower, etc.
- Health and sanitation: information on sub-health post/health post, hospitals, main disease, incidence of water born disease and infectious disease such as HIV/AIDS
- Gender, children, the elderly, poor and ethnic minorities
- Land holding size and ownership
- Community infrastructures and service: drinking water, supply, irrigation, foot trails, transportation, electricity, telecommunication, etc
- Local institution and activities: government and non-government agencies, cooperatives, community based organizations
- Other development activities
- Cropping pattern, practices and production
- Livestock raising
- Estimation of loss of standing crops due to project construction, by crop type area and value
- Local price information: land, agriculture and forest products, etc
- Economy: occupation, employment, agriculture and livestock production, non-timber forest products, trade and commerce, etc.
- Land ownership: list of landowners likely to be affected by land acquisition and resettlement
- Income and expenditure of the Project Affected Families (PAFs)
- Measurement and valuation of houses, cowsheds and other structures to be acquired by the project
- Compensation rates for land, agriculture products, forest, houses and other private infrastructures
- Places of cultural importance; historic, religious or cultural sites in the project affected area and the special occasions of celebrations/gathering, including the relative importance of these sites (local, regional or national);
- Aesthetic value of the affected landscape
- Attitude of the local people to the development and to this project
- Cultural practices of the project area and
- Religion wise population of the project area.

The socio-economic and cultural environmental survey of the people residing in the project affected area as defined in this section was carried out by using the methodology described in the following chronological order. Secondary data published by District Development Committee of the concerned districts and Central Bureau of Statistics, Kathmandu was intensively used to draw the baseline information of moderate and low impact zones. However, the baseline information of high impact zone was collected from the field survey by using the appropriate techniques as mentioned in the subsequent sections.

Literature Review

Based on previous experiences and the review of relevant literature associated with IEE studies of various transmission line projects, demographic tables were developed. To fill these tables, a desk study was conducted in the office. All the relevant information associated with socio-economic and cultural environment was reviewed. On the basis of the reviewed information, data gaps were identified and the following techniques were used to generate the remaining data.

Identification of PAFs and SPAFs

The land owners of the Angle Towers/substation/access road and the land owners/structure owners of the high impact zone have been identified. These identified families were considered as Project Affected Families (PAFs).

Data Collection Tools

After identification of PAFs, their baseline information was collected by using the following techniques: Households' Survey (filing questionnaire), Key Informant Survey, Focus Group Discussion, Observation and Photographs.

a) Households' Survey

Pre-tested questionnaires were designed and applied by a trained team of enumerators to solicit information from project affected families. Households' survey was conducted only for project affected families belonging to angle towers and structures falling in right of way. A copy of the questionnaire is attached in Attachment-I.

Household survey during the field visit

Altogether, 46 questionnaires were filled. The land owners belonging to tower points, access road and substation area were identified through walkover survey and survey report and hence socio-economic status of them has been studied using questionnaires. Households' survey of landowners belonging to Right of Way was not conducted in this stage. It will be finalized during detail design and check survey of the transmission line route.

The questionnaire has been designed especially to cover the sectors like demographic characteristics, basic health and sanitation conditions, income and expenditure, availability

of infrastructure facilities, water and energy related issues, information about project, attitude towards resettlement and expectations from the project.

b) Key informant survey

Key informant survey was employed during the field visit to gather information on socio-economic and cultural activities. VDC level information was collected by walk over sites, interacting with key informant and VDC level checklist, checklist was designed to collect information on basic demographic and migration patterns, food sufficiency and cropping patterns, existence of user's group/committees, public facilities and infrastructure, labor force availability, existence of archaeological and religious sites and the existence of disadvantaged groups and ethnic minorities. Similarly, checklist belonging to agriculture sector was designed to collect the price rate of various agricultural commodity and construction materials rate in the project affected VDCs.

c) Focus Group Discussion

Group discussions were organized in some of the project affected VDCs/community forest users' groups to give special attention to issues concerning specific target groups such as women, children and farmers. Local people, political leaders, teachers and other intellectuals were also included in the discussion. Indigenous and tribal communities, dalit, women and other ethnic minorities were included in the discussion, which give opportunity for the people in the project area to voice their questions and concerns regarding the project and to provide in-depth information associated with their religion, culture, festivals, etc.


Public Interaction at the project sites

d) Observation

Observation of the project site was made to obtain information on different socio-economic and cultural activities of the impact area. Religious and archaeological sites of the impact area were identified to assess the impact on these sites within the high, moderate and low impact zones. At the end of each day notes were written about the observations and a field diary was maintained. Project photographs were also taken during field investigation.

3.3.3.2 Data analysis

The field data from each project affected VDCs were compiled edited and analyzed in Kathmandu using windows software like WORD and EXCEL. The analysed data were then interpreted and discussed in appropriate sections of the IEE report.

3.4 Impact Identification, Evaluation and Prediction

A logical, simple and systematic approach has been adopted for impact identification, evaluation and prediction. The impact has been identified for physical, biological, socio-economic, and cultural environment of the project area. The following tools have been used for impact identification:

- VDC Checklist'
- Households Questionnaire
- Table format for loss of land, crop production and property of the project affected families
- Expert's judgment

Topographic map of the route alignment has been used in predicting the impacts of the proposed TL by analyzing the effect of project activities on the resources like existing infrastructures, rivers/rivulets, settlements, private land, forest etc present in the location. The expert's judgment using past experiences of similar type of projects have been used to predict impacts. Wherever possible, impact predictions have been done quantitatively.

Field inventories before project implementation provide the baseline condition of resources. The assessment of impacts is based on the baseline environmental conditions of the affected area with the project activities in relation to spatial and temporal aspects in terms of magnitude, extent and duration using various environmental prediction methods. The impact has been predicted over a specified period and within defined area. Consequences of environmental impacts were interpreted in terms of local, regional and national contexts. The significant positive and adverse environmental impacts associated with the project components have been identified considering the impact zone. The magnitude, extent and duration of the impacts which were categorized according to the National EIA Guidelines, 1993 are given below:

Magnitude of impacts

- Low Impact (L): If the value of the resources could be used with no or minimum inconvenience to the public
- Medium/Moderate Impact (M): If the value of the resources could be used with inconvenience to the public
- High Impact(H): If the value of the resources reduced far below publicly acceptable level

Extent Impacts

- Site Specific (S): The impact is limited within RoW then it is site specific one.
- Local (L): If the impact of the work extends to the adjoining wards and or within 100m up 300m from the transmission line or angle tower then it is termed as local.
- Regional (R): If the impact of the work extends to the entire district or further then it is termed regional.

Duration of the Impacts

- Short Term (ST): If the impacts last for 3 years after project initiation it is classified as short term. Construction phase impacts are mostly categorized under this category.
- Medium Term (MT): An impact that continues for more than 3 years but less than 20 years is considered as medium-term. The construction phase impacts which carry over for few years of operation falls under this category.

- Long Term (LT): An impact that lasts beyond 20 years is considered to be long term. The operation phase impacts are mostly categorized under this category.

3.5 Public Involvement

Public consultation process was carried out by conducting group discussion, interaction meetings, and household survey among the local people/stakeholders, concerned VDC and related officials/agenesis of the project areas.

As per EPR 1997, a 15 days public notice in Gorkhapatra national daily was published on BS 2071/2/19 Monday (2nd June, 2014). The notice consists of a statement regarding brief project information and request to provide comments and suggestions within 15 days to the project office or ESSD. A copy of the public notice is attached in Annex-III.

The notice was displayed at notice boards of DDC Office of Nuwakot, District Forest Office and the Office of the project affected VDCs. The draft IEE report was made available to stakeholders for feedback and suggestions regarding the procedure adopted and implemented in the project. Muchulka (letter of deed) of posting the notice and the recommendation letters from the affected VDCs and Community Forest Users Groups were collected. Copies of Muchulka, suggestion and recommendation letters are given in Annex-IV.

Thaprek and Halde Kalika VDCs mentioned in the survey license but the final proposed TL alignment does not pass through these two VDCs. Therefore, the recommendation letters of 11 VDCs of the project area (namely Mankamana, Tupche, Gerkhu, Bageshwori, Lachyang, Narjamandap, Kharanitar, Ralukadevi, Sundardevi, Balkumari and Samundratar) are attached in Annex-IV.

During the field visit to collect Muchulka and suggestion, copies of Executive Summary (in Nepali language) of the draft IEE report were distributed to participants in the interaction meeting. Public views, comments and suggestion raised during the interaction program were noted and have been incorporated in the IEE report. The list of key contact persons during the field visit in the project area is given in Annex-V. Attendance of the interaction meeting is attached in Annex-VI.

3.6 The Study Team

The following personnel are involved in this IEE study:

Table 3.1: List of Persons Involved in IEE Study

S. No.	Name	Designation	Remarks
1	Rabindra P. Chaudhari	Manager/ Coordinator	
2	Thark B. Thapa	Project Manager/Electrical Engineer	
3	Milan Dahal	Deputy Manager/Team Leader	
4	Laxman Regmi	Electrical Engineer	
5	Shailaza Gyawali	Sociologist	
6	Krishna Prasad Joshi	Statistician	
7	Prakash DC	Environmental Engineer	Outsourced
8	Sudarshan Regmi	Forester	,, ,,
9	Umesh Bista	Liaison Officer	

Enumerators and field helpers were hired at the local level to assist the study team in collecting baseline on each environmental domain and other necessary field data.

CHAPTER-IV
REVIEW OF PLANS/POLICIES, ACTS, RULES/REGULATIONS, GUIDELINES AND CONVENTIONS

4.1 Introduction

Nepal integrated environment aspects in all its development activities and projects only from early 1980s. Environment conservation was included in the policies since the Fifth Plan (1975-1980). The second milestone was taken during the Sixth Plan. The Sixth Plan under the environment and land use policy emphasized the integration of environmental aspects into the construction of large-scale development projects. Then finally, in the Seventh Plan it was stated that developmental programs would be implemented only after an approved EIA/ IEE report. The Eighth, Ninth and Tenth Five Year Plans have further emphasized the making of more effective EIA systems. The formulation of Sectoral Guidelines, promotion of participatory EIA/IEE system and inclusion of mitigation cost into the total project cost were some of the activities included in these three five year plans.

The prevailing Acts, Policies, Regulations and Guidelines, which are required for the construction and operation of Transmission Line Projects in Nepal, have been reviewed as per the followings while preparing the present IEE report. The proponent will abide by any other laws besides those already mentioned in the documents that are attracted due to different activities that will be undertaken during project implementation.

4.2 The Interim Constitution of Nepal, 2063 (2006)

Article 35(5) of the Interim Constitution requires the State to give priority to the protection of the environment and also the prevention to its further damage due to physical development activities by increasing the awareness of the general public environment cleanliness. The state shall also make arrangements for the special protection of the environment and rare wildlife. Provision shall be made for the protection of the forest, vegetation and biodiversity, its sustainable use and equitable distribution of the benefit derived from it. Similarly, the Article 16 of Part 3 states about the Right to Environment and Health: According to this article all citizens shall have the right to live in clean environment.

The proposed project is a component of hydropower development project and it attracts the provisions made in Interim Constitution. Hence, it is mandatory to follow the Interim Constitution of Nepal, 2063 (2006) in regards with environment conservation while implementing the project.

4.3 Plan & Policy

4.3.1 Nepal Environmental Policy and Action Plan, 2050 (1993) and 2055 (1998)

Nepal Environmental Policy and Action Plan (NEPAP) were endorsed to further institutionalize environmental protection in the development processes. The NEPAP recognize that a growing number of people are exposed to pollute from industrial enterprises. The NEPAP identifies the following factors as contributing to this process:

- Industrial plan inappropriately cited close to population centers
- Insufficient emphasis on fuel efficiency.
- Little, if any pollution abatement equipment used for reducing emission, and
- A total lack of industry pollution standards.

Hence, the NEPAP emphasizes the need for mitigating adverse environmental impacts to address urban and industrial development, air and water pollution and infrastructures development.

4.3.2 Forestry Sector Policy, 2000

The Forest Sector Policy of Nepal such as the National Forestry Plan, 1976, Master Plan for the Forestry Sector, 1988, Periodic Five Year Plan and Forestry Sector Policy, 2000 have emphasized people's participation in the forestry management. Nepal's main forest management is based on people's participation and various management models are underway. Similarly, Forestry Sector Policy, 2000 stresses on conservation of biodiversity, ecosystem and protection of land degradation by soil erosion, landslide, floods desertification and other ecological disturbances. The Public participation in forest management is sought through community forestry, collaborative forest management, leasehold forestry etc. The mitigation measures such as plantation, NTFP program and other social and community support program proposed by the project will be implemented by mobilizing the local people which is in line with the Forest Sector Policy.

The procedural guidelines for the use of forest land for other purpose stated that feasibility study will be carried out with no use of forest land to the extent possible. If it is not possible, the alternate will be considered with minimum use of forest land. This guideline also stated that the project proponent will be responsible for the plantation of 2 tree species for the loss of one tree and their management for 5 years and handing over to the concerned forest office of the district.

4.3.3 Hydropower Development Policy, 2058 (2001)

The Hydropower Development Policy was promulgated in 2001. The main objectives of the policy include producing clean energy through the development of hydroelectric projects and to help conserve the environment. It is stipulated that one of the policies is to extend the use of electricity for achieving a reduction in the utilization of fuel wood and to render necessary assistance in the conservation of forest and environment.

4.4 Acts

4.4.1 Aquatic Animals Protection Act, 2017 (1961)

This Act provided legislative protection of the habitats of aquatic species. Under this Act, it is offence to introduce poisonous, noxious or explosive material in to a water source or destroy any dam, bridge, fish ladder or water system the intent of catching or killing aquatic life. The Act was amended in 1988 to prohibit the use of unsafe pesticides.

4.4.2 Land Acquisition Act, 2034 (1977)

One of the important acts that have a bearing on the implementation mechanisms and mitigation adverse impacts of power projects is the Land Acquisition Act, 2034. This Act covers all aspects of land acquisition and compensation of land and other assets. It authorizes the government to acquire land for public purposes by providing compensation to the private landowners.

Land acquisition and compensation has not been a major issue in the rural electrification in the past because the area required for erection of a pole is so small that it has not been an

issue. However, this study recommends providing appropriate cash compensation for the land acquired by the erection of the towers. The compensation paid under this Act will be given in cash. To decide the amount of the compensation, the Land Acquisition Act (1977) has made provisions for the constitution of a Compensation Fixation Committee (CFC). That committee consists of the CDO, Chief District Land Administration and Revenue Office, Project Chief or an officer designated by the CDO and the Representative of the DDC.

The proposed project will acquire 55.3692 ha of land for transmission line and substation including forest and cultivated land. As per the land Acquisition Act, 2034 (1977), it is mandatory to acquire the land prior to the implementation of the project. The provisions made here will be applied while acquisition of land. Cultivated land requires for the project will be acquired by direct negotiation with the land owners while the forest land will be acquired by taking approval from the government.

4.4.3 Soil and Watershed Conservation Act, 2039 (1982)

In order to manage watersheds of Nepal, the Soil and Watershed Conservation Act, 1982 was enacted. The act is devoted to the protection of watersheds. Under Section 10 of SWCA, power is extended to the Watershed Conservation Officer to grant permission to construct dams, drainage ditches and canals, cut privately owned trees, excavate sand, boulders and soil, discharge solid waste and establish industry or residential areas within any protected watersheds. The Act outlines the essential parameters necessary for proper watershed management.

The Act is relevant to the proposed project as the project will utilize the soil for tower foundation in different location. There is likely to impact on soil and watershed condition of the project area. Hence, the project is obliged to follow the Soil and Watershed Conservation Act, 2039 (1982) during project implementation.

4.4.4 Water Resources Act, 2049 (1992)

The objectives of the Water Resources Act, 2049 is to make legal arrangements for determining beneficial uses of water resources, preventing environmental and other hazardous effects thereof and also for keeping water resources free from pollution. The Act strives to minimize environmental damage to water bodies, especially lakes and rivers through environmental impact assessment studies and the proponents who wish to use water resources for various purposes should prepare IEE report before a license can be granted. The Act stipulates that soil erosion, flooding, landslides or any significant impact on the environment should be avoided in all uses of a water resource. The provisions made in Water Resources Act, 2049 (1992) is mandatory in case of the implementation of the proposed project. As per the provision, the environmental impact mitigation and enhancement measures have been proposed in view of environment conservation.

4.4.5 Electricity Act, 2049 (1992)

Electricity Act, 2049 is related to survey, generation, transmission and distribution of electricity. Electricity includes electric power generated from water, mineral oil, coal, gas, solar energy, wind energy etc. Under Section 3 of the Act it is stated that survey, generation, transmission or distribution of electricity without obtaining a license is prohibited. The Electricity Act, 2049 also contain provisions to minimize soil erosion, flood, air pollution and damage on environment while producing electricity and transmission of the power (Article

24). This Act is not relevant in case of transmission and distribution of generated electricity. The present study is only for hydropower generation excluding transmission component. NEA is responsible for electricity transmission and distribution.

4.4.6 Forest Act, 2049 (1993)

The Forest Act, 2049 (Amendment 2055) recognizes the importance of forests in maintaining a healthy environment. One of the major objectives of the enhancement and enforcement of the Forest Act is the promotion of a healthy environment.

The Act requires decision-makers to take account of all forest values, including environmental services and bio-diversity. It emphasizes the development and implementation of an approved work plan for different categories of forest, i.e. Community Forests, Leasehold Forests, Private Forests and religious forests.

This Act is relevant in case of the proposed project as the project will acquire an area equivalent to 23.1046 ha forest land belonging to community, and national. It is mandatory to follow the Forest Act, 2049 (1992) while proposing the mitigation measures and also in implementation phase.

4.4.7 Labour Act, 2049 (1993)

This act is enforced by GoN in 2049/2/2. This Act classified below 15 years as child and 'anabolic' for the age group of above 14 years and below 18 years. The Act has also made provision of labour court and department of labour. The Act clearly mentions that the appointment letter should be issued for all the employees which include their working hours, working time, wages and other benefits. The Act allows for the time bond contract for the manpower required for development work. The Act specifies that working hours for the Anabolic and women must be within 6 AM to 6 PM which clearly restrict to deploy women in night works. The Act also state that equal opportunity shall be given to women as men. Similarly working period for the other employees must not exceed 8 hours a day and 48 hours in a week. If some people work beyond that period, over-time allowances must be paid which is 150% of the normal per hour wages and such over-time must not exceed 4 hours in a day. According to this act the wage rate of the employees shall not be less than the rate fixed by the concerned offices of GoN.

4.4.8 Environment Protection Act, 2053 (1997)

Nepal has enacted a comprehensive and umbrella type Act, the Environment Protection Act, 1997 (EPA, 97) which is now enforced through appropriate regulatory measures. The EPA provides a legal basis for the concerned authorities for regulation an initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA). Section 3 of the Act requires the proponent to conduct an IEE or EIA in relation to the prescribed proposals. The Act uses the word proposal instead of Projects which makes the scope of the Act much broader in relation to environmental studies. Proponent includes any government, semi government or non government agency or organization submitting an application for the approval of a proposal and possessing the responsibility to work according to such a proposal or implementing the proposal.

According to the provision in Section 6 (1) of the Act, the relevant agency is empowered to grant approval for the IEE and EIA report, only if it finds that no significant adverse effects will be caused to the environment by the implementation of the proposal. Implementation of

any proposal without the approval of the relevant agency is prohibited by the Act. As per EPA, 1997, the proposed project has obligation to carry out IEE study prior to the implementation of the proposed project.

4.4.9 Local Self-Governance Act, 2055 (1998)

The Local Self-Governance Act, 2055 contains several provisions for the conservation of soil, forest and other natural resources and implementation of environmental conservation activities. Section 28 and 19 of the Act provide that the Village and the District Development Committees are responsible for the formulation and implementation of the programs related to the protection of the environmental bio-diversity. Section 96 stipulates that it is the duty of the municipality to protect the environment through the control of air, water and sound pollution. It also obligates the Municipality to maintain environmental cleanliness through the implementation of solid waste management, flood and landslide control programs.

This Act is relevant as the proposed project will utilize natural resources and carry out development activities in the project affected VDCs. Hence, it is mandatory to the project for proposing mitigation measures.

4.4.10 Child Labor (Prohibition and Regulation) Act, 2056 (2000)

The Child Labor (Prohibition and Regulation) Act, 2056 is enacted and enforced adopting ILO Convention concerning Elimination of Worst Forms of Child Labor and Minimum Age Convention. This Act has defined the 'Child' as a person who has not achieved the age of 16 year. Article 3 bans the employing a child below the age of 14 to work as a laborer and engaging a child in the hazardous and risky works listed in the Schedule of the Act.

The proponent is mandatory to follow the Child Labour (Prohibition and Regulation) Act, 2056 (2000) during the project implementation phase. The project requires 255 manpower including skilled, semi-skilled and unskilled for the construction activities. Priority will be given for local employment. The contractor may use child labour during construction period. Hence, the contractor will be instructed to follow the Child Labor (Prohibition and Regulation) Act, 2056 (2000).

4.5 Rules and Regulations

4.5.1 Electricity Rules, 2050 (1993)

Regulations on electricity sectors have been formulated for the implementation of the provisions made in the Electricity Act, 2049. The Electricity Rules, 2050 emphasize environmental analysis, which should include environmental mitigation measures to minimize adverse impacts likely to occur while developing hydro-electricity (Rule 12 and 13). Rule 12 (f) and Rule (g) are related to the EIA/ IEE process which emphasize that the IEE report should include measures to be taken to minimize the adverse effects of the project on social, biological and physical environments and should also elaborate utilization of local labour, source of materials, benefits to the local people after the completion of the project, training to local people in relation to construction, maintenance and operation, facilities required for construction site and safety arrangements.

4.5.2 Water Resources Rules, 2050 (1993)

It is mandatory under Rule 17(e) of the regulation that any person or corporate body, who desires to obtain a license for utilization of water resources must state in his application that

appropriate measures will be taken to lessen the adverse effects due to the project on the overall environment. Rule 19 stipulates that the water resources committee shall publish a notice giving detail information about the project to the people.

