INITIAL ENVIRONMENTAL EXAMINATION
OF
NIJGADH-POKHARIYA 400kV TRANSMISSION LINE PROJECT

(Double Circuit, Rautahat, Bara and Parsa District, Madhesh Province, Nepal)

Submitted to:

Ministry of Energy, Water Resources and Irrigation

Singhadurbar, Kathmandu

through

Department of Electricity Development

Sanogaucharan, Kathmandu

Submitted by:

Nepal Electricity Authority

Durbarmarga, Kathmandu, Nepal

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कार्यकारी सारांश

१.० परिचय

नेपाल विद्युत प्राधिकरण (ने.वि.प्रा.) विद्युत उत्पादन, प्रसारण तथा वितरण गर्ने उद्देश्यका साथ वि.सं. २०४२ सालमा नेपाल सरकारको पूर्ण स्वामित्वमा खडा गरिएको संस्था हो। नेपालको विद्यमान एकीकृत राष्ट्रिय ऊर्जा प्रणालीलाई विस्तार गर्दै अझ भरपर्दो बनाउन आवश्यक छ। अन्यथा, निकट भविष्यमा देशमा उत्पादन भएको विद्युत खपत हुन नसकी खेर जाने अवस्था आउन सक्ने देखिएको छ। नेपाल विद्युत प्राधिकरणले विद्युत उत्पादन तथा प्रसारणको योजनाहरुलाई तिव्रताका साथ अघि बढाइरहेको छ। हाल ने.वि.प्रा. अन्तर्गत ३९७६.६ सर्किट किलोमिटर प्रसारण लाइन सञ्चालनमा रहेको छ। जस अन्तर्गत ५१४.४६ सर्किट किलोमिटर ६६ के.भी., ३१२९.५४ सर्किट किलोमिटर १३२ के.भी., २५४.६० सर्किट किलोमिटर २२० के.भी. र ७८.०० सर्किट किलोमिटर ४०० के.भी. क्षमताको प्रसारण लाइन रहेका छन्। यसैगरी, १४०८.०० सर्किट किलोमिटर १३२ के.भी., ११६५.०० सर्किट किलोमिटर २२० के.भी. र ७५६.०० सर्किट किलोमिटर ४०० के.भी. गरी जम्मा ३३२९.०० सर्किट किलोमिटर प्रसारण लाइन निर्माणाधीन रहेको छ (ने.वि.प्रा., २०२१)।

मधेश प्रदेशमा बढ्दो उद्योगधन्दा तथा शहरीकरणको कारण विद्युत ऊर्जाको माग दिन प्रतिदिन बढ्दो रहेको छ। तसर्थ, मधेश प्रदेश अन्तर्गतका रौतहट, बारा र पर्सा जिल्लाको दक्षीणी क्षेत्रमा बढ्दो विद्युत मागलाई सम्बोधन गर्न तथा गुणस्तरीय र भरपर्दो विद्युत सेवा उपलब्ध गराउन तथा भविष्यमा उत्पादन हुन सक्ने विद्युत प्रसारणको लागि नेपाल विद्युत प्राधिकरणले निजगढ पोखरिया ४०० के.भी. विद्युत प्रसारण लाइन आयोजना (NPTLP) प्रस्ताव गरेको छ। प्रस्तावित आयोजनाको प्रस्तावक नेपाल विद्युत प्राधिकरण (ने.वि.प्रा.) हो। यस अन्तर्गतको बातावरण तथा सामाजिक अध्ययन विभागले प्रस्तावित NPTLP आयोजनाको प्रारम्भिक बातावरणीय परीक्षण (IEE) प्रतिवेदन तयार गरेको हो। प्रस्तावित आयोजनाको सर्वेक्षण अनुमतिपत्र श्री ऊर्जा, जलस्रोत तथा सिंचाइ मन्त्रालय (MoEWRI) द्वारा नेपाल विद्युत प्राधिकरणलाई मिति २०७८/११/१२मा प्रदान गरिएको र बहाल अवधि मिति २०८०/११/११ सम्म रहेकोमा म्याद थप गरी २०८१/११/११ सम्म गरिएको छ। यस आयोजनाको IEE का लागि तयार गरिएको कार्यसूची श्री ऊर्जा, जलस्रोत तथा सिंचाई मन्त्रालयबाट मिति २०८०/०१/०५ मा स्वीकृत भएको छ।

बातावरण संरक्षण नियमावली, २०७७ को नियम-३ सँग सम्बन्धित अनुसूची २(च) को १(क) अनुसार १३२ के.भी. वा सो भन्दा बढी क्षमताको प्रसारण लाइनको लागि प्रारम्भिक बातावरणीय परीक्षण आवश्यक छ। प्रस्तावित प्रसारण लाइनको क्षमता ४०० के.भी. रहेकाले उल्लेखित नियमावली अनुसार यसको प्रारम्भिक बातावरणीय परीक्षण गरिएको हो। त्यसैगरी सर्वेक्षण अनुमतिपत्रको बुँदा नं. ८-झ अनुसार पनि प्रचलित कानून अनुसारको प्रारम्भिक बातावरणीय परीक्षण वा बातावरणीय प्रभाव मूल्याङ्कन गर्नुपर्ने सर्त रहेको छ।

२.० आयोजना सम्बन्धी विवरण

प्रस्तावित निजगढ-पोखरिया ४०० के.भी. विद्युत प्रसारण लाईन तथा सवस्टेशन आयोजनाले निर्माणाधीन हेटौंडा-ढल्केबर-इनरुवा ४०० के.भी. प्रसारण लाइनलाई, रौतहट जिल्लामा प्रस्तावित निजगढ

सवस्टेसनदेखि, वारा जिल्लामा प्रस्तावित रमौली सबस्टेसन र पर्सा जिल्ला स्थित निर्माणाधीन पोखरिया सवस्टेसनसम्म पुऱ्याउने लक्ष्य राखेको छ। यसर्थ प्रस्तावित आयोजनाले, मुख्यतया बारा र पर्सा जिल्लाको औद्योगिक करिडोरमा विद्युत् वितरण गर्नेछ। भविष्यमा यो प्रसारण लाइनले नेपाल र भारतबीच अन्तरदेशीय विद्युत आदानप्रदानको रूपमा पनि काम गर्ने सक्नेछ ।

प्रस्तावित विद्युत प्रसारण लाइन आयोजना नेपालको मधेश प्रदेश अन्तर्गतका बारा, पर्सा र रौतहट जिल्लामा पर्दछ। यो आयोजना काठमाडौंबाट करिब २०० किलोमिटरको दुरीमा अवस्थित छ। प्रस्तावित आयोजना निर्माणबाट जम्मा ११ वटा स्थानीय निकाय प्रभावित हुनेछन्। प्रभावित बारा, पर्सा र रौतहट जिल्ला आयोजना प्रभावित जिल्लाको रुपमा व्याख्या गरिएको छ। त्यसैगरी प्रभावित महानगरपालिका/उपमहानगरपालिका/नगरपालिका तथा गाउँपालिका आयोजना प्रभावित स्थानीय तहको रुपमा व्याख्या गरीएको छ। पोखरिया न.पा. १,२, सखुवा-प्रसौनी गा.पा. २,३,४,५,६, पर्सागढी न.पा.४,५,७,८, बिरगंज म.न.पा. २९,३१,३२, जगरनाथपुर गा.पा. ६, जीतपुर-सिमरा उ.म.न.पा. ८,९,१२,१९,२०, कलैया उ.म.न.पा.१५,२१,२२,२४, करैयामाई गा.पा. १,५,६,७, कोल्वी न.पा. १, ५,११, गुजारा न.पा.२,३, फतुवा-बिजयपुर न.पा. ११ आयोजना प्रभावित स्थानीय तह अन्तर्गत पर्दछन्। निजगढ-पोखरीया ४०० के.भी. प्रसारण लाइनको लागि गुजरा न.गा.पा., वडा नं. ३ मा अवस्थित पूर्व-पश्चिम ४०० के.भी. प्रसारण लाइनको विद्युत मार्गको अधिकार क्षेत्रमा नयाँ सवस्टेसन निर्माण गरि शुरु गरिनेछ र पोखरीया न.पा., वडा नं. ५ मा निर्माणाधीन पोखरीया सवस्टेसनमा गएर टुङ्गिनेछ। प्रसारण लाइनको कुल लम्बाइ ६४.६०४ किलोमिटर र मल्टी सर्किट र डवल सर्किटको हुनेछ।

आयोजनाका प्रमुख विशेषता

अवयव	प्राविधिक विशेषता		
आयोजनाको नाम	निजगढ-पोखरीया ४०० के.भी. विद्युत प्रसारण लाइन आयोजना		
प्रभाव क्षेत्र	**प्रदेश**	**जिल्ला**	**नगरपालिका/गाउँपालिका**
	मधेश	३	११ स्थानीय तह, ३५ वडा
		रौतहट बारा पर्सा	पोखरिया न.पा.१,२, सखुवा-प्रसौनी गा.पा.२,३,४,५,६, पर्सागढी न.पा.४,५,७,८, बिरगंज म.न.पा. २९,३१,३२, जगरनाथपुर गा.पा.६, जीतपुर-सिमरा उ.म.न.पा. ८,९,१२, १९,२०, कलैया उ.म.न.पा.१५,२१,२२,२४, करैयामाई गा.पा.१,५,६,७, कोल्वी न.पा.१,५,११, गुजारा न.पा.२,३, फतुवा-बिजयपुर न.पा. ११
प्रसारण लाइन शुरु हुने स्थान	निजगढ सवस्टेसन, गुजरा नगरपालिका वार्ड नं. ०३, रौतहट		
प्रसारण लाइन पुग्ने स्थान	निर्माणाधीन पोखरिया सवस्टेसन, पोखरिया नगरपालिका वार्ड नं. १, पर्सा		
पार गरिने संरचनाहरु	राजमार्ग-६ पटक, खोला तथा नदी-४१ पटक, लाइन क्रसिंग (२ वटा १३२ के.भी. प्रा.ला., ५ वटा ३३ के.भी., २६ वटा ११ के.भी लाइन)		
डिजाइनको विशेषता			
कुल लम्बाइ	६४.६०४ किलोमिटर		
प्रसारण लाइन मार्गको उचाइ (समुन्द्र सतहबाट)	समुद्र सतहदेखि ८९.२१ मिटर देखि १५२.८३ मिटर सम्म		

अवयव	प्राविधिक विशेषता
कन्डक्टर कन्फिगरेसन/सर्किट	डबल सर्किट लाइन
कन्डक्टरको किसिम	ACSR-MOOSE
टावर बिचको दुरी	औसत ४०० (न्यूनतम १५५.३१८ मिटर अधिकतम ५६१.५२ मिटर)
टावर प्याडको क्षेत्रफल	२८९ वर्ग मिटर देखि ७०२.२५ वर्ग मिटर सम्म
ग्राउन्ड क्लियरेन्स	सडक तथा खेती- ९.५मिटर, वितरण लाइन - ५.५ मिटर संचार लाइन - ५.० मिटर, अन्य क्षेत्र-९ मिटर
विद्युत प्रसारणको भोल्टेज र परिमाण	
भोल्टेज (system nominal voltage)	४०० के.भी.
अधिकतम सञ्चालन भोल्टेज	४०० के.भी.
System Nominal Frequency	५० हर्ज (Hz)
विद्युत प्रसारण क्षमता	२००० मेगावाट
टावरको किसिम	lattice tower
कन्डक्टर	ACSR-MOOSE, 520mm^2
प्रसारण लाइन टावर	
कन्फिगरेसन	डबल सर्किट
जम्मा टावरको संख्या	१८५ (Dead-end Tower समेत)
एङ्गल टावरको संख्या	८५ (Dead-end Tower समेत)
सस्पेन्सन टावर	१००
टावरको अधिकतम उचाइ	५९.४३ मिटर
विद्युत मार्गको अधिकार क्षेत्र	४६ मिटर (केन्द्र रेखाबाट दुबै तर्फ २३-२३ मिटर)
प्रस्तावित सबस्टेसन	
प्रस्तावित सबस्टेसनको संख्या	नयाँ सबस्टेसन: निजगढ र रमौली सबस्टेसन सबस्टेसन स्तरोन्नति: पोखरीया ४००/२२० के.भी., १३२ के.भी. को bay extension
सबस्टेसनको क्षेत्रफल	निजगढ सबस्टेसन (७.९७१४ हे.) र रमौली सबस्टेसन (५.३४१२ हे.)
भोल्टेज स्तर	निजगढ: ४००/१३२/३३ के.भी. रमौली: ४००/१३२/३३/११ के.भी. पोखरीया: ४००/२२०/१३२/३३/११ के.भी.
पावर ट्रान्सफरमर	४००/१३२, ३१५ एम.भी.ए., १३२/३३, ६३ एम.भी.ए. -(निजगढ र रमौली), १३२/११, ३० एम.भी.ए., (रमौली) ४००/२२०, ३१५ एम.भी.ए., २२०/१३२, ३१५एम.भी.ए., (पोखरीया)
जैविक वातावरण सम्बन्धी	
प्रभावित बन क्षेत्र (हे.)	६१.२१४ हे. (११.१३१ हे. खोला तथा बगर समेत)
प्रभावित बन	सरकारद्वारा व्यवस्थित बन, जंगलसहिया साझेदारी बन, पशुपति सामुदायिक बन तथा अंजुमन सामुदायिक बन
कटान हुने रूखको संख्या	१४,७९५

अवयव	प्राविधिक विशेषता
सामाजिक तथा आर्थिक वातावरण	
प्रभावित स्थानीय तहको संख्या	११
प्रभावित घरधुरी	१९९ (टावर तथा सवस्टेसन मात्र)
सर्वेक्षण गरिएको घरधुरी	१७३
आयोजनाको कुल लागत	१६.५ अर्ब (अनुमानित)

स्रोत: निजगढ-पोखरीया ४०० के.भी. प्र.ला.आ. सर्वेक्षण प्रतिवेदन, २०२४

३.० अध्ययन विधि

यो प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन वातावरण संरक्षण ऐन, २०७६, वातावरण संरक्षण नियमावली, २०७७ तथा राष्ट्रिय वातावरणीय प्रभाव मूल्याङ्कन निर्देशिका, २०५० लाई अनुसरण गरेर तयार गरिएको छ। यसबाहेक, नेपाल सरकारको कानूनी प्रावधानलाई मध्यनजर गर्दै स्थलगत अध्ययन, सरोकारवाला व्यक्ति/समुदाय/संस्था तथा अधिकारीसँग पनि परामर्श लिइएको छ।

अध्ययनको क्रममा भौतिक वातावरण अध्ययन अन्तर्गत हावापानी तथा जलवायु, भौगोलिक अवस्था, भू-उपयोग सम्बन्धी तथ्याङ्कको प्रयोग गरिएको छ। हावापानी, जलवायु, भू-बनोट, टावरको स्थिरता, अवस्थिति सम्बन्धी तथ्याङ्क द्वितीय स्रोत, क्षेत्रीय भौगर्भिक नक्सा तथा अन्य प्रतिवेदनबाट सङ्कलन गरिएको छ। भने प्रभावित जग्गाको प्रकार, क्षेत्रफल जस्ता तथ्याङ्क स्थलगत नक्सा, सर्वेक्षण प्रतिवेदन, समूहगत छलफल तथा स्थलगत भ्रमण आदिबाट सङ्कलन गरिएको छ।

जैविक वातावरण अध्ययनमा वन, वन्यजन्तु र वनस्पति सम्बन्धी तथ्याङ्क प्रयोग गरिएको छ। वनस्पति सम्बन्धी तथ्याङ्क स्थलगत भ्रमण, वन स्रोत सर्वेक्षण तथा समूहगत छलफल आदिबाट सङ्कलन गरिएको छ। त्यस्तै सामाजिक, आर्थिक तथा सांस्कृतिक वातावरणको अध्ययनको लागि आयोजना प्रभावित क्षेत्रको जनसंख्या, धर्म, संस्कृति, जात/जाति, पूर्वाधार आदि तथ्याङ्कको सहायता लिइएको छ भने यी तथ्याङ्क प्रभावित परिवारको परिवार सर्वेक्षण, बजार सर्वेक्षण तथा समूहगत छलफल जस्ता विधिको प्रयोग गरी सङ्कलन गरिएको छ।

आयोजना क्षेत्रमा स्थानीयसँग छलफल तथा १७३ परिवारको सामाजिक-आर्थिक सर्वेक्षण गरिएको छ। त्यसैगरी प्रारम्भिक वातावरणीय परीक्षण तयारीको सिलसिलामा रायसुझाव सङ्कलन गर्नको लागि मिति २०८१/०१/२८ गते शुक्रबार बिहान १०:०० बजे श्री पर्सागढी नगरपालिका, वडा नं-४ को कार्यालयको सभाहल, बर्बाटाँडी, पर्सा र सोही दिन दिउँसो ३:०० बजे श्री नेपाल राष्ट्रिय रामचन्द्र राउत सलोतरी देवी अहिर प्रथमिक विद्यालय, पोखरीया नगरपालिका-२ लमरीया, पर्सा, २०८१/०१/२८ शनिवार बिहान १०:०० बजे श्री नेपाल राष्ट्रिय आधारभुत विद्यालय, जितपुरसिमरा उप-महानगरपालिका-८, गम्हरगाउँ, बारा, २०८१/०१/२८ शनिवार दिउँसो ३:०० बजे श्री जन सामुदायिक माध्यामिक विद्यालय, करैयामाई गाउँपालिका-१, मधुवन, हरैया, बारा, मिति २०८१/०१/३० गते आइतवार श्री हिमाली जनता माध्यामिक विद्यालय, फतुवाबिजगपुर-११, हिमालीबास, रौतहट गरी पाँच ठाउँमा वातावरण संरक्षण नियमावलीको बमोजिम सार्वजनिक सुनुवाइ कार्यक्रम गरिएको छ। यी पाँच ठाउँमा गरिएको कार्यक्रम मध्ये मिति २०८१/०१/ गते दिउसो

३ बजे श्री नेपाल राष्ट्रिय रामचन्द्र राउत सलोतरी देवी अहिर प्रथमिक विद्यालय, पोखरीया नगरपालिका-२ लमरीया, पर्सामा आयोजना गरिको कार्यक्रममा भने सहभागी हरुले लिखित रुपमा राय सुझाव दिन अस्वीकार गरेका थिए। यद्यपी सो ठाउँका स्थानीयहरुले मिति २०८१/०२/२८ मा पोखरिया नगरपालिका २ नं वडा कार्यालय मार्फत लिखित पत्रमा आफ्नो सुझाव पेस गरेको हुदाँ उक्त सुझाव लाई समावेश गरिएको छ। यस स्थान बाहेकका सार्वजानिक सुनुवाई कार्यक्रमहरुमा कुल २७१ जनाको सहभागिता रहेको थियो।