4.5.3 Environment Protection Rules, 2054 (1997)

The Environment Protection Rules (EPR) was endorsed in June 1997 and was made under the provisions of the Environment Protection Act. The EPR has been amended several times and the recent was done in 2010/01/27. The recent amendment states that transmission line projects up to 400 kV voltage level requires only IEE unless it traverses through protected area, buffer zone or national parks. The EPR adopts the environmental assessment criteria mentioned in the EIA guidelines. However, the EPR establishes the administrative framework for assessing, exhibition and determination of the EIA/IEE, in terms of issues needing to be addressed and the format/layout of the EIA/IEE document.

Under section (18) of EPA, any person who contravenes any of the provisions of the Act, or the Regulations or the guidelines issued under the Act, shall be punishable with a fine up to Rs 50,000. If a proposal is implemented without the approval of the Ministry of Environment (in case of IEE, Ministry of Energy) or relevant government agency, or the person implementing the proposal is not complying with the conditions of the approval or license, the authorized official is empowered to close down that activity and may impose fine of up to Rs. 100,000 on such person or organization. This Act is relevant to the proposed project.

Under this Rules, the IEE study of the proposed project has to be carried out by the proponent and get approval from the Ministry of Energy prior to the project implementation.

4.5.4 Local Self Governance Rules, 2056 (1999)

Local Self Governance Rules, 2056 empower the local bodies to coordinate and implement development program and for rationale utilization of local natural resources. Article -7 (69) empowers the VDCs for monitoring and supervision of development work implemented in the VDC. The Article - 4 of DDC has provision of 3 members (Agriculture, Forest and Environment) committee to look after the concerned issues. Article-6 (206) specifies that the need of social, economic, environmental and public facilities should be consider while planning the project. Article-7 (210) focuses on environmental studies and stresses due consideration while implementing the project like sand quarry, stone quarry, coal mines and others.

4.6. Guidelines and Conventions

4.6.1. Biodiversity Convention, 1992

The convention contains a series of far reaching obligations related to the conservation of biological diversity and sustainable uses of its components. One of these obligations is the requirement for environmental study. The purpose of an environmental study in relation to biodiversity conservation is to identify in advance:

- The aspects of the project which is likely to have significant adverse effects on biological diversity at genetic, species and ecosystem level, and
- The steps to be taken to avoid or minimize significant adverse effects to ensure that the proposed project comply with existing environmental legislation.
- The GoN has included 17 species of plants and 39 species of wild animals in the protection list.

If the project area is in the core habitat of these species and project activity will likely to affect them, mitigation measures shall be proposed and be implemented to avoid and/ or mitigate the adverse impacts. Nepal is a party to the convention of Biological diversity and in accordance to the article 14, adequate attention should be given to minimize and or avoid the impacts.

4.6.2 National Environmental Impact Assessment Guidelines, 1993

The National EIA Guidelines, 1993 developed by the National Planning Commission in conjunction with IUCN, set out the process for the environmental review and management of infrastructure projects in all sectors and the respective roles of certain GoN agencies and project proponents. The guideline was part of a comprehensive program to develop the national and sectoral guidelines for establishing a national system for Environmental Impact Assessment which was part of GoN's National Conservation Strategy. The EIA Guideline was endorsed by GoN on 27 September 1992 and gazette on 19 July 1993. The schedules attached to the Guidelines include:

Schedule 1	:	Projects requiring an IEE Report
Schedule 2	:	Projects requiring an EIA
Schedule 3	:	EIA based on project sites
Schedule 4	:	Projects requiring an IEE Report
Schedule 5	:	Format for Terms of Reference
Schedule 6	:	Environmental Impact Report Format

It is mandatory to follow the National Environmental Impact Assessment Guidelines, 2050 (1993) during the IEE study. Following the guidelines the environmental impact prediction and evaluation of the proposed project has been done on physical, biological and socio-economic and cultural environment of the project area. The guideline is used for analysis of significant issues.

4.6.3 EIA Guidelines for Forestry Sector, 1995

The GoN in keeping with the spirit of the National Environmental Impact Assessment Guidelines, 1993 framed EIA guidelines for the forestry sector in 1995. The Guideline aim to facilitate the sustainable use of forest resources for socio-economic development and meeting basic need to the community regarding the forest products, to make proposals socio culturally acceptable, economically feasible, and environmental friendly to conserve genetic resources and biodiversity and minimize environmental damage in forest areas and facilitate in identification of positive and negative impacts of programs to be implemented by other agencies in forest areas. The guideline emphasized the need of carrying out an EIA/IEE study of development projects and programs proposed for implementation in forest areas.

4.6.4 Forest, Production, Collection and Sales Distribution Guidelines, 2057 (1998)

The Clauses 3 to 10 of the Guidelines have specified various procedure and formats for getting approval for vegetation clearance, delineation of lands for vegetation clearance, evaluation of wood volume etc. and government offices and officials responsible for the approval, delineation and evaluation. These provisions have a direct relevance to the development of the project and need compliance to these provisions. These provisions have a direct relevance to the development of the project and need compliance to these provisions. The project requires to fell down an estimated of 5875 trees (size having DBH greater that 10 cm) from national and community forests and some 1760 privately owned

trees. Hence, it is obligation to the project for getting approval in view of vegetation clearance and evaluation of wood volume from district forest office prior to the construction phase.

4.6.5. Community Forest Guidelines, 2058 (2001)

This guideline has been prepared by including amendments of acts, rules by officials of GoN and related experts. Through these guidelines persons involved in the development and management of community forest like facilitators, User Groups, forester and managers etc will get help to understand about the process and stages of development of community forest. Forest Users Group, forest officials, NGOs and INGOs are getting benefit by this guideline. Till date, more than 15000 Community Forests have been handed over to the Community Forest Users Groups.

4.6.6. Community Forest Inventory Guidelines, 2005

The guideline for inventory of community forests advice to classify the forest into timber trees, pole size trees and regeneration on the basis of diameter. It has recommended using 20m x 20m size of quadrant for timber trees, 10m x10m for shrub and 5m x 5m for regeneration plots in the community forest. Plants having DBH (Diameter at breast height, i.e. 1.3m above ground) greater than 30 cm are considered as trees. Trees having DBH between 10 to 30 cm are categorized as pole and plants having less than 10 cm DBH belong to regeneration species.

4.7 Convention on International Trade in Endangered Species of Wild Fauna & Flora

Nepal became a contracting party to the convention on June 18, 1975.That aims to control the trade of certain wildlife species to prevent further endangered of their survival. CITES classified species according to the following criteria:

- Species threatened with extinction
- Species which could become endangered.
- Species that are protected

As Nepal is party to the convention related to species conservation, attention should be given to evaluate the impacts of the project activities on meeting their obligation. It is relevant to IEE study that species protection list could also be used to evaluate the significant of the identified and predicted impacts. Plant and wild animal species under legal protection provides a basis to purpose EMPs for their conservation and for least damaging them during project implementation.

Nepal is signatory to this agreement, which classified species according to criteria where access or control is important (eg. I-species threatened with extinction; II-species which could become endangered; III-species that are protected).

4.8 International Labour Organization (ILO) Convention of Indigenous and Tribal Peoples (No.169)

Nepal ratified ILO Convention No. 169 on September 14, 2007. In 2007 the UN Declaration on the Rights of Indigenous Peoples was adopted by the General Assembly. The declaration reaffirms the importance of the principle and approaches provided for under Convention No. 169 and its adoption therefore provide a fresh impetus for promoting the ratification and implementation of 169. ILO Convention No. 169 highlights the need to recognize indigenous

and tribal people's specific knowledge, skills and technologies as the basis for their traditional economies and self determined development process. Article-1 of the convention provides definition of the tribal indigenous people. Article-6 deals the consultation of the people concerned through appropriate procedure in particular through their representative institutions. Whenever, consideration is being given to legislative or administrative measures which may affect them directly.

In Article 15, the rights of the people concerned to the natural resources pertaining to their lands shall be covers the total environments of the areas which the peoples concerned occupy or other use. The peoples concerned shall wherever possible participate in the benefit of such activities and shall receive fair compensation for any damage which they may sustain as a result of such activities. Article 16 (2) clearly mention that where the relocation of these peoples is considered necessary as an exceptional measures such as relocation shall take place only with their free and inform consent.

Where their consent cannot obtained, such relocation shall take place only following appropriate procedures established by national laws and regulations, including public inquiries where appropriate , which provide the opportunity for effective representation of the peoples concerned . Article 16 (3) mention that whenever possible these peoples shall have the right to return their traditional land as soon as the grounds for relocation cease to exist. Article 16 (5) elaborated the persons thus relocated shall be fully compensated for any resulting loss or injury.

The ILO Convention on Indigenous and Tribal Peoples, 1989 (No.169) is relevant for the proposed project as there are indigenous and tribal families in the project affected area. The project will acquire and utilize most of the natural resources belonging to those families. Hence, the project has obligation to have consultation and taking consensus from them before the implementation of the project.

Article-15 states that the rights of the people concerned to the natural resources pertaining to their lands shall be specifically safeguarded. Provision includes the people to participate in the use, management and conservation of these resources. This provision creates some confusion and ultimately brings conflict between the project proponent and resources owners. Project share distribution and employment priority to these people will somehow reduce the possible conflict. The provision made in the ILO Convention on Indigenous and Tribal Peoples, 1989 (No.169) is not line fully with the prevailing acts and rules regarding environmental study of the proposed project.

CHAPTER-V
EXISTING ENVIRONMENT CONDITION

The proposed project is located in the mid-hill region of the Nuwakot district. The existing environment of the project area with regard to physical, biological and socio-economic and cultural aspects are presented in subsequent sub-chapters.

5.1 Physical Environment

5.1.1 Physiography and Topography

The proposed project area lies in Midland zone of Nepal. The proposed Samundratar substation lies on the right bank of Tadi River just below confluence of Tadi River and Chadrawati Khola. The proposed substation site is moderately steep terraced field. Starting from the substation, the proposed 132 kV transmission line runs down along the Tadi river through flat terrain of Tadi river valley.

Proposed site for Substation at Samundratar

From Kharanitar, the proposed transmission line alignment turns north-west and runs uphill crossing over undulated mountain terrains, ridges and cliffs. From Gerkhu, it runs downhill and crosses Trishuli river nearby Betrawati bazar. Then, the proposed alignment runs along the right bank of Trishuli river through flat terrain of Trishuli river valley and mountain terrains up to its terminating point at the proposed Trishuli 3B Hub substation.

A View of the project area in Narjamandap VDC

The proposed route alignment of length 26.6 km traverses through hilly region of Nuwakot district. The alignment runs through several topographic features comprising of rugged hills with mild and steep slope. The altitudinal variation of the transmission line is between 1479 masl to 605 masl at Lachyang VDC and Tupche VDC respectively. The altitude of the starting point at Manakamana VDC is 679 masl and terminal point of the transmission line at Sumandartar VDC is 855 masl. The altitudinal variation and the land use of the angle points are given in the table below.

Table 5.1: Altitudinal variation of the alignment

S.N.	Angle Points	Elevation, masl	Land-use	S.N.	Angle Points	Elevation, masl	Land-use
1	AP-1	679.03	Cultivated	34	AP-34	1422.95	Barren, Forest
2	AP-2	738.31	Forest	35	AP-35	1353.67	Cultivated
3	AP-3	713.20	Cultivated	36	AP-35A	1322.67	Cultivated
4	AP-4	798.33	Cultivated	37	AP-36	1456.10	Forest
5	AP-5	804.82	Cultivated	38	AP-37	1479.77	Cultivated
6	AP-6	789.82	Barren, Forest	39	AP-38	1383.37	Cultivated
7	AP-7	706.12	Cultivated	40	AP-39	1352.82	Cultivated
8	AP-8	673.67	Cultivated	41	AP-40	1315.82	Cultivated
9	AP-9	680.59	Cultivated	42	AP41	1395.97	Cultivated
10	AP-10	672.61	Forest	43	AP-42	1334.55	Cultivated
11	AP-11	622.90	Cultivated	44	AP-43	1086.05	Cultivated
12	Ap-12	618.34	Cultivated	45	AP-44	908.44	Cultivated
13	AP-13	624.89	Cultivated	46	AP-45	755.29	Cultivated
14	AP-14	614.85	Cultivated	47	AP-46	890.56	Cultivated
15	AP-15	618.10	Cultivated	48	AP-47	856.47	Forest
16	AP16	605.72	Cultivated	49	AP-48	710.73	Cultivated
17	AP-17	747.66	Cultivated	50	AP-49	725.02	Cultivated
18	AP-18	786.38	Cultivated	51	AP-50	740.37	Cultivated

19	AP-19	851.47	Cultivated		52	AP-51	763.05	Cultivated
20	AP-20	912.49	Cultivated		53	AP-52	776.14	Cultivated
21	AP-21	955.63	Cultivated		54	AP-53	786.31	Cultivated
22	AP-22	1020.18	Forest		55	AP-54	784.68	Cultivated
23	AP-23	1134.29	Cultivated		56	AP-55	805.18	Cultivated
24	AP-24	1266.64	Cultivated		57	AP-56	835.21	Cultivated
25	AP-25	1399.09	Forest		58	AP-57	846.98	Cultivated
26	AP-26	1428.05	Cultivated		59	AP-58	855.20	Cultivated
27	AP-27	1415.20	Barren, Forest					
28	AP-28	1458.47	Barren					
29	AP-29	1456.53	Cultivated					
30	AP-30	1428.75	Cultivated					
31	AP-31	1454.10	Barren					
32	AP-32	1377.07	Cultivated					
33	AP-33	1391.37	Forest					

Source: Survey Report and field verification, May 2014

5.1.2 Land Use

The main land use pattern of the project area is cultivated land, forest and barren land. The alignment avoids densely populated areas, major structures, protected areas and dense forests. The other land uses along the alignments consists of road crossings, rivers and river beaches. Overall approximately 66.15% of the transmission line alignment passes through cultivated land, 23.54% is forest, 3.48% barren land and 6.83% others (road crossings and river crossings etc.).

5.1.3 Climate

Sub-tropical and tropical climates prevail in the project area. The project area experiences wide seasonal variations, with wet monsoons from June to September and dry weather from October to May. Occasional snow fall has not experienced yet within the project area during winter. The table below lists the climatic data such as minimum and maximum temperature, maximum monthly rainfall of the Nuwakot district.

Table 5.2: Climatic Data of Nuwakot district.

SN	Month	Max. Temp.(°C)	Min. Temp.(°C)	Average rainfall (mm)
1	Baishak - Jestha (May)	23.6	12.0	19.2
2	Jestha - Ashar (June)	22.8	14.9	210.2
3	Ashar - Shawan(July)	22.5	15.1	691.7
4	Shawan - Bhadra (August)	22.8	15.4	612.7
5	Bhadra - Ashoj (September)	22.5	13.9	454.9
6	Ashoj - Karthik (October)	21.2	10.7	13.0
7	Karthik - Mangshir (November)	18.2	7.0	0
8	Mangshir - Pousha (December)	13.5	5.1	6.0
9	Pousha - Magh (Janaury)	13.8	3.2	30.0
10	Magh - Falgun (February)	14.4	3.8	65.0
11	Falgun - Chaitra (March)	18.2	7.1	68.0
12	Chaitra - Baishak (April)	23.5	12.0	45.0
13	Annual average	19.75	10.2	184.64

Source: Statistical Information of Nepalese Agriculture 2003/04

The annual average minimum and maximum temperature ranges from 10.2°C to 19.75°C in Nuwakot district. The annual average and monthly maximum rainfall are 184.64 mm and 691.7 mm respectively.

5.1.4 Geomorphology and Geology

The proposed 132 kV Transmission Line Project lies in lesser Himalayan midland of central development region since its location is geologically risky zone. Geologically this zone mainly composed of low grade metamorphic rock like slate, Phyllite, schist, quartzite, marble and sedimentary rocks like limestone, siltstone, sandstone, claystone and mudstone. This zone is separated from south of siwaliks by MBT (Main Boundary Thrust) and MCT(Main Central Thrust) on the north of Higher Himalaya zone.

The Middle hill exhibits a rugged topography with deeply dissected gullies and steep slopes in the initial stretch and especially between the stretch AP17 – AP47. The proposed substation site is located on the terraced field formed by colluvial deposit of Tadi river. The flat terrain of Tadi river as well Trishuli river consist of alluvial soils along the proposed alignment in some areas. Rocky outcrop, large boulders and conglomerates are common in the mountain terrains along the proposed 132 kV TL route.

5.1.5 Air and Noise Quality

The proposed transmission line passes mainly through the flat terrain, hill ridge, and nose of the hills avoiding roads, settlements and market centers. However, at some stretches, it traverses along the right-of-way of black topped, gravel and earthen roads.

During the field visit it was observed that the major stretch of the linear project stretch traverses through rural setting with minimum industrial activities. The main source of air pollution along the alignment is due to the vehicular moment along the earthen road. Other

sources of air pollution along the alignment are household fire, fugitive dust particles created by the movement of public vehicles along the access road to the settlements and vehicular emissions. However, the transportation density and frequency of the vehicles along the road is not very high. Therefore, the overall status of air quality at the immediate project area can be considered to be satisfactory and within the range of acceptable limits.

In addition, during the field visit it was also observed that the source of air and noise pollution at AP-28 due to use of excavator for the opening of track of the rural road.

However, air and noise pollution is apparent in Betrawati Bazaar. The overall noise levels along the alignment can be considered to be within the acceptable limits.

5.1.6 Water Quality

The water quality of river and other water bodies along the transmission line corridor appear to be unpolluted. However, dumping of solid wastes into the Trishuli river was observed at Betrawati Bazaar. The other sources of water pollution along the alignment where pollution is evident is due to soil erosion, open defecation in water bodies, dumping of household waste near the river and construction of road etc.

5.1.7 Watershed Conditions and drainage patterns

The project area alignment lies in the lesser Himalaya zone. This zone is the most important barrier of the monsoon clouds and it greatly influences the rainfall distribution pattern in Nepal. This project alignment passes through mainly 4 rivers i.e. Trishuli and its tributaries Dorkhu, Salakhu and Tadi. Trishuli river is itself one of major tributaries of Gandaki river system.

Tadi river is partially snow fed and partially rain fed. Trishuli River from up-hills through which the proposed TL alignment passes.

The proposed substations at Manakamana VDC and Samundartar VDC are observed to be at floodplain of Trishuli river and Tadi river respectively. The major rivers which drain out the project area are Trishuli, Dorkhu, Salakhu and Tadi. The river crossings along the alignment are tabulated below.

Table 5.3: Crossings along the transmission line corridor

S.N.	Strech	Major Rivers	No of crossings
1	AP-12---AP-13	Salakhu Khola	1
2	AP-16---AP-17	Trishuli Nadi	1
3	AP-44---AP-45	Dorkhu Khola	1
4	AP-53---AP-54	Tadi Nadi	2
5	AP-54---AP-55	Tadi Nadi	1
6	AP-56---AP-57	Tadi Nadi	1
8	AP-57---AP-58	Tadi Nadi	1
Total			**8**

No major landslides or other instabilities were observed along the alignment except for the

area near AP10 - AP11 and AP37 - AP36. Although most of the angle towers are located on relatively stable areas, some angle towers are located on sites susceptible to erosion and instabilities. The table below lists the angle towers located on fragile topography observed during the field survey.

Table 5.4: List of Critical Angle Points

S.N.	Angle Points	Type of instabilities	Remarks
1	AP 57	Located in the middle of floodplain of Tadi river.	Protection works needed
2	AP 53	Located at terraced land but small scale fresh landslide observed approximately 10 m uphill near to the road-section.	
3	AP 47	Located near to the prone to the landslide area of community forest.	
4	AP 36	Located at the ridge prone to landslides.	
5	AP 28	Located at the upper part area of Dwache water supply water tank area.	20 m away from the RoW. No disturbance to the water tank.
6	AP10-AP11	Located near to the downward of road section where two landslide area were observed.	Protection works needed
7	AP 8	Located at the Trishuli 3B Power house area.	TL passes through the powerhouse site but no interference.

Source: Field survey, May 2014

5.1.8 Crossings of Other Utilities

The proposed Samundratar-Trishuli 3B Hub 132 kV T/L alignment crosses the major rivers like the Trishuli, Salakhu, Dorkhu and Tadi rivers and existing 66 kV transmission line one time; 33 kV three times, 11kV nine times, 380/400 volt two times and distribution line seventeen times. Similarly, it crosses Pasang - Lhamu highway and Trishuli - Samundratar blacktopped road single time and other inter-connected gravel/ earthen/trails feeder roads eighteen times.

The field verification for other crossings like houses, huts and shed and other infrastructure was also done. Altogether eight built up infrastructures are found under the RoW of the transmission line which includes one 2-storied tin roofed house at the stretch AP44 - AP45, 3 suspension bridges, 4 times hydro-power canal. The summary of the crossings is given in the table below.

Table 5.5: Summary of the crossings

Utilities	Total No of crossings	Remarks
Road	20	Major roads Trishuli-Dhunche road, Gangate-Samundratar road
Rivers	8	Major rivers Tadi, Trishuli, Salakhu, Dorkhu
Transmission Line	32	66 kV-1; 33 kV-3; 11 kV-9; 380/400 V-2; 220 V-17
Other Structures	8	1-house; 3- suspension bridges; 4- Hydropower canal

Source: Field survey, May 2014

5.2 Biological Environment

Geographical and climatic conditions determine biological environment of particular areas. The project area belongs to sub-tropical bio-climatic zone in the low lands of river valley and sub-temperate bio-climatic zone in the high hills. The proposed Samundratar substation and 132 kV TL alignment is not located within national park, wildlife sanctuary, buffer zone or conservation area. Although some part of Nuwakot district lies in Langtang National Park, its nearest boundary is 7.5 km away from the proposed substation at Samundratar.

5.2.1 Forest and Vegetation

According to District Forest Office, out of total area (112,100 ha) of Nuwakot district, forest area consist of 35,991 ha i.e. 32.1%. Based on LRMP aerial photography survey and ISO potential map recently prepared by Department of Forest, 5 types of forests are found in Nuwakot district. Among them the forest types available along the entire project alignment of Samundratar-Trishuli Hub 132 KV Transmission Line are falls under Sub-tropical and Temperate categories. The section wise vegetation type is as follows:

Table 5.6: Distribution of Forest by type and dominant species

Alignment/ Location	Forest Type	Dominant Tree Species
AP 45 to AP 48 Kharanitar VDC	Tropical* & sub tropical	Sal, Kyamuno and Chilaune
AP 35A to AP 36 Lachyang VDC	Subtropical	Chilaune, Kattus and Salla
AP 30 to AP 33 Bageswori VDC	Subtropical	Chilaune, Kattus and Salla
AP 26 to AP 27 Bageswori VDC	Subtropical	Chilaune, Kattus and Salla
AP 24 to AP 25 Gerkhu VDC.	Subtropical	Chilaune, Kattus and Salla
AP 19 to AP 22 Gerkhu VDC	Subtropical	Chilaune, Mauwa and Utis
AP 11 to AP 1 Manakamana VDC.	Tropical* & sub tropical	Sal,Chilaune,Kyamuno Utis and Bot Dhayero

Note: * Hill sal forest *Source: Field survey, May 2014*

The Sal forest type in the project area is dominated by Sal species. Sal is a source of timber

for construction and furniture, fuel wood for domestic uses, fodder for domestic animals and leaves for preparing plates.

Among subtropical forest important vegetation types, which are found in project area, are *Schima castonopsis* forest that is dominated by *Schima wallichii* (Chilaune) and *Castonopsis spp.* (Kattus), Pine forest dominated by *Pinus roxburghii* and *Alnus nepalensis forest* dominated by Utis.

The project area also comprises some temperate vegetation like Lali gurans (*Rhododendron arboretum).* Other dominant tree species available are Bot Dhayero (*Lagerstroemia parviflora*), Mauwa (*Engelhardtia spicata*), Sissoo (Dalbergia sissoo), Padke (*Albizia julibrissin),* Kyamuno *(Cleistocalyx operculata),* Dhayero *(Lagerstroemia parviflora*), *Terminalia Tomentosa* (Saj) *etc.*

The shrub species available in the area are Simali (*Vitex negundo*), Banmara (*Eupatorium odoratum*), Bhogate (*Maesa microphylla*), Pipiri, Aiselu (*Rubus paniculatus*), Kantakari (*Solanum surattense*), Chutro (*Berberis aristata*), Argeli (*Daphne sureil*), Malingo (*Thamnocalamus spathiflorus*), Ghangaru (*Pyracantha crenulata*), Titepati (*Artimisia spp.*) etc.

Harro (*Terminalia chebula*), Barro (*Terminalia bellirica*), Amala (*Phyllanthus emblica*), Kurilo (*Asparagus spp*.), Thulo aukhati *(Astilbe rivularis*), Hadchur (*viscum album*), Rajgante, Chiraito (*Swertia chirayita*), Pakhanbed (*Berginia cilliata*) are some of the plant species available in the project area having medicinal values. Argeli (*Daphne sureil*) has commercial value and being used for making nepali paper. The list of plant species available in and around the project area are given in Annex-VII.

Significant numbers of Sal trees, mostly pole sized and very few no. of tree sized, are supposed to be felled in between the stretch AP 11 and 1 which lies in Manakamana VDC. Besides Sal trees, Salla, Kymuna, Kattus, Chilaune etc are also supposed to be felled along the transmission line. Among total 59 APs, 15 number of AP are located inside the forest area.

The crown cover of vegetation in the project area varies from 40% to 80% within community forest depending upon the degradation of forest, vegetation types, altitude etc. Since very few area lies on government managed forest, which is degraded land without trees thus there is no crown coverage None of the part of the proposed alignment falls in National Park, Environmentally Sensitive Area, Wildlife Sanctuary Area, Buffer Zone and Conservation Area. The total land area, total forest area and number of community forests along the transmission line alignment in this district is given below in Table:

Table 5.7: Distribution of community forest along the transmission line

District	Total Area (ha)	Forest Area (ha)	Forest Area (%)	Total No. of Community Forests in the District	Community Forests along the TL Alignment
Nuwakot	112100	35991	32.1%	354	10

Source: Data from District Forest Office Annual Report 2069/2070

Community and National Forest

From the record of District Forest Office, Nuwakot, it is found that total 354 numbers of community forests have been handed over to the community forest user groups at this district. During the field study, a total 9 numbers of community forests were identified under RoW of the transmission line. While comparing the number of CFs under RoW among the Nuwakot project district, it is found that highest number (four out of ten) of CFs lie in Manakamana VDC.

Sirupani CF in Mankamana VDC along the proposed alignment

Besides these community forests, national forest is also found under RoW between AP 40 to 41 in Narjamandap VDC in Nuwakot district. This national forest is found to be highly degraded steep land without trees and cover very few area (0.02 ha). Since part of this section (AP 40 - 41) is steep land without trees, trees are not need to be fallen during construction period of the project.

Cutting of trees for firewood and timber by locals, illegal felling of trees, occasional forest fires, encroachment are the disturbing factors which has led to the degradation of vegetation of the in and around the project area. However, local people are making efforts to protect the forest by formation of Community Forest User groups to enhance the natural regeneration. The walkover survey revealed that the proposed TL alignment passes through nine different community forests. The list of community forests falling under RoW of the transmission line is as follows:

Table 5.8: Area and benefitted Hhs of community forest by AP section and VDC

S.N.	Name of the Community Forest	VDC & Wards	Align. Location (From … to …. AP)	Area (ha)	Hhs
1.	Kharanitar	Kharanitar -1,2,3,4,5,7	AP 47	76.55	218
2.	Ramche Lamrang Jasmati	Lachyang -9	AP 36	69.94	92
3.	Laprang	Bageswori -5 ,	AP 34	58.00	34
4.	Surya Gadi Bhangeri	Bageswori -3,4	AP 27,31,33	66.25	225
5.	Seti Debi "Ka"	Gerkhu -1,2,9	AP 21,25	199.20	341
6.	Pahare Bhal Danda	Manakamana -3	AP 7,9,10	31.43	45
7.	Shir Pani	Manakamana -4	AP 6	12.50	60
8.	God Dung	Manakamana -4	AP 5,4	8.00	34
9.	Jamle Bhir Pakha	Manakamana -5	AP 2	150.99	100

Source: Field survey, May 2014

5.2.1.2 Protected Species of Flora

Government of Nepal has imposed restriction on the export of a number of plant species in unprocessed condition. Sal (*Shorea robusta),* the species available in the project area, is banned for felling, transportation and export as per the Forest Rules, 1995.

5.2.2 Wildlife

In Nepal, wildlife has been regarded as a resource belonging to the public. The ideal management concept is "preservation through wise use" and the basic objectives of wildlife management are to prevent disappearance of species native to the country employing biological principle (Amatya et al, 2002).

The transmission line route and adjoining areas have various ecological and vegetation characteristics which has provided a natural habitat for different types of wildlife species along the route. The route consisting of forests, shrub land, and grassland crossed the wildlife habitats and riverian features. In total 19 species of mammals and 34 species of birds were recorded in the project area during the field survey.

5.2.2.1 Mammals

Altogether 19 species of mammals were reported in the project area. The list of mammals is given in Annex-VII. It is reported that most of the wildlife in the proposed construction areas are of migratory nature and not confined only to the project area. The proposed project site is not a specific habitat for any wildlife and avifaunal species. The reported mammals of the project area are Rhesus Monkey (*Macaca mulata*), Jackal (*Canis aureus*), Squirrel (*Funanbulus sp*.), Bat (*Pteropus giganteus*), Chituwa (*Panthera paradus*), Ratuwa Mriga (*Muntiacus muntjak*), Kharayo (*Lepus nigricollis*), Dhendu (*Macaca assamensis*), Ban Biralo (*Felis chaus*), Dumsi (*Hystrix indica*), Mal sapro (*Martin flavigula*), etc.

5.2.2.2 Birds

Forests, bamboo grooves, agricultural fields, villages, rivers and streams in the project vicinity provide a variety of habitats for different species of birds. However, like the mammals, most birds of the project area are migratory and are not only confined to the project area. The locals informed that the Cuckoo (*Plantative cuckoo*), Crow (*Corvus splendens*), House Sparrow (*Passer domesticus*), Kalij (*Lephura leucomelana*), Baj *(Buteo spp.), Sarau (Sturnus spp.), Baudai (Falco tinnunculus),* Mayur (*Pavo cristatus*), Ban Kukhura*,* Kalij Phesant (*Lephura leucomelanos)*, Suga *(Psittacula cyanocephala)*, Dhukur *(Streptopelia chinensis),* Koili *(Surniculus lugubris),* Jureli *(Pycnonotus cafer),* Titra *(Francolinus spp.),* Kalchaude *(Myophonus caeruleus),* Bakulla *(Bubulcus ibis),* Lampuchchhre *(Cissa erythrorhyncha),* Haleso *(Treron spp.),* Chibe *(Dicrurus adsimilis)* are the common bird species found in the project area. The list of bird species available along the project area and its vicinity is given in Annex-VII.

5.2.2.3 Protected Species of Fauna

As per the National Park and Wildlife Conservation Act, 1973 of Nepal, 27 mammal species and 9 bird species of Nepal have been enlisted into the protected categories. None of the bird and mammal species reported during field study in the project area fall under this category.

5.2.3 Ethno Botany/ Plant Resource Use Pattern

Plants are an integral part of the farming system, livelihood and the cultural lifestyle of the locals. For a long time, local people have been using various plant and animal products for different purposes like food, fodder, timber, firewood as well as medicine. Local ethnic people use some of the plants for traditional purposes.

The major timber yielding plant of the project area is Sal (shorea robusta), Salla (*Pinus roxburghii)*. Common fodders are Kutmero (*Litsea monopetala*), Khaniyo (*Ficus semicordata*), Kavro (*Ficus lacor*), Badahar (*Artocarpus lokoocha*) Dabdabe (*Garuga pinnata*), Tanki (*Bauhinia purpurea*), Siris (Albizzia spps.) and Bans (*Dendrocalamus sps*). Almost all the trees are used as firewood depending upon their availability. Citrus species (*Nibuwa,Bhogate*,etc) like Katahar (*Artocarpus integra*), Banana (*Musa sps*), Aanp (*Magnifera indica)*, Litchi and Bhuin Katahar are the common fruits of the project area.

Chiraita (*Swertia chiraita),* Pakhnbhed (*Berginia ciliata),* Amala (*Emblica officinalis*), Kurilo (*Asparagus racemosus*), Bel (*Aegle marmelos*), Bhalayo, Harro (*Terminalia chebula*), Barro (*Terminalia bellirica*), Tittepati (*Artemisia capillaries),* Pani amala (*Nephrolepis auriculata),* Bans (*Dendrocalamus sps*), Argeli (*Daphne sureil*) Thulo okhati etc are the common Non Timber Forest Products (NTFP) of the project area. These NTFPs are used for the production of various medicines, which are used for the treatment of different minor to serious type disease. Among these NTPFs chiraita, pakhanbhed, Kurilo, Amala are highly important NTFP species and GoNl has recognized these species as valuable NTFPs.

5.3 Socio-economic and Cultural Environment

5.3.1 General Introduction of the project affected district

The proposed project is located in Nuwakot District. The total area of the district is 1121 Sq. km. According to National Population census 2011, the total population of the project affected district is 277,471 with 132787 male and 144684 female. The percentage of the male and female population is 47.86 and 52.14 respectively. The project affected district population covers 1.05% of the total population of the country. The average population density of the project district is 247.52 persons/sq.km. There are 59215 households and the average household size is 4.69. Similarly, the average literacy rate of the (Population of five years and above) project district is 59.80, with male 67.95% and female 52.41. The average population growth rate is (2001-2011) -0.39 and male and female sex ratio is 91.77. General demographic introduction of the project districts is presented in the Table 5.9.

Table 5.9: Demographic Characteristics of the Project district

Descriptions	Data
Total Population	277,471
Male	132,787 (47.86%)
Female	144,684 (52.14%)
Total Numbers of Households	59,215
Average Households size	4.69
Population Density (persons/ Sq.km)	247.52
Sex Ratio (Males per 100 Females)	91.77
Urban Population (%)	10.00

Population below 14 years (%)	32.00
Elderly Population 15 - 59 Years (%)	57.17
Elderly Population 60+Years (%)	10.83
Economically Active Population 14 yrs+ (%)	68.00
Percent of Literacy Rate (5 years & above)	59.80
Population Growth Rate (2001-2011)	-0.39
Human Development Index	36th
Total Development Index of District	0.40
Total Area of the Districts (Sq. km)	1121
Total No of VDC / Municipality	61/1
Percent of District Population Compared with Country's	1.05

Source: Demographic Profile of Nepal 2013/2014

5.3.2 Socio-economic features of the Project VDCs

The proposed alignment traverses through 11 VDCs of Nuwakot District, Central Development Region of Nepal. The map showing the project affected VDCs and is presented in figure-2.2. Transmission line is started from Samundratar VDC ward no 3.to Manakamana VDC ward no 9 of Nuwakot district. As per Electricity Regulations, 2050 (1993), the right of way of the transmission line is taken as 9 meters on either side of the transmission line. Socio-economic tables are mostly given in Annex-VIII.

5.3.2.1 Demography

According to the National Population Census 2011, the total population of the project VDCs is 42,856 with 20,543 (47.93%) male and 22,313 (52.07%) female. The female population is higher as compared with the male population.

The population of the project VDCs covers 15.45% of the total population of the project affected district and 0.16% in national. The total number of households is 9198 with average household size 4.66. The household size in Nargamandap VDC is highest (5.27) and least at Tupche VDC (4.13).

The average population density of the project VDCs is 330.73 persons sq.km which is higher than the average population density 247.52 persons/sq.km of the project affected district. The population density in Balkumari VDC is least (187.91 persons/sq.km) and highest in Sundradevi VDC (388.87 persons/sq.km) among the project affected VDCs. Detail demographic characteristics of the project affected VDCs is presented in the Table 5.10.

Table 5.10: Demographic Characteristics of the project affected VDCs/Municipality

S.N.	VDCs	Population			Hhs	Family Size	Sex Ratio	Total Area of VDC (sq.km)	Population Density (persons/ Sq.km)
		Total	Male	Female					
1	Samundratar	1,997	926	1,071	450	4.44	86.46	6.21	321.57
2	Balkumari	2,486	1,230	1,256	496	5.01	97.93	13.23	187.91
3	Sundradevi	2,411	1,207	1,204	511	4.72	100.25	6.20	388.87
4	Ralukadevi	4,563	2,299	2,264	916	4.98	101.55	18.30	249.34
5	Kharanitar	1,609	779	830	375	4.29	93.86	4.33	371.59
6	Narjamandap	5,335	2,656	2,679	1,012	5.27	99.14	13.82	386..03
7	Lachayang	4,480	2,238	2,242	876	5.11	99.82	15.64	286.44
8	Bagehwori	4,986	2,382	2,604	1,073	4.65	91.47	NA	0
9	Gerkhu	6,382	2,888	3,494	1,421	4.49	82.66	22.61	282.26
10	Tupche	5,286	2,401	2,885	1,279	4.13	83.22	18.97	278.65
11	Manakamana	3,321	1,537	1,784	789	4.21	86.15	10.27	323.36
Total/Average		42,856	20,543	22,313	9,198	4.66	92.07	129.58	330.73
%		100	47.93	52.07					

Source: Demographic Profile of Nepal 2013/2014

5.3.2.2 Settlements

There are three sections of settlements in the Samundratar-Trishuli 3B Hub 132 kV transmission line alignment. Section I is Samundratar to Kharanitar, in which dense settlements and small market centers were observed. Section II is Narjamandap to Gerkhu having scattered settlements and the last Section III is Tupche to Manakamana having dense settlements and small market centers. Table shows the name of settlements and their locations by districts.

A typical view of settlement in the project area

The proposed alignment from AP 13 to AP 17 nearby Betrawati bazaar passes through dense settlement. There is crossing over Trishuli River. The area on left bank of Trishuli river upstream of Betrawati bazaar lies in buffer zone of Langtang National Park. In order to avoid the alignment passing through the buffer zone, the proposed alignment has been finally selected through the settlement area. However, there is no any public and private structure along the RoW.

Table 5.11: List of settlements nearby which the transmission line passes

S.N.	VDC	SETTLEMENT/WARD NO.
1	Samundraar	Naunise-3, Samundratar-3
2	Balkumari	Gairikhet, Bhangle-1
3	Sundaradevi	Chalisephat-1, Satbise-2, hande, Ghiraule pakha, Mulkhet
4	Ralukadevi	Bhangle, 1
5	Kharanitar	Dabade Danda-5, Pahire-2
6	Nargamandap	Kalimati-1, Morya-5, Gairi Gaun, Phadpur-9, Bohore Bhangyang
7	Lachyang	Maharthum Danda-8
8	Bageshwori	Bohore Bhangyang-5, Furkethar-9, Chulidanda, Katungegairo, Chokade (Uppaloo, Tallo)-3, Chaptar-9, Banauli-1
9	Gerkhu	Bahulekuna, Chhaptar-, Kaule-2, Syale-9, Tallo Syale-4
10	Tupche	Betrawati-9, Sholebazzar-1
11	Manakamana	Jayadanda-3, Kapanekhet,kokedanda-4, Archale-5, Pahirebenai-9, Nayapool-3

Source: Field survey, 2014

5.3.2.3 Caste and Ethnicity

The project area is a multi-ethnic composition of different origins, cultures, language and religion. Altogether 44 castes/ethnic groups are found in the project district. Tamang is the dominant caste/ethinic group (49.11%).

Other Major caste/ethnic groups of the project area are Brahmin-Hill (18.64%), Chhetri (16.08%), Sherpa, Gurung etc.Tamangs are habitat of Nuwakot district as well as project affected VDCs. Details about caste/ethnicity is presented in Table 5.12 (Refer Annex-VIII).

Government of Nepal has categorized 59 castes/ethnic groups as indigenous and tribal group. Under this provision, there is 65.24% population in the project affected VDCs that fall under this category of Indigenous and Tribal groups. The identified indigenous and tribal groups of the project affected VDCs are Tamang, Newar, Magar, Gurung, etc.

5.3.2.4 Mother Tongue

Nepali (53.42%) is the main language widely spoken in the project area. Beside this Tamang followed by Newar, Sherpa,Gurung and others are main language used in project area. In field observation we found that the main language is Nepali because most of the tribal people also use national language to communicate. Detail of population distribution of the project area by mother tongue is presented in Table 5.13 (Annex-VIII).

5.3.2.5 Religion

Hindu (56.47%) is the dominant religion followed by Bouddha (42.56%) in the project area. Other religious groups are Muslim, Kirat, Christian and a few number of population are not stated (CBS 2001). According to district level information Hindu are 57.77%, followed by Bouddha, Muslim, Christian and Prakriti (Demographic Profile of Nepal 2013/14). In field observation only two religious groups are found observed in project affected households. Refer Table 5.14 in Annex-VIII.

5.3.2.6 Festivals, Cultural and Religious Practices

The major festivals adopted by the Hindu population in the project area are Vijaya Dashami, Tihar, Maghe Sankranti, Holi (colour festival), Ram Nawami, Shivaratri and Teej. Lhosar is the major festival of, Tamang, Gurung and Magar communities. In project area Tamang is a major community. Tamangs are believes in Tantra-Matra and Lama and Bonpo are their priests. When people are die they made 'Mane' (small shrine) in respect of dead person. Similarly, Jatra (fete) like Hile Jatra, Sindur Jatra, Ghode Jatra and Lakhe Jatra are also celebrated particularly in the project area.

Popular cultural activities in the area are Teej mela (fair), Bhailo and Deushi (singing and dancing activities) in Tihar, Holi, Ghatu Naach, Bhajan/Kirtan (praying by singing) in Ram Nawami and Kirshnajanmastami, cultural programs in Shripanchami and Dhami and Jhankri Naach (dance performed during various religious activities and festivals.

Other religious activities in the project area are Pasni (rice feeding ceremony for newly born babies), Bratabanda (Hindu baptized ceremony of teenage boys), marriage and Shraadha (worship for the soul of the dead people), etc.

5.3.2.7 Education and Literacy

According to National population census 2011, the total population (5 years and above) of the project area is 39736. Of the total population (population of age 5 and above years), the average literacy rate of the project area is 58.52% consisting 66.63% male and 51.15% female literacy rate. Women literacy is very low in comparison in male. Literacy status of affected VDCs is slightly low in comparison of district 59.80% and very low in nation 65.9%.

In field observation we found most of the people were aware about education of their children either boy or girl. This shows the awareness towards education is increasing. This indicate the educational status of the project affected VDC is satisfactory. Details about VDCs literacy rate is presented in Table 5.15.

According to district source, there are 521 primary schools, 180 lower secondary schools, 103 secondary schools, 49 higher secondary schools in the project affected district. Bachelor and Masters' Degree education facility is available only in Bidur municipality and Kharinitar VDC a large number of people goes Kathmandu for better education. Educational institutions status of district and VDCs is presented in Table 5.16 and 5.17.

5.3.2.8 Migration

Poverty, unemployment, low agricultural production and desire of improving quality of life are the main reasons of migration in Nepal so as the project area. Migration has helped to improve socio-economic status of the local people of the project area and positive impact on local economy.

Due to lack of presence of infrastructures, better facilities, and fertile cultivated land the in-migration pattern from hilly areas to riverside flat land is common practiced in the project area. The out-migration specially the young generation migrate to neighboring country and abroad seeking for employment is also common. India, Malaysia, Qatar and Dubai are the main destinations in abroad to most of the migrant. Hence, remittance is the prominent

source of income for most landless, poor, and marginalized households of the project area. The in-migration to the cities such as Bidur, Battar and Kathmandu, etc for various purposes like business, employment, study and medical services is reported common in the project area.

5.3.2.9 Gender Status

About 52.07% of total population is women in project affected VDCs. The literacy rate of women in the project area is low as compared with the male. Most of the women in the project area are engaged in the household works as well as labor in agricultural, construction and other sectors. Cooking, washing, food processing, household maintenance, hygiene and sanitation activities, caring of children and taking care of the sick, elderly and other members of the family are daily activities of women.