वातावरण संरक्षण नियमावली २०७७ मा भएको व्यवस्था अनुसार सम्वन्धित स्थानीय तह तथा विषयगत कार्यालयवाट रायसुझाव सहितको सिफारिस संकलन गर्नुपर्नेमा तीनवटा स्थानीय तह (पोखरीया नगरपालिका, फतुवा विजयपुर नगरपालिका तथा कलैया उपमहानगरपालिका) बाट प्राप्त हुन नसकेकोले मिति २०८१/११/२३ मा विद्युत विकास विभागवाट उक्त स्थानीय तहहरुमा पत्राचार गरिएको थियो (अनुसूची ।)। वातावरण संरक्षण नियमावली २०७७ अनुसार निर्धारीत समयमा पोखरीया नगरपालिकावाट मात्र सिफारिस पत्र प्राप्त भएको र अन्य दुई स्थानीय तहवाट सिफारिस पत्र प्राप्त हुन सकेन।

४.० नीतिगत र कानूनी प्रावधानको समीक्षा

आयोजना कार्यान्वयन गर्दा प्रस्तावकले वातावरण संरक्षणसँग सम्वन्धित विद्यमान नीति, नियम, ऐन, कानून तथा निर्देशिकामा तोकिएका मापदण्डलाई विशेष रुपमा ध्यान दिनेछ। यस अध्ययनको क्रममा विद्युतसँग सम्वन्धित महत्वपूर्ण ऐन, नियम, नियमावली, तथा निर्देशिका जस्तै वातावरण संरक्षण ऐन २०७६, वातावरण संरक्षण नियमावली २०७७, जग्गा प्राप्ति ऐन, २०३४, वातावरणीय प्रभाव मूल्यांकन सम्वन्धी राष्ट्रिय निर्देशिका २०५० को पुनरावलोकन गरिएको छ।

५.० विद्यमान वातावरणीय अवस्था

५.१ भौतिक तथा रासायनिक वातावरण

कुल ६४.६०४ किलोमिटर लम्बाईको प्रस्तावित प्रसारण लाइनको सम्पूर्ण भूभाग तराइ क्षेत्रमा अवस्थित छ। आयोजना समथर खेतियोग्य जमिन र वन जङ्गलमा रहेको छ। आयोजनाको समुद्री सतहबाट उचाई ८९.२१ मिटर देखि १५२.८३ मिटर सम्म रहेको छ। नेपाल राष्ट्रिय भवन संहिता-एन.बि.सी. १०५:२०७७ अनुसार प्रस्तावित आयोजना क्षेत्र नजिक रहेको वीरगंजको ४७५ वर्षमा आउन सक्ने भुकम्पको PGA (Peak Ground Acceleration) फ्याक्टर ०.३ रहेको छ भने आयोजना क्षेत्रको ०.३-०.३५ को विचमा रहेको छ (MoUD, २०७७)। आयोजना क्षेत्रको भूकम्पीय नक्सा यस प्रकार रहेको छ। आयोजना क्षेत्रका मुख्य स्रोतमा बकैया खोला, धनसार खोला, सिर्सिया खोला, आदी रहेका छन्। थप केही खोल्सो पनि आयोजना क्षेत्रमा अवस्थित छन्। यी पानीका स्रोतमध्ये धेरैमा सुख्खा मौसममा पानी हुँदैन।

५.२ जैविक वातावरण

प्रस्तावित आयोजनाको प्रसारण मार्गको १९.७२% भाग वन क्षेत्रमा पर्दछ। प्रस्तावित विद्युत प्रसारण लाइनको मार्ग कुनै पनि राष्ट्रिय निकुञ्ज, वन्यजन्तु आरक्ष, संरक्षण क्षेत्र भित्र पर्दैन। किसिमको आधारले प्रभावित जिल्लामा तराई साल वन र उष्ण प्रदेशीय साल वन रहेका छन्।

स्थलगत अध्ययनका क्रममा आयोजनाबाट दुई सामुदायिक वन तथा एक साझेदारी वन प्रभावित हुने देखिएका छन्, जहाँ सालको बाहुल्यता रहेको छ। त्यस्तै, अन्य प्रजातिमा साज, सिमल, खयर, बोटधाएरो, क्यामुना, बकाइनो, टिक, कदम, जामुन, सिसौ, खमारी जस्ता रूखहरू रहेका छन्। स्थलगत अध्ययनका क्रममा विद्युत मार्गको अधिकार क्षेत्रभित्र निजी र ऐलानी जग्गामा बाँस, आँप, दबदबे, सिन्दुरे, बेल, लिची, कटहर, आदिका रूखहरू रहेका छन्। स्तनधारी प्रजातीमा आयोजना क्षेत्रमा बाघ देखिने गरेको स्थानीयले उल्लेख गरेका छन्। त्यसैगरी, फ्याउरो, जङ्गली बँदेल, खरायो, चितुवा, रतुवा आदि त्यस क्षेत्रमा पाइन्छन्। चराचुरुङ्गीमा सुगा, डाइग्रे, ढुकुर, भँगेरा, बकुल्ला, काग, मयुर, चिल, गिद्ध, चिबे, आदि त्यस क्षेत्रमा पाइन्छन्। आयोजना निर्माणको क्रममा प्रभावित वनबाट पोल/रूख गरी कुल १४,७९५ वटा रूखहरू हटाउनुपर्ने देखिएका छन्। यो विद्युत प्रसारण लाइन कुनै पनि राष्ट्रिय निकुञ्ज, वन्यजन्तु आरक्ष, संरक्षण क्षेत्र तथा मध्यवर्ती क्षेत्र भित्र पर्दैन।

५.३. सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

आयोजना प्रभावित घरपरिवार

प्रस्तावित आयोजना निर्माण गर्दा बारा, पर्सा र रौतहट जिल्लाको ११ स्थानीय तह, ३४ वडा प्रभावित हुन्छन्। आयोजना प्रभावित परिवारमध्ये कुल १७३ परिवारको सामाजिक आर्थिक सर्वेक्षण गरिएको छ। स्थलगत अध्ययनमा गरिएको पारिवारिक सामाजिक तथा आर्थिक सर्वेक्षण अनुसार, आयोजना प्रभावित परिवारको कुल जनसंख्या १,३३९ रहेको छ, जसमा ६६४ (४९.५९%) पुरुष र ६७५ (५०.४१%) महिला रहेका छन्। साथै, उक्त परिवारको औसत आकार ७.७ रहेको छ। आयोजना नजिकका मुख्य बस्ती हिमालीबास, कोल्वी बजार, बर्साताडी, बसबलपुर, बहनियार, मदिलवा, भसौली, हरपुताडी, बन्ठाकट्टी टोल, लमरीया, पिपरीया, सपही, सानो मच्छीरिया, बसाबल टोल, मझौलिया, बलुहा, गुलबरीया, करैयामाई, मधुवन, सिहोखा, बागेश्वरी आदि पर्दछन्। आयोजनाका दुई सबस्टेसन मध्ये एउटा सबस्टेसन वनक्षेत्रमा एउटा सबस्टेसन निजी जग्गामा निर्माण प्रस्ताव गरिएको छ।

६.० प्रभाव मूल्याङ्कन

६.१ भौतिक तथा रासायनिक वातावरण

आयोजनालाई टावर निर्माण (एङ्गल र सस्पेंशन), सबस्टेसन निर्माण, प्रसारण लाइनको विद्युत मार्ग अधिकार क्षेत्र (राईट अफ वे) र भण्डारण/कामदार शिविर स्थापनाका लागि गरी कुल ३१०.६४७ हे. जग्गा आवश्यक पर्नेछ। त्यस्सैगरी अन्य प्रभावमा ग्रामिण सडकमा सवारीको आवागमनको कारण निस्कने धुलो/धुवाँ, निर्माणको क्रममा भाइब्रेसनबाट निस्कने आवाज, अस्थायी श्रम शिविरबाट उत्पन्न हुने फोहरबाट वायु, जमिन र पानीको गुणस्तरमा असर पर्नेछ।

६.२ जैविक वातावरण

प्रस्तावित प्रसारण लाइन निर्माणको कारण जैविक वातावरणमा पनि प्रभाव पर्ने देखिन्छ। आयोजनाले दुई सामुदायिक वन - अजुमन सा.व. र पशुपति सा.व., लाई प्रभावित गर्नेछ। यसैगरी एक साझेदारी वन - जङ्गलसहिया साझेदारी वन र सरकारद्वारा व्यवस्थित वनबाट आयोजनाको कार्यान्वयनले कूल ६१.२१४ हेक्टर वन क्षेत्र (११.१३१ हेक्टर खोला-नाला र बगर) र १०.९९६ हेक्टर खेती गरेको र बाँझो ऐलानी जग्गा प्रभावित हुने देखिन्छ। स्थलगत अध्ययनको सिलसिलामा आयोजना

कार्यान्वयनको चरणमा पोल/रूख साइज गरी अन्दाजी १४,७९५ रूख/पोल हटाउनुपर्ने देखिन्छ, (जसमध्ये सा.व.बाट ८३७ र साझेदारी वनबाट १०,९८१ र सरकारद्वारा व्यवस्थित वनबाट २,९७७)। अन्य प्रभावहरूमा प्रसारण लाइनले गर्दा वन्यजन्तुको वासस्थानमा हुने असर, तारले चराचुरूङ्गीमा पर्ने असर, मानव-वन्यजन्तु द्वन्द्व आदि पर्दछन्।

६.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

प्रस्तावित विद्युत प्रसारण लाइन आयोजना निर्माण हुँदा टावरको जग (८.०२४ हे.), सबस्टेसन (५.३४१हे.), विद्युत मार्गको अधिकार क्षेत्रको लागि (२१८.८०० हे.) र अस्थायी कामदार शिविर, निर्माण सामग्री भण्डारणको लागि (२ हे.) गरी कुल २३४.१६५ हे. निजी जग्गा आवश्यक पर्नेछ। एक परिवारको गोठ पनि आयोजना निर्माणको क्रममा स्थानान्तरण गर्नु पर्ने देखिएको छ। जम्मा आयोजनाको लागि अधिग्रहण गरिने जग्गा मध्ये सर्वेक्षण गरिएका परिवारको जमिनमा उत्पादन हुने ६१.६९ मेट्रिकटन स्थायी रुपमा र १०८६.३० मेट्रीकटन अस्थायी रुपमा नोक्सान हुनेछ।

७.० प्रस्ताव कार्यान्वयन विकल्प

आयोजनाको वैकल्पिक विश्लेषण गर्दा नो एक्सन विकल्प तथा डिजाइन विकल्पको अध्ययन गरिएको थियो। आयोजनाको प्रसारण मार्गको छनौट गर्दा विद्युत प्रसारण लाइन मार्ग-२ र ३ भन्दा मार्ग १ बस्तीबाट टाढा, कम टावर भएको र छोटो लम्बाइको हुने देखिएकाले समग्र दृष्टिकोणले मार्ग-१ नै उपयुक्त रहेकाले उत्तम विकल्पको रुपमा यस प्रसारण मार्गलाई प्रस्ताव गरिएको छ।

तालिकाः आयोजनाको प्रारम्भिक वैकल्पिक विश्लेषण

क्र. सं.	विवरण	निजगढ-पोखरिया ४०० केभी विद्युत प्रसारण लाइन आयोजना		
		मार्ग-१	मार्ग-२	मार्ग-३
१	जम्मा लम्बाइ (किलोमिटर)	८०.५	६४.६०४	६७.३८
२	डवल सर्किट एङ्गल टावरको संख्या	७३	८५	९०
३	पहुँचको सुविधा	केही वन क्षेत्र बाहेक अधिकांश भागका लागि पहुँच सुविधा राम्रो छ	आयोजनाको सबै खण्डहरूको लागि पहुँच सुविधा राम्रो छ	आयोजनाको सबै खण्डको लागि पहुँच सुविधा राम्रो छ
४	प्रसारण लाइनले पार गर्ने			
	तार क्रसिङ (HT/LT)	५७	५४	६१
	नदी/खोला	४०	४१	४३
	राजमार्गको संख्या	३	३	३
	स्थानिय सडकको संख्या	९९	९८	९५
५	वन क्षेत्र (किलोमिटर)	२७	१३	१६
६	दलदल र अस्थिर क्षेत्र	देखिएको छैन	देखिएको छैन	देखिएको छैन

क्र. सं.	विवरण	निजगढ-पोखरिया ४०० केभी विद्युत प्रसारण लाइन आयोजना		
		मार्ग-१	मार्ग-२	मार्ग-३
७	कुनै अन्य स्थायी संरचना	देखिदैन	देखिदैन	देखिदैन
८	फाइदा	यो मार्ग सबैभन्दा छोटो हो र मार्गको अधिकांश भाग बस्ती क्षेत्रबाट धेरै टाढा छ	छोटो बाटो, पहुँच सुविधा राम्रो, कम बसोबास क्षेत्र र सडक कसिड	मार्गमा राम्रो पहुँच सुविधा
९	बेफाइदा	यो लाइन जङ्गलको ठूलो क्षेत्र, राष्ट्रिय निकुञ्जको मध्यवर्ती क्षेत्र र एयरपोर्टको नजिकका क्षेत्रबाट जान्छ।	यो लाइन धेरै सडक, सिँचाइ नहर र खेतीयोग्य क्षेत्रबाट गुज्रिएको छ	यो लाइन अन्य मार्गहरूको तुलनामा धेरै सडक, खेती गरिएको क्षेत्र र घना बस्ती क्षेत्र पार गर्दछ। यसबाहेक, यसमा अन्य कुनै मार्गहरू भन्दा धेरै कोण बिन्दुहरू पनि छन्।
१०	प्राथमिकता	३	१	२

८.० प्रस्ताव कार्यान्वयनबाट वातावरणमा पर्ने प्रभावको रोकथामका विषय

८.१ भौतिक तथा रासायनिक वातावरण

टावर तथा सबस्टेशन निर्माणको क्रममा निस्किएको माटोलाई सबस्टेसन क्षेत्रमा backfill गरी व्यवस्थापन गरिनेछ। प्रत्येक टावर क्षेत्रमा, जमिन र सतहमा नालाद्वारा निकास बनाई अधिक पानी जम्ने समस्या हटाइनेछ। सके-सम्म टावर बनाउने र तार तन्काउने काम सुखा मौसममा गरिनेछ। आयोजना क्षेत्रमा खोलाको कटान रोक्न ग्याबिन पर्खाल लगाउन प्रस्ताव गरिएको छ।

८.२ जैविक वातावरण

जैविक वातावरण अन्तर्गतका प्रभाव न्यूनीकरणका उपायहरू प्रभावित वन क्षेत्रको लागि सट्टाभर्नाको जग्गा, क्षति हुने रूखको लागि क्षतिपूर्ति वृक्षारोपण, चराचुरूङ्गीको तथा वन्यजन्तुको लागि न्यूनीकरणका उपायहरू पर्दछन्। त्यसैगरी अभिवृद्धिका उपायहरूमा प्रभावित सामुदायिक वनलाई वन तथा वन्यजन्तु संरक्षण सम्बन्धी तालिम, गैर-काष्ठ वन पैदावार खेती सम्बन्धी तालिम आदि उपलब्ध गराइनेछ।

८.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

जग्गाको क्षतिपूर्ति

आयोजनाकोले लिने जग्गाको बदलामा प्रस्तावकले बजार मुल्य अनुसार प्रभावितलाई मुआब्जा तथा क्षतिपूर्ति दिनेछ। सरकारी ऐन र नियमावली अनुसार अधिग्रहण गरिने जग्गा तथा अन्य संरचनाको लागि नगद क्षतिपूर्ति दिनु अनिवार्य छ। आयोजनाले सबस्टेसन र टावर निर्माणको लागि १३.३६५ हेक्टर जग्गा अधिग्रहण गर्नेछ भने अस्थायी जग्गाको लागि २१८.८०० हेक्टर जग्गा आवश्यक पर्ने। सम्पूर्ण जग्गाको औपत मूल्यलाई आधार मानेर जग्गाको मूल्य निकालिएको छ। आवश्यक जग्गा जग्गा प्राप्ति ऐन, २०३४ लाई आधार मानेर मूल्य निर्धारण समितीले निर्धारण गर्नेछ।

स्वास्थ्य, सरसफाइ तथा सुरक्षा

प्रभावित क्षेत्रको स्वास्थ्य, सरसफाइ तथा सुरक्षा अवस्थामा पर्ने प्रभावको बारेमा सर्वसाधारणलाई जानकारी दिनको लागि सचेतना मूलक कार्यक्रम सञ्चालन गरिनेछ।

व्यवसायिक जोखिम तथा सुरक्षा

निर्माण क्षेत्रलाई सफा र खुला राख्नुका साथै निर्माण क्षेत्रमा जनचेतना सम्बन्धी होर्डिङ्ग बोर्ड राखिने छ। कामदारलाई आवश्यक सुरक्षा हेल्मेट, चश्मा, सुरक्षा बुट, सुरक्षा बेल्ट, आगोबाट बच्ने सामग्री, सावधानीका चिन्ह त्था अन्य आवश्यक सामग्री प्रदान गरिनेछ।

क्षमता अभिवृद्धि कार्यक्रम

आयोजना प्रभावित क्षेत्रमा मौरीपालन तालिम लगायत कृषि तालिम, लघु उद्यम तालिम, तथा हलुका सवारीसाधन ड्राइभिङ्ग तालिम तथा आतिथ्य सत्कार प्रशिक्षण दिइने छ।

सामुदायिक सहयोगका कार्यक्रम

प्रभावित क्षेत्रमा पूर्वाधार तथा सेवा सुविधा विकासको लागि सामुदायिक सहयोग कार्यक्रम अन्तर्गत रु. ७,००,००,०००/- प्रस्ताव गरिएको गरिएको छ।

९.० वातावरण व्यवस्थापन योजना

आयोजना कार्यान्वयन गर्दा प्रस्तावको प्रकृति अनुसार विभिन्न वातावरणीय क्षेत्रमा पर्ने असर न्यूनतम मात्रामा ल्याउन न्यूनीकरणका उपाय प्रस्ताव गरिएको छ। यसको कार्यान्वयको लागि वातावरण व्यवस्थापन योजना खाका डिजाइन गरिएको छ।

१० वातावरणीय अनुगमन योजना

यस खण्डमा निजगढ-पोखरीया ४०० के.भी. प्रसारण लाइन तथा सवस्टेसन आयोजनाको अनुगमन कार्यक्रमको रुपरेखाको बारेमा छलफल गरिएको छ। यसले वातावरणीय कानूनको अनुमोदनका साथै नकारात्मक प्रभाव हटाउन सुनिश्चतता प्रदान गर्दछ। यस परिच्छेदमा वातावरण संरक्षण नियमावली, २०७७ र यसका प्रावधान अनुसार अनुगमन कार्यको तर्जुमा गरिएको छ।

१०.१ वातावरणीय व्यवस्थापन इकाइ

वातावरण तथा सामाजिक अध्ययन विभागको विज्ञ कर्मचारीको संलग्नता र स्थानीय बजारमा उपलब्ध दक्ष जनशक्ति सम्मिलित एक वातावरणीय व्यवस्थापन इकाइ स्थापना गरिनेछ। स्थापना भएका स्थलगत कार्यालय मार्फत अनुगमन र न्यूनीकरणका गतिविधि सञ्चालन गरिनेछ। यो इकाइ दैनिक वातावरणीय अनुगमन कार्यको लागि जिम्मेवार रहनेछ। निम्न अनुसारका विज्ञ सम्मिलित इकाइ कार्यालय रहने छ।