The decision making process on economic activities is mostly exercised by the both male and female. However, the land and property holding is dominated by the males. The average daily wage/labor rate in the project affected VDCs is only NRs. 300 which is low as compared with male NRs. 500. In field observation found that school enrolment is similar in boy and girl. Some women are observed engaged in small business in the highway area. Girls trafficking were not reported during the field visit.

5.3.2.10 Economically Active Population

According to CBS 2011, the total population of age 15 to 59 years of the project affected VDCs is calculated to be 24344 which is 56.80% of the total population of the project affected VDCs. Hence, there is 56.80%% population categorized as economically active. Similarly, there is 43.20% dependent population on which 29.66% are below 15 years and 13.53% are senior citizen (sixty years and above age). Percentage of senior citizens is increased in comparison of CBS 2001 to CBS 2011 because mortality rate is become low. A detail of economically active and inactive population is shown in Table 5.18.

5.3.2.11 Occupation and Employment

Agricultural is the main occupation of people in the project area. Most of the population is engaged in the agricultural activities, second major occupation is foreign employment. Remaining people are engage in other activities like, service, trade/business, wage and labor, manufacturing, transportation, tourism etc.

5.3.2.12 Agricultural Production and Livestock Practice

Paddy, Maize, wheat and millet are the major food crops grown in the project area. The main cash crops grown are potato, vegetables, and oil seeds. The hilly section of the proposed transmission line is suitable for fruits like mango, pear, peach, strawberry etc as a cash crop production. See Table 5.19 for the landuse pattern (Annex-VIII).

Irrigation canals, ponds and rivers are the major irrigation facilities of the proposed transmission line alignment. The hilly region of the project area has low cultivated and not fully irrigated land as compared with low hill region.

Goats, cows, bulls, buffaloes, and poultry are the domesticated livestock found in the project area. These livestock are sold at local markets for supplementary income of the households.

5.3.2.13 Public Health, Drinking Water and Sanitation

Most of the households in the project area are equipped with toilet facilities (59.0%), although a large scale of population (41.0%) is not uses toilet. There is an only 17.12% household at Lachyang VDC uses toilet, it indicates that sanitation situation is very unsatisfactory at their. Use of toilet is high (84.36%) at Tupche VDC. This indicates that there is open defecation along the project area. However, the level of awareness particularly towards the use of toilet is gradually increasing in the project area. The in-house sanitation facility in most of the households is satisfactory. A detail of having and without toilet is shown in Table no 5.20.

Public tap/piped (91.93%) water is the major source of drinking water in project affected VDCs and other sources (8.07%) are spout water, tube well, river stream etc in the transmission line alignment. In field visit observed that there is huge scarcity of drinking water in some VDCs (e.g. Gerkhu, Bageshwori, Lachyang) in the project area. All information about source of drinking water is presented in Table 5.21.

Vessels gathered for collecting drinking water in Bageshwori

Health posts and sub-health posts are available in most of the project affected VDCs. The average distance of the health posts/sub-health posts from the main settlements is 5 km. The district level health facility is available in Bidur municipality. In field observation found that people believes in Dhami/Jhakri, especially in Tamang and other tribal (Janjati) groups.

According to the district health source the common disease reported in the project affected VDCs are diarrhea, skin disease, acute respiratory infection, chronic bronchitis, gastritis, diabetes, abdominal pain, and eye/ear problems. Medical shops are available in the market area.

5.3.2.14 Infrastructure

i) Transportation

Most of the section of the transmission line is accessible by rural earthen and graveled roads. Pasang Lahmu Highway (Kathmandu-Trishuli-Dhunche) is main entry access of the project area. Similarly, the proposed transmission line can also be accessed through feeder roads. Status of rural Roads in Different VDCs is presented in Table 5.22 (Annex-VIII).

ii) Communication

Communication services such as mobile, CDMA and landline phone facilities are available in all of the VDCs. Modern communication facilities like cable-network, email, internet and fax are available in the market centers. Local and national level newspapers are also available

in the district head quarters, settlements close to the main high way and market areas.

iii) Energy

Almost households (91.29%) are electrified whereas some households of all VDCs are even not uses electricity. People use electricity through the national grid and private hydropower. Aadishakti Small Hydropower Project and some other Small Hydropower Projects are providing electricity service particularly in Samundratar, Ralukadevi, Balkumari and Kharnitar VDCs. A details of households Having and Not-having Electricity is shown in Table 5.23.

Firewood is the major source for cooking and most of the households use traditional cooking stoves. However, improved stoves, cooking gas and kerosene are also being used by some households in the market area.

iv) Market centers and other service facility

Satbise (Raluka VDC), Dhikure, Kharanitar (Kharanitar VDC), Bohore bhangyang (Lachyang VDC),Chokde (Bageshwori VDC), Betrabeti (Tupche VDC) are the major markets and trade centers of the project area. The average distance of these market centers from the proposed transmission line corridor ranges between 500 m to 15 km.

The other service facilities available in and around the project area health post, health care centers, agriculture service centre, veterinary center, postal service, educational institutions, police office, cooperative office and banking service, etc.

v) Industrial Activities

Few small scale industries such as brick, traditional ornament, handicrafts, trout fish farming, etc. are reported in the project affected VDCs.

5.3.2.15 Law and Order

During the field survey, it was observed that law and order situation in the project area was satisfactory. The District Police Office and Ilaka Police Offices are maintaining the law and order situation of the project area. Local political leaders and stakeholders are also cooperating in maintaining peace, law and order situation.

5.3.2.16 Religious and cultural places

There are no religious, historical and cultural sites of considerable importance along the RoW of proposed transmission line alignment. However, there are many religious and cultural sites in the project VDCs. Among them, notable ones are Dupcheswor Mahadav

A Hindu shrine in Tupche VDC nearby the proposed aligment

(Shikharbensi VDC), Uttargaya (Betrawati, Gerkhu VDC), Kalipokhari Gupha (Tupche VDC), Battshala Devi (Nargamandap VDC) a main Kot in Nine Kots of Nuwakot District, Nuwakot Darbar Square, Prithivinarayan Smirti Uddhyan,, and Bouddha Gumba (Bageswori VDC) are some of the significant historical and religious sites that fall in the low impact zone of the project affected VDCs. Durga and Shiva temples are commonly found in most of settlements of the project area.

5.3.2.17 INGOs and NGOs Activities

A number of INGOs, NGOs and Clubs, CBOs, mothers' groups, etc are working in the field of water supply, sanitation, sports, women awareness, infrastructure development and income generating activities to improve the socio-economic status of people of the project area. Some of NGOs and INGOs working in the project area are: Japanese Fund for Poverty Alleviation, Nepal Children Organization, Family Planning Association of Nepal, Nepal-UK Community Forest Program, Commercial Agricultural Alliance, Plan international, UNICEF, UNDP, etc.

5.3.2.18 Tourism Activities

Kakani, Nuwakot Darbar is the major tourist attraction centers in project district for internal and external tourist. Trishuli river of Nuwakot is famous for rafting, huge number of internal and external tourists visit Nuwakot for it every year. Nuwakot is nearest city from Kathmandu so people visit for refreshing weekend.

5.4 Profile of the project affected households

5.4.1 Population and Households

The construction of project will affect 59 households. Out of the total affected households, households survey of 46 households have been conducted. Households affected by the foundation of suspension towers are not identified at this stage so their socio-economic aspects has not been incorporated in the report.

Table 5.24: List of Surveyed Households Survey by VDCwise

VDC	Affected Households	Surveyed Households	Surveyed Percentage
Manakamana	8	7	87.50
Tupche	4	2	50.00
Gerkhu	7	7	100.00
Baneshwori	3	3	100.00
Lachyang	4	4	100.00
Nagliwang	5	5	100.00
Kharanitar	4	1	25.00
Ralukadevi	3	2	66.67
Sundaradevi	6	4	66.67
Balkumari	1	1	100.00
Samudratar	14	10	66.67
Total	**59**	**46**	**77.97**

Households survey for 46 households in the project affected VDCs have been conducted.

The survey revealed that the total population of the project affected sample household is 305 out of which 152 (49.84%) are male and 153 (50.16%) are female. Similarly, the average households size and sex ratio of the project affected households are 0.99 and 6.63 respectively. Details are presented in Table 5.25 (Annex- VIII).

As per the broad age group classification, the majority of population falls in the age group of 15-59 year, which comprised of 62.29% population. Similarly, the total dependent population (population of the age group 0-14 (23.28 %) years and senior citizen-age group of 60 year and above (14.43%)) is 37.71%. Details is presented in Table 5.26

Type of family

There are similar 50/50% of nuclear and joint family types in project affected families.

Marital status

Of the total population 156 (51.15%) are married and 139 (45.57%) and unmarried. Similarly, the population of widow/widower is 10 (3.28%). Detail is presented in Table no. 5.27 (Annex-VIII).

5.4.2 Caste and Ethnicity

The major ethnic groups in the project affected households are Tamang 14 (30.43%) followed by Brahmin Hill (17.39%), Newar (13.04%), Dalit, Ghale, Magar and Chhetri. The detail ethnic composition of the project affected families is presented in Table 5.31.

5.4.3 Religion

Hinduism and Buddhism are the main religions followed by project affected households. The majority of the project affected households (65.22%) Hindu and (34.78%) Buddhist are main religious groups in project affected families. In Sundaradevi, Ralukadevi and Balkumari VDCs 100% families practice Hindu religion and Kharinitar, Lachyang and Bageshwori VDCs 100% families practice Buddhism. Other affected VDCs affected families' are mixture of both religious groups. (See Table 5.32 in Annex-VIII)

5.4.4 Mother Tongue

Nepali and Tamang are the mother tongues spoken by the surveyed households. About 69.57% of the surveyed households speak Nepali and 30.43% are speaks Tamang languages. Details is presented in Table no. 5.33 (Annex-VIII).

5.4.5 Occupation

Agriculture is the main occupation of the surveyed households. About 29.50% of the surveyed households have adopted agriculture as a main occupation. The percentage of households occupied other than agriculture are business and small industry (2.00%), Labour 20% (including labor work in outside country 6.0% and in the country 14.0%), service 10.0%% within the country, households work 8.0% And students are 30.50%. Table 5.34 depicts the detail of the occupational distribution of the surveyed households.

5.4.6 Literacy

From the household's survey, it is revealed that 79.79% of the surveyed populations are literate with male literacy rate 88.19% and female literacy rate 71.33%.

Out of the literate population, the percentage with Primary Level, Lower Secondary Level, Secondary Level, SLC, Intermediate Level and Bachelors Level and above education is 18.34, 20.52, 13.54, 9.61, 10.04 and 12.23 respectively. Population having literate only is 15.72%. Table 5.29 and Table 5.30 describe the educational attainment among the literate population of the sample households. (Refer Annex-VIII)

5.4.7 Land ownership status and holding size

Landholdings of the Households by Type of Land

The household's survey shows all of the affected households have their own land for cultivation. Average land holding size of the surveyed households is estimated to be 0.780ha. Similarly, among project affected families land 0.436 hector is irrigated khet, 0.31 ha is non-irrigated bari and 0.034 is ghaderi. Detail distribution of land is presented in Table 5.44.

Land holding categories

The surveyed households have been classified on the basis of different landholding categories such as marginal, small and medium. Majority of the households i.e. 61.32% are categorized as small type families having own land ranges from 0.5 ha to 2.0 ha whereas 19.77% are medium type having land 2.0 ha to 4.0 ha, rest 18.91% are marginal farmers having land less than 0.5 ha. There is not any large type having land greater than 4 ha among project affected families. The distribution of the land holding size on the basis of holding category is shown in Annex-VIII.

5.4.8 Agriculture

The main cereal crops cultivated by the surveyed households are paddy, wheat, maize, and millet. Similarly, cash crop like potato is also cultivated by the surveyed households. From the households' survey, the total production of paddy, wheat, maize and millet are 63.54 MT, 4.44 MT, 29.04 MT and 7.21 MT, 14.52MT respectively. Similarly, the average yield of paddy, wheat, maize and millet are 3.28 MT/ha, 2.21MT/ha, 1.96MT/ha and 1.29MT/ha respectively. The detail of the major crops, production and yield are presented in Annex-VII, Table 5.46.

Food sufficiency and deficiency

The households' survey shows that out of total households, 17 households (36.96%) have food deficiency. On the basis of classification of food deficiency period of the surveyed households, 5 (29.41%) households have food deficiency for 6 to 9 months of the year. Similarly, 7 (41.18%) households have food deficiency for 3 to 5 months, 2 (11.76%) households have less than 3 months and 3 (17.65%) households have greater than 9 months. Details about food sufficiency and deficiency is presented in Table 5.35 and Table 5.36.

5.4.9 Income pattern

Household's survey shows that the total average annual income of the surveyed households is Rs. 210135. Of the total income share of service is highest i.e. 71298 (33.93%) followed by remittance 48609 (23.13%), daily wage/porter (17.07%), business (4.63%), and pension/Bridha Bahatta (1.74%). Income from agriculture and animal husbandry sector contributes only 40957 (19.49 %). Annex-VIII, table 5.38 depicts the detail of the income sources of the surveyed households from different sectors.

5.4.10 Drinking water

Pipe water supply, public tap and tube well are the main sources of drinking water of the surveyed households. About 71.74% of the surveyed households depend on pipe water supply while 23.91% use public tap and 4.35% use spout water. Households survey shows that hundred percent of the surveyed households of VDCs like Samundratar, Balkumari, Sundradevi, Ralukadevi and Kharinitar use pipe water supply in their homes. The household's survey shows the available supply of drinking water is not sufficient throughout the year.

5.4.11 Source of energy

Cooking fuel

Fuel wood and LP gas are the main sources of energy for cooking purpose of the surveyed households. About 86.96% of the surveyed households use fuel wood for cooking purpose while 10.87% use LP gas and 2.17% use biogas. Households of 7 VDCs like Balkumari, Sundradevi, Ralukadevi, Kharinitar, Nargamandap and Lachyang use fuel wood only for cooking purpose. Similarly, households of Tupche VDC used only LP gas.

Fuel wood is collected similarly from community forest and private forest (47.50/47.50%), and by purchasing. 5.00% of the surveyed households.

Lighting fuel

Household survey shows that most of the surveyed households (93.48%) use electricity for lighting purpose. Only 6.52% of the surveyed households use kerosene lamp for lighting purpose.

5.4.12 Health and sanitation

Most of the surveyed households have their own toilet for defection. Similarly, nearby forest area and open field are also used by affected households. Management of solid waste disposal is satisfactory in the surveyed households.

Three methods such as dump at safe place, burn and buried have been adopted by the surveyed households for the management of solid waste disposal. 56.52% of the households have dumped the solid waste at safe place, while 21.74% buried in nearby house and 15.22% burnt the solid waste. Dump at safe place is mostly practiced in the households of Balkumari, Ralukadevi and Bageshwori VDCs

5.4.13 Knowledge and Attitude Regarding the Project

Knowledge

86.95% households have knowledge about the proposed project and its activities. According

the surveyed households, the main sources of information about the project activity are through the NEA employers, neighbors and others. About 85.00% of the households got information from NEA employers, 12.50% got information through neighbors and 2.50% have knowledge through other sources.

Attitude

71.74% of the households have shown their positive attitude towards the proposed project while 19.57% of the households are neutral the project activities, 6.52% are against and 2.17% households have no any detail information about proposed project.

5.4.14 Expectation from the project

The expectations of the project affected families are mainly for good compensation for the land and property, employment and local development. However, majority (60.87%) of the households have shown their interest for good compensation. Similarly, 28.26% of the households have shown their expectation for employment and 10.87% for local development.

5.4.15 Willingness for compensation by property type

Three options such as cash, land for land and house for house have been preferred by the surveyed households for compensation by property type. Percentage of households preferred for cash compensation is highest i.e. 86.96% followed by land for land 10. 87% and house for house 2.17%.

Use of cash compensation

The surveyed households have expressed their interest for using cash compensation on purchase of land, construction of new house, to run business and pay the loan. About 80.43% households wanted to use cash compensation for the purchase of land in the project area or its vicinity. Similarly, 8.69% of the households are willingness to start new business 4.35% for construction of new house and 4.35% want pay the loan.

5.4.16 Type of Houses

By wall and floor type

All of the surveyed households have their own house for residence. The walls of houses are usually constructed by cement and brick, mud and stone/brick, wood, bamboo and galvanized zinc sheet. About 84.78% of the houses of the surveyed households are made up of mud and stone/brick wall followed by wooden wall 8.70%, cement and brick/stone 6.52%. The houses of cement and brick wall are mostly prevalent in market centers.

By roof type

Thatched, galvanized zinc and RCC type roof are prevalent in the surveyed households. Majority of the households (80.43%) have their house with galvanized zinc sheet followed by slate tiles roofed (17.39%), and only 2.17% house having concrete roof.

By no. of storey

Two storey houses are common among the surveyed households. About 80.43% of the households have their house with 2 storey, 13.4% have one story house and only 6.52% households have 3 storied houses.

5.4.17 Resettlement Issues

Household's survey shows that one residential house is affected by the project so it will be relocated with proper mitigation measures.

5.4.18 Public Consultation

Public have the right to know and to be involve in information sharing and decision-making that affects their lives, resources and properties from the very beginning of a project. Community participation and consultation from the beginning is essential to reduce misunderstandings and successful implementation of a project. When the public is well informed and motivated, project implementation could be relatively trouble-free. Considering this, interaction meetings were held during the field visit at different sites in the project area.

The participants were requested to express their opinions as well as they were informed regarding the project and its activities. Information such as project purpose, project type, impact area, likely impacts and potential opportunities due to project implementation were provided to the people during the consultation.

The local people have positive attitude regarding implementation of the project realizing the need of substation for regular supply of electricity. During the interaction several issues and concerns were raised by the people. The key issues and concerns raised by the local people are related to compensation, employment, implementation of mitigation and enhancement measures and local participation in the project activities. The key issues/concern raised by the local people during community consultations are summarized in Table 5.60.

Table 5.60: Summery of Key Issues and Concerns

Key Areas of Concerns	Details of Issues/Concerns
Compensation	• Appropriate compensation for land and private property, • Compensation of land/property as per the prevailing market price, • Distribution of compensation on timely and it should be similar for all affected people,
Livelihood	• Employment to local people during the construction period , • Devaluation of land due to various transmission line corridor, • Women empowerment program should held and should give opportunity for them in project,
Community Support Programs	• Support and upgrade local infrastructure like health centre , education/school buildings, irrigation cannels, road/bridge and temple in the project affected area, • Community support programs like skill development, women empowerment program, income generation program should be launched by the project.
Other	• Information about adverse impact of high voltage should be provided for the local people prior to the project construction, • Further assistance is required for all the affected people.

CHAPTER-VI
IMPACT ASSESSMENT

This chapter addresses the likely adverse impacts in the construction and operation of the Samundratar-Trishuli 3B Hub 132 kV TL Project. The construction and operation of the project will result changes in the existing baseline condition. The study team have also figured out beneficial impacts of the project. The general discussions are organized in three categories, namely the physical, biological and socio-economic and cultural environment, and split into the construction and operation phases.

6.1 Physical Impacts

The main physical impacts on the environment are those associated with land take for the proposed transmission line project. The major impacts anticipated during the construction phase are discussed in the sections below.

6.1.1 Topography

Construction Phase

The land take for the substation and tower pad, ground levelling and construction activities on it will change existing topography of the project sites but very small land areas at different places. The impact on topographic changes is considered to be low in magnitude, site specific and for long term.

Operation Phase

No impact on topography is expected during the operation phase except for the impact on natural scenery.

6.1.2 Land Use

Construction Phase

The land use changes will be due to the permanent and temporary land acquisition. The project will require 47.336 ha land for the placement of substations, tower foundations, access road and RoW. Out of this, 2.562 ha land will be permanently acquired. Land area for the 18 m of RoW (excluding tower pads) is 44.774 ha which will be temporarily acquired for stringing of cables and later restricted for housing under the RoW.

The permanent land take consists of 2.332 ha of the agricultural land. The temporary land-take consists of 29.546 ha of cultivated land. The summary of the land take and land use are given in Table 6. The impacts on land take and land use change can be considered to be moderate in magnitude, local in extent and long termed.

Table 6.1(a): Land Requirement for the Project

S. N.	Project Component	Land Types(ha)					Total Land Take (ha)		Total (Ha)
		Agriculture Land (private)	Forest			Others (barren/ riverbank)	Tempo rary	Perma nent	
			Community	national	Private				
1	Land required under RoW	29.546	10.581			4.647	44.774		**44.774**
2	Land acquired for Angle Towers	0.47	0.1			0.02	0.00	0.59	**0.59**
3	Land acquired for Suspension Towers	0.2	0.07			0.04		0.31	**0.31**
4	Substation	1.549	0.00			0.00	0.00	1.549	**1.549**
5	Access Road	0.113						0.113	**0.113**
Total		**31.878**	**10.751**			**4.707**	**44.774**	**2.562**	**47.336**

Source: Field Survey, 2014

Ninety towers will be constructed for Samundratar–Trishuli 3B substation project. Out of 90 towers, 67 towers will be located in cultivated land, 17 in forest land and remaining 6 in others type of land.

Table 6.1(b): Location of Towers by Land Type

S.N.	Project Components	Cultivated Land	Forest	Others	Total
1	AP0 – AP16	16	5		21
2	AP16 – AP 48	37	11	5	53
3	AP 48 – AP 58	14	1	1	16
	Total	67	17	6	90

Source: Field Survey, 2014

6.1.3 Air Quality

Construction Phase

Different construction activities like site clearance, excavation for the tower; concreting and conductor stringing will generate dust at the project sties. Apart from these activities, movement of vehicles carrying construction materials along earthen/gravel roads will generate dust and combustion emissions. Since the construction activities are limited to small area, the impact on the ambient air quality will be low in magnitude, site specific and of short duration.

Operation Phase

No impact on air quality is envisaged during the operation phase.