- वातावरणविद्
- सिभिल ईन्जिनियर
- समाजशास्त्री
- फिल्ड सहयोगी

यस इकाइका मुख्यतया दुई किसिमका कार्य रहनेछन्। पहिलो समुदाय लक्षित प्रभाव न्यूनीकरण कार्यक्रम तथा दोस्रो प्रवर्द्धनात्मक कार्य रहेका छन्। आयोजना निर्माणको दौरानमा अनुगमन गर्दा समुदायमा आउन सक्ने समस्याहरूको पहिचान गर्ने कार्य इकाइले गर्नेछ। प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन, ठेक्का सम्झौता अनुसार दिइएको कार्यक्रम इकाइले वातावरण व्यवस्थापन योजना तयार गरी कार्यान्वयन गरी वातावरणीय प्रभाव न्यूनीकरण गरिनेछ।

आयोजना प्रवर्द्धकबाट निर्माण व्यवसायीलाई समेत पूरक अनुगमन र न्यूनीकरण कार्यक्रमको बाँडफाँडमा जिम्मेवार बनाइनेछ। आयोजना कार्यान्वयनमा आउने पूरक मुद्दाको अनुगमन इकाइ मार्फत गरिनेछ। स्वीकृत भएको निर्माण व्यवसायीको वातावरणीय योजना र वातावरणीय सुरक्षा योजना कार्यान्वयन इकाइले संरक्षणको जिम्मेवारीमा रहने छ। यसका अतिरिक्त इकाइ आयोजना प्रमुखसँग समन्वय गरी ठेक्का सम्झौताका अनुच्छेदमा उल्लेखित वातावरणीय सुरक्षाका विधिहरूको कार्यान्वयन निर्माण व्यवसायीले नगरेमा कारवाही गर्न सक्ने अधिकार रहनेछ।

१०.२ वातावरणीय अनुगमन योजना

प्रभावकारी वातावरणीय अनुगमन कार्यक्रम आयोजना कार्यान्वयनको तीनवटा चरणमा तर्जुमा गरिनेछ।

प्रारम्भिक अवस्था अनुगमन

प्रारम्भिक अनुगमन कार्य कार्यान्वयन अन्तर्गत तथ्याङ्क सङ्कलन, कार्यक्रम र आधारभूत अवस्थाको आकलन गरिनेछ। प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदनमा थप गर्नुपर्ने आवश्यक वातावरणीय र सामाजिक सुरक्षा अध्यावधिक गरिनेछ।

नियम पालन अनुगमन

यस अन्तर्गत नेपाल सरकारका अनुमतिपत्रमा उल्लेखित तथा अन्य गाइडलाइन र स्वीकृत अनुगमन योजना अनुसार अनुगमन गरिनेछ। इकाइ कार्यालयलाई दैनिक अनुगमन कार्य गर्ने जिम्मेवार बनाइनेछ।

प्रभाव अनुगमन

प्रभाव अनुगमनले अनुगमन गरिने सूचक अनुसार प्रयाप्त र प्रभावकारी रुपमा अनुगमन भए-नभएको जाँच गर्नेछ। प्रस्तावित ४०० के.भी. विद्युत प्रसारण लाइन आयोजना समेत अनुगमन विधि अन्तर्गत पर्दछन्।

१०.३ गुनासो सुनुवाइ संयन्त्र

कुनै पनि पूर्वाधार आयोजनामा प्रभावित क्षेत्रका वासिन्दाको सहज पहुँच र गुनासाको सुनुवाइ गर्न गुनासो सुनुवाइ संयन्त्र रहनेछ। प्रभावित क्षेत्रका वासिन्दाका गुनासा समाधान गर्न जिल्ला स्तरमा गुनासो सुनुवाइ इकाइ गठन गर्नेछ। उक्त इकाइमा आयोजनाको प्रतिनिधि, स्थानीय प्रशासन, नागरिक समाज र प्रभावित वासिन्दाहरूको प्रतिनिधित्व रहने छ। यस इकाइले स्वामित्वमा रहेको गुनासा र समस्याको विवाद पैत्रिक सम्पत्तिको क्षतिपूर्तिको न्यायोचित वितरण, गणनामा छुटेका सम्पत्ति र

व्यक्तिको विवरणबारे कार्य गर्नेछ। गुनासो सुनुवाइ इकाइ स्थापनाको लागि आवश्यक बजेटको प्रबर्द्धन आयोजना प्रमुखको कार्यालयले गर्नेछ। उल्लेखित व्यवस्थाका अतिरिक्त आयोजना क्षेत्रको वातावरणीय व्यवस्थापन पक्षसँग सम्वन्धित गुनासा इकाइले दर्ता गर्ने र सम्वद्ध पक्ष सँगको छलफलबाट निरुपण गर्नेछ।

११.० निष्कर्ष

प्रस्तावित आयोजना निर्माणले कुल १९९ परिवारलाई प्रभावित गर्नेछ। आयोजनाको लागि कुल ३१०.६४७ हेक्टर जग्गा आवश्यक पर्नेछ। आयोजना निर्माण तथा सञ्चालन चरणमा विभिन्न नकारात्मक प्रभाव न्यूनीकरण र क्षमता अभिवृद्दीका योजना प्रस्ताव गरिएको छ। आयोजनाको कुल वातावरणीय प्रभाव लागत (नकारात्मक प्रभाव न्यूनीकरण, जग्गाको लागत, क्षमता अभिवृद्दी, सामुदायिक सहयोगका कार्यक्रम तथा अनुगमन) रु. २३,६९,४५,३२७ (ने. रु. तेइस करोड, उनन्सत्तरी लाख, पैतालिस हजार, तीन सय र सत्ताइस मात्र) लाग्ने अनुमान गरिएको छ जुन सम्पूर्ण आयोजना लागतको १.४४% हो। प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन तयारीको क्रममा देखिएका वातावरणीय मुद्दा/प्रभाव न्यूनीकरण र व्यवस्थापन गरिनेछ। प्रस्तावित निजगढ-पोखरीया ४०० के.भी. प्र.ला. आयोजना कार्यान्वयन योग्य रहेको छ। यस अध्ययनका अलवा थप वातावरणीय अध्ययन गर्नु पर्ने देखिदैन।

Acronyms and Abbreviation

ADB	:	Asian Development Bank
AP	:	Angle Point
CAAN	:	Civil Aviation Authority of Nepal
CBOs	:	Community Based Organization
CBS	:	Central Bureau of Statistics (the then)
CDC	:	Compensation Determination Committee
CF	:	Community Forest
CITES	:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSP	:	Community Support Program
DBH	:	Diameter at Breast Height
DCC	:	District Coordination Committee
DFO	:	Division Forest Office
DHM	:	Department of Hydrology and Meteorology
DIA	:	Direct Impact Area
DoED	:	Department of Electricity Development
EIA	:	Environmental Impact Assessment
EMF	:	Electromagnetic Field
EMP	:	Environment Management Plan
EMU	:	Environment Management Unit
EPA	:	Environmental Protection Act
EPR	:	Environment Protection Rules
ESSD	:	Environment and Social Studies Department
FUGs	:	Forest Users' Group
GIS	:	Geographic Information System
GoN	:	Government of Nepal
GPS	:	Global Positioning System
GRC	:	Grievance Redress Cell
GRM	:	Grievance Redress Mechanism
HHs	:	Households
IEE	:	Initial Environmental Examination
IIA	:	Indirect Impact Area
IUCN	:	International Union for Conservation of Nature
LPG	:	Liquefied Petroleum Gas
MC	:	Metropolitan City
MoEWRI	:	Ministry of Energy, Water Resources and Irrigation
MoFE	:	Ministry of Forests and Environment
NAAQS	:	National Ambient Air Quality Standard
NEA	:	Nepal Electricity Authority
NGO	:	Non-Governmental Organization
NO_2	:	Nitrogen Dioxide
NPHC	:	National Population and Housing Census
NPTLP	:	Nijgadh-Pokhariya 400kV Transmission Line Project
NSO	:	National Statistical Office

PAA	:	Project Affected Area
PAD	:	Project Affected District
PAF	:	Project Affected Families
PM	:	Particulate Matter
PNP	:	Parsa National Park
RM	:	Rural Municipality
RoW	:	Right of Way
SMC	:	Sub-Metropolitan City
SO_2	:	Sulphur Dioxide
SPAF	:	Severely Project Affected Family
SS	:	Substation
ST	:	Suspension Tower
TL	:	Transmission Line
ToR	:	Terms of Reference
TSP	:	Total Suspended Particles

Units

BS	:	Bikram Sambat
°C	:	Degree Celsius
µg/m3	:	Micro gram per cubic meter
ha	:	Hectare
km	:	Kilometer
kV	:	Kilo Volt
m^3	:	Cubic Meter
MT	:	Metric Ton
MW	:	Megawatt
NRs.	:	Nepalese Rupees

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1 Organization Preparing IEE

1.1 Background

Nepal possesses tremendous amount of hydropower potentials, which has to be exploited for the economic growth of the country. Development of proper power evacuation scheme and networks is very much important for busting investments in the generation sector. Currently NEA is Operating 3976.6 circuit kilometers of transmission lines. Under which 514.46 circuit km is 66kV, 3129.54 circuit km is 132kV, 254.60 circuit km is 220kV. and 78.00 circuit km of 400kV capacity transmission lines. Similarly, 1408.00 circuit km of 132kV, 1165.00 circuit km of 220 kV and 756.00 circuit km of 400kV transmission Lines are under construction. A total of 3329.00 circuit km of transmission line is under construction (NEA, 2021).

As Nepal Electricity Authority (NEA) is the solely responsible utility for expansion and reinforcement of the networks of Integrated Nepalese Power System, NEA had conducted several evacuation studies considering the candidate hydroelectric projects in the country. The lack of adequate transmission facilities has been one of the bottlenecks in power sector development in Nepal. In order to cope with this problem, Government of Nepal (GoN) has allocated funds for development of different transmission lines projects varying from 33kV to 400kV in the country.

Due to increasing industrialization and urbanization in Madhesh Province, the demand for electrical energy is increasing day by day. Therefore, in order to address the increasing electricity demand in the southern areas of Rautahat, Bara and Parsa districts of Madhesh province, and to provide quality and reliable electricity service; Nepal Electricity Authority has proposed Nijgadh-Pokhariya 400kV Transmission Line Project (NPTLP).

Proposed NPTLP starts at Ward no. 2 and 3 of Gujara Municipality of Rautahat district, and terminate at Pokhariya Substation located in Ward no. 1 of Pokhariya Municipality of Parsa district. The project aims to construct Nijgadh 400/132/33/11kV substation, Ramauli 400/132/33/ 11kV substation and 64.604km of 400kV Transmission Line. Once the proposed project is constructed, this will contribute significantly to the industrial development of the region as well as also help for cross-border electricity trade with India.

1.2 Proponent

Nepal Electricity Authority (NEA), the major electricity generator and sole agency responsible for transmission and distribution of electricity, is the proponent of the proposed NPTLP. The Department of Electricity Development (DoED) of Ministry of Energy, Water Resources and Irrigation (MoEWRI) has granted a survey license on 2078/11/20 BS to NEA for feasibility and Initial Environmental Examination (IEE), which is valid up to 2081/11/11 BS. A copy of survey license is attached in Appendix-I.

Address of the Project Proponent:
Nepal Electricity Authority
Durbar Marg, Kathmandu, Nepal
PO Box. No. 10020
Phone No.: 01-4153007/4153193;
Fax No.: 01-4447969

1.3 Organization Preparing IEE

Environment and Social Studies Department (ESSD) of NEA is responsible for the preparation of the Initial Environmental Examination (IEE) of the proposed project. ESSD executes all activities related to identifying, conducting and coordinating the environmental aspects of the projects studied, designed and constructed or operated by NEA. The department has more than one decade of experience in conducting Environmental Impact Assessment (EIA), IEE, monitoring and implementation of mitigation measures, monitoring plan for hydropower, transmission line (TL) and distribution line projects and environmental auditing of hydropower and TL projects. The ToR for the IEE of the project was approved by Ministry of Energy, Water Resources and Irrigation (MoEWRI) on 2080/01/05. This IEE is prepared based on approved ToR and EPR, 2077. Conditions for the IEE preparation while approving the ToR of the project is given in Table 1-1 below.

Table 1-1: Conditions while Approving the ToR

SN	Conditions on Approved ToR	Conditions Comply
1.	During the IEE, Necessary coordination should be done with the concerned stakeholders.	Appendix F and Appendix G
2.	The department should be informed for any changes on layout and structures of the project as per the approved ToR, and the changes has to be included in the IEE.	Changes in Route and substation are incorporated.
3.	The IEE report must include the details of parcel no. with components of the project on cadastral map.	Appendix K and the Cadastral survey report
4.	The details of the project impacted public structures and households (structures and land) has to be affixed on affected wards and the public notice of public hearing has mentioned the notice affixed on ward office.	Appendix

Contact Address:
Environment and Social Studies Department
Engineering Service Directorate
Nepal Electricity Authority
Lazimpat, Kathmandu, Nepal
Phone No. : 01-4435800
Email : env.social@nea.org.np

1.4 Scope of the IEE

The scope of this work is to prepare IEE document and get approval from MoEWRI through Department of Electricity Development (DoED). The study area covers the administrative limits or boundary of the project affected Municipality/Rural municipality including the directly project affected area of Nijgadh and Ramauli substations and about 64.604 km long TL along with its Right of Way (RoW) of 46m (with 23m on either side from the center of TL). All the social and environmental aspects within the 46 m RoW of the proposed line are within the scope of the IEE.

1.5 Objectives of the IEE

The aim and objective of the IEE is to assess and inform decision makers by identifying the potentially significant environmental effects and risks of the proposed project and to suggest appropriate mitigation measures to mitigate and/or minimize the adverse impacts so that the project is implemented in an environmentally sound manner. The specific objective of the study is to prepare an IEE report. The other general objectives of the study are to:

- Document physical, biological, socio-economic and cultural baseline conditions of project area;
- Analyze alternative TL routes;
- Identify, predict and assess the adverse and beneficial environmental impacts of the TL in project affected areas in terms of magnitude, extent and duration during project construction and operation phases;
- Suggest appropriate and pragmatic mitigation and enhancement measures for potential adverse impacts;
- Familiarize various stakeholders with the IEE outcomes through public consultation and participation programs and to incorporate their relevant concerns and issues;
- Prepare an environment monitoring plan;
- Analyze whether the IEE is sufficient for the project or not;
- Facilitate informed decision making including setting the environmental terms and conditions for implementing the proposed project.

1.6 Rationality for Conducting IEE

As per the Rule 3, Schedule-2, Clause-Cha 1(ka) of Environment Protection Rules (EPR), 2077; for any TL of voltage level 132kV or above, an IEE is mandatory. So, the proposed project of 400kV requires IEE. Similarly, according to condition 8(jha) of survey license of NPTLP, IEE or EIA of the proposal should be done according to the prevailing law.

Electricity Act and Regulations have not been promulgated as per the new federal structures in Nepal. So, according to the existing Electricity Act, 2049 and Electricity Regulations, 2050 it seems that the proposed project falls under the jurisdiction of the Federal Government. Therefore, in accordance with sub-section 2 of section 3 of the Environmental Protection Act, 2076, the IEE report of the proposal that falls under the jurisdiction of federal government must be submitted to the designated body.

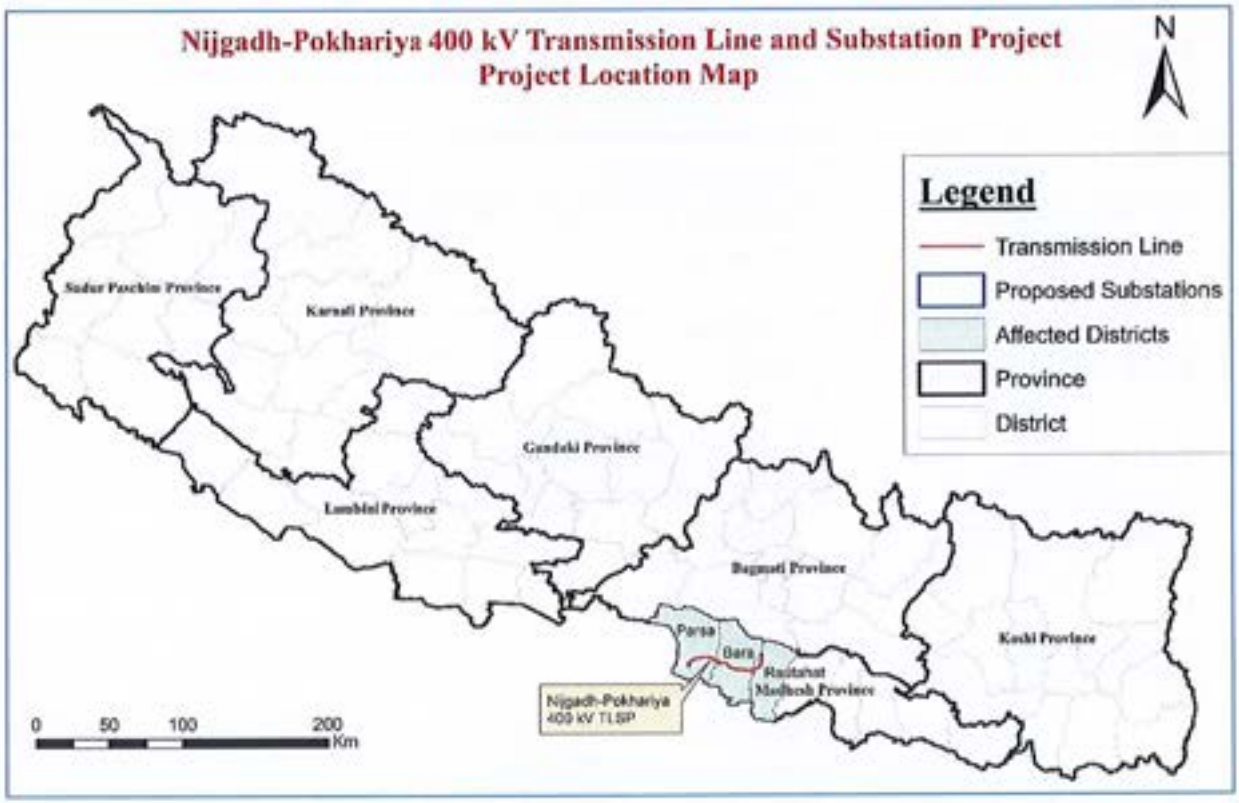
The proposed NPTLP project is being developed under the financial support of Asian Development Bank (ADB), so the Initial Environmental Examination (IEE) is prepared in English language.