6.1.4 Noise and Vibrations

Construction Phase

Generation of noise and vibrations are inevitable during construction. Construction works at substation and tower foundation are potential to generate noise levels higher than the background noise. Similarly, noise is also expected at areas near to construction camp sites and storage area during loading and unloading activities. The location of the most of the towers is relatively far from the settlements. Noise pollution will be temporary. The envisaged impact is low in magnitude, site specific and short in duration.

Operation Phase

The transmission lines do create some noise in certain circumstances such as during rain and the process is known as Corona effect. However, noise due to the corona effect of the proposed transmission line 132 kV voltage level will not be loud. Similarly, a kind of humming sound may be created at the substation area. The impact is expected to be low in magnitude, site specific and long termed.

6.1.5 Water Quality

Construction Phase

During the construction period, water from nearby streams and irrigation canals will be used construction, and other purposes. Soil disturbances due to construction activities of tower pads, anthropogenic wastes and construction wastes like chemicals, cement slurry may deteriorate the water quality of nearby river and streams. Such impact is expected to be low in magnitude, site specific and for a short duration.

Operation Phase

Leakage of oils from transformers at the substation site is always risk into water sources and water bodies. Since the proposed Samundratar substation is very close to Tadi River, it is one of serious issues. Beside that, the operation and maintenance activities of the transmission line will have no impact on the water quality in the project area. In overall, the impact is categorized as low in magnitude, local in extent and long term in duration.

6.1.6 Watershed and Natural Drainage

Construction Phase

During construction of tower pads and substation of the proposed project, it might cause disruption of natural drainage system and soil erosion because there are several streams and rivulets flowing down to Trishuli and Tadi rivers. However, since the requirement of land for the construction of tower pad as well substation is limited, the impact on drainage and soil erosion is envisaged to be low in magnitude, site specific and long term for duration.

Operation Phase

No significant impact on the watershed and natural drainage is expected during the operation and maintenance period.

6.1.7 Waste and Spoil Generation

Construction Phase

The improper disposal of solid waste like cement bags, iron bar and other leftover construction materials, kitchen waste and waste generated by the temporary labor camp might cause adverse impact to the environment. The spoil generated due to the excavation

of tower pad might deteriorate nearby water sources. However, almost excavated material will be back filled at the tower base and remaining will be disposed in nearby land. The magnitude of impact is considered to be low, extent is local and duration is short term.

Operation Phase

The operation and maintenance activities of the proposed transmission line will have no impact of waste and spoil generation in the project area.

6.1.8 Crossing of other Utilities and Interference

Stringing of cables might disrupt road traffic and power lines during the construction phase. Since the vertical clearance of 8 m will be provided between the road surface and conductors, the operation of the proposed Samundratar-Trishuli 3B Hub Substation Transmission line will not cause any interference to road traffic even it crosses Pasang Lhamu highway once between AP-16 and AP-17. Similarly, all crossings of existing 66 kV and 11 kV lines are designed with standard safe vertical and horizontal clearance for 132 kV lines. The expected impact due to crossing of other utilities and interference is low in magnitude, site specific and short termed.

Table 6.2: Physical Environment Impact Assessment Matrix

S. N.	Issues	Impacts	Identification and Evaluation of Impact				
Construction Phase			**D**	**IND**	**M**	**E**	**Du**
1.	Topography	Topography of the tower pad and substation will be changed but very little area.	D		L	S	LT
2.	Land use	The project will acquire 47.326 ha of land for placement of tower pads, substation and RoW of Transmission line.	D		M	L	LT
3.	Air Quality and noise level	Different construction activities and vehicular movements will generate dust/smoke and affect air quality at the project sites. Noise from construction machines.	D		L	S	ST
4.	Water Quality	Soil disturbance and wastes may pollute water.	D		L	S	ST
5.	Watershed and Drainage	Disturbance to natural drainage and soil erosion problem might be occurred.	D		L	S	ST
6.	Waste and Spoil generation	Construction waste and garbage from camps.	D		L	S	ST
7.	Crossing of other Utilities and Interference	Cable stringing might disturb road traffic and interfere power lines	D		L	S	ST
Operation Phase							
1.	Topography	Visual impact on natural secenary	D		H	L	LT

2.	Noise Level	Transformer at Kerunga Sub-station may produce small noise	D		L	S	LT
3.	Water Quality	Risk of oil leakage from substation to Tadi river.	D		M	L	ST

Note: D: Direct, IND: Indirect

Extent (E)	S= Site Specific;	L=Local;	R= Regional
Magnitude (M)	L= Low;	M= Medium;	H = High
Duration (Du)	LT= Long Term;	MT= Medium Term;	ST = Short Term

6.2 Biological Environment

The implementation of the project will multitudinously affect the existing ecosystems in the project area. The major impacts on the biological environment will be the loss of individual trees and loss of vegetation cover due to site clearance; increased demand of fuel wood and timber; impact on Non Timber Forest Products (NTFPs); habitat loss of mammals, bird and reptiles because of change of vegetation cover and site disturbances.

6.2.1 Forest/ Vegetation Loss

Construction Phase

The total estimated forest area falling under the RoW of transmission line alignment is 10.751 ha (actual forest/vegetation cover is 7.09 ha only). This area is inclusive of forest land, grass land shrub lands and degraded lands. Transmission line passes through different community forest and government managed forest. This represents 41.64% of the total land area occupied by the project.

Based on the survey report of the proposed transmission line alignment, 17 towers of the proposed transmission line are located in the forestland. Thus, total 17 towers will be placed on the forest land which will acquire 0.17 ha forest area (area occupied by each tower pad = 10 x 10 sq. m). This area is very small in comparison to 7.09 ha of forest area affected along the RoW.

Since tall trees will be removed and only shrubs and short trees will remain, it will diminish the crown cover of the forest along the TL corridor. The impact due to the loss of vegetation during project implementation is expected to be moderate in magnitude, local in extent and long termed.

Table 6.3: Total Affected Forest (by Types)

Forest Type	Forest Area under Right of Way (ha)	Forest Area required for Angle Tower and Suspension Tower (ha)
Community Forest	7.07	0.17
Govt. Forest	0.02	
Total	7.09	0.17

Source: Field Survey, 2014

Transmission line traverses through 10.751 ha (RoW) of forest land (including degraded land). Out of the total forest land, the actual forest to be cleared is 7.09 ha (RoW) belonging to nine different community forests and a patch of government forest.

Based on the forest sampling, a total of 2868 trees including 204 numbers of mature trees and 2664 number of pole size belonging to 16 different species are estimated to be felled. Sal is found to be the dominant tree species throughout the TL alignment followed by Salla *(Pinus roxburghii)*, Chilaune (*Schima wallichi)* and Kattus *(Castanopsis spp.)*. Other tree species are Kyamuna *(Cleistocalyx operculata)*, Bot dhayaro *(Lagerstroemia spp.)*, Ankha taruwa *(Trichilia connaroides)*. The total number of Sal (*Shorea robusta)* trees to be felled down is estimated to be 1,527 which are 53.24% of the total trees falling under RoW.

Approximately 373.83 cubic meter of wood volume and 245.58 cubic m of firewood of 2868 trees (matured and pole sized) will be removed during the project construction period. This estimate is based on the forest samplings that represent the forest types and conditions of the project area.

The impact on forest and vegetation cover will be moderate in magnitude, local in extent and long term. This loss of forest and vegetation cover might create indirect impacts resulting in the degradation of the mid-hill environment for a long duration but is of little or no significance.

In addition, total of 436,768 kg of dry biomass will be lost from the ecological system. Table 6.4 to Table 6.7 provide the details of forest clearance.

Table 6.4: Forest Loss

Project Component	Type of Forest	Loss of Vegetation		Crown Cover (%)	Forest Type (Sal, Pine, Shrubs, Barren etc)
		Forest Area (ha.)	No of trees >10 cm DBH		
Substation	Govt. Managed				
	Community				
	Leasehold				
	Religious				
	Private				
Tower Pads and TL Alignment	Govt. Managed	0.02	degraded land without trees	0	Barren land
	Community	7.07	2868	40 - 80	Mixed Forest, Pine Forest and Sal Forest
	Leasehold				
	Religious				
	Private				
Total		7.09	2868		

Source: Field Survey, May 2014

Above table reveals that construction of the proposed line affect very less area of government managed forest area (0.02 ha) in comparison to community managed forest (7.07 ha). In addition, government managed forest is degraded land without trees thus does not required to clear trees.

The details of the tree species loss in terms of number, wood volume, firewood volume and biomass is given in the Table 6.5. It also shows species wise loss of regeneration in terms of seedlings per ha and saplings per ha.

Table 6.5: Tree Loss in Terms of Plant Species

S. N.	Botanical Name	Local Name	Loss of Vegetation					Standing Wood Volume (Cu. m.)	standing wood volume (Cft)	Fire wood vol. (cu.m.)
			Loss of Regeneration		Loss of Tree (No.)					
			Sapling per Ha	Seedling Per Ha.	Pole Class	Tree Class	Total			
1	*Shorea robusta*	Sal	400	700	1483	44	1527	193.48	6810.56	96.74
2	*Albizzia spp.*	Siris	125		5	4	9	2.07	72.88	1.04
3	*Myrsine capitellata*	Seti kath	50		3	0	3	0.11	3.87	0.05
4	*Pinus roxburghii*	Salla	200	325	273	76	349	81.38	2864.67	64.77
5	Albizia julibrissin	Padke	0	100	8	0	8	0.75	26.40	0.37
6	*Engelhardtia spicata*	Mahuwa	350	500	89	16	105	11.48	403.98	11.61
7		Lati kath	100	50	24	0	24	1.35	47.53	0.68
8	*Ficus deltoides*	Lahare papal	0	50	10	0	10	1.01	35.38	0.50
9	*Cleistocalyx operculata*	Kymuna	500	700	222	48	270	29.97	1054.99	35.24
10	Castanopsis spp.	Kattus	100	50	110	11	121	15.07	530.47	15.07
11	*Schima wallichi*	Chilaune	350	100	189	0	189	18.13	638.18	9.06
12	*Lagerstroemia spp.*	Bot dhayaro	120	50	167	0	167	13.82	486.46	6.91
13		Badkaule	50	60	21	0	21	0.86	30.27	0.43
14	*Trichilia connaroides*	Ankha taruwa	0	50	42	0	42	1.39	48.93	0.7
15	*Magnifera indica*	Aanp	0	0	8	0	8	2.07	72.86	1.04
16		Unknown	500	600	10	5	15	1.89	66.69	1.36
				Total	2664	204	2868	374.83	13194.13	245.58

Source: Forest Sampling, May 2014

Note: *Seedling 0-4 cm; Sapling 4-10 cm; Pole Class 10-30 cm; Tree Class >30 cm.*

Table 6.6 shows that the average regeneration rate of seedlings and saplings in the community managed and government managed forest along the line alignment are 43 and 33 per hector respectively. It is likely to be affected during project construction. The crown cover of the vegetation is found to be varied from 40 - 80%.

Table 6.6: Tree loss in terms of TL station

Alignment/ sized	stem vol (m^3)	Stem vol (ft^3)	Fire wood (m^3)	No.	Alignment/ Sized	stem vol (m^3)	Stem vol (ft^3)	Fire wood (m^3)	No.
Ap 1-2	**10.02**	**352.76**	**25.69**	**73**	**AP 33**	**2.11**	**74.32**	**1.06**	**27**
Pole	5.94	209.18	2.97	41	Pole	2.11	74.32	1.06	27
Tree	4.08	143.58	22.72	32	**AP 45-46**	**7.47**	**262.80**	**3.73**	**85**
Ap 16-17	**0.79**	**27.69**	**0.39**	**8**	Pole	7.47	262.80	3.73	85
Pole	0.79	27.69	0.39	8	**Ap 47-48**	**40.60**	**1429.09**	**20.30**	**217**
AP 19-20	**8.56**	**301.47**	**4.28**	**126**	Pole	28.60	1006.82	14.30	190
Pole	8.56	301.47	4.28	126	Tree	12.00	422.27	7.00	27
AP 20-21	**25.75**	**906.32**	**13.78**	**201**	**Ap 6-7**	**35.60**	**1253.09**	**22.14**	**380**
Pole	23.93	842.29	11.96	194	Pole	26.92	947.73	13.46	354
Tree	1.82	64.04	2.82	6	Tree	8.68	305.36	8.68	25
Ap 21-22	**26.32**	**926.49**	**15.65**	**190**	**Ap 7-8**	**18.31**	**644.43**	**9.15**	**153**
Pole	19.27	678.45	9.64	169	Pole	18.31	644.43	9.15	153
Tree	9.05	248.04	7.05	26	**Ap 9-11**	**71.58**	**2519.65**	**35.79**	**663**
AP 2-3	**14.18**	**499.24**	**7.09**	**111**	Pole	71.58	2519.65	35.79	663
Pole	10.90	383.80	5.45	104	**Grand Total**	**374.83**	**13194.13**	**245.58**	**2868**
Tree	3.28	115.44	1.64	7					
AP 24-25	**14.26**	**502.06**	**7.13**	**54**					
Pole	5.72	201.38	2.86	36					
Tree	8.54	300.68	4.27	18					
AP 26-27	**64.46**	**2268.87**	**32.23**	**265**					
Pole	39.77	1399.95	19.89	207					
Tree	24.69	868.92	12.34	58					
AP 31	**0.59**	**20.77**	**0.30**	**4**					
Pole	0.59	20.77	0.30	4					

Source: Field Survey, May, 2014

Table 6.7: Total Forest Loss

Type of forest	Area (ha.)	Loss of Vegetation				Crown Cover (%)	Standing Wood Volume (m^3)	fire wood volume (m^3)	Biomass for Standing Tree (kg.)	Biomass Usages *
		Loss of Regeneration		Loss of Tree (no.)						
		Seedlings per ha.	Saplings per ha.	Pole class	Tree class					
Government	0.02	200	150	2664	204	0	374.83	245.58	4,36,768.64	Timber, Firewood, Fodder, NTFP
Community	7.07					40-80				
Religious										
Leasehold										
Private										
Total	**7.09**	**200**	**150**	**2664**	**204**		**374.83**	**245.58**	**436,768**	

Operation Phase

During the operation phase of the project, only trees which grow under the RoW after some years might need to be cleared. Regular trimming of tall trees and allowing growing shrubs and short trees will change the vegetation cover. This impact is low, site specific, and long-termed.

In terms of the biological environment, the project area will reap beneficial impacts from the project's forestation program that will be implemented to replenish the loss of forest and vegetation especially in the project affected community forests.

6.2.2 Changes of Demand for Fuel Wood and Timber

Construction Phase

The existing community forest cover is found to be large enough to support the demand of forest resources such as firewood and timber to the dependent households. Therefore, even cutting down a large number of standing trees is of little significance to the livelihood of local people but direct and long-termed. The economic impact will be insignificant because timber and firewood obtained from the felled trees can be sold in local markets. It is assumed that most of the labor force will be from local areas. There will be a few people from outside the project area for a short period of time. Due to this, the increase in demand of fuel wood and timber during the construction period is expected to be low in magnitude, site specific and short-termed.

Operation phase

During the operation phase, site-specific and short-term effects such as increase in pressure on forest resources will settle down. Patrolling and maintenance activities along the transmission line will involve only a few people occasionally. This activity will not have a noticeable impact on the forest and vegetation.

6.2.3 Exploitation of Non-Timber Forest Products (NTFPs)

The term 'non-timber forest product' encompasses all biological materials other than timber which are extracted from forests for human use. The NTFPs include edible plants (food, edible oils, spices, fodder, etc.) and non edible plant products such as bamboo, medicines, ornamental plants, etc.

Construction Phase

Since there will be a small number of work force involved in the project construction, collection and sale of NTFPs by workers will be negligible. Community Forest User Groups have imposed strict rules regarding the collection of NTFPs in their community forests. However, even the collection of tiny volumes of NTFPs might result in social conflicts. Therefore, these impacts are considered as low in magnitude, site-specific and of a short duration.

Table 6.8: Total Loss of NTFP

Commercially Important NTFP	Botanical name	Govt (No.)	Community Managed (No.)	Relig (No.)	L-hold (No.)	Priv (No.)
Amala	*Emblica officinalis*		Frequent			
Barro	*Terminalia bellirica*		Rare			
Bel	*Aegle marmelos*		Frequent			
Bokeful	*Pseudognaphalium affine*		Frequent			
Chiraito	*Swertia chirayita*		Rare			
Chutro	*Berberis asiatica*		Rare			
Harro	*Terminalia chebula*		Rare			
Gujro	*tinospora sinesis*		Frequent			
Kurilo	*Asparagus officinalis*		Rare			
Pakhanbed	*Bergenia ciliate*		Rare			
Thulo Aukhati			Rare			

Source: Field Survey, May, 2014

(Note: Estimation of NTFPs in number could not be made due to practical reason. Rather it is estimated as Rare, Frequent, Abundant and Dominant)

Operation Phase

During the operation phase, there will be an occasional intervention of just a few people maintaining the transmission line. This will have an insignificant affect on the forest itself and the NTFPs along the transmission line alignment.

6.2.4 Wildlife and Avifauna

Construction Phase

The possible adverse impacts on wildlife and avifauna population during the project construction phase are loss of physical habitat and food habitat, possibility of hunting and poaching by labor force and disturbance in the migratory movement of mammals and birds.

The construction disturbances resulting from digging of foundation, vehicle movement, transportation of materials, and other related activities would interrupt normal movements, feeding and other activities of mammals available in the surrounding areas. Construction activities may affect migratory movement of birds resulting in the temporary disturbance to their normal route.

The possibilities of hunting and poaching by work force during the construction period will have some adverse impact on local wild fauna. However, such pressure on wildlife will be site specific and will decrease once the work is completed.

Since the project area is not observed to be the ecologically significant, core and undisturbed habitat; the magnitude of impact on wild animals and birds is considered to be low, extent is local and duration is of short term.

Operation Phase

During operations, there will be some adverse impact on wildlife. Pylons might attract population of primates in the project area as they are climbers and high voltage transmission lines could pose a danger for such animals.

The TL may affect bird mobility to some extent. Inability of birds to notice the wires can cause fatal injuries from collisions. This type of impact is predicted to be high in low visibility conditions such as bad weather and foggy days and during nights. Since the TL route does not pass through any identified bird migration route, this impact is of low magnitude, site specific and will remain for long duration. Similarly, fragmentation and destruction of habitat due to tree felling will reduce movement of wild animals, availability of their food and shelter. This impact will be low in magnitude, local in extent and long termed.

6.2.5 Impacts on Rare, Protected, Endangered and Threatened Species of Flora and Fauna

Construction Phase

Because of different construction activities and influx of outsiders, pressure on the vegetation and the forest will increase. Physical habitats, feeding habits, reproductive behaviors and movement of wild animals and birds might be disturbed due to construction activities and increased human presence in and around the project area. This might change the existing ecosystem diversity altering natural communities of plants and animals. Ultimately rare, endangered and threatened plant and animal species will be more prone to such adverse impacts. The magnitude of impact is considered to be medium, extent will be local and duration will be long-term.

Operation Phase

Clearance of trees along the RoW will create open linear stretches in the forest. That would further divide small patches of forest into smaller fragments. Fragmentation of the forest would also fragment the existing habitat, which in turn, affects flora and fauna in a number of ways. For example, some wild animals like *Panthera pardus* (Chituwa) are reluctant to pass through open stretches in the forest. Likewise, an open stretch in the forest may be barrier for propagation of plants. Thus, bio-diversity of the project area and the status of rare, endangered and threatened plants might be adversely affected. This impact is expected to be low in magnitude, site-specific and for a long duration.

6.3 Socio-economic and Cultural Environment

The likely impacts due to project implementation are associated with land take, social and cultural problems, health and sanitation etc. The anticipated impacts regarding the socio-economic and cultural environment of the project area are discussed below:

6.3.1 Acquisition of Land and Structures

Construction Phase

- **Households losing land and structure**

The implementation of the proposed project will affect approximately 59 households (excluding those households who will be affected due to the suspension tower foundation). These Hhs will be affected due to the location of different project components such as tower pad, structure falls under RoW, access road and substation.

Table 6.9: Households Affected by the Project

S.N.	Project Components	Type of losing Structure	Affected Household	Surveyed Households
1	Substation	Land and Structure	2	2
2	Substation	Land Only	7	6
3	Substation	Private Infrastructure (Water mill)	1	
2	Substation &Access Road	Land only	2	1
3	Access Road	Land Only	2	1
3	Tower foundation	Land Only	44	35
4	RoW	Structure Only	1	1
		Total	**59**	**46**

Source: Field survey 2014

- **Households Losing structure**

Out of total project affected households, 3 households will lose their structures. A total of 3 structures (1 house, 1 cow shed and 1 temporary shed) will be affected due to implementation of the project. Of the 3 affected households, 1Hh is categorized as relocate. It loses their place of residence (Table 6.10).

Table 6.10: List of Project Affected Surveyed Hhs by Area and Type of Structures

Area	No. of Affected Houses	Affected Area						
		Houses (Sq.ft.)				Cowsheds (Sq.ft.)		
		Kachchi	Semi Pakki	Pakki	Avg	No.	Area	Avg.
Single Floor	0	0	0	0	0	0	0	0
<100 Sq.ft.	0	0	0	0	0	0	0	0
100-150 Sq.ft.	0	0	0	0	0	1	135	135
150-200 Sq.ft.	0	0	0	0	0	0	0	0
> 200 Sq.ft.	0	0	0	0	0	0	0	0
Double Floor	1	0	1500	0	1500	1	450	450
Total:	**1**	0	**1500**	0	**1500**	**2**	**575**	**287.5**

Note: Kachchi: Mud/Wood/Bamboo wall with Thatch or Bamboo Roof; Semi–Pakki: Cement/Brick/Stone wall with Zinc plate Roof; Pakki: Cement/Brick wall with RCC Roof.

Type of structures

On the basis of structure type (according to the classification made by CBS), of the total 3 structures, 1 is Semi-Pakki and 2 are Kachchi type cowsheds.

All of affected households are belonging to indigenous and tribal communities who lose their structure. The list of project affected households by caste wise with number of structures is described in Table 6.11.