2 Introduction and Relevancy of the Project

The project aims to construct 400kV TL for strengthening of power supply system at Rautahat, Bara and Parsa district. At present, the electricity supply in the project area including industrial corridor of Bara and Parsa district has been managed through the 33kV, 66kV and 132kV transmission lines. Due to the high and increasing power demand in the area, power supply in the project area has been facing a number of challenges. The rationale behind this project is to provide adequate power to the area so as to meet the demand and to reinforce the existing transmission system in the region.

At present, Hetauda-Dhalkebar-Duhabi 400kV TL is under construction to enhance the transmission system in Nepal's Eastern and Central Terai regions. This line will be connected to the northern region via the proposed Arun-Inaruwa-Tingla-Mirchaiya 400kV TL project (TLP). In the Western region, NEA has planned the Butwal-Lamahi-Kohalpur-New Attariya 400kV TL, extending from Butwal to Attariya. In the central region, a 400 kV transmission network linking these two regions will be done through the proposed 400kV TLP by MCA Nepal connecting Hetauda to New-Butwal via Ratmate and Damauli. Together, these transmission lines will form a continuous 400kV network from East to West of Nepal.

Currently, Dhalkebar-Muzzaffarpur 400kV TL operates as a cross-border link for electricity trade between Nepal and India. Additionally, the Butwal-Sunauli-Gorakhpur 400kV TL is under construction, and the proposed Nijgadh-Pokhariya 400kV transmission line will further enhance Nepal's 400kV network, ensuring a more reliable and robust electricity supply.



2.1 Salient Features of the Project

The total length of the proposed TL is 64.604km. The voltage level will be 400kV. The proposed TL will be double circuit comprising with ASCR "MOOSE" conductor. The tower configuration for the project will be double circuit and multi circuit. The TL starts from the proposed Nijgadh

substation at Gujara Municipality of Rautahat and connects with Ramauli substation in Jitpur Simara SMC of Bara and finally terminates at Pokhariya substation in Pokhariya Municipality of Parsa district. The project description and components listed in table below confirms with the design and technical reports. The TL design features are given in the Table 2-1 below:

Table 2-1: Salient Features of the Project

Features	**Description**		
General			
Project	Nijgadh-Pokhariya 400kV Transmission Line Project		
Impact Area	**Province**	**District**	**RM/Municipality-Ward No.**
	Madhesh	Rautahat Bara Parsa	Pokhariya Municipality- 1, 2 Jagarnatpur R.M.- 6 Sakhuwa Prasauni R.M.- 2,3,4,5 and 6 Prasagadhi Municipality- 4,5,7 and 8 Birgunj M.C.- 29, 31 and 32 Jitpur-Simara S.M.C.- 8,9,12, 19 and 20 Kalaiya S.M.C.- 15, 21, 22 and 24 Karaiyamai R.M.- 1, 5, 6 and 7 Kohalbi Municipality- 1, 5, 11 Fatuwa Bijayapur Municipality- 11 Gujara Municipality- 2, 3
Initial Point	New Nijgadh Substation, Gujara Municipality- 2,3, Rautahat		
Terminal Point	Pokhariya substation at Pokhariya Municipality Ward no. 1.		
No. of Khola/Nala crossing	Highway -3 times, Khola/kholsi Crossing -41 times, TL crossing-33 times (132 kV-2, 33kV-5, 11kV-26)		
Clearance	Road and Cultivated land– 9.5m Distribution Line – 5.5 m Communication line -5 m Natural land: 9 m		
Elevation range	Minimum 89.213masl at AP78 to Maximum 145.033masl at Nijgadh substation		
Design Features			
Line Length	64.604 km		
Conductor configuration/ circuit	Double		
Type of Tower	Double circuit lattice tower		
Type of Conductor	ACSR "MOOSE" 597mm^2		
Conductor Bundling	Bundled		
Nominal System Voltage	400kV		
Capacity	2000MW		
Size of conductor	597mm^2		
Span between towers	Average: 400m Minimum span:155.318m Maximum span: 561.52m		
Maximum Tower height	59.43 m		
Foundation type	Pad Foundation/ Pile foundation		
No. of Angle Tower	85		
No. of Suspension Tower	100		
Right of Way	46m (23m on either side from the center line)		

Features	Description
Foundation Area	289 m^2 to 702.25 m^2
Substation	
Proposed Substation	Nijgadh SS and Ramauli SS, Upgradation of Pokhariya SS
Location of Substation	Nijgadh Substation in Government Managed Forest Area Ramauli Substation in Private Cultivable Land
Area of Substation	Nijgadh Substation- 7.9714 ha Ramauli Substation - 5.3412ha
Voltage Level	Nijgadh - 400/132/33 kV Ramauli - 400/132/33/11 kV Pokhariya – 400/220/132/33/11 kV
Power transformer	400/132 kV- 315 MVA, 132/33kV -63MVA (Nijgadh and Ramauli SS), 132/11kV -30 MVA (Ramauli SS) 400/220kV – 315 MVA, 220/132 kV – 315 MVA (Pokhariya SS)
No. of Bays	400kV bay- 31 nos., 220 kV bay -8 nos., 132 kV bay-28 nos., 33kV bay -22 nos., 11kV bays -12 nos.
Ancillary facilities	Control room, Staff quarter, Store room, Firefighting pump house, Guard house, underground water tank, internal access road
Galvanised Steel Earth wire	
X-sectional area	73.65 mm^2
Stranding and wire nominal diameter	7/3.66 mm
Overall diameter	10.98 mm
Cable weight	Approx. 583 kg/km
Minimum breaking load	6972 Kg or 68.4 KN.
Modulus of elasticity	1.933 x 106 Kg/cm^2
Coefficient of linear expansion	11.50 x 10-6 per ^0C.
D.C. resistance at 20^0C	2.51 ohms/km
Conductor wire	
Conductor	ACSR "MOOSE" 54/3.53 mm Aluminum + 7/3.53 mm steel
Total conductor sectional area	597.00 mm2
Overall diameter	31.77 mm
Ultimate Tensile strength	161.20 kN
Conductor diameter	23.45 mm
Modulus of elasticity	0.703 x 10^6 kg/cm^2
Coefficient of linear expansion	19.35 x 10^{-6}per ^oC
Biological Environment	
Impacted Forest Area (ha)	61.214 ha (including 11.131 ha of water bodies and flood plain)
Impacted Forest	Government Managed Forest, Jangalsaiya Collaborative Forest, Pashupati Community Forest and Anjuman Community Forest
Number of trees to be felled	14,795
Social and Economic Environment	
Project affected local level	11
Project Affected Families	199 (Tower and Substation only)
Surveyed Households	173
Project Cost	NRs. 16.5 Arab

Source: Field visit and Feasibility study of Nijgadh-Pokhariya 400 kV TLP, 2081

2.2 Accessibility

The starting point (Nijgadh Substation) of the proposed project is situated about 5 km east of the Nijgadh Bazzar along the East-West Highway. The Nijgadh Substation is adjacent to the East-West highway in north direction. The end point (Pokhariya Substation) of the proposed project is located about 15.5 km west Tribhuvan Rajpath along the Nepal Eastern canal of Gandak Barrage. The NPTLP crosses East-West Highway (Nijgadh Substation – AP1), Dhansar-Jangalsaiya Road (AP8-AP9), Nijgadh-Kohalbi Road (AP15-AP16), Piluwa-Kalaiya Road (AP38-AP39), Tribhuvan Rajpath (AP48-AP49), Birgunj-Jagarnathpur Road (AP73-AP73) and a numbers of village road at various locations. The nearest Simra Airport is about 6.43 km away from this project area (AP46) and the proposed Nijgadh Airport is about 4.34 km away from the proposed route alignment. Most parts of the project are accessible by village roads.

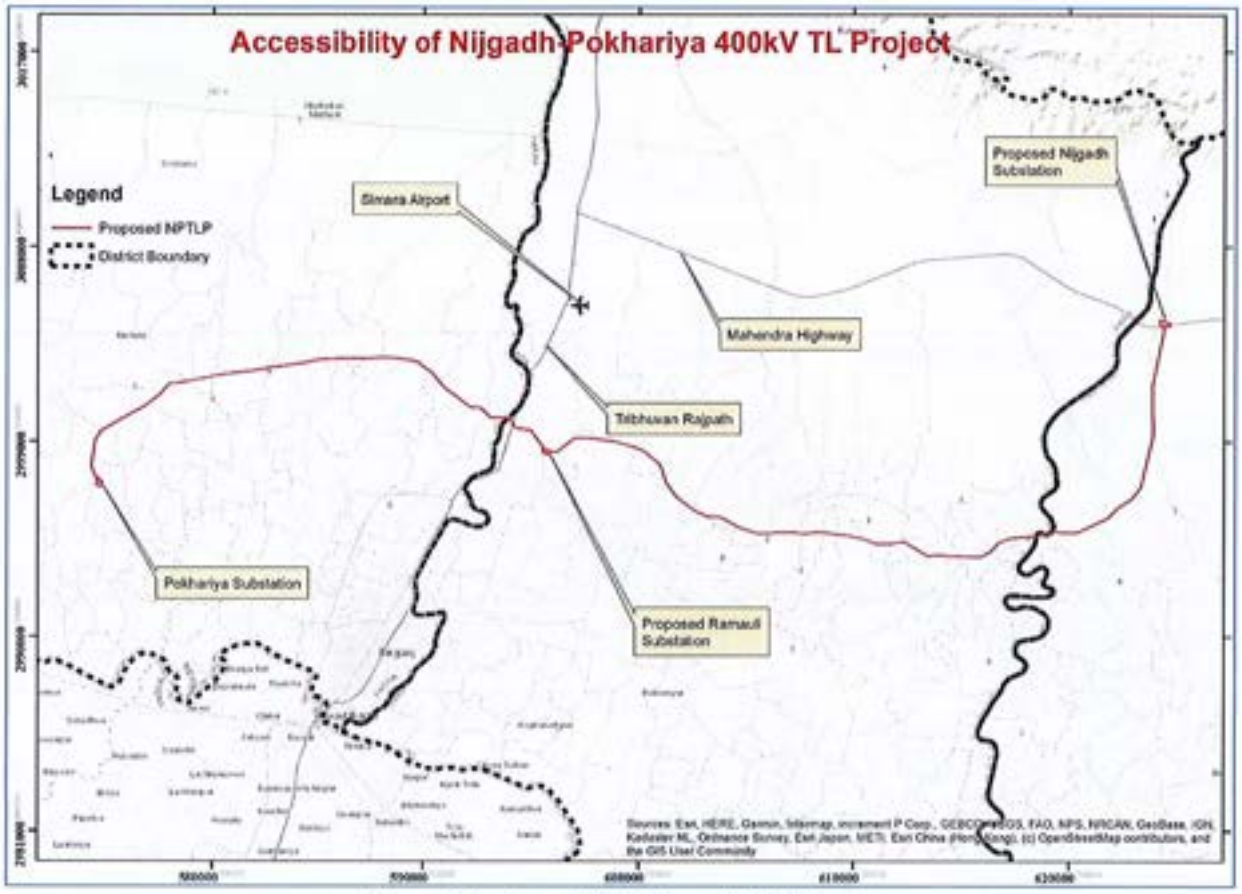


Figure 2-1: Accessibility Map of the Project

2.3 Project Components

2.3.1 Substation

The project consists of the construction of 400/132/33kV substation at Nijgadh and 400/132/33/11kV substation Ramauli. The Nijgadh substation is located in Gujara Municipality Ward no. 2 and 3 of Rautahat District in adjacent to the Hetauda-Dhalkebar-Inaruwa 400kV Transmission Line. The layout map of the Nijgadh Substation is given in Appendix B-III.

The Ramauli substation is located in Jitpur-Simara SMC Ward No. 8 of Bara District. The substation is located in private cultivable land. The layout given in Appendix B-III. The Pokhariya substation is located in the Ward no. 1 of Pokhariya Municipality of Parsa District. The substation is under construction. The details of the substation components is given in Table 2-2.

Table 2-2: Details of Substation components

Description	Nijgadh 400/132/33 kV	Ramauli 400/132/33 kV	Pohariya 400/220/132/33/11 kV
400 kV Bays (Nos.)	12	9	10
220 kV Bays (Nos.)			8
132 kV Bays (Nos.)	11	15	2
33 kV Bays (Nos.)	10	12	
11 kV Bays (Nos.)		12	
400/220 kV Transformer (MVA)			3x315
400/132 kV Transformer (MVA)	3x315	3x315	
220/132 kV Transformer (MVA)			2x315
132/33 kV Transformer (MVA)	2x63	2x63	
132/11 kV Transformer (MVA)		2x30	
400 kV Reactor (MVAr)	1x80		1x50

2.3.2 Transmission Line and Towers

The 400kV double circuit TL starts from proposed Nijgadh substation and terminates at Pokhariya substation. The length of TL is about 64.604 km long of ACSR-MOOSE conductor. There will be double circuit towers configuration for the TL. A total of 85 APs and 100 STs will be constructed for this project. Typical tower layout is shown in Appendix B-IV.

2.4 Construction Planning

2.4.1 Preliminary Works

Preliminary works for the proposed TL consist of contract award, the detail design study and mobilization of the contractors. During the route survey, spotting of the tower locations, preparation of longitudinal profiles, geological field test and laboratory testing, tower design etc. will be re-verified. To achieve effective tower footing, earth resistance will also be measured at each tower site.

2.4.2 Land Acquisition and Tree Clearance

After the approval of IEE, the required land will be acquired by NEA as per Land Acquisition Act, 2034 in the coordination with Compensation Determination Committee (CDC). As well, approval to use forest land for Nijgadh substation, forest area under RoW, and felling of trees within RoW and substation will be obtained. Private trees within RoW will be felled for the tower foundation and the RoW in coordination with land owner.

2.4.3 Substation Construction

At first, civil works for ground leveling, boundary wall, control building, office cum staff quarter buildings, line bay foundation and others will be done. Transformers and equipment will be transported to the sites and installed.

2.4.4 Tower Foundation

The construction of tower foundation will be undertaken by manual labor assisted by the mechanical plant wherever possible. The mechanical plant will be limited to small demountable steel skid framed concrete mixers, air compressors, air drills/chisels and tamping/compaction tools. Excavation and the concreting of the tower foundations will be carried out as per the design requirements and after necessary curing the foundations will be backfilled with suitable material.

2.4.5 Erection of Tower

Tower parts manufactured in the factory will be transported to the individual tower locations and will be erected manually by employing pulleys, wenches, etc. into the tower foundations.

2.4.6 Insulator Fittings, Conductor and Ground Wire Stringing

The TL utilizes two types of towers: (i) angle towers/angle points (APs), where conductors are spliced with a loop across insulators which are approximately horizontal and (ii) suspension towers (STs), from which the conductors (wires) are connected to vertical-hanging insulators. Suspension towers are used for straight segments of the line, while APs are normally used for angles in the alignment.

Typically, there are several STs between APs. This allows for a continuous conductor to be installed across several STs between two APs. A series of pulleys are installed on the transmission towers in a working segment between tension towers. A guide rope or wire is passed from one end of the segment through the successive pulleys until the other end of the segment is reached. The guide rope installation requires traversing the RoW either manually or with a mechanical puller. The conductors are attached to one end of the guide rope, which is then pulled by a powered winch. After the conductors are pulled through the working segment, they are drawn mechanically to the design tension and then attached to the insulators. Drone can also be used for the installation of conductors.

2.5 Land Requirement

The project will permanently acquire about 23.099ha of land for foundation of towers and SS, whereas 285.548 ha of land will be restricted as RoW (excluding tower foundation). As the camp and storage area are proposed within the substation area, and 2.00ha additional land is required for these temporary facilities. The details of land requirement for NPTLP are presented in the Table 2-3.

Table 2-3: Land Requirement for NPTLP

Description	Forest (ha)				Private (ha)			Government (ha)		Canal	Road	Temporary	Restricted Land	Permanent	Total (ha)
	National	Collaborative	CF	Water Body	Cultivation	Barren	Pond	Cultivation	Barren						
Rautahat															
Area of AP	0.222	0.211	0.293	0	0.106									0.832	0.832
Area of ST	0.063	0.416	0.304	0	0.211									0.994	0.994
RoW Area	1.485	25.771	13.347	3.865	11.840					0.115	0.607		57.0302		57.030
Area of SS	7.971													7.9714	7.9714
Storage Area/Mobile Camp															0
Total	**9.741**	**26.398**	**13.944**	**3.865**	**12.156**	**0**	**0**	**0**	**0**	**0.115**	**0.607**	**0**	**57.030**	**9.7974**	**66.827**
Bara															
Area of AP				0	2.424	0	0.000	0.145	0.000	0.000	0.000			2.569	2.569
Area of ST				0	2.015	0	0.000	0.108	0.000	0.000	0.000			2.123	2.123
RoW Area				2.877	106.639	0.437	3.519	7.641	0.798	0.000	1.599		123.509		123.509
Area of SS					5.341									5.341	5.341
Storage Area/Mobile Camp					0.750	0.25						1.000			1.000
Total	**0**	**0**	**0**	**2.877**	**117.169**	**0.687**	**3.519**	**7.894**	**0.798**	**0.000**	**1.599**	**1.000**	**123.509**	**10.033**	**134.543**
Parsa															
Area of AP				0	1.637	0	0.000		0.000	0.000	0.000			1.637	1.637
Area of ST				0	1.631	0	0.000		0.000	0.000	0.000			1.631	1.631
RoW Area				4.388	91.250	1.104	4.011	1.808	0.497	0.745	1.205		105.008		105.008
Area of SS														0.000	0.000
Storage Area/Mobile Camp					0.750	0.25						1.000			1.000
Total	**0**	**0**	**0**	**4.388**	**95.268**	**1.354**	**4.011**	**1.808**	**0.497**	**0.745**	**1.205**	**1.000**	**105.008**	**3.268**	**109.276**
Grand Total	**9.741**	**26.398**	**13.944**	**11.131**	**224.594**	**2.041**	**7.530**	**9.701**	**1.295**	**0.860**	**3.411**	**2.000**	**285.549**	**23.099**	**310.647**
	61.214				**234.165**			**10.996**		**0.860**	**3.411**	**2.000**	**285.549**	**23.099**	**310.647**
Percentage, %	**19.72**				**75.36**			**3.54**		**0.28**	**1.1**	**0.64**	**92.01**	**7.35**	**100**

Source: GIS Analysis and Field Study 2080/81

***Note: Government cultivated land: the government land using by local people for cultivation (ailaani)under the ministry of Land Management Cooperatives and Poverty Alleviation*
Government barren land: under the ministry of Land Management Cooperatives and Poverty Alleviation
Ownership of Road: Ministry of Physical Infrastructure and Transport,
Canal: Ministry of Energy, Water resources and Irrigation,
River, water bodies, land covered by sand: Ministry of Forest and Environment.

2.7 Camp and Storage Site

The contractors are responsible for the construction of camps for its work force. It is envisaged that a camp site is required for the proposed project of 64.604 km. There will be a permanent camp in Nijgadh, Ramauli and Pokhariya substation and 8 number of temporary camps near the RoW of the TL during the construction period. About 2.0 ha land will be temporary used for camp and storage site.