Table 6.11: Distribution of Surveyed Households Losing Structures

Caste	No. of Households	Type of Structure	No. of Structures
Dalit	1	Shed (Ghatta)	1
Newar	1	Nonresidential Structure	1
Tamang	1	House	1
Total			3

Source: Field Survey, 2014

- **Private/Public Infrastructure**
  One traditional water mill (Pani Ghatta) owned by one household located in proposed Samundratar Substation area will be affected by the construction of project.

- **Households Losing Land**

Implementation of project will affect 59 households in which 57 households will lose their land. Out of the the 57 affected Hhs due to land acquisition, Hhs survey of 45 households have been conducted. They are likely to be affected due to the location of angle tower, suspension towers, access road and substation on their lands. Out of the total affected households, 82.22% households will lose less than 10% of their land. Similarly, 13.33% of households will lose land in the range of 10% to 25%. Moreover, 2.22% of the households will lose land between 25 to 50% and 2.22% of the households more than 50% of land as well (Table 6.11).

Table 6.12: Affected Household by Land loss

% of loss of land	Type	
	No of Households	%
< 10	37	82.22
10 - 25	6	13.33
25 -50	1	2.22
>50	1	2.22
Total	45	100.00

Source: Field Survey, 2014

Land requirement

The project will acquire 31.878 ha of cultivated land. Out of total 2.332 ha is permanent land (land required for angle tower, suspension tower, access road and substation area). Out of total 59 angle towers and 31 suspension towers, 47 angle towers and 20 suspension towers will be located in cultivated land. Samundratar Substation is also located in cultivated land. The land under the RoW of transmission line will be restricted permanently for the construction of houses, cow sheds and plantation of timber size big trees, etc. However, there will be no restriction on agricultural farming after the construction work is over. The detail loss of land of project affected families due to construction of towers and substations is shown in Annex-IX.

Table 6.13: Cultivated land and other type of private land use by project components

Project components and facilities	Quantity	Area (ha)	Remarks
Angle towers	47nos.	0.47	47 angle towers are in cultivated land and 12 are in other type.
Suspension towers	20	0.2	
RoW		29.546	Total area of ROW only
Access Road		0.113	
Substation	1 no.	1.549	Naubise, Samundratar VDC
Mobile camp		Will be taken as requirement	Mobile camp and store construction material
Total Cultivated land		31.878	

Source: Field Survey, 2014

Households' survey of land owners related to suspension towers has not been conducted. Similarly, land loss of households regarding Trishuli 3B Hub substation has not been considered for land calculation. Land belonging to this area has already been included in the proposed Hub substation of Trishuli 3B Hub 220 kV Substation Project. However, baseline study of the mentioned households has been incorporated in VDC level information. The magnitude of impact is considered to be moderate, site specific and long termed. The level of impact may vary with the proportion of land acquired.

Operation Phase

Land acquisition will not be required during operation and no significant impacts are expected during this phase. Due to safety reason, houses and other permanent structures are not allowed to be constructed within the RoW as per the Electricity Regulation, 2050. The land price under the RoW and in the vicinity of RoW, especially near to the highway and built up areas will be reduced significantly. It is difficult to quantify level of impact on the pricing of the land because there are other factors too that would play the significant role. The land used for camp will be returned to the respective land owners as in the previous condition. Thus, overall magnitude of impact is high, extent is site specific and duration is long term.

6.3.2 Loss of Crops

Construction Phase

Permanent loss of crops

The permanent acquisition of 2.26 ha private cultivated land will result crop production loss of 9.2 MT annually (Cereal crops 8.7 MT & Cash crop 0.5 MT). Cash crop loss is 0.5 MT of potato. Similarly, loss of cereal crops like paddy, wheat and maize are 5.34 MT, 2.73 MT and 0.63 MT respectively. Based on the household survey (considering of 45 households, 12 households were absent), however, their total production of cash and cereal crops is estimated as 111.78 MT annually (Table shows the details, 6.14). Thus, due to the permanent land acquisition, the PAFs will loss only 9.2 MT or 8.23% of crop production loss, out of their total crop production 111.78 MT annually. Market value of 9.2 MT crop production loss annually is NRs. 301700.

Table 6.14: Annual Loss of Agricultural Production Due to Land Acquisition

S.N.	Crop type	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Total Production (MT)	Amount
1	Paddy	1.628	5.34	3.28	62.34	186900
2	Wheat	1.393	2.73	1.96	28.68	81900
3	Maize	0.488	0.63	1.29	14.04	18900
4	Potato	0.134	0.5	3.72	6.72	14000
Total			**9.2**		**111.78**	**301700**

Source: Field Survey, 2014

Cropping pattern in the project area is paddy, wheat, maize and potato but all of them are not found produced in all of that permanent land 2.26 ha acquisition. Based on the household survey of PAFs, data of annual loss of agricultural production due to land acquisition given in Table 6.14 was obtained based on the household survey of PAFs. For its details, refer more tables in Annex-VIII.

Preferably the construction of transmission line is to be carried out during lean season so that standing crops will not be damaged or with minimal damage due to construction activities. However, it is not completely ignored that construction activities will not take place during the cropping season. Therefore, the adjoining area of RoW may be disturbed due to movement of contractor's machine, labor force and stringing of the line.

Temporary loss of crops

Similarly, about 67.5MT of crops (paddy 31.88MT, wheat 4.73MT, maize 23.96MT, millet 7.53 MT) will be lost due to the construction of transmission line. This loss is calculated considering that stringing of the line will be completed in one year and compensation will be paid for one seasonal cropping. The magnitude of this impact is considered to be moderate, extent is site specific and duration is long termed.

Table 6.15: Annual Loss of Agriculture Production Due to Land Utilization

S. No.	Crops Cereal crops	Total area (ha)	Yield (MT/ha)	Production (MT)
1	Paddy	9.72	3.28	31.88
2	Wheat	2.14	2.21	4.73
3	Maize	11.92	1.96	23.36
4	Millet	5.84	1.29	7.53
	Total			**67.5**

Source: Field Survey, 2014

Operation Phase

The towers constructed in cultivated area, especially those erected in the middle of land parcels will pose hindrance while tilling agricultural field. The field may be cultivated by using human labor that will increase the cost of agriculture production. The overall magnitude of impact is considered to be low, extent is site specific and duration is long term.

6.3.3 Health, Water supply and Sanitation

Construction Phase

Health and sanitation

The likely influx of construction forces during this phase may add further stress on the local health and sanitation situation. Besides, the increase in the noise level due to vehicular movement in the project area is likely to influence the physical and mental health of the local community. Discharge of wastes of various types including metals, paper, kitchen wastes etc. is potential to degrade the sanitary hygienic conditions particularly around the construction sites and campsites. Considering only 300 numbers of manpower and their short termed mobility at one site the impact is considered to be low, site specific and for short termed.

Drinking water

Similarly, with the increase in population along with the construction activities, a potential decline of the access to the drinking water and existing sanitation condition will occur in the project area. The overall impact on water supply and sanitary situation will be: shortage of drinking water, increase pressure on the existing water supply system, increase distance to the safe drinking water, increase in disease vectors, and reduced water quality due to increased sanitation problems etc. However, the impact on water supply and sanitation will be low, short term and site specific.

Operation Phase

No impact is anticipated during the operation phase.

6.3.4 Occupational Hazards and Safety

Construction Phase

Work related injuries and vehicle accidents are likely impacts expected during the construction of the project. The magnitude of impact is low, the extent is site specific and the duration is short termed.

Operation Phase

The people residing in the vicinity of the transmission line will be vulnerable to electrical hazards. Similarly, lack of operation and maintenance skill and unavailability of the essential safety equipments may add further risk with safety regards. The public can be affected principally through their own activities, such as tendency of climbing towers by children; high vehicles attempt to pass beneath the transmission line, surveyors using metal leveling staffs under the conductors, etc. These risks have low probability of occurrences, but a great significance to individuals involved.

The overall magnitude of impacts is considered to be moderate, extent is local and duration is long termed.

6.3.5 Impact on House, Settlements and Social Infrastructures

Construction Phase

Some tower pads including RoW are proposed to construct close to the house, settlements, social infrastructures and other private properties. The list of such structure/property is presented in Table 6.16.

Table 6.16: List of private and social infrastructures located in or close to the angle point/transmission line

AP section/substation area	Address	Type of structure	Average distance from angle point/transmission line	Remarks
AP-0 (substation area) and AP-58	Naubise, Samundratar VDC-3	House , toilet and cowshed	Within 20 m from the boundary of substation	Private property,
AP-57	Bhangle, Balkumari VDC	School compound	Located within 100 m from angle point	Community structures
AP-56	Chailsephant, Sundaradevi VDC	Irrigation cannel,) and settlement	Located within 10m from the angle point and T/L	Public property
Ap-55	Dhande, Sundaradevi VDC-1			
AP-54	Sangepakha, Sundaradevi-2	Maranghat (a shed use in funeral	Located in angle point	Private property
AP-53 to AP-52	Satbise, Sundradevi-2	Settlement	Located within 100 from the RoW	Private property
AP-51	Mulkhet Satbise, Sundradevi-2	Houses and Serge tank of Aadishakti Hydropower	Located within 80 m from the RoW	Private property
AP-50	Gairi Khet, Ralukadevi-5	Underground cannex crosin, Aadishakti hydro., Gairikhet settlement	Located within 100 m from the RoW	Private property
AP-49 to AP-47	Ralukadevi VDC,	House, community, Koshgade, school, ,Bhorle settlement, powerhouse of Aadishakti hydro	Located within 100m from transmission line	Private property
AP-46	Kharanitar VDC,	community forest	Near the AP a shed use fir funeral of Tamang Community	Public property
AP-45	Kharinitar,	House	Located under RoW angle point	Private property
AP-44 to AP-43	Narjamandap,	School,a small temple, ghatta, Narja, Kalimati settlement	Located within 200 m from transmission line	Private & public property
AP-42 to	Narjamandap	Narga settlement	20 m within Row and AP	Private property
AP-41	Lachyang VDC	Maharthum settlement, graveyard of Tamang community	Located within 30m from angle point and under the RoW	Public property
AP-40 to AP-37	Narjamandap VDC	Gairi Gaun	located about 50 m from AP	Public property
AP-36	Lachyang VDC-2	Community forest		Public property
AP-35 A to 35	Lachyang-9	Fadpur settlement, temple and a water tank(not in use)	Located within 20m from the Row	Public property
AP 32 to AP-31	Bageshwori VDC	Houses	Located under the ROW; Settlement within 15 to 25m.	Private property
AP-30 to AP-29	Bageshwori VDC	Health post, Chokade settlement	Within 150 from RoW	Public property
AP-28	Bageshwori VDC	Constructing tanks of	The water tank is out	Public property

		drinking water	of RoW, about 20 m away.	
AP-25 to AP23	Gerkhu VDC	Chhaptar settlement	Within 100 m from RoW	Public property
AP-19	Gerkhu VDC	Shayle settlement, school	Within 50 m from RoW and AP	Public property
AP-16	Tupche VDC	A temple, suspension bridge	Within 50m from RoW	Public property
AP-15	Tupche	Shole Bazaar	Within 50 m from Row ans AP	Public property
AP-14 to AP 13	Tupche	Trishuli river, Shole settlement	25m from AP and RoW	Public property
AP-12	Manakamana VDC	Suspension bride, funeral shed	About 15m from RoW	Public property
AP-9 to AP 8	Manakamana VDC	Proposed powerhouse site of Trishuli 3B HEP	Within 100 m from RoW. No interference to the powerhouse site.	NEA property
AP-5	Manakamana VDC	Bhandaradanda, Kapanekhet settlement, school	Within 200 m from RoW	Public property
AP4 to AP-3	Manakamana VDC	Koke settlement	Within 100m	Public property
AP-1 to AP-0	Manakamana VDC	Proposed Trishuli 3B Hub substation	At substation	NEA property

Source: Field survey, 2014

The magnitude of impact on above mentioned private and social infrastructures are moderate, extent is local and duration is long term.

Operation Phase

The impact on settlements and community structures remain same in this period also. The magnitude of impact is moderate extent is site specific/local and duration is long term.

6.3.6 Impact due to crossing of power cables, communication lines, foot trails, roads/highways, etc.

Operation Phase

The baseline study shows the proposed TL alignment crosses Pasang Lamhu Highway and other inter-connected blacktopped/gravel/earthen/trails number of times. The alignment crosses 11 kV and 66/ 220 V distribution lines. The transmission line 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. The impact is expected to be low, local and long term.

6.3.7 Impact on communal resources (recreation area, places of public congregation)

Construction Phase

The proposed transmission line doesn't passes through communal resources like recreational areas, places of public congregation, etc. Hence, there will be no impact on such resources due to construction of transmission line.

Operation Phase

Some settlements, markets, schools, temples and cremation sites are located close to the alignment and substation thus imposing impact on these structures/places. There will be likely impact on those structures and settlements due to the project implementation. The magnitude of impact is moderate, extent is site specific and duration is long termed.

6.3.8 Impact on PAF due to alteration of land and property values

Operation phase

The land and property values under the RoW and close proximity to house and settlement will be devalued due to the construction and operation of transmission line. The nature of impact is expected to be high, local and long termed.

6.3.9 Impact due to restriction of future land use development close to the settlements

Operation phase

The proposed transmission line mostly passes through rural and semi urban sections. However, the transmission line passes through some sections like , Satbise of Samundrarar VDC, Bhorle Bazaar of Ralukadevi VDC, Chokade of Bageshwori VDC Betrawati of and Tupche VDC which belongs to growing up market setting. This creates the land devaluation.

Due to implementation of transmission line, land near by settlement and road will be affected mostly. It restricts the multipurpose land use potentiality of the area. Plan and programs proposed by concern VDCs and DDCs will be affected. Hence, impact is expected on future land use development. The nature of impact is high, local and long termed.

6.3.10 Disturbances to radio, television, and mobile /cell phone reception

Operation phase

There will be likely impact on radio, television, telephone, and mobile/cell phone due to creation of electromagnetic field interference in the conductor of 132 kV TL. The frequency of electrical gadgets will be disturbed. However, there are no proven findings of impact due to high voltage transmission line.

6.3.11 Electric and Magnetic Field Effect

Construction Phase

No significant impacts are expected during this phase.

Operation Phase

Electric power transmission lines create electric and magnetic field together known as electromagnetic field or EMF, which will pose hazard to people residing in proximity of transmission line and substation. Electric field is created by the presence of voltage and is expressed in volt per meter (V/m). Magnetic field is produced by the present of current in the line and is expressed in terms of ampere per meter (A/m). Power lines EMFs are strongest beneath the lines and diminish rapidly with distance. Numerous researches have been done abroad to investigate the effect of EMF associated with transmission line but none has proved and quantify about the health risks.

Electric field of high voltage line gives rise to corona effect causing ionization leading to the generation of ozone and oxides of nitrogen, possible radio and television interference and

audible noise at high levels. Such noise will increase under rain and smog conditions. Similarly, there will be impact on pacemaker users.

The magnitude of overall impact is considered to be low, extent is site specific and duration is long termed.

6.3.12 Gender and Vulnerable Group

Construction Phase

During the project construction people will be employed on daily wages for excavation, transportation of construction materials and other construction related works. The contractor, especially the sub-contractors, may discriminate the women and vulnerable group while hiring the worker. Despite, the Government of Nepal ban on child labor, it remains a potential temptation in an economically poor region such as the proposed project area for children to be exploited to pursue mental jobs. It is assumed that most of the labor force required for the construction of the transmission line will be farmers and landless people from the vicinity of the actual work place moving around the alignment as the construction proceeds.

Considering the nature of construction work and manpower employed the magnitude of impact is considered to be low, the extent is local and the duration is short termed.

Operation Phase

No impact is expected on gender and vulnerable group during the operation phase.

6.3.13 Economic Activities

Construction Phase

Some sections of the transmission line passes through market area like Satbise, Barabise and Shole Bazzar where economic activities are high. Similarly, most of the section of the transmission line passes close to the rural roads which are considered as the semi-urban area. The project construction boosts up economic activities of the project area. The experience with other project has revealed that sudden cash flow may cause unproductive spending earned by the workers. The availability of cash may divert some workers towards gambling and other awful habits like alcohol consumption. The magnitude of impact is moderate, extent is local and duration is short term.

Operation Phase

Local people will benefit from the project induced economic opportunities. After the project completion, these opportunities will be closed and the workers will lose their job. Demand for local agricultural production, community and local commodity transactions will be reduced. The withdrawal or decrease in economic activity during operation phase may affect the life of the local people after the habitual of spending more during construction phase. They will face difficulty in managing the lifestyle once the economic activities will be reduced and earning will drastically decline. However, due to the linear nature of the project, the local labors will be hired at the different locations only for the short duration of time.

Thus, the magnitude of the impact is considered to be low because the economic activities are limited and are spread throughout the settlements of the alignment. The extent is local and duration is of mid term.

6.3.14 Religious, Historical and Archeological Site

Construction Phase

Though there are numbers of temples, religious and cultural sites in the project area, none of them are located under the RoW. Therefore, none of such structures need to be relocated due to the proposed pylon and transmission line construction.

Operation Phase

No impact is expected during the operation phase.

6.3.15 Infrastructure and Service Facility

Construction Phase

Infrastructure

Satbise of Samundrarar VDC, Bhorle Bazaar of Ralukadevi VDC, Chokade of Bageshwori VDC Betrawati of Gerkhu VDC and Shole Bazaar of Tupche VDC are the main markets/trade centers of the project area. The average distance of these market centers from the proposed transmission line is ranged from 500m to 2000m. The implementation of project will likely to affect these market centers. The magnitude of the impact is moderate, extent is local and duration is long termed.

Service facility

The construction work and related influx of population in the project area will make the existing institutions regarding health, water supply, telecommunication, electricity, etc. unable to deliver the required service. Besides, existing market and hotels will come under pressure. However, privately operated service is expected to cope up with this situation considering the nature of job and limited workers staying with their families in the project area. The impact is expected to be low in magnitude, local in extent and short duration.

Operation Phase

No impact is anticipated during the operation phase.

6.3.16 Social and Cultural Practices

Construction Phase

During the project construction, the influence of the outside workforce on the local way of life and traditional cultural practice may result into cultural erosion, undesired social practices, disputes, conflicts and possible dilution of social bonds among the local people. However, the social and cultural life style of the local people will hardly be affected by the influx of workers due to nature of project. This is because of the linear type of the affected project area, low number of the construction workers from outside and their fast mobility. These impacts are expected to low in magnitude, local and short termed in duration.

Operation Phase

After completion of the construction work, the impact on culture by the construction work force will subside and will slowly return to its normal social condition.

6.3.17 Law and Order

Construction Phase

During the construction, labors from different places with different religion and faiths will be employed by the contractor and there will be possibilities of conflict of interest thus affecting the law and order situation. The past experience reveals that local people have misunderstanding with the employer's and contractor's staff. Since the project is of linear type and the number of local labor for construction activities will be less the likely impact on law and order situation due to project is expected to be low in magnitude, local and short termed.

Operation Phase
No significant impacts are expected during this phase.

6.3.18 Impacts of Aesthetics

Construction Phase
No significant impacts are expected during this phase.

Operation Phase
The proposed transmission line and substation structures will depreciate natural scenery of the project area. Thus, there will be impact on aesthetic value of the project area. Hence, the magnitude of impact on aesthetic will be moderate, local and long termed in nature.

6.4 Beneficial Impacts

Construction Phase

6.4.1 Local Employment

One of the major beneficial impacts of the project during the construction phase is the creation of employment opportunity. Such employment opportunities to some extent may check out migration of the project area and promote in-migration. In this regard, the employment opportunities contribute to poverty alleviation to some extent. The availability of reliable power in the Central Development Region will assist in establishing new industries which will generate employment for the local people. The magnitude of impact is considered to be moderate, extent is local and duration is short termed.

6.4.2 Local Economy

The employment opportunity, income from shops, house rental, increase demand for fresh vegetables, fruits, meat and rental/lease of land etc are the areas of income during construction period.

Furthermore, local contractor and local people will also be engaged for some construction work, which is considered as beneficial impacts for the local economy. As a result of increased trade and business, significant amount of cash will be introduced into local economy. This short term economic boom will contribute to the development of local economy. The increase in business will enhance the economic status of local people. The magnitude of impact is considered to be moderate, extent is local and duration is medium term.

The people of project area will have opportunity to sell their products to the construction workforce and project personnel at cost better than market price. This is the significant benefit to the local farmers in terms of cash economy.

With the start of proposed project construction, visible and significant impact will be realized in the local economy of the area as whole and economic activities of the urban/semi urban centers like Satbise, Barabise, Chokade, Betrawati and Shole Bazaar.

6.4.3 National/Regional Economy

The proposed project will evacuate the energy from Tadi river and other projects to be developed in Central Development Region of Nepal. The reliability in power distribution will enhance the production of the industries and boost up the economic activity in the central Nepal.

6.4.4 Living Standard

Beneficial impacts of the development project are development of urban and semi urban area with better facilities and amenities, which avail short term economic benefits to the local community. Given the opportunity of job (150 locals) in the project, the unemployed people of the area and households depend upon labor will benefit immensely. Their purchasing power is expected to improve the living standard during the construction phase. People thriving in subsistent agriculture will have cash flow, then exposed to the direct cash earning economic activities will certainly lead to positive changes in the existing social relationships and socio-economic value.

CHAPTER-VII
ALTERNATIVE ANALYSIS

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. In case of Samundratar-Trishuli 3B Hub 132 kV TL Project, a range of site alternatives was investigated and the lowest and highest impacts on engineering, environmental and land use of these sites was determined to select the best substation site.

The alternative location of the proposed project was selected taking into consideration the following criteria:

- which have minimal environmental impact
- Improvement of reliability of the power system
- 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.