2.8 Spoil Dumping Site

Since the construction of TL requires clearing and excavation of fairly small areas at tower locations, construction work will not require spoil dumping sites. The spoil will be filled up and compacted in the foundation area. Similarly, spoil generated from the substation construction will be used to the same location compacting and filling in grading. Total estimated volume of spoil to be generated from the foundation of tower considering the bulking factor of 1.2 (as per the soil type of project site) is 7200m^3. Total estimated volume of backfill considering the compaction factor of 0.8 (as per the soil type of project site) is 5760m^3. The net volume of soil to be disposed is 1440m^3. The soil to be disposed will be disposed in substation site as the backfill is required in substation site. Total estimated volume of spoil to be generated from substation considering the bulking factor of 1.2 (as per the soil type of project site) is 3600m^3. Total estimated volume of backfill considering the compaction factor of 0.8 (as per the soil type of project site is 2880 m^3. No disposal of soil is required in substation.

2.9 Construction Power

The existing 11kV/33kV feeder line will be used for the purpose of power needed for construction of substation. In case of unavailability of feeder line, diesel generator will be used for construction power.

2.10 Construction Materials

The main materials required for construction works related with the TL and substation will be cement, sand and aggregates; Steel reinforcement. Steel reinforcing bars and cement can be acquired from local manufacturers or can also be imported. Kalaiya, Jitpur and Birgunj are the nearest market from project site. Coarse and fine aggregates will be purchased from nearby market, the excavated foundation material can be used as a backfill material required for the foundation construction. The approximate quantity of construction material required for the proposed project is given in Table 2-4.

Table 2-4: Requirement of Construction Material

SN	Description	Unit	Nijghadh SS	Nijghadh Ramauli TL	Ramauli SS	Ramauli Pokhariya TL	Pokhariya SS	Total Quantity
1	Total Concrete	m^3	7,600.00	10,660.00	7,920.00	7,185.42	6,866.10	40,232
2	Total Reinforcement Steel Quantity	MT	563.00	889.00	595.00	599.23	495.86	3,142
3	Total Cement quantity	MT	3,025.00	4,242.00	3,152.00	2,860.00	2,732.00	16,011
4	Total Sand quantity	m^3	3,151.00	4,419.00	3,283.00	2,979.00	2,846.00	16,678
5	Total Aggregate quantity	m^3	6,301.00	8,838.00	6,566.00	5,957.00	5,693.00	33,355
6	Total Admixture quantity	ltrs	10,640.00	14,924.00	11,088.00	10,059.59	9,612.53	56,324
7	Steel Structure for Tower	MT	750.00	8,295.00	750.00	5,591.28	458.40	15,845
8	Total Conductor length		25.00	985.00	25.00	682.44	13.00	1,720

Source: Feasibility study of Nijgadh-Pokhariya 400 kV TLP, 2081

2.11 Requirement of Workforce

During the construction period of the project, altogether approximately 654 persons will be employed including 250 unskilled, 370 semi-skilled and 34 skilled human resources. And about 69 persons will be required during operation phase. Most of the unskilled manpower will be hired locally as per required skill and experiences. Semi-skilled and skilled manpower will be managed by Contractor and Employer (NEA). A list of human resources required to the project for the project construction and operation are given in Table 2-5.

Table 2-5: Workforce Required

Qualification	Expertise	No.	Availability in local area	Man-Months
Construction Phase				
Skilled	Electrical Engineer	6		216
	Civil Engineer	6		216
	Electrical Supervisor	10		360
	Civil Supervisor	10		360
	Others (surveyor)	2		72
Semi-skilled	Foreman	30		1080
	Fitter	90		3240
	Mason	90	Few people	3240
	Others	160		5760
Unskilled	Labor/Porter	250	Few people	9000
Total		**654**		
Operation Phase				
Electrical Engineer		6		Throughout the project operation period
Supervisor for TL		6		
Supervisor for Substation (1 for each shift)		12		
Foremen/Electrician for TL		16		
Foremen/Electrician for Substation (2 for each shift)		24		
Helper		5		
Total		**69**		

Source: Feasibility study of Nijgadh-Pokhariya 400 kV TLP, 2081

2.12 Project Schedule (Construction and Operation)

The estimated completion period of the project is 36 months which includes 12 months pre construction phase and 24 months construction and commissioning phase. The construction work will be carried out throughout the year; however, preference will be given during the month October to May when ground conditions are essentially conducive to allow easy movement of construction materials. The construction schedule of the project is given in the Table 2-6.

Table 2-6: Construction Schedule of NPTLP

	SN	Activity	Duration (month)	Time period in month (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36)
Substation	**1**	**Survey, soil investigation and Design works**	9	
	1.1	Design of Civil work and Approval	8	
	1.2	Design of Electrical work and approval	8	
	2	**Purchase and Shipping**	10	
	2.1	Equipment documents approval and order	3	
	2.2	Outdoor equipment manufacture and transportation to site	7	
	2.3	Switchgear and control panel manufacture and transportation to site	6	
	2.4	Cable manufacture and transportation to site	5	
	2.5	Other equipment manufacture and transportation to site	4	
	3	**Construction**	18	
	3.1	civil works	18	
	3.2	Outdoor equipment installation	7	
	3.3	Switchgear and control system installation	8	
	3.4	Other equipment	6	
	3.4	Cable Laying and terminations	5	
	3.6	Testing and commissioning	3	
Transmission Line	1	Survey, soil investigation and Design work	6	
	2	Manufacture and Transportation	10	
	3	Foundation works	10	
	4	Tower assembly and Erection works	12	
	5	Stringing works	7	
	6	Connection works to the substations	2	
	7	Testing and commissioning	4	

Source: *Feasibility study of Nijgadh-Pokhariya 400 kV TLP*

3 Study Methodology

For the preparation of this IEE report, different methods and methodologies were adopted. The methodology was mainly guided by the EPA-2076, EPR-2077 and National EIA Guidelines, 2050. Literature review, transect-walk survey, quadrat sampling, public consultation, household survey, public hearing, Geographic Information System (GIS) analysis were some important tools/methods used for data collection and analysis. The different methodologies adopted are discussed in the following sub-sections;

3.1 Desk Study and Literature Review

Prior to the mobilization to the project area, desk study of the proposed project was carried out by reviewing survey report of proposed project prepared by NEA. The desk study consisted of review of relevant literature and Legislation.

3.1.1 Physical Environment

While carrying out the IEE, literature review on topographic maps, land use maps, the then Central Bureau of Statistics (CBS) publications and project survey report was done. Information on climate (temperature, rainfall, and relative humidity, etc.) was obtained from Department of Hydrology and Meteorology (DHM) and district profile. Similarly, data on geology, hydrology and sedimentation was obtained from project feasibility study report and geological map of Nepal. Data on air quality was obtained from literature review.

Table 3-1: Topographic Maps of Project Area

SN	Name of Topographic Sheet	Sheet No.	Scale
1.	BARIYARPUR	268501A	1:25,000
2.	SIMRAUNGAD	268501B	1:25,000
3.	BHISWA	278415D	1:25,000
4.	SHRIPUR PACHGAWA	278416A	1:25,000
5.	SIMARA	278416B	1:25,000
6.	BINDABASINI	278416C	1:25,000
7.	BIRGANJ	278416D	1:25,000
8.	HATTISAR	2785813A	1:25,000
9.	NUGADH	278513B	1:25,000
10.	KALAIYA	278513C	1:25,000
11.	KOLBI	278513D	1:25,000

3.1.2 Biological Environment

District level data on forests, species and the management regime, and identification of wildlife and birds was initially be gathered from Division Forest Profiles of Rautahat and Bara and other literatures. The literatures published by the Ministry of Forests and Environment (MoFE) was collected and reviewed for the data on forest and wildlife.

3.1.3 Socio-economic and Cultural Environment

On socio-economic and cultural environment, district, municipality level demographic data, data published by National Statistical Office (NSO) and other related information was collected through literature review. Household survey of 173 HHs out of 199 directly affected HHs was conducted and the profile of the surveyed HHs was prepared using MS excel/SPPS software. The remaining 26 HHs were missing and could not be contacted during the survey.

3.2 Delineation of Project Impact Area

For the IEE of the proposed project, the project area is defined as the area for the construction of TL and two substations as well as the area that will be impacted due to the construction and operation of the project. Gujara and Fatuwa Bijayapur municipalities of Rautahat district, Kolhabi Municipality, Karaiyamai Municipality, Kalaiya SMC and Jitpur Simara SMC of Bara district and Birgunj MC, Parsagadhi Municipality, Sakhuwa Prasauni RM, Jagarnathpur RM and Pokhariya Municipality of Parsa District can be delineated as the project impact area. The project impact area that has been considered during IEE has been defined as follows:

3.2.1 Direct Impact Area (DIA)

The impact area delineation will be based on the Safety Measures Regarding Electric Devices as guided by Chapter 5 of the Electricity Rules, 2050 (1993). Rule 50 and Schedule-13 of the Rule, 2050 defines the minimum distance to be maintained on either side of the electric wire, which in fact defines the RoW for TL. This RoW delineated on alignment of detailed survey will be referred as the Direct Impact Area (DIA) for IEE. In addition, The National EIA Guidelines, 1993 defines the direct impact as a direct alteration in the existing environmental conditions as consequences of project activity. So, the DIA includes all the components of the NPTLP which mainly consists of 46m RoW for 400kV TL. In addition, the DIA also includes the area of a substation. Thus, the settlement area, forests or other vegetation and places having built up infrastructures or facilities that fall within the RoW constitute the 'Direct Impact Area' of the project. On the basis of spatial coverage this area is also termed as High Impact Area.

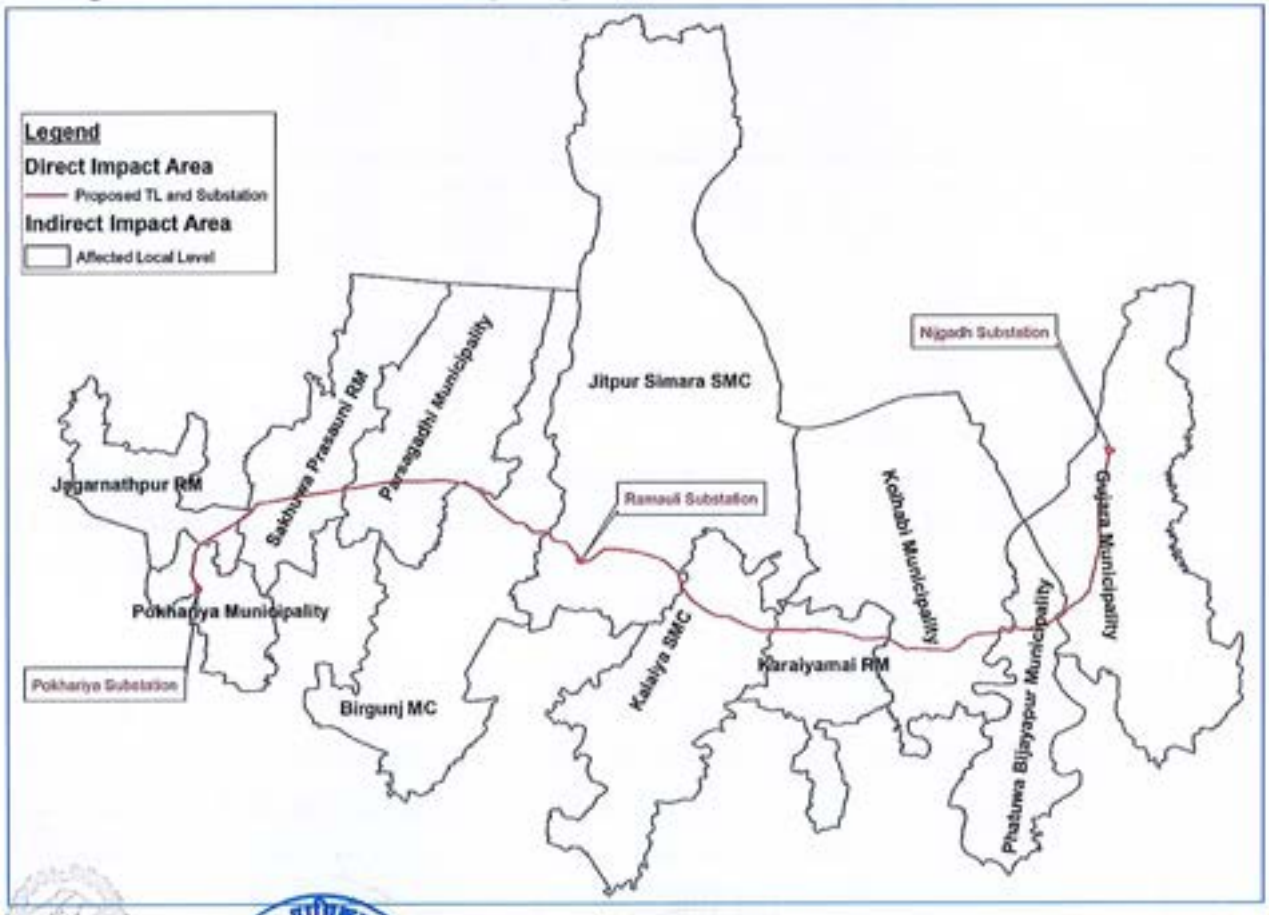


Figure 3-1: DIA and IIA of the proposed Transmission Line

3.2.2 Indirect Impact Area (IIA)

This consists of the surrounding area. Any built-up community infrastructures and facilities, forests, surrounding the DIA has been studied in this impact area. This area is also termed as Indirect Impact Area.

3.3 Data Collection

Study team members visited the field to collect baseline information on physical, biological, and socio-economic and cultural environment. During field visit, every environmental aspect of the project affected area was recorded.

3.3.1 Physical Environment

The methodology incorporated under this heading include:

- Sound level measurement by Sound Level Meter (SL-4023SD) in proposed Ramauli substation on 2024/05/12 for 24 hours.
- The PM10, PM2.5 TSP, NO_2 and SO_2 at Ramauli Substation is measured on 2024/05/11 (9:30) and near AP44 on 2024/05/12 (3:00) for 24 hours. The sample analysis was don at Soil, Water and Air Testing Laboratories, Pvt. Ltd., Kathmandu (Appendix C)
- Analysis of water quality of Lal-Bakaiya River was done on 2081/01/06. The water samples were tested on Hetauda Water Supply Management Board Laboratories (Appendix C).
- Field observation using checklist for data on land use, topography, drainage, watershed, etc.
- GPS to locate project components and infrastructure (settlement, river/stream, road, etc.);
- GIS Analysis; and
- Photographs of the project area.

The methods that were used to collect the baseline information on the physical environment for IEE is mentioned in Table 3-2.

Table 3-2: Methods for Collection of Data related to Physical Environment

SN	Component	Required Data	Methods for Data Collection	Location
1.	Air Quality	PM10, PM2.5, TSP, SO_2, NO_2	• Site measurement by instrument using cyclonic flow technique and oxides of nitrogen, IS 5182 • Secondary sources	• Ramauli substation (27°6'1.44" E, 84°57'39.6"N) • Near AP44 ((27°6'14.76" E, 84°59'45.6" N)
2	Noise level	Noise Level	• On site measurement using (Digital Sound Level Meter with SL-4023SD)	• Ramauli Substation and Pokhariya Substation
3.	Water Quality	Turbidity, pH, TDS, Temperature, EC, Iron, Arsenic, Nitrate, Ammonia, Fluoride, Calcium, *E. coli*, Total coliform	• Sample collection from site and lab test • Secondary source if available	• Lal Bakaiya River between AP10 and AP11 • Sirsiya river
4.	Geological data	Geology and geomorphology	• Literature Review	Along the project component
5.	Spoil volumes	Spoil type, volume and disposal	• Consultation with project • Feasibility report	Substation and tower foundations

SN	Component	Required Data	Methods for Data Collection	Location
6.	Crossing	TL crossing with house, river, road and other physical structure	• Survey report and site verification • Feasibility report and site verification • Google earth	• Along the TL alignment • Substation
7.	Air Traffic	Airway Path, Height limitation of towers	• Consultation with Civil Aviation Authority Nepal (CAAN)	• Along the TL alignment • Substation

3.3.2 Biological Environment

The methodology incorporated under this heading include measurement of vegetation/forest resource and identification of fauna in the project area of NPTLP. The detail of the methodology is discussed in following sections and summary is given in Table 3-4.

Vegetation and Forest Resources

The route alignment and substation boundary of the project was spotted on the site with the help of GPS using the line alignment of the project. The study team including Sub-division forest office staffs and local people walked along the proposed alignment to identify the affected forests. The boundary point between two forests was marked with the GPS. The number and management type of the forest was noted down and the impacted forest area was estimated on ArcGIS. The RoW of 46 m and the substation boundary were considered for this analysis. Vegetation in the impacted forest area was surveyed with quadrat sampling methods.

Nijgadh Substation

20mx25m grid was generated in the Nijgadh substation area using fishnet tool of the ArcGIS 10.2.2. A total of 222 such grids (all the grids touching the boundary line are included) were generated in the area. Taking 222 grids as a population unit of the area, 11 grids were selected using random number generator tool for this sample survey.

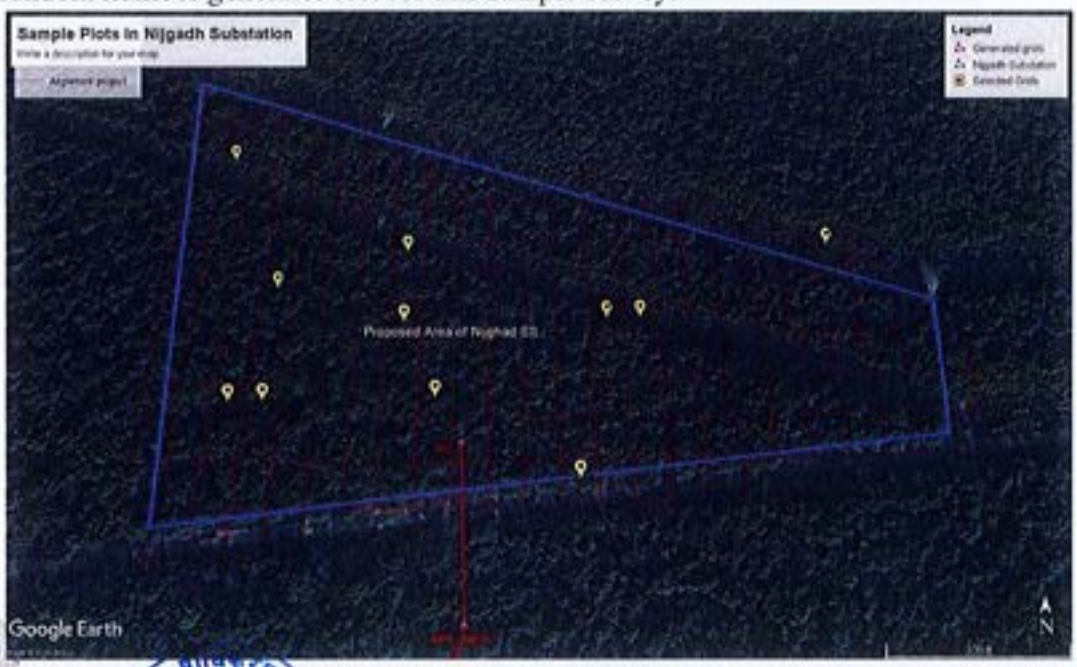


Figure 3-2: Sample plots in Nijgadh substation (Google Map)

Forest in RoW of the TL

About 8.5km of the TL alignment lies in the forest area in Rautahat District. Following the same methods used in Nijgadh substation, 20m x 25m grid was generated in the RoW using fishnet tool of the ArcGIS 10.2.2. A total of 1,178 such grids (all the grids touching the 23m buffer line are included) were generated in the area. Taking 1,178 grids as a population unit of the area, 35 grids were selected using random number generator tool for this sample survey.

Altogether, 46 sample plots (of size 500m^2 each for tree) were selected for sample plot survey. This represents 4.67 % of total forest area (2.300ha out of 49.193ha) impacted by the project. The ground vegetation and any new species of tree sighted outside the sample plot were also noted. Based on this information, loss of regeneration (saplings and seedlings), loss of vegetation (pole and tree class), species wise standing wood volume and biomass is calculated.

Table 3-3: Detail of Sample Plot Design

S.N.	Type	Plot Radius (m)	Area (m^2)	DBH limit (cm)
1	Seedling	1.78	10	<4
2	Sapling	2.82	25	4-10
3	Pole	5.64	100	10-30
4	Tree	12.61	500	>30

Picture 3-1: Forest Survey

For private trees (including fruit, fodder and other trees), Total enumeration was carried out. The following table summarizes different methods used to collect baseline information on the biological environment.

- **Bird Survey**

The field study was carried out in the early summer season (17-23 March 2024). This time is the beginning of breeding season of many birds. During this time birds mostly singing their song, active on pairing and nest building which helps for the easy detection.

Picture 3-2: Bird Expert carrying out field study

Vantage Point Count

Vantage point count method was applied to know the bird diversity and abundance along the proposed transmission line project area. Each vantage point was plotted at a distance of 2 km interval. Minimum of 30 minutes was spent at these vantage points to carry out survey of birds. Additionally, 1 km buffer zone from each vantage point was also explored for checking either there is vulture and other large bird nesting or not.

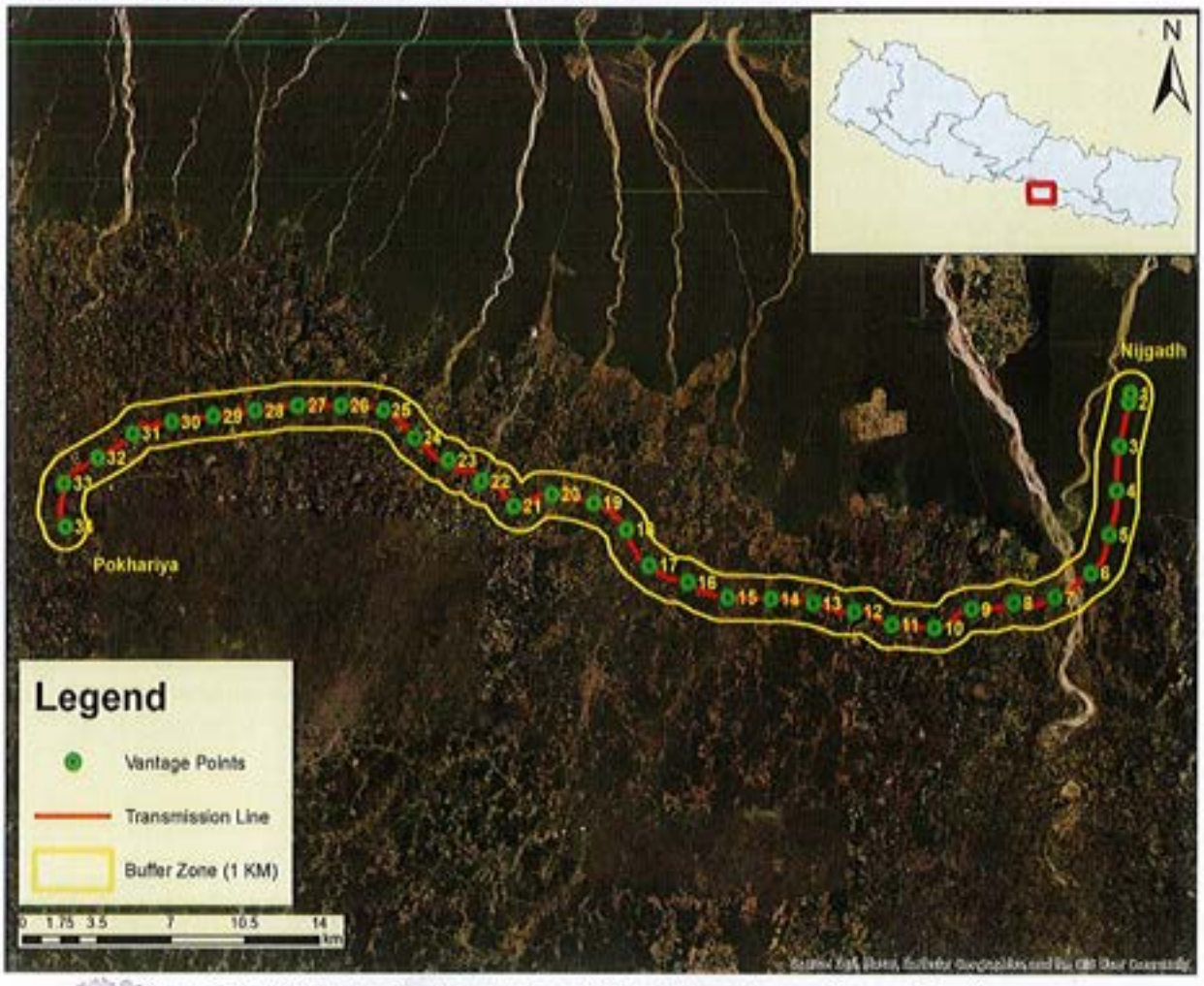


Figure 3-3: Map showing the proposed TL with vantage points and buffer area

Mackinnon's Listing of Birds

Mackinnon's species richness counting method was carried out to know the species richness, abundance and distribution in the whole transmission line project site. This also covered the bird species encountered beyond the vantage points. Each new encountered (seen and heard) bird species was recorded until a list of 20 species. Subsequent lists with 20 bird species in each was prepared. During the survey, much care was taken not to repeat the same species in the same list, but to list the species in subsequent lists. A final running species total obtained by extracting the number of species in list 2 that were not in list 1 and so on throughout all the lists recorded for that area. By plotting the cumulative total of species detected against the number of lists, species richness curve produced, that is a measure of species diversity.

Transect Walk Survey

Transect walk survey (Line Transect) was also carried out for about 9 km in between Nijgadh Substation to AP 9 for the detail study of birds and their habitat as the transmission line passes inside the important forest habitat and river crossing. Line transect survey will be carried out in the substations area also as the construction may affect in the larger area.

Vulture and Storks Nest Searching

Exploratory nest search and monitoring within the buffer zone area of transmission line was also carried out for vultures and storks. Local people consultation in the project site. Nesting status, nesting tree species and nesting height as well tree height and distance from transmission line was recorded.

- **Wildlife Survey**

For Wildlife survey following methodologies were adopted:

- Transect survey;
- Key Informant surveys with Divisional Forest Offices,
- Focus Group Discussion with Community Forest User Groups and other stakeholders

Picture 3-3: Consultation with Forest Stakeholders

Table 3-4: Methods for Collection of Data related to Biological Environment

SN	Component	Required Data	Methods for Data Collection
1.	Forest	• Forest type and Management at district and PAA level • Tree/vegetation loss • Impacted forest area	• Review of division forest offices profile of Bara, Parsa and Rautahat District. • Review of DFRS forest survey report. • Laying of plots of size 25mx20m in forest area and quadrat sampling of forest area. • KI and FGD.
2	Terrestrial Flora	• List of major plant species	• Transect Walk Survey. • FGD/KII
3.	Terrestrial Fauna	• Diversity of Wildlife • Diversity of Birds • Migratory birds and it's route • Availability of Conservation Significance Species	• Literature Review • Vantage Point Count and Mackinnon's Listing of Birds. • Transect Walk Survey. • Wildlife Survey. • Photographs, Field Investigation/KII and Public Consultation
4.	Species Conservation Status	• Availability and status of rare, endangered, protected species of flora and fauna	• Verification of collected list of flora and fauna with GoN laws, IUCN red List and CITES Appendices.

3.3.3 Socio-economic and Cultural Environment

- **Identification of PAFs and SPAFs and Household Survey**

The owners of the land where towers and substations will be situated, were identified. These identified families were considered as Project Affected Families (PAFs). In addition, the families losing their residence and to be relocated anywhere else, irrespective of their land holding size and other off farm income, and the families losing more than 50% of land were categorized as Severely Project Affected Families (SPAFs). Census survey for all these PAFs/SPAFs was done. The details of the methodologies used for socio-economic data collection is given in Table 3-5.

- **Identification of settlements nearby project area**

The settlements and wards nearby the project area was identified and the views of the people of the area regarding the project was collected through consultation meetings and discussion with local people and local level representatives.

Picture 3-4: Discission held with People of Project Area

- **Market Survey**

Market survey was done at five places of MC/SMC/RM/Municipality to get the prevailing price of agricultural products including both cash crops and food crops, major construction materials and wage rate. It was done using market survey form prepared by the study experts.

- **Key Informant Interview (KII)**

Ten KII was carried out with social workers, businessmen, and teachers, representatives of political parties and intellectuals of the project affected areas. The main objective of KIIs was to assess their views, concerns and expectation from the project and collect relevant information of the project area.

Table 3-5: Methodologies used to collect socio-economic and cultural data

SN	Parameter	Literature Review	HH Survey	Market Survey	KII	Meeting/ Public Consultation
	Social Features					
1	Demography	√	√			
2.	Settlements				√	√
3	Ethnicity	√	√		√	
4	Language	√	√		√	
5	Religion	√	√		√	
6	Festivals	√	√		√	
7	Migration	√	√		√	√
8	Gender Aspect	√	√		√	√
9	Law and Order Situation	√			√	
10	Education and Literacy	√	√			√
11	Health and Sanitation	√	√			√
12	Road and Transportation	√				
13	Energy	√	√		√	
14	Communication and Other Facilities	√			√	
15	Development Initiative/Activities in the Project Area	√				√
16	Tourism activities	√				√
	Economic Features					
17	Local price information			√		
18	Economy	√			√	√
	Cultural Features					
19	Archeological, Historical and Religious Sites	√			√	
20	Aesthetic value				√	√
21	Attitude of the local people to the development of this project				√	√

- **Meetings/ Public Consultation**

All together twenty four stakeholder meetings were conducted with community forest officials and locals of nearby settlement areas while carrying out IEE. The purpose of the meeting/consultation was to inform them about the project, collect their concerns/expectations regarding the project such as project purpose, project type, impact area, likely impacts and potential opportunities due to project implementation and required information for the IEE. A total of 272 people participated. Female participation percentage in these meetings are very low. The details of stakeholders meeting is given in table below.

Table 3-6: Details of Public Meetings

SN	Location		No. of Participants			Date
	Municipality-Ward No.	Settlement	Male	Female	Total	
1	Karaiyamai-6, Bara	Sihorwa	11	2	13	2080/02/05
2	Karaiyamai-5 Baara	Dhodiya	12	0	12	208002/05
3	Kolhabi-1, Bara	Batauliya	10	0	10	2080/02/04
4	Kolhabi-11, Bara	Rampurwa	12	0	12	2080/02/04
5	Kalaiya-21, Bara	Bhodaha	12	0	12	2080/02/05
6	Kolhabi-1, Bara	Khaira	7	3	10	2080/02/03
7	Kalaiya-16, Bara	Majhauliya	13	0	13	2080/02/06
8	Jitpur Simara-12, Bara	Pipariya	13	0	13	2080/02/06
9	Jitpur Simara-20, Bara	Basdilwa	8	0	8	2080/02/06
10	Jagarnathpur-6, Parsa	Bahuwari	12	1	13	2080/02/09
11	Sakhuwa Prasauni-5, Parsa	Baluwa	13	0	13	2080/02/09
12	Pokhariya-2, Parsa	Lamariya	10	0	10	2080/02/09
13	Parsagadhi-8, Parsa	Harpur	13	0	13	2080/02/09
14	Parsagadhi-5, Parsa	Jhingna	14	0	14	2080/02/09
15	Sakhuwa Prasauni-2, Parsa	Sakhuni Jamuniya	11	0	11	2080/02/08
16	Birgunj-31, Parsa	Islampur	11	0	11	2080/02/08
17	Jitpur Simara-20, Bara	Basatpur	3	0	3	2080/02/07
18	Jitpur Simara-20, Bara	Basatpur	10	2	12	2080/02/07
19	Fatuwa Bijaypur-11, Rautahat	Rangi	10	0	10	2080/12/05
20	Jitpur Simara-8, Bara	Gamar Gaun	14	0	14	208012/06
21	Gujara-5, Rautahat (Jungle Shahiya Ban Members)	Laxmipur	13	0	13	2080/02/14
22	Nijgadh-9, Bara (Aadarsha Sadabahar Ban Members)	Hospital Road	11	0	11	2080/04/13
23	Fatuwa Biajypur-11, Rautahat (Shahid Manrup Mahato CF)	Bhaisahi	10	0	10	2080/04/14
24	Fatuwa Bijaypur-11, Rautahat (B.P. Puspalal CF)	Butuwa Tole	11	0	11	2080/04/12
		Total	**264**	**8**	**272**	

3.4 Data Analysis

3.4.1 Physical Environment

The collected data from the field visit was analyzed using different software like ArcGIS 10.7.1, AutoCAD, and Google Earth Pro by the study team in coordination with the project engineers and experts. Necessary maps and information thus generated were presented in the report. The beneficial and adverse impacts was predicted and appropriate mitigation measures propose to reduce the impacts.

3.4.2 Biological Environment

Proposed TL passes through forest area (Government managed forest, Community Forest and Collaborative Forest). All the forest data collected from the sample plot survey were analyzed. Information of flora and fauna (plants, mammals, reptiles, avifauna, herpeto-fauna, etc.) were collected and listed. Nationally protected species, CITES listed species and IUCN Red list was identified by cross checking the respective list of flora and fauna. In addition, nationally banned flora species for collection, felling, transportation and export was also be reviewed. "Birds of Nepal: An Official Checklist" published in 2022 by Department of National Parks and Wildlife Conservation and Bird Conservation Nepal were reviewed while preparing the list of bird species recorded in the project site.

3.4.3 Socio-economic and Cultural Environment

The field data from project affected RM/Municipalities/SMCs/MC was compiled edited and analyzed in Kathmandu using Microsoft office software like Word and Excel. The resulting tables and charts are presented in the appropriate section of the report.

3.5 Impacts Identification, Prediction and Evaluation

The main basis for the identification of the impacts was the baseline information collected from the field study. Simple checklists, questionnaires and expert judgment were used to identify the impact. The primary and secondary data was analyzed qualitatively and quantitatively.

The emphasis of the analysis was to establish relationships between environmental changes (issues and alternatives) with or without the proposed project. The differences detected by the analysis, field observation and circumstantial evidences form the basis for recommending and designing the environmental enhancement and mitigation measures, monitoring and evaluation schemes, and management plan.

The impact prediction was done using the GIS Maps, expert judgment and other field experimental methods. The impacts were predicted over a specified period and within defined area and to collect their views. The magnitude, extent and duration of the impacts was categorized according to the National EIA Guidelines, 1993 are given below:

Magnitude of Impact

- 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 of Impact

- Site Specific (S): The impact is limited within RoW and other project footprint 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 TL or AP then it is termed as local.
- Regional (R): If the impact of the work extends to entire district or further then it is termed regional.

Duration of Impact

- 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.

Table 3-7: Numerical Scale for Impact

Extent (E)	SS= Site Specific (10)	L= Local (20)	R= Regional (60)
Magnitude (M)	L= Low (10)	M= Medium (20)	H= High (60)
Duration (Du)	ST= Short Term (05)	MT= Medium Term (10)	LT= Long Term (20)

The number in the bracket refers to Impact value as per National EIA Guidelines, 1993. The sum of impact values provides a maximum of 140 and minimum of 25.

3.6 Public Involvement

For the preparation of IEE, a team of experts visited the project site for field investigation during the month of May 2023 and May, 2024 to collect the baseline information of the project area and identify the potential environmental impact areas and the pertinent issues. During the field visit, the team met the local stakeholders and discussed with some key persons. Meetings were mainly focused on issues likely to arise due to implementation of the project, existing environment of the project area and views/concerns of stakeholders. The details of the meeting are given in Appendix-I. The views, opinions, suggestions and information received from the participants were documented for incorporation in the IEE.

3.6.1 Public Hearing

Five public hearing programs were held in the project area as per the provision of EPR, 2077. List of Landowners were affixed in the nearby settlement of PAA, ward office and RM/Municipality/ SMC/MC Executive offices. Public notice regarding the public hearing was published in Bhojpuri Times daily newspaper on 2081/01/26. The notice of programs was also broadcasted through local FM radio station. Request letters for participation in the public hearing were sent to RM/Municipality/SMC/MC Offices as well as other concerned offices and receipt of the same were collected. The notices were displayed at district level offices, RM/Municipality office and at public places of the major settlement of project RMs/Municipality. Total 269 people are presented in public hearing programs. However, the public hearing program of Pokhariya-2, Lamariya Parsa could not be conducted formally as the participant refused to provide their suggestions and so the attendance of this program is not counted in the mentioned numbers. The locals of this area including the PAFs were highly negative towards the TL project because of negative impacts it carries basically on their private land. It has come to understand that they wanted the TL to shift through another route to fully avoid the adverse impact in their village. So, it seemed to be a pre-planned and organized refusal to public hearing program at this venue. The most common issue raised by the participants of the program was about the impact on private land and its compensation provision for land owners followed by safety issues to nearby settlement area. Video record was made for the entire program and written concerns of the participants were also collected. Detail of the public hearing program is mentioned in Appendix G.

3.6.2 Public Deeds and Recommendation Letter

As per EPR 2077, a seven days public notice was published first by the project and attested in the concerned RM/Municipalities, district level line agencies and other local stakeholders. After that, which same particulars, seven days' notice was published in Bhojpuri Times Daily Newspaper on 2081/02/09 (Appendix H). The notice consisted of statement regarding brief project information and request to provide comments and suggestions within seven days to the project office or ESSD. A team was mobilized in the field with copy of public notice along with cover letters to the concerned RM/Municipalities, district level line agencies and other local stakeholders. Similarly, recommendation letters and consent letters were collected from the affected RMs/Municipalities/ SMCs/MC, community forest committee and other concerned offices. (Appendix I).