7.1 Alternatives considered

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

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

7.1.1 Site Alternatives

Comparative studies for the feasibility of the different routes were done on the basis of the following guidelines:

1. Proximity to the all expected hydroelectric plants to be constructed and shortest distance from the highway as far as possible.
2. Rectangular or square in shape for ease of proper orientation of bus-bars and feeders.
3. Far away from obstructions, to permit easy and safe approach/termination of high voltage overhead transmission lines.
4. Free from master plans/layouts or future development activities for the present and the future.
5. Easily accessible to the public road to facilitate transport of material.
6. Leveled ground to reduce leveling expenditure.
7. Above highest flood level (HFL) to avoid water logging.
8. Minimum or no forest and vegetation.
9. Avoid the negative impact to the environment.
10. Located on geologically stable ground
11. Avoid settlements areas or densely populated area
12. Minimum no of affected households
13. Avoid close vicinity of radio stations, radar canters and airport
14. Avoid forest, protected area and wildlife sanctuaries

7.1.2 Construction alternatives

Manual excavation has been adopted. Different design alternatives for substation 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 construction has been selected.

The alternative study included the comparative studies for the voltage level of 220 kV and 400 kV. The voltage level of 220 kV has been opted for to avoid the excess area of land restriction and land disturbances.

Since it provides more opportunity for the local employment will have less impact on topography, low disturbance to surrounding areas and does not require wider access road. Mechanical excavation requires motor able 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. Internationally accepted standard technology will be applied for the installation and procurement of the goods and equipment.

The construction activity shall be planned in 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.

7.1.3 No Forest Option

No forest option was studied as far avoiding the forest land through which the proposed TL alignment will pass.

7.1.4 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 in financial loss to the country.

If the proposed project is not implemented then there will be no project induced loss/effects on vegetation, cultivated area and other project induced environmental and socio-economic impacts. No action alternative would result in heavy deficit of power and energy in central part of the country where major industries are located.

The construction of the proposed project will reduce system loss and provide reliable power to the load centres of Nepal. Increase in electricity supply to local people will help to switch energy consumption trend. Socio-economic conditions of the local people are likely to be increased through employment opportunities and income generation activities. There will also be possibilities of establishment of small scale industries. The construction of Samundratar-Trishuli 3B Hub 132 kV TL Project is essential to evacuate power of hydroelectric project in Tadi river which are in different stages of development by private sector.

CHAPTER-VIII
MITIGATION AND ENHANMCENT 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 general 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 VI– Impact Assessment. The mitigation measures to be carried out have been listed below.

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

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

8.1.1 Topography and Land Use

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 especially AP57, AP 53, AP 47, AP 36, AP 10 - AP 11.
- 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 cannot be mitigated. However, the land under the RoW will not be restricted for the cultivation 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.

In order to avoid the hindrance to agricultural activities the construction activities will be done during the period of less agro- activities.

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 under the RoW and plantation of trees of tall species cannot be mitigated. However, cultivation will be allowed.

8.1.2 Air Quality

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; 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. Air mask will be provided to labor force working in areas susceptible to dust pollution.

Operation Phase
No mitigation is required.

8.1.3 Noise and Vibrations

Construction Phase
No construction work will be carried out during the night time so as to minimize the noise and vibrations. Blowing pressure horn in school and dense settlement areas will be prohibited. Ear mufflers will be provided to labour force working in the areas susceptible to noise pollution.

Operation Phase
The impacts due to corona effect cannot be mitigated.

8.1.4 Water Quality

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 meter distance from the water bodies. 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

Operation Phase
The samundratar substation will be designed with provision of collecting pit not allow to mix into Tadi river, if transformer oil is leaked.

8.1.5 Watershed and Drainage Condition

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. Beside that, 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 tower pads and at substation area to drain away the excess water and prevent water logging.
- Excavation will be done in phases with higher number of labourers 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.

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.

8.1.6 Waste and Spoil Disposal

Construction Phase

The anthropogenic waste is usually biodegradable and non-hazardous, so 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 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. The contractor will be responsible for the establishment of the waste management system at the construction and camp areas.

8.1.7 Crossing of Other Utilities and interferences

All crossings of existing transmission and distribution lines will be designed with standard safe vertical and horizontal clearances for 132 kV lines. Design clearances for communication lines will be maintained.

8.2 Biological Environment

8.2.1 Forest and Vegetation

8.2.1.1 Minimizing the Forest Clearance

Construction phase

Trees in the RoW will be selectively felled to minimize the forest loss, if ground profile allows enough vertical clearance especially in gulley and valley. In such area, 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. RoW vegetation clearance will be carried out manually. As far as practicable, Angle Towers and Suspension Towers will be placed in ridges to avoid the forest clearance to the extent possible.

8.2.1.2 Compensatory Plantation

Construction Phase

As a compensatory measure for the loss of trees due to the site clearance, plantation in 1:2 ratio will be carried out in the area provided by the concerned Community Forest Users Groups and District Forest Offices, as per the new provision made in "शासकीय तथा आर्थिक सुधारको तत्कालीन कार्ययोजना २०६९" against the earlier provision of plantation in the ratio of 1:25.

Though the forest sampling shows 2868 numbers of standing trees to be felled, actual number of tree felling will be marked, counted and measured before felling the trees as per Forest Rules 2051. However, the compensatory plantation has been estimated considering for 2868 trees (pole and tree sized) to be felled down during project construction.

A number of seedlings @ 2 seedlings per tree cut down will be planted. In addition, as per the requirements of Procedural Guideline for the Use of Forest Land 2063 the plantation of 11,344 number of seedlings will be done in 7.09 ha of forest area (at the standard ratio of 1600 seedlings in one ha.) which is equivalent to the total forest area occupied by the project components.

As per Procedural Guideline for the Use of Forest Land 2063 plantation shall be conducted in the land designated by the District Forest Offices of the concerned district. A Plantation Action Plan will be prepared before implementing the plantation program. The Action Plan will figure out the plantation sites, nursery sites, tree species and mode of plantation program consulting the affected community forest users group and District Forest Office.

Nursery will be established in the project site to meet the seedling requirement. As per the Procedural Guideline for the Use of Forest Land 2063 the plantation site shall be managed by the proponent for five years or required cost for such management must be paid to Department of Forest. The proponent will manage the plantation site for one year of project operation and after that it will be handed over to concerned Forest Users Group or District Forest Office. The cost for such management will be borne by the proponent.

8.2.1.3 Harvesting Costs

Construction Phase

The cost of harvesting, logging and transporting of the forest products in community forest will be provided as per the district norms to the concerned agency following the provision made in Article 65 of Forest Regulations 2051. The harvesting costs for each community forest will be deposited in Bank account of the concerned CFUG in consultation with the concerned community forest. 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.

8.2.1.4 Utilization of Forest Products

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 forest users. Wood and other forest products extracted as part of the site clearance from the forest will be utilized as per the Forestry Regulations. For the RoW clearance in community forest, concerned CFUG will be mobilized rather than labors from outside which indirectly helps for the conservation of forestland. The project proponent will adopt methodology to minimize loss of saplings during construction to the extent possible.

8.2.1.5 Plant Diversity

Construction Phase

Due attention will be paid to plant local species, species affected by the project, preferred by the local communities, income generating and those species which contribute to the improvement of habitats for locally available birds and mammals. Plantation designs for each specific sites identified by the related community living in and around the area will be developed after consultation and interaction with the concerned stakeholders.

8.2.1.6 Supply of Alternative Fuel

Construction Phase

The construction contractors will be abided by tender clause to provide kerosene to the project workers to minimize the loss of forest

8.2.1.7 Management of the Plantation Sites

Operation Phase

The plantation sites will be managed by the concerned Forest User's Group in community forest plantation area. Replacement plantation will be conducted after one year based on the survival result and four years operation cost for such sites will be born by the project.

8.2.1.8 Clearance of Vegetation

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 18 meter (9 meter on either side of the centre line).

8.2.2 Wildlife

8.2.2.1 Habitat Loss

Construction Phase

The impact on habitat loss is a permanent phenomenon. However, the compensatory plantation of trees and awareness for forest and wildlife conservation is considered to help for minimizing the impact to some extent. 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.

8.2.2.2 Restriction on Hunting and Poaching

Construction Phase

The project workers will strictly be prevented from hunting and poaching and any other kind of illegal activities related to hunting and poaching. The construction work in community forest area will be coordinated through DFO and Community Forest Users Group (CFUGs). Informative and warning sign will be placed at relevant construction sites.

8.2.2.3 Avian Hazards

Measures to minimize bird injury and death associated with the transmission line 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. The required cost for it will be included in the contractor's cost.

8.2.3 Enhancement Measures

8.2.3.1 Assistance to Community Forest Users Group

Training and other assistance program will be provided to the community forest affected by the project. The program basically includes capacity building training, forest management training etc.

8.2.3.2 Non Timber Forest Products

The project proponent will prohibit project workers for the collection of non-timber forest products. Informative and warning sign at each construction sites located in and around the forest area will be placed.

Training for cultivation of Non Timber Forest Products (NTFP) especially medicinal aromatic plants and other herbs and condiments and agro forestry will be given to members and users of each CFUG. The members from the affected CFUGs will be encouraged for the plantation of NTFPs and other vegetations 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.

The detail of training program will be developed with due consideration of the needs of the local communities in consultation with DFO.

8.2.3.3 Awareness for Nature Conservation

Awareness program will be conducted for local people, labours and member of forest users group of the project area about the importance of forest conservation, wildlife conservation, plantation and economic importance of forest and its role in rural society, existing rule regulations etc. Organization of lectures, distribution of pamphlets, audiovisuals, posters and mobilization of local NGOs will be the methods to be utilized for awareness program.

The program will be implemented in close coordination with local NGOs, CBOs, District Forest Office and other concerned government organizations. Organization of lectures, distribution of pamphlets, audiovisuals, posters and mobilization of relevant experts will be the methods to be adopted for conducting awareness program. Beside that, hoarding boards with slogan about various aspects of nature conservation will be displayed in public places.

8.2.3.4 Biological Mitigation and Enhancement Cost

The total biological mitigation and enhancement cost is estimated to be NRs. 60,00,000 (Mitigation cost NRs.30,00,000 and Enhancement cost NRs. 30,00,000).

Table 8.1: Biological Mitigation Measures Cost

SN	Mitigation Program	Unit /Rate	Amount in NRs.		
			Construction Phase	Operation Phase	Total
1	**Biological Environment**				
1.1	Plantation of 17,000 seedlings and management of planted site (Nursery establishment, seedling production, plantation and maintenance for 5 years)	100	17,00,000		17,00,000
1.2	Compensation for the loss of private plants	LS	10,00,000		10,00,000
1.3	Placement of informative and warning signs	LS	3,00,000		3,00,000
	Subtotal-1		**30,00,000**		**30,00,000**

Table 8.2: Enhancement Measures Cost

S. No.	Enhancement Program	Unit/ Rate	Amount in NRs.		
			Construction Phase	Operation Phase	Total
2	**Biological Environment**				
2.1	Capacity building training on Forest Management to CFUGs and technical support.	LS	6,00,000	-	6,00,000
2.2	Training program on plantation of Non-timber forest products and technical support.	LS	10,00,000	-	10,00,000
2.3	Awareness training for nature conservation to local, labours and forest users	LS	9,00,000	-	9,00,000
2.3	Technical support from concerned District forest Office and Community Forest Office (TA/DA, program design etc.)	LS	3,00,000	200,000	5,00,000
	Subtotal-2		**28,00,000**	**200,000**	**30,00,000**

Above mentioned training programs will be provided to the selected users and members of the affected CFUGs. The number of training programs to be conduced 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.

8.3. Socio-economic and Cultural Environment

8.3.1 Acquisition of land and structure

Construction Phase

- **Compensation for permanently acquired land**

The project will acquired 31.878 ha of cultivated land. Out of total, 2.332 ha is permanent land (land required for angle tower, suspension towers, access road and substation area) and 29.546 ha is temporary land (land required for ROW excluding angle tower and mobile camp).

However, compensation cost for 1.831 ha of land to 45 households has been calculated for the study purpose. Hence, mitigation cost for 1.831 ha of land is estimated to be NRs. 2,24,73550. Based on this cost, using prediction method, cost for 2.332 ha of permanently acquired land will be NRs. 2,77,20,280.

Table 8.2 (a): Cost for calculation of permanently acquired land

S.N.	Project Components	Number of tower	Area (ha)	Rate(NRs.)	Cost(NRs.)
1	AP0 – AP16	16	0.16	16170000	2587200
2	AP16 – AP 48	37	0.37	5880000	2175600
3	AP 48 – AP 58	14	0.14	12740000	1783600
4	Substation	1	1.549	12740000	19734260
5	Access Road	1	0.113	12740000	1439620
			2.332		2,77,20280

- **Compensation for temporarily land**

The land used for transmission line and camp sites is considered as temporary land. The total temporarily cultivated land to be used is 29.546 ha. Based on the market price the compensation cost of 29.546 ha of land is calculated as NRs.262245550. As per NEA practice, project will provide only 20% of the total land value for temporary land. Therefore, the compensation cost for temporary land is NRs. 5,24,49,110.

Table 8.1(b): Cost for calculation of land Utilization

S.N.	Project Components	Area (ha)	Rate(NRs.)	Total Cost(NRs.)	20% of Cost (NRs.)
1	AP0 – AP16	2.689	16170000	43481130	8696226
2	AP16 – AP 48	18.357	5880000	107939160	21587832
3	AP 48 – AP 58	8.699	12740000	110825260	22165052
		29.546		26,22,45,550	5,24,49,110

- **Total compensation for land**

Hence, the total compensation of land to be acquired permanently and temporarily used is NRs. 8,01,69,390.

- **Compensation for structures**

Compensation will be provided for 3 structures (house=1& cowshed/shed=2). 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)**

The total compensation for 750ft^2 area occupied by 1 structure is estimated to be Rs. 3,00,000. Since cowshed and temporary shed are situated in substation area so additional amount for land occupied by the structures will not be required

Table 8.2 (a): Compensation cost for land occupied by structures

Type of structures	No.	Plinth area (Sq. ft.)	Rate (NRs./ft^2)	Amount (NRs.)
House	1	750	400	300000
Cowshed	1	275		
Temporary Shed	1	67.5		
Total	3	985.5		300000

- **Compensation of structures based on construction cost**

The total compensation of 3 structures based on the construction cost is estimated to be Rs. 13,47,000. Out of which compensation for 1 house and 2 cowsheds are Rs. 10,50,000 and Rs. 2,97,000 respectively.

Table 8.2(b): Estimation of construction cost of structures

Description	Type of structures	No.	Area (sq. ft)	Rate (NRs./ sq.ft.)	Amount (NRs.)
A. House	Pakki				
	Kachchi/pakki	1	1500	700	1050000
	Kachchi				
	Sub-total	1	1500		1050000
B. Other Structures					
Cow shed	Kachchi Pakki	1	450	600	270000
Shed	Kachchi	1	135	200	27000
	Sub total	2	585		297000
Total (A+B)		3	2085		13,47,000

Hence, the total compensation (compensation for plinth area of structures and construction cost) of structures is estimated to be Rs. 13,47,000.

- **Compensation for Private Infrastructure**

The traditional water mill located in Samundratar Substation will be relocated from the project site and NRs.70,0000 is allocated for the displacement**.**

8.3.2 Compensation for loss of standing crops

Production loss in permanent land

The total compensation of the project affected surveyed households for production loss of 9.2 MT is estimated to be Rs.2,68,280. 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 8.3.

Table 8.3: Value of Total Loss of Agriculture Production due to Land Acquisition

S.N.	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Total Production (MT)	Amount
1	Paddy	1.628	5.34	3.28	62.34	160200
2	Wheat	1.393	2.73	1.96	28.68	76440
3	Maize	0.488	0.63	1.29	14.04	17640
4	Potato	0.134	0.5	3.72	6.72	14000
		Total	9.2		111.78	268280

Source: Household Survey, 2014

Production loss in temporary land

The project requires 29.616 ha of cultivated land for RoW. The value of 48.389 MT of crops is estimated to be Rs. 19,53,760. The crop wise area allocation, production and amount of production is shown in Table 8.4.

Table 8.4: Value of Total Loss of Agriculture Production due to Land Utilization (RoW)

S.No.	Crops Cereal crops	Total area (ha)	Yield (MT/ha)	Production (MT)	Local market value (NRs/MT)	Amount (NRs.)
1	Paddy	9.72	3.28	31.88	30000	956400
2	Wheat	2.14	2.21	4.73	28000	132440
3	Maize	11.92	1.96	23.36	28000	654080
4	Millet	5.84	1.29	7.53	28000	210840
			Total	**67.5**		**19,53,760**

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.

The domestic solid waste generated in the project area will be either buried in designed landfill areas or converted in to compost. Alternately, the existing health post/sub-health posts will be strengthened to provide health facilities to local people and the workers. Additional water supply facilities will be provided along the project area whenever the pressure on the existing system.

Operation Phase

No mitigation measures are required during this phase.

8.3.4 Occupational Hazards and Safety

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 contractors will provide safety helmet, eye glass, safety boot, safety belt, fire fighting accessories, caution signals and other safety equipment as required at particular site and 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 transmission line and potential risks associated with transmission line construction will also be implemented. The project workers involved in construction work will also be trained for health and occupational measures.

Operation Phase

Safety equipment required for the operation of the transmission line will be provided. During the maintenance, the construction area will be restricted for entry of unauthorized person to avoid disturbances and risk. Safety helmet & glass, safety boot, ear plugs, good electric light system, good earthling devices, fire fighting accessories, caution signals, safety belt and other safety equipments as required at particular site and working area will be provided. The RoW will be strictly maintained to minimize the likely risks of conductor breakage, induced voltages, etc

8.3.5 House, Settlements and Social Infrastructures

Operation phase

Altogether 8 numbers of the proposed tower pads 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 and 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.

8.3.6 Crossing of power cables, communication lines, foot trails, roads/highways, etc

Operation Phase

The proposed transmission line crosses inter-connected gravel road /earthen road /foot trails number of times. Similarly, the alignment crosses 11 kV and 400/ 220 V distribution lines. The transmission line 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;
- Placemen of signboard where necessary

Public awareness program at critical location will be conducted.

8.3.7 Communal Resources (Recreation Area, Places of Public Congregation)

Construction Phase

The transmission line does not pass through communal resources/private properties. However, it passes close to the structures like suspension bridge over Tadi Khola, cremation site 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 transmission line and close to it. Hence, no mitigation measures required.

8.3.8. Impact on PAFs due to alteration of land and property value

Construction Phase

Land fragmentation will be minimized as far as possible. Remaining portion of land that will not 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 return to respective land owner as in the previous condition.

8.3.9 Impact due to restriction of future land use development close to settlement

Construction Phase

Coordination with the project affected households, VDCs/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

Construction Phase

The project will ensure not to discriminate the local people based on their gender, caste, colour 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. No impact is expected.

Operation Phase

No mitigation measures required during operation phase.

8.3.11 Economic Activities

Construction Phase

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

- 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.

Operation Phase

No mitigation measures required during operation phase.

8.3.12 Infrastructure and Service Facility

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.

Operation Phase
No mitigation measures are required during this phase.

8.3.13 Social and Cultural Practice
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:

- Special instruction to all the construction workers to act in a responsible manner during and after working hours;
- Respecting the rights, properties and practices of local people;
- Prohibiting all the outside labors to live outside construction camps.

Operation Phase
Employment in the substation will be given to the local people to reduce tension and potential conflicts with local residents.

8.3.14 Law and Order
Construction Phase
The proponent will implement a strict code of conduct for the workforce. 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 Nuwakot district will be used to maintain the law and order situation as and when required basis. The proposed awareness program will also minimize this impact to some extent.

Operation Phase
No mitigation measures.

8.3.16 Enhancement Measures
8.3.16.1 Agricultural Intensification Program and Vegetable Farming
The proposed project will itself provide the local communities and the region with numerous opportunities for socio-economic development. As more than 60% of the transmission line traverses through the cultivated land, 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.

To increase the agricultural production in the area, improved techniques and methods need to be introduced. A training program on improved agricultural farming will be conducted for the local farmers, which will provide opportunities for increasing agricultural production in their farmlands. This program is especially focused for those households who lose their land 10–25% in the assumption that they can improve production and productivity by applying new methods and techniques.

The total cost allocated for training programs regarding agriculture is NRs.4,49,000 (including cost for trainee's allowance, expert hiring, training materials, logistic support, etc).

Table 8.5: Cost for Agricultural Productivity Intensification

S. N.	Particulars	No. of persons	No. of days	Unit cost (daily allowance)	Total Cost (NRs)
1	Local Farmers /participants	15	7	500	1,37,000
2	Agriculturist /trainer	2	7	3000	42,000
3	Distribution of seed/ improved materials			LS	70000
4	Training Materials and Logistics			LS	2,00,000
				Total Cost	**4,49,000**

8.3.16.2 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 substation. Awareness program on construction related safety issues and electrocution will also be given to the local residents. To tackle the problem, a joint program on health and sanitation can be launched in association with local NGOs during the construction phase. The project will allocate a sum of budget for sanitation and safety programs.

8.3.16.3 Skill Development Program

The project affected people (especially focus for those households who lose land more than 25%) will be benefited from skill development program on sewing/knitting, driving, electrical/house wiring, computer in their own localities. The total estimated cost for such training programs is NRs.34,70,000 (including cost for trainee's expenses, expert, training materials, logistic support, etc). This training will enable the PAF members in getting suitable jobs during and after the construction. The estimated cost for these trainings is given in Table 8.6.

Table 8.6: Cost for Skill Development Training

Particulars	Total Number	Allowance (including Lunch)	Total Days	Total (NRs.)
Electrical Wiring				
Trainees	10	700	30	2,10,000
Training Expert	2	2500	30	1,50,000
Training Material & Logistics			Lump Sum	2,00,000
Total				**5,60,000**
Computer & Electronics				
Trainees	10	700	30	2,10,000
Training Expert	2	2500	30	1,50,000
Training Material & Logistics			Lump Sum	2,00,000
Total				**5,60,000**
Sewing/Knitting				
Trainees	10	700	90	6,30,000
Training Expert	2	2,500	90	4,50,000
Training Material & Logistics			Lump Sum	5,00,000

Total				**15,80,000**
Driving				
Trainees	10	700	30	2,10,000
Cost for service provider	10	1000	30	3,10,000
Licensing	10	5000		50,000
Training Material & Logistics			Lump Sum	2,00,000
Total				**7,70,000**
			Grand Total :	**34,70,000**

8.3.17 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:

- **Education Support Program**

Schools which are located within 250 m from the proposed transmission line alignment will be supported through educational support program. Support will be provided for purchase of computer, library establishment, drinking water facility, ladies toilet construction and extra curriculum activities. The total amount for this provision is NRs. 7,00,000.