By the time the report was presented to the DoED, recommendation letters from three local levels: Pokhariya Municipality, Fatuwa Bijayapur Municipality, and Kalaiya SMC, had not been collected. In response to the project's request, the DoED sent a letter on 2081/11/23 to these local levels asking for the recommendation letters for the IEE study, as per the EPR 2077 (Appendix I). During this period, only Pokhariya Municipality provided the required recommendation letter (Appendix I).

3.7 Study Team

A group of experts from the NEA-ESSD was involved in the IEE of the proposed 400kV TL Project. In addition, some experts were also outsourced for completing the assessment. The following table provides the details of the experts involved in the IEE. The declaration of the IEE team is included in Appendix.

Table 3-8: IEE Team Members

SN	Name	Expertise/ Position	Responsibility	Years of experience	Remarks
1	Achyut Dawadi	Economist	Coordinator	18	NEA-ESSD
2	Prakash Gaudel	Environmentalist	Team Leader / Biological part/ overall report	13	
3	Shailaza Gyawali	Sociologist	Socio-economic Part	13	
4	Krishna Prasad Joshi	Statistician	Data analysis and Social-Economic part	13	
5	Binod Pyakurel	Environmentalist	Biological part/ overall report	5	
6	Kamal Hari Dulal	Civil Engineer	Physical part	2	
7	Jagadish Budhathoki	Economist	Socio-economic Part/overall report	1.5	
8	Krishna Bhusal	Bird Expert	Bird Survey report	15	Outsourced
9	Jeevan Rai	Wildlife Expert	Wildlife survey report	10	

Picture 3-5: IEE Team Members at proposed Ramauli Substation area

4 Review of Project Related Policies and Legal Provisions

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 following 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.

Table 4-1: Project Related Policies, Acts and Legal Provisions

The Constitution of Nepal	In the Article 30 of Part 3 of the Constitution of Nepal states about the Right to Clean Environment: According to this article all citizens shall have the right to live in clean environment, and in case if there is injury caused from environmental pollution or degradation, the victim has the right to obtain compensation. In the same way, Section 51(g) explains Policies relating to Protection, Promotion and use of Natural resources
Plan and Policy	
Sixteenth Five Year Plan (2076/77-2080/81 BS)	This plan aims to achieve average economic growth of 7.3% during the plan period along with achieving the sustainable development goal in 2087 BS, Nepal is aiming to upgrade to a middle-income country. As per this plan, by the year 2100 BS, the electricity production will be 40,000 MW, 100% of households will have access to electricity, and the per capita electricity consumption will be 3,500 kilowatt hours. At the end of this plan period (FY 2085/86) the power generation of the country is targeted to be 11,679 MW and per capita electricity consumption goal is set to be 3500 kWh. In order to increase energy efficiency, a strategy has been taken to make the distribution system effective and reliable and to increase the consumption by increasing the access to electricity
National Environment Policy, 2076	Main objective are pollution control, solid waste management and greenery enhancement in order to secure the right to live in clean and healthy environment.
National Climate Change Policy, 2076	The aim of this policy is to develop climate progressive society and national socio-economic development.
National Forest Policy, 2075	The policy aims to manage forest resources sustainably, manage biodiversity, increase productivity and overall production from forests.
National land Policy, 2075	The policy aims to bring the economic prosperity of the country with land distribution to marginalize people, the maximum utilization and good governance of the land.
National Policy for Disaster Risk Reduction, 2075	The policy aims to reduce disaster mortality and number of affected people substantially, increase resiliency by reducing disaster damage to means of livelihoods as well as critical infrastructures and disruption of basic services such as agriculture, industry, roads, communication, water supply and sanitation, education and health facilities, and reduce direct disaster economic loss.
National Energy Crisis Reduction and Development Decades, 2072 Concept Paper	The then MoEn has declared 2016-2026 as the National Energy Crisis Reduction and Electricity Development Decade (Energy Emergency Decade). The objective of this policy is to substantially end the power outage within the next one year, completely end power outage (even in the dry season) within the next two years, and to ensure energy security within the next decade.

Water Induced Disaster Management Policy, 2072	The policy has taken a vision to reduce the human-life, physical and economic losses caused by water-induced disasters in the country through appropriate technology.
Landuse Policy, 2015	The objectives of the Landuse Policy 2072 are following: • To categorize entire lands of the country into various Land Use Zones; • To devise of level wise (Federal, Provincial and Local) Land Use Plans; • To ensure of the use of Land and Land Resources on the basis of land use plans for protection of agricultural land, hygienic, beautiful, well-facilitated settlement and sustainable urbanization, and for forests areas including natural heritages, biodiversity and historical, cultural and religious, archaeological and areas of strategic importance; • To mitigate natural and human created-disastrous hazards; • To assess and apply minimum property valuation and progressive tax system on lands on the basis of specific use after getting prepared of plot-based records.
National Employment Policy, 2071	Government of Nepal has endorsed National Employment Policy, 2071. The long-term vision of the National Employment Policy is to make the national economy strong and dynamic by contributing to the productive, dignified and secure employment through competent labor market by making the available labor force competitive in Nepal.
Land Acquisition, Resettlement and Rehabilitation Policy for Infrastructure Development, 2071	The Policy has following guiding principles: • Appropriate and adequate compensation for loss of assets or income is a fundamental right of all project affected persons. Physically displaced people must be relocated with basic amenities and other facilities. • All affected persons should be assisted to restore at least their pre-project income and livelihood sources. • The absence of legal title to land should not be a bar for compensation, resettlement and rehabilitation assistance. • Vulnerable groups are entitled to special benefit and assistance packages in addition to compensation and resettlement.
Acts	
Environment Protection Act, 2076	Section 3 of the Act requires proponent to conduct Environmental Study: Brief Environmental Study, Initial Environmental Examination or Environmental Impact Assessment. Section 4 highlights the detailed need of alternative analysis. Section 5 and 6 relates to scoping and ToR as well as its quality. Section 8 and 9 highlights the provision related to approval of environmental study reports and prohibition of implementation of the project without approval of the reports. Strategic environmental assessment, Environmental Management Plan and Supplementary EIA are focused in Section 9-11. In terms of pollution control, Section 15-20 highlights the provisions related to pollution control, import and management of hazardous chemicals, establishment of laboratory, sample collection, pollution control certification.
Land Use Act, 2076	The Land Use Act, 2076 has come into force in Nepal. As per the act, land has been classified into 10 categories: agricultural; residential; commercial; industrial; mining and mineral; forest; river, stream, pond and wetland; public use; cultural and archaeological; and others.

Forest Act, 2076	Section 42 of the Act empowers the government to permit the use of any part of the national forest for national pride projects, the implementation of a plan or project of national priority, and projects approved by the Investment Board Nepal, if there is no other alternative to forest land and if the environmental assessment conducted as per prevailing Act shows that the use of such forest would not lead to significant adverse impact on the environment. As per Section 42(2), the project needs to make available the equivalent amount of land to the government for forest development. Such lands should be in similar ecological and geographical areas and near the impacted national forest as far as possible. If the project is not able to buy lands, it could deposit the money needed to buy such land in the Forest Development Fund established as per Section 45 of the Act. Section 42 (5) requires the project developers to pay the expenses needed to reforest and maintain reforested area for five years.
Land Related Act (8th Amendment), 2076	Section 7 of the Act provides special provision for exemption of land ceiling. Section 18 of the act has provision related to providing land to landless people.
Right to Employment Act, 2075	Section 2 of this Act has the provision related to the employment right, right to choose employment, right to unemployment assistance, no discrimination and not to be removed from employment. Section 3 has the provision of employment service center. Similarly, Section 4 and 5 has the provision of director committee and the unemployment assistance respectively.
Labour Act, 2074	Section 4 prohibited to engage non-Nepalese citizen at work in any post. Section 6 prohibits for discrimination on the ground of religion, colour, sex, caste, tribe, origin, language, ideological conviction or any other similar ground. Similarly, Section 74 of the Act has the provision to constitute a Safety and Health Committee of employee if there are 20 or more.
Electricity Regulation Commission Act, 2074	Section 3 (1): Regulates the generation, transmission, distribution, and trade of electricity; Section 17 (1): Ensure compliance of Licensees with the Act, sub – legislation (rules, orders etc.) or other prevailing laws, Section 19 (1): Power to fine licensees not complying with orders or directions
Disaster Risk Reduction and Management Act, 2074	The Act has envisioned establishment of 'National Council for Disaster Risk Reduction and Management, headed by the Prime Minister (Section 3). Section 20 of the Act prescribes duties of public enterprises and business establishment on disaster management. Section 21 of the Act has provisions for government offices, NGOs, local organizations, communities, volunteers, civil societies, private sector and individuals for supporting the disaster management activities
Local Government Operation Act, 2074	The act has stipulated several arrangements related to authorities, duties and responsibilities of local government.
Contribution Based Social Security Act, 2074	The Social Security Act provides that the government publishes the notice in Nepal gazette prescribing the sector, industries, business, service or employer undertaking certain transaction to whom the Social Security Act applies. The Social Security Act specifies the Scheme that shall operate. The Scheme Include (a) Medical and Health Protection Scheme, (b) Maternity Protection Scheme, (c) Accidental Protection Scheme, (d) Old-age Protection Scheme, (e) Dependent Family Protection Scheme, (f) Unemployment Protection Scheme. The Fund has also authority to introduce other Schemes.

Muluki Dewani Sanhita 2074	Section 18 of the act prohibits the discrimination to any people by any means. As per Section 25, no any private property to be acquired by the government except in case of public will.
Muluki Dewani Karyabidhi Sanhita, 2074	Since it is necessary to simplify and streamline the procedure law by amending and consolidating the prevailing laws related to the scope, proceedings, hearing and disposal of civil cases and other related procedures and implementation of decisions in such cases, the Legislature-Parliament in accordance with Article 296 (1) of the Constitution of Nepal, Act has been made.
Control of International Trade of Endangered Wild Fauna and Flora Act, 2073	The Act has strictly prohibited the trade, use, farming, breeding or transport (export or import) of endangered species of fauna or flora or their samples.
Solid Waste Management Act, 2068	Section 4 rests the responsibility of the solid waste management under the prescribed standards with the persons or institution that has generated the waste Section 38 stipulates discharge of solid waste without the consent of the local body as an offence and Section 39 provisions for the punishment /penalty in case of offense.
Child Labor (Prohibition and Regulation) Act, 2056	Article 3 bans employing a child below the age of 14 to work as a laborer. No child shall be engaged in works as a laborer against his/her will by way of persuasion, misrepresentation or by subjecting him/her to any influence or fear or threat or coercion or by any other means and working hour for the child is mentioned in Article 4.
Electricity Act, 2049	Under Section 3 of the Act, it is stated that survey, generation, transmission or distribution of electricity without obtaining a license is prohibited.
Soil and Watershed Conservation Act, 2039	Under Section 10, 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.
Land Acquisition Act, 2034	Section 3 of the Act empowers GoN to acquire any land at any place for any public purpose, subject to compensation under this Act. The institution requesting for land acquisition is required to pay all costs associated with such acquisition. Section 6 outlines procedures for preliminary action relating to acquisition of land, and Section 7 has made provision for compensation of losses incurred during preliminary action. Section 9 of the Act relates to notification of land acquisition. Section 13 makes a provision for compensation rate. The compensation would be paid in cash as per this Act; there is no provision for land-for-land compensation. Section 18 of this Act requires Chief District Officer (CDO) to prepare a list of persons to compensation and issue a notice accordingly for the information of the concerned persons. This Section has also made provision for lodging complaints by unsatisfied persons and grievance redress mechanism. As per Section 27, land can be acquired through negotiation.
National Parks and Wildlife Conservation Act, 2029	Section 4 of the act restrict the entry into the National Park. Section 5 listed the prohibited acts within National Park and Reserve. Schedule 1 related to Section 10 of the act listed the protected species of fauna.

Explosive Act, 2018	Section 4 of the Act emphasizes the need of permission for the use, sell, transportation and import of explosive item. The act made provision of penalty up to NRs. 20,000 if transporting or using the explosive items without proper permission. The act authorized chief District Officer to grant such permission. According to Section 8 of the act any accident caused by the use of explosives shall be informed to nearest Police Station to the earliest possible.
Rules and Regulations	
Forest Rules, 2079	Section 12 of the Rules, has made provisions regarding the use of national forest areas for development projects. According to Rules 88 and 89, if it is necessary to use the national forest area, there is a provision that an application should be made through the relevant Ministry. Such application would be made in order to provide land to land compensation by the project developer. In the case if such land could not be made available, there is a provision for cash deposition by the developer (Rule 93). For each tree felled down for any project, the compensatory plantation ration is 1:10 (Rule 93 (5).
Environment Protection Rules, 2077	The EPR has provided a schedule for carrying out environmental assessment based on the threshold of the different proposals/ projects. Schedules 1, 2 and 3 provide a list of proposals that require Brief Environmental Study (BES), IEE and EIA studies respectively.
Disaster Risk Reduction and Management Rules, 2076	The Government of Nepal framed the Rules, 2076 as per the powers conferred by Section 47 of the Disaster Risk Reduction and Management Act, 2074. Rule 3 describes the Function, Duties and Powers of the Executive Committee whereas Rule 5 specifies the Functions, duties and power of the National Disaster Risk Reduction and Management Authority.
Regulation on International Trade in Endangered Species of Wild Flora and Fauna, 2076	The Government of Nepal has made the regulations using the powers given by Article 37 of the International Trade in Endangered Species of Wild Fauna and Flora Act, 2073. The regulation has made the provision of license, arrangement for species registration, transfer and transfer of ownership. The regulation also defines the duties of management body, scientific body and others.
Labor Rules, 2075	Rule 3 of the Labor Rules has set out the criteria for determining if any dispute arises on whether or not an employment is regular employment. Rule 4 of the Labor Rules requires the employment contract to cover (a) nature of employment, (b) primary work of the employee and his/her position, (c) statement that the employees' service rule will be integral part, (d) date, time, place of contract and its effective date, (e) Other important terms and conditions related to the work or service of the employee.
Right to Employment Regulation, 2075	The Government of Nepal has issued Right to employment regulation, 2075 regarding the right to employment using the right given by Article 31 of the Right to Employment Act, 2075.
Electricity Regulatory Commission Rules, 2075	The ERC Rules clarified further about the key functions and duties of the Commission, and provided a more focused list of action points, mandatory requirements and guidance for the Commission.
Contribution Based Social Security Regulation, 2075	The Regulations has made arrangements for providing social security to the contributors. As per law, both employers and employees must mandatorily deposit their instalment for the scheme and it is applicable for all types of workers. The Regulations has provisions for enlisting in the Social Security

<table>
<tr><td></td><td>Fund, the individuals drawing salary from the government fund, the labourers in the informal sector and self-employed individuals.</td></tr>
<tr><td>Solid Waste Management Rules, 2070</td><td>The Local Body shall, while fixing segregation at least of organic and non-organic solid waste at its source under Section 6, have to make management and segregation of harmful or chemical waste separately.
The Local Body shall conduct programs for increasing people's awareness in relation to applying appropriate technology for making segregation through reduction of generation of solid waste at its source and management under Sub-Rule (1).
No one shall discharge solid waste by mixing harmful, chemical, organic or inorganic waste with other waste. The arrangement for final discharge should only be made after processing of harmful, chemical, organic or inorganic waste into a general waste.</td></tr>
<tr><td>Water Resources Rules, 2050</td><td>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.</td></tr>
<tr><td>Electricity Rules, 2050</td><td>Rule 48: Minimum Distance from Ground to the Electric Wire-
(1) Distance between the electric wire of different volts of the distribution and transmission system and the ground shall not be less than as prescribed in Schedule12.
Schedule 12: Distance which ought to be from wire to ground
<table>
<tr><th>Standard of Voltage of Electricity</th><th>While crossing the road (m)</th><th>On the side of the road (m)</th><th>In other places (m)</th></tr>
<tr><td>In between 230/400 and 11,000</td><td>5.8</td><td>5.5</td><td>4.6</td></tr>
<tr><td>In between 11,000 and 33,000</td><td>6.1</td><td>5.8</td><td>5.2</td></tr>
</table>
(2) In case where electric line is to be installed by the side of the road or along it, it shall be done by adopting appropriate technological measures.
(3) If it is necessary to install electronic line of more than 33,000 volts, it shall have to be done by adding 0.305m for each 33,000 volts on the distance as prescribed for 33,000 volts in Schedule12.
Rule 49: Regarding the Installation of Electric Line Across the Road: While installing electric line of more than 11,000 volt across the road in a densely populated area, the double insulator system shall have to be used.
Rule 50. Distance to be Maintained on either side of the Electric Line: (1) While installing electric line of distribution and transmission system, it shall not be installed in a distance lower than the distance as prescribed in Schedule-13 from the house or tree.
(2) If it is necessary to install electric line of more than 33,000 volt, it shall have to be done by adding 0.305m for each 33,000 volts on the distance as prescribed for 33,000 volts in Schedule13.</td></tr>
</table>

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

Schedule 13

Minimum distance which ought to be from the wire to the house wire

<table>
<tr><td>Standard of Voltage of Electricity</td><td>Minimum Distance to be from house or tree</td></tr>
<tr><td>Standard 230/400 to 11,000</td><td>1.25 meter</td></tr>
<tr><td>From 11,000 to 33,000</td><td>2.0 meter</td></tr>
</table>

Rule 55. In Relation to Installation of Electric Lines and Telephone Lines: While installing electric line near to the telephone lines or vice versa, the licensee and the concerned office of tele-communication shall hold discussions between them and it shall be installed in such a way that no obstacle or charge shall be made to the telephone line from the technical point of view.
</td></tr>
<tr><td>National Parks and Wildlife Conservation Rules, 2030</td><td>Chapter 2, rule 3 focused on publishing a notice at least 35 days of time period to submit the shield tender in the major newspapers for operating any services from any bodies of the Government of Nepal inside national parks and reserves. To operate any services or facilities related to construction work within the national park or reserve, the person shall take the approval of the Government of Nepal. Except the Government employees deputed for the duty, other person shall not be allowed to enter into the preserved national reserve without receiving the written permission from the chief.</td></tr>
<tr><td>Explosive Rules, 2020</td><td>Explosive Rules, 2020 provides the rules for production, use, sale, transportation and import of the explosive. The Rules prohibit the production, storage, use, transport or import of explosive without obtaining a license.</td></tr>
<tr><td colspan="2">Guidelines and Working Procedures</td></tr>
<tr><td>Order for Remission of Land Ceiling Exemption, 2074</td><td>Nepal Government, Ministry of Land Reform and Management published a notice in Section 67 number 29 Nepal Gazette part 5 dated 2064/06/25, by using the authority given in Article 12 of Land Reform Act 2021, containing the provision to purchase more than dissociated land by the education or health institution, hydropower, cultural, industrial work, work for agricultural industry and co-operative farming organization, if such industry or institutions need.</td></tr>
<tr><td>National EIA Guidelines, 2050</td><td>It is mandatory to follow National EIA Guidelines, 2050 during the EIA. Following the guidelines, 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. The schedules attached to the Guidelines include:
Schedule 1 : Projects requiring IEE Report
Schedule 2 : Projects requiring EIA
Schedule 3 : EIA based on project sites
Schedule 4 : Format for Terms of Reference
Schedule 5 : EIA Report Format
Schedule 6 : Format of EIA Report Annexes</td></tr>
<tr><td colspan="2">Standards and manuals</td></tr>
<tr><td>National Ambient Air Quality Standard, 2069</td><td>The National Ambient Air Quality Standards, 2012 enforced by GoN has set maximum concentration limit for nine air quality parameters. These parameters include total suspended particles (TSP), particulate matter (PM_{10}), sulfur dioxide, nitrogen dioxide, carbon mono-oxide, lead, benzene, $PM_{2.5}$ and Ozone.</td></tr>
</table>

Nepal Vehicle Mass Emission Standard, 2069	This standard has set the limit values on different parameters of emission for petrol and diesel fueled vehicles. These parameters include carbon monoxide, hydrocarbon, oxides of nitrogen particulate matters (PM) and smoke opacity.
National Ambient Sound Quality Standard, 2069	It has set the limit of allowable noise/sound intensity in different areas at different time, during the day and the night. The limit of sound intensity is different for different area like industrial area, commercial area, settlement areas in rural and urban settings, etc.
Standard on Emission of Smoke by Diesel Generators, 2069	The standard has set the limits on four parameters of emission including Carbon monoxide (CO), hydrocarbon (HC), oxide of nitrogen (NO_x) and Particulate Matter (PM).
Standard related to Excavation, Sale and Management of Stone, Gravel and Sand, 2077	Section 3 of the Standard has provisioned the different criteria to be followed by Local Levels for defining areas for excavation. Section 6 has ensured some restrictions and regulated excavation in forest and Chure Area. Environmental assessment has been mandated for such excavation. Section 11 has set out different criteria for operating crusher plants. To ensure supply of riverine material for large, transformative, national pride and priority projects, arrangements are to be made to collect construction materials from designated place on the recommendation of the project office for a fee (Section 12).
International Conventions	
Convention on Biological Diversity, 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.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	Aims to control the trade of certain wildlife species to prevent further endangered species 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 EIA that species protection list could also be used to evaluate the significance 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.