- **Drinking water supply**

The project will provide financial support to local communities in the affected VDCs for drinking water supply scheme. A sum of NRs. 10,00,000 is allocated for physical works and construction materials to improve the drinking water supply system in the local communities of the following 4 VDCs which are lacking of adequate drinking water. However, the project proponent will not be liable for operation of the drinking water supply system.

Table 8.7: List of VDCs/Ward No. benefitted by drinking water scheme

S.N.	Name of VDC	Availability of drinking water
1	Narjamandap	Drinking water is available only for 6 months
2	Lachyang	Scarcity of drinking water throughout year
3	Bageshwori	Support needs for reliable supply of drinking water
4	Gerkhu	Support needs for construction of water tank roof, sufficient only for 8 months

- **Health and Sanitation Program**

Mobile health clinic will be launched during project construction. Health clinic will be organized for 2 days in each project affected VDCs. Health post of the project affected VDCs will be strengthen. Program will be implemented through VDCs and local NGOs. NRs. 5,00,000 is allocated for the scheme.

- **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, management of drinking water sources, strengthening public meeting place in VDCs office, etc. For this NRs. 8,00,000 has been allocated.

8.3.18 Resettlement and Rehabilitation Plan (RRP)

- **Relocation of House**

One house belonging to 1 household has to be relocated.

- **Applicable policy and legislation**

Land Acquisition Act 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 the entitlement policy matrix (Table 8.8).

- **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 Ministry of Forest and Soil Conservation.

- **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 $550 which is equivalent to NRs.53,460 (@ 1$= NRs.97.2) of one month based on the calculation for a household. Titleholders, tenants in own accommodation and squatters will be entitled to this allowance, to be paid at the time of compensation payment.

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- **Rehabilitation Measures**

Apart from the provision of displacement allowance, the rehabilitation of PAFs will additionally be supported through preferential access transmission line construction employment opportunities to the extent possible. The project will, in addition, provide some support allowances to the vulnerable or marginalized project affected households. In this project, Indigenous, Dalit and Tribal households are categorized into this category.

There is potentially for two types of grievances: grievances related to land acquisition and resettlement requirements, and grievance related to compensation or entitlement. Special project grievance mechanisms such as site provision of complain hearings allows project affected persons to get fair treatment on time.

The project authority will ensure that funds are delivered on time to CFC and the implementing consultants for timely preparation and implementation of the proposed, as applicable. The compensation issues and rehabilitation measures will be completed before civil work starts. Civil works contracts will not be awarded unless required compensation payment has been completed.

- **Rehabilitation Allowance**

Relocated household will receive a housing rehabilitation allowance. A total of NRs. 30,000 has been allocated for displacement and rehabilitation allowances.

Table 8.8: Displacement and Rehabilitation Allowance

Allowances	No	Unit cost (Rs.)	Amount (Rs.)
Housing rehabilitation	1	30,000	30000
Total			**30000**

Table 8.9: Entitlement Policy Matrix

Type of loss	Entitlement unit	Description of entitlements	Implementation Measures
1. House and other structures			
Loss of own house and residential plot	• Titleholders • Tenant • Squatter on public land	Cash compensation for full or partial loss of house at replacement cost, according to house type	• Land valuation undertaken by CDC, house and other structure valuation by project authorities, compensation rate established by CDC • Material may be salvaged with no deduction from compensation • Displaced households will receive a housing displacement allowance • Notice to vacate will be served at least 35 days prior to acquisition date • An appropriate compensation advance and housing displacement allowance to be paid at time of notice to vacate, balance payable prior to possession of property • Compensation for partial losses payable prior to acquisition • To ensure fair compensation, determination of rates will be done not more than one year prior to property acquisition • All transfer costs and taxes will be the responsibility of the project
	Titleholder	Where displaced, cash compensation (at replacement value) for residential plot, or provision of suitable replacement residential pot in the vicinity, if available.	
	Tenant	Assistance with identification of alternative residential land	
Loss of commercial establishment	Titleholder	• Cash compensation for full or partial loss at replacement cost, according to building type • Where displaced, cash compensation for plot or provision of suitable replacement plot in the vicinity if available • Assistance with identification of alternative business	• Compensation determination, notice to vacate and compensation payment • Owners of displaced commercial establishments will receive a business displacement allowance
Loss of other privately owned structures	Titleholders, Tenant	• Cash compensation for full or partial loss at replacement cost, according to building type • Cash compensation for damages to structures resulting from temporary occupation of land	• Other structures includes: sheds, water tank, etc • Loss of structures other than houses and commercial establishment does not entail payment or a displacement allowances • Compensation determination, notice

			to vacate
2. Cultivable land			
Loss of private land	Titleholder	• Provide compensation at full replacement cost • Provide full title to land of equal area and productivity acceptable to owner in the vicinity • If land is not available elsewhere then provide cash compensation at full replacement cost based on current market rate or government rate which ever is higher • 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.	• A list of affected and entitled persons and the area of land loss is required • Notice to vacate will be served at least 35 days prior to acquisition date • 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 frees, taxes and duties will be borne by the project • Case-wise compensation will be either by cash or by cheque, depending on the owner's preferences • To ensure fair compensation, determination of rates will be established not more than one year prior to property acquisition
Vulnerable social categories	Adults 18 years and older in the vicinity	• Assistance in reestablishment and improvement of livelihood • Training in life skills • Preferential employment on project construction and maintenance to the extent possible	• Vulnerable social categories actually affected by the project will be identified • Tribal groups • Dalits • Landless households • Women headed households
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	• An assessment of maintaining that kind of vegetation • To be undertaken in consultation with Department of Forestry
Loss of government land	Relevant agency	• No provision of compensation	• Consultation with relevant government agencies
4. Other privately owned resources			
Building and structures	Local community	• 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	• Community buildings and structures includes: tempos, water tank, irrigation canals trails and bridges

5. Rehabilitation Assistance			
Displacement of households	Titleholders, tenant	• Housing displacement allowance for loss of own residential accommodation	• 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 • Allowance will be paid at the time of serving the notice to vacate • Displacement allowance will be paid.
6. General counselling			
All project impacts	Households within RoW or outside the RoW	• General counselling on project impacts, construction schedules and acquisition dates, valuation compensation and grievance resolution mechanisms construction employment procedures and local development initiatives	• This will be achieved through the periodic distribution of information sheets and consultation with local officials • Cooperation with GoN line agencies such as District Agriculture Office, District Forest Office to support effective resource utilization and community development

8.4 Environmental Mitigation and Enhancement Cost

The mitigation and enhancement cost including CSR cost for implementing various mitigation and enhancement measures mentioned above is estimated to be NRs.9,71,10,970 . The cost breakdown is given below in Table 8.10.

Table 8.10: Cost estimate for Environmental Mitigation and Enhancement Measures

Description	Amount (NRs)
I. Physical Environment	Included in civil cost
II. Biological Environment	
Mitigation Measures	30,00,000
Enhancement Measures	30,00,000
III. Socio-economic and Cultural Environment	
A. Mitigation Measures	
1. Land acquisition	4,76,00,400
2. Compensation for Structure	16,47,000
3. Loss of standing crops	22,22,060
4. Private Infrastructure	70,000
5. Relocation Cost	83,460
Sub-total A	**8,41,91,970**
B. Enhancement Measures	
1. Skill oriented training program	34,70,000
2. Agricultural intensification program	4,49,000
Sub-total B	**39,19,000**
C. Corporate Social Responsibility (CSR) Cost	
1. Education	7,00,000
2. Health	5,00,000
3. Drinking Water	10,00,000
4. Infrastructure	8,00,000
Sub-total C	**30,00,000**
Total of Socio-economic and Cultural Environment	**9,11,10,970**
Grand Total	**9,71,10,970**

Table 8.11: Matrix of Environmental Impact Mitigation Measures

	Potential Impacts	Magnitude	Extent	Duration	Mitigation Measures	
					Action	Agency to be Consulted
Construction Phase	**Physical Environment**					
	Topography					
	Very small area affected	L	S	LT	Slope disturbance minimize, bioengineering and propoer landscaping	
	Land use					
	Project requires 47.4 ha land	M	L	LT	Compensation to land owners, the construction area will be reinstated.	VDC, DAO
	Air quality and Noise Level					
	Dust and combustion emission, noise pollution but temporary.	L	S	ST	Emission standard compliance. Maintainance of vehicle. Ear mufflers and mask to workforce. Bliwing pressure horn in school and dense settlement areas will be prohibited.	
	Water Quality					
	Likely chance of antropogenic and construction waste into water bodies.	L	S	ST	Proper care of waste not to mix into water bodies. Good construction practices.	CBO
	Watershed and Natural drainage					
	Disruption to natural drainage due to tower excavation.	L	S	ST	Proper muck management, restoration of vegetation, construction in dry season.	
	Waste and Spoil Disposal					
	Construction solid waste and garbage	L	S	ST	Proper waste management system by contractor.	CBO
	Crossing over other utilities and interference					
	Cable stringing might disturb road traffic and interfere power lines	L	S	ST	No mitigation	

	Potential Impacts	Magnitude	Extent	Duration	Mitigation Measures	
					Action	Agency to be Consulted
Construction Phase	**Biological Environment**					
	Forest and Vegetation Loss					
	7.09 ha forest area under RoW, 0.17 ha for tower pad, felling of 2868 trees.	M	L	LT	Minimize forest area, compensatory plantation, pay harvesting cost, utilization of forest products.	DFO, CFUG
	Demand for Firewood and Timber					
	Demand for Firewood and Timber increases.	L	L	ST	Supply of keresene to labor camp.	
	Exploitation of NTFP					
	Collection of NTFP by workforce	L	L	ST	No mitigation.	
	Wildlife and avifauna					
	Disturbance to wildlife and avifauna habitat and movement	L	L	ST	Special instruction to workforce and awareness.	CFUG, CBO
	Impacts on Rare, Protected, Endangered and Threatened Species of Flora and Fauna					
	Habitat disturbance might affect.	M	L	LT	Awareness for nature conservation	DFO, CFUG
	Socio-economic and Cultural Environment					
	Acquistion of land and structure					
	59 families affected due to landtake	M	L	LT	Adequate Compensation and according to the agreed procedures/rates	VDC, DAO
	Three hhs loss their structure, one hh loose their place of residence	M	L	LT	Adequate Compensation and according to the agreed procedures/rates	VDC, DAO
	Loss of agricultural production	L				
	Temporary loss of crops by lease land and RoW (67.5 MT)	M	S	ST	Proper compensation for crop loss	
	Loss of yield due to permanent landtake (9.2 MT)	M	S	ST	Compensation, agriculture intensification program and training etc.	VDC, DADO
	Health, water supply and sanitation					
	Stress on local health, water supply and sanitation due to influx of workforce	L	S	ST	Proper waste management. Additional water supply and temporary toilet at construction sites.	VDC, CBO
	Occupational Hazards and Safety					
	Accident risks while construction work	L	S	ST	Sign Boards, safety training for workers, safety awareness programs• Provision of safety measures like helmets, gloves, dress, boots and safety belt,	

	Potential Impacts	Magnitude	Extent	Duration	Mitigation Measures	
					Action	Agency to be Consulted
	Impact on house, settlments and social infrastructures					
	Some impacts on them due to RoW and tower pad	M	L	LT	Protection measures will be applied.	
	Impact due to crossing of power cables, communication lines, foot trails, roads/highways, etc.					
	Inconvience to people	M	L	LT	Avoidance as far possible during construction. Awareness.	
	Impact on communal resources (recreation area, places of public congregation)					
	No impact					
	Gender and Vulnerable Group					
	No impact is expected.					
	Economic Activities					
	Local economy increase, sudden cash flow	M	L	ST	Priority for job to locals, skill training	VDC
	Religious, Historical and Archeological Site					
	No impact					
	Infrastructure and Service Facility					
	Pressure on the existing infrastructures due to influx of workers	L	L	ST	Additional water supply, health facility, coordination with police	VDC
	Impact on the Social and Cultural practices					
	Influence of outsider workforce on local way of life and traditional practices	L	L	ST	Awareness programmes, close camp for outsider workforce.	CBO
	Law and Order					
	Conflict of interest	L	L	ST	Awareness program.	CBO
	Beneficial Impacts					
	Local employment. Contribution to local economy and	M	L	MT	Priority to local people and local products/agency	
	Physical Environment					
	Topography					
	No impact.					

	Potential Impacts	Magnitude	Extent	Duration	Mitigation Measures	
					Action	Agency to be Consulted
Operation Phase	**Landuse**					
	No impact					
	Air and Noise quality					
	Corona effect	L	S	LT	No mitigation	
	Water Quality					
	Chances of leakage of oil to Tadi river	L	L	LT	Ensure special design structure like oil pit in detail design of substation and procurement of quality transformers.	
	Watershed and Drainage					
	No impact					
	Waste and Spoil Generation					
	No impact					
	Biological Environment					
	Vegetation loss					
	Trimming of tall growing trees	L	S	LT	No mitigation	
	Changes of Demand for Fuel Wood and Timber					
	No impact					
	Exploitation of NTFPs					
	No impact					
	Wildlife and avifauna					
	Risk to primates, bird hits	L	L	LT	Colour balls in towers to improve visibility	
	Impacts on Rare, Protected, Endangered and Threatened Species of Flora and Fauna					
	Habitat fragmentation	L	S	LT	No mitigation	
	Socio-economic and Cultural Environment					
	Acquisition of Land and Structures					
	Restriction under RoW, market value of land falls	H	S	LT	No mitigation	
	Loss of agricultural production					

	Potential Impacts	Magnitude	Extent	Duration	Mitigation Measures	
					Action	Agency to be Consulted
	Permanent loss of agricultural production from the acquired land. Hindrance to farming due to tower structures.	L	S	LT	No mitigation. Already compensated during construction phase.	
	Health, Water supply and Sanitation					
	No impact					
	Occupational Hazards and Safety					
	Safety risk to staffs and public	M	L	LT	Awareness	VDC, CBO
	Impact on House, Settlements and Social Infrastructures					
	Risk to houses and settlement	M	S/L	LT	Awareness	VDC
	Impact due to crossing of power cables, communication lines, foot trails, roads/highways, etc.					
	Pose risks	L	L	LT	Awareness	
	Impact on communal resources (recreation area, places of public congregation)					
	Disturbance to them	M	L	LT	No mitigation	
	Impact on PAF due to alteration of land and property values					
	Main impact of TL, land devalued.	H	L	LT	No mitigation. Already compensated during construction phase.	
	Impact due to restriction of future land use development close to the settlements					
	Land restriction due to RoW	H	L	LT	EMF hazard disappear beyoun RoW.	
	Electrical and magnetic field effect					
	Hazard to people residing to TL due to EMF	L	S	LT	RoW is taken 9m on either side.	
	Economic Activities					
	Retrenchment of job and local economy slow down	L	L	MT	Awareness.	
	Impacts of Aesthetics					
	Depreciate natural scenary	M	L	LT	No mitigation measures.	

CHAPTER- IX
ENVIRONMENTAL MONITORING PLAN

This section discusses and outlines the environmental monitoring programs of the proposed Trishuli 3B Hub Substation 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 amendments.

9.1 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. 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.

The Project proponent will primarily be responsible for the implementation of monitoring program. 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.

9.2 Environmental Monitoring Unit

An Environmental Monitoring Unit (EMU) will be formed which will consist of experts from ESSD 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 like

- Environmentalist/Sociologist
- Field staffs

This unit will have two principal functions. The first is to conduct community related mitigation measures on behalf of the project; while the second is the implementation of mitigation measures. The Unit will work in close co-ordination with the Project Manager 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 and clauses in Tender Documents regarding environmental compliance. The co-ordination of the compliance monitoring and mitigation program allocated under the contractor will be the responsibility of the project proponent.

9.3 Environmental Monitoring Plan

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

i) Baseline Monitoring

The baseline monitoring will collect the field data regarding baseline conditions of the project area. Focus will be on the gathering of scientific and sociological information needed to verify and update the data provided by this IEE process.

ii) Compliance Monitoring

In this monitoring, the project proponent will 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.

iii) 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 Samundratar–Trishuli 3B Hub 132 kV Transmission Line will include:

a) Physical Environment

- Land use and stability
- Air, Water and Noise pollution

b) Biological Environment

- Indirect impact on surrounding forests
- Disturbances to wildlife and ecological settings

c) Socio-economic and Cultural Environment

- Employment and opportunity to locals
- Economic status of the affected people and relocated people
- Adaptation of resettlement households to their new homes and communities
- Public safety and security
- Health and sanitation
- Compensation

9.3.1 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 Redress Cell (GRC) will be established at the project site. 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 of local people, outsider labors and stakeholders.

Table 9.1: Monitoring Plan and Schedule

SN	Parameter	Indicators	Method	Location	Schedule
A	**Baseline Monitoring**				
	Physical Environment				
1	Land use and stability	Changes in land use pattern and stability/flood risk	Site observation	Substation site	Once during the construction phase and operation phase each
2	Air, water and noise pollution	Air and water quality, Noise level	Site observation, Sampling	,, ,,	Before and after rainy season prior to construction
	Biological Environment				
3	Demand of firewood and timber	Observation of Vegetation and maintenance of RoW	Discussions with Users Group, observation, local people and District Forest Office	Surround community forest	Once each during preconstruction and construction

4	Wildlife and avifauna	Wildlife habitat and clearance	Observation, discussion with local people	Surrounding area	Once each during preconstruction and construction phase
	Socio-economic and Cultural Environment				
5	Settlement/infrastructure	Increae in settlements/infrastructure, migration	Discussion with local people, VDCs, observation	Project area	Once each prior to construction and operation
6	Socio-economic/cultural baseline	Update socio-economic/cultural baseline	Discussion with local people, observation, review	Project affected areas	Once prior to construction
B	**Impact Monitoring**				
	Physical Environment				
1	Land use	Stability/ landuse changes from the baseline	Observation	Substation	Continuous observation during construction, annually during operation
2	Waste disposal	Unpleasant odour and visual impact	Observation	substation	Monthly during construction
3	Air Quality/water quality		observation	Project area	Monthly during construction
	Biological Environment				
4	Pressure on Forest	Forest Cover	Observation and survey of the forest area before and after construction, discussion with local people and FUGs.	Surrounding Community forests	Regular basis during construction and annually during operation
5	Wildlife	No, of wildlife seen	Observation, keeping records on wildlife, birds and reptiles killed	Surrounding areas	Regular basis during construction and annually during operation
Socio-economic and Cultural Environment					
6	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
7	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
8	Safety	No. of casualties	Records of accidents	Project area	Continuous during construction period/operation phase
9	Employment	No. of local people employed by project	Records kept by management	Project area	Continuous during construction period and annually during operation

10	Impact on Women/Children	Status of women children	Record of women employment; children education; Inspection on Child Labor	Project area	Continuous during construction period
11	Indirect economic benefits	Economic activities in the area	Trade and business revenues	Project affected VDC	Once a year during construction and once during operation
C	**Compliance Monitoring**				
1	Incorporation of IEE recommendations 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 the 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 documents	Yes/No	Review process	Kathmandu office	During project approval
4	Allocation of adequate budget for the implementation of the environmental mitigation measures and monitoring works		Review, inquiry and consultation	Kathmandu office	During detail design and contract agreement
5	Land/property acquisition procedures	Compliance with national legal requirements	Discussions with local people	Affected VDCs/site office	At the time of acquisition
6	Trainings and trainees	Number of trainings and trainees	Survey/observation	Project affected area/VDCs	Periodic during construction and operation

9.4 Monitoring Cost

The monitoring costs have been estimated in Table 9.2. The total cost for the monitoring activities has been estimated as NRs. 72,56,000.

Table 9.2: Environmental Monitoring Cost

S.N.	Particulars	Man month/Quantity	Rate in NRs	Total in NRs
1	**Manpower**			
	Environmentalist	18	143000	25,74,000
	Sociologist/Statistician	18	143000	25,74,000
	Field staffs	36	30,000	1,08,000
2	Logistics and transportation	Lumsum		20,00,000
	Total			72,56,000

9.5 Agencies Responsible for Environmental Monitoring

The project proponent NEA will have the prime responsibility to carry out the monitoring activities. ESSD will be the organization responsible for pre-construction monitoring of the proposed project. The Environmental Management Unit comprising the staff from ESSD. This Unit will work on behalf of the project. The Unit will be responsible for compliance and impact monitoring.

9.6 Summary of Cost Benefit Assessment

The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 10,09,36,810 which is 10.16 % 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

SN	Description of cost	Amount (NRs.)
1	Cost for environmental mitigation measures	76,22,520
2	Cost for enhancement measures	68,89,000
3	Cost for other social support program and CSR cost	52,00,000
4	Cost for environmental monitoring	72,56,000
5	Land Compensation cost	4,76,00,400
	Total environmental cost including monitoring cost	**10,09,36,810**
	Total Project cost	US $ 11.03 million (NRs. 99,27,00,000)
	Percentage of total environmental cost to the total project cost	10.16%

CHAPTER-X
CONCLUSION

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.

The total land requirement will be approximately 47.336 ha (930 ropani) for tower pads, substation and RoW. Out of that, the project requires 31.878 ha (626 ropani) of private land, 10.751 ha of forest land and 4.707 ha of barren and rivers. There will be loss of 2868 trees for the RoW clearance belonging to 9 different community forests. Due to land acquisition, 59 households will be affected.

Wherever possible, efforts have been made by the project planning team to limit adverse impacts on the environment. 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 total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 10,09,36,810 which is 10.16 % of the total project cost. This cost also includes compensation to the private land acquired for the proposed substation. Based on experience of similar kind of other project and prevailing market rates, the cost has been estimated and supposed to be sufficient.

In overall, this IEE study concludes that the proposed Samundratar-Trishuli 3B Hub 132 kV Transmission Line Project shall not have significant impacts on physical, biological and socio-economic & cultural environment of the project area; hence the proposed project is environmentally and socially feasible. The IEE study is adequate and no further study is supposed to be required regarding environmental assessment of the proposed project.

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