5 Existing Environmental Condition

Existing Physical, Biological and Socio-economic condition along the project site has been discussed in detail in this chapter.

5.1 Physical Environment

The proposed alignment passes through different terrain affecting variety of land use pattern. The topography, land use, climatic condition, geomorphology and geology, seismology, watershed and drainage pattern, crossing of other utilities and air traffic that are the physical aspects of the project construction and operation has been discussed in each topic ahead:

5.1.1 Topography

The proposed alignment of length 64.604km traverses through Terai region. The alignment runs through flat lands with gentle slope land forms. The altitudinal variation of the TL points is between 89.213masl at AP-78 to 145.033masl at Nijgadh substation. Topographic map of Nepal is mentioned in Appendix B, Figure 1.

5.1.2 Land use

For the TL of 400kV the right of way (RoW) is defined as 23m on either side from the central line. A total of 310.647ha of land will be required for the project as RoW including tower pads, substation and other facilities (Table 2-2). The main land use pattern of the project area is cultivated land. The alignment avoids densely populated areas, major structures and forests. The land use map of PAA is given in Appendix B, Figure 6.

5.1.3 Climate

Tropical to Sub-tropical climates prevail in the project area. The annual Average rainfall, Average wind speed and temperature of stations near project site is given in Table 5-1, Table 5-2 and Table 5-3.

Table 5-1: Annual rainfall by station near proposed project

SN	station	Annual Rainfall (mm)				
		2013	2014	2015	2016	2017
1	Kalaiya	1516.3	1502.2	1167.7	1157.5	1333.6
2	Birgunj	NA	NA	NA	NA	1227.4
3	Gaur	751.4	NA	NA	NA	NA
4	Kolbi	1317.7	1556.6	NA	1471.3	1975.6
5	Simara Airport	1664.2	1604.2	1335.4	1587.5	1967.1
6	Nijgadh	754.5	NA	NA	NA	NA

Source: CBS,2019

Table 5-2: Average wind speed by station near proposed project

Station	Average wind speed (km/hr)											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Parsa, Parwanipur	2.5	1.7	0.7	1.3	0.4	0.5	NA	NA	NA	0.47	NA	NA

Source: CBS,2019

Table 5-3: Annual Average temperature by station near proposed project

SN	Station	Annual Average temperature (°C)				
		2013	2014	2015	2016	2017
1	Birgunj	NA	NA	NA	NA	26.1
2	Parwanipur	24.8	24.6	24.8	25.1	24.9
3	Simara Airport	24.3	24.1	24.8	25	24.6

Source: CBS,2019

5.1.4 Geomorphology and Geology

Nepal has been divided into five different tectonic zone: Terai zone, Sub-Himalayan zone, Lesser Himalayan zone, Higher Himalayan zone and Tibetan-Tethys zone as shown in the geological map of Nepal (modified from Dahal, 2006) in Figure 5-1. Terai is the southernmost tectonic division of Nepal and it is the northern edge of the Indo-Gangetic alluvial basin. The Terai plain is made up of alluvium of Pleistocene to Recent age (1.8 million years to the present) with an average thickness of about 1,500m.

The proposed alignment of TL lies within Terai zone. The geological structure of the region consists of alluvium deposits of mainly sand clay silt, gravels and coarse fragments. The surface geology along the TL alignment mainly consists of gravels, sand and clay. Most part of proposed TL route follow the agriculture land and sandy and alluvial soil is found in project area. The geological map of Nepal showing proposed project is shown in figure 5-2.

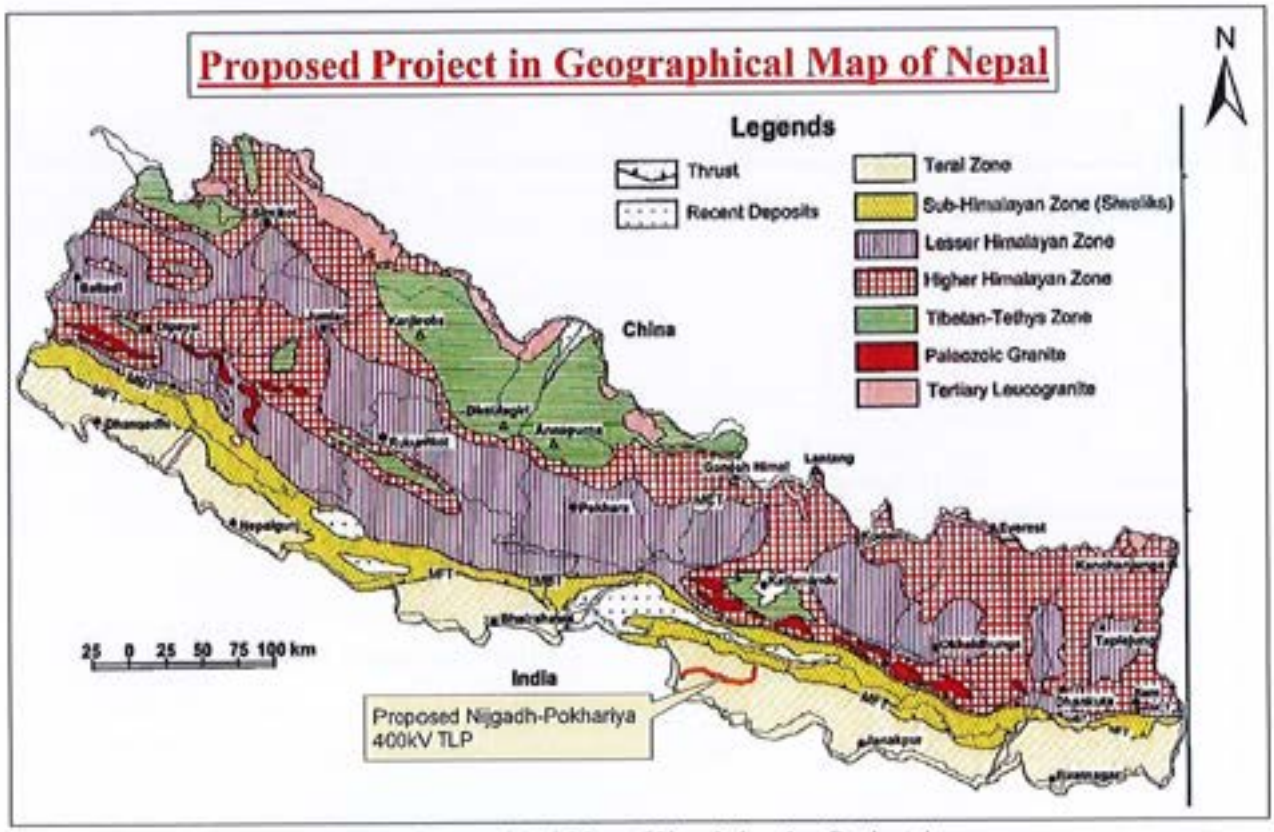


Figure 5-1: Geographical Map of Nepal showing Project Area

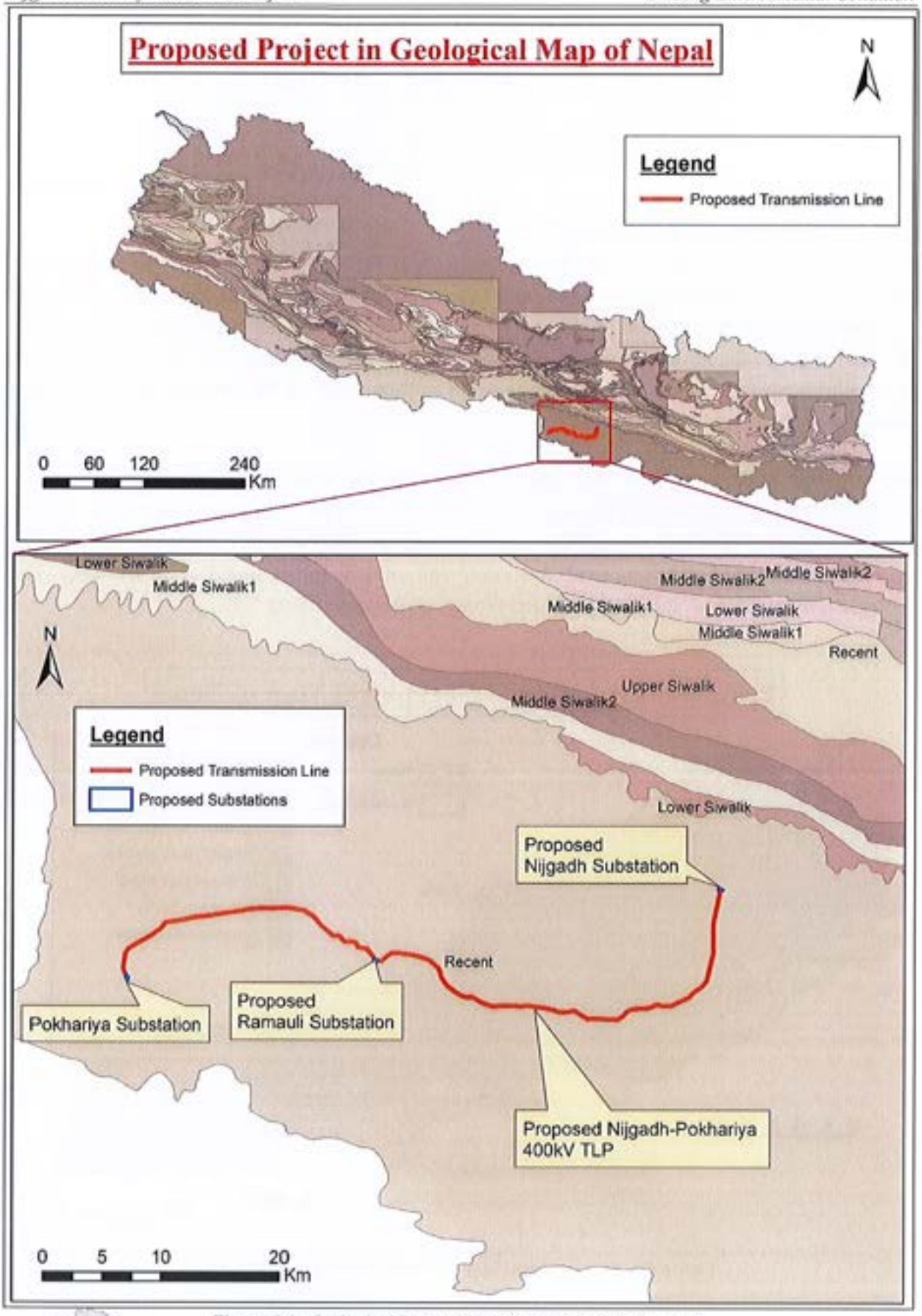


Figure 5-2: Geological Map of Nepal showing Project Area

5.1.5 Seismology

Nepal is located at the boundary between Indian and Tibetan tectonic and therefore lies in a seismically active region. There have been a number of devastating earthquakes over the past few decades which have caused the substantial damage of life and property. The seismic zonation factor of Birgunj City and Kalaiya City is 0.4 which represents the peak ground acceleration for 475 years return period. The whole project area lies between the PGA of 0.3-0.35 (MoUD, 2077). Tower pads, towers and other physical structures of substation will be designed considering seismic effect so that the structures will have minimum effect during earthquake. Seismic zoning map of Nepal with proposed project is shown below.

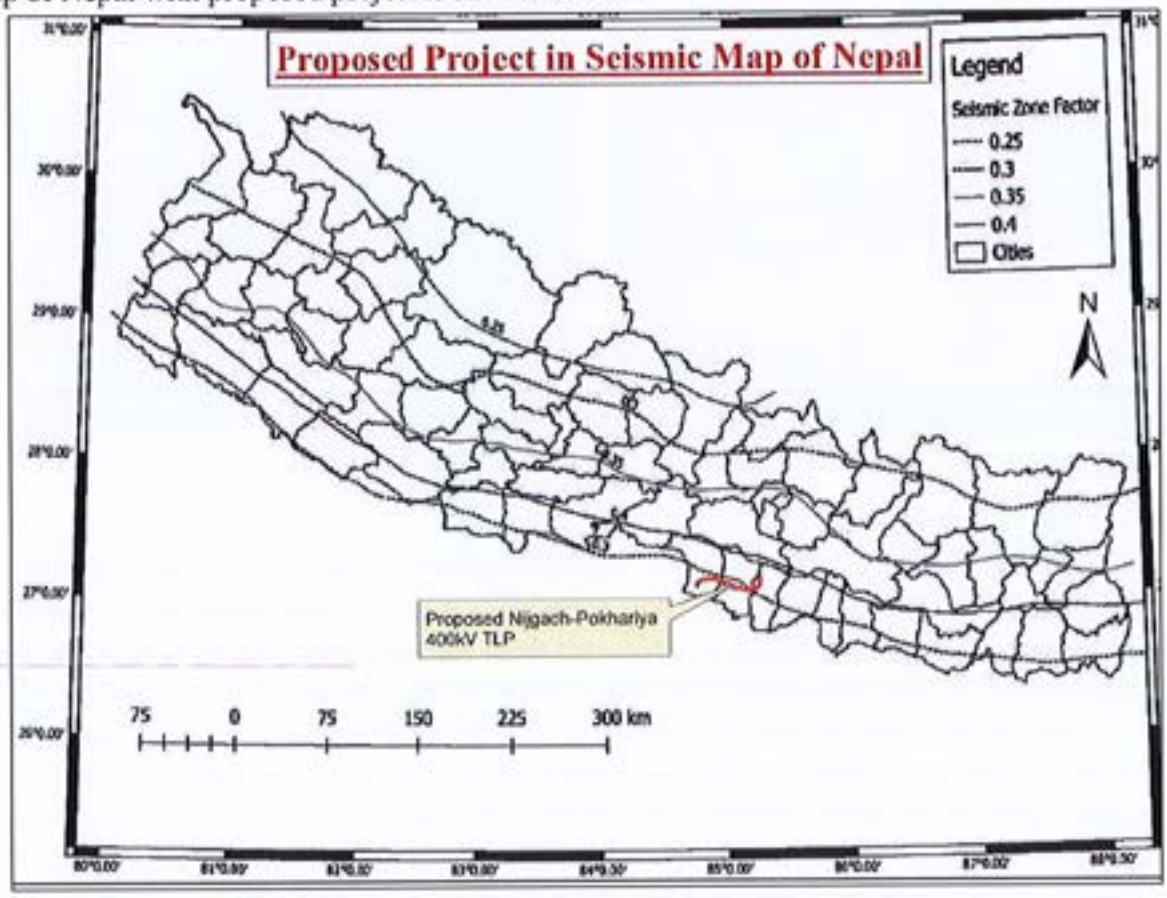


Figure 5-3: Seismological Map of Nepal showing Project Area

5.1.6 Air and Noise Quality

The proposed TL passes mainly along the agricultural land. The line also crosses the earthen and graveled road in some places. Air pollution is felt maximum at those alignment which is nearer to road section. The main source of air and noise pollution along the alignment is due to the vehicular movement along the earthen road. The project area is also a growing industrial area, and the industrial emissions also contribute to air pollution. During the time of filed visit, the air and noise quality of the project area seems good. The measured value of PM_{10}, $PM_{2.5}$ TSP, NO_2 and SO_2 of Ramauli Substation in 2024/05/11 (9:30) and near AP44 in 2024/05/12 (3:00) are within the tolerance limit of National Ambient Air Quality Standard (NAAQS), Ministry of Forests and Environment (MoFE), 2012. The measured value is listed in Table 5-4. The Average Sound Level (Leq) recorded at Ramauli substation in 2024/05/12 at day and night time were 60 dB(A) and 45 dB(A) respectively (Lab Analysis Report, 2024).

Table 5-4: Air Quality monitoring data

Parameters	Jitpursimara-4 near AP44, (µg/m³)	Ramauli Substation (µg/m³)	Tolerance Limit (NAAQS, 2012) (µg/m³)
Particulate Matter (PM_{10})	69	78	120
Particulate Matter ($PM_{2.5}$)	26	32	40
Total Suspended Particles (TSP)	141	157	230
Sulphur Dioxide (SO_2)	0.96	1.21	70
Nitrogen Dioxide (NO_2)	0.82	1.07	80

Source: Lab Analysis Report., 2024

Picture 5-1: Sources on Air pollution in the Project Area

5.1.7 Water Quality

The main water bodies near the project area are Bakaiya Khola, Pasaha Khola, Balganga Khola, Sirsiya Khola, Dudhaura Khola, Bauga Khola, Katahawa Khola, Phanti Khola, Singyahi Khola, Tilabe Khola, and Naurangiya Khola. In additional there are some water ways (kholsi) along the TL alignment. All of these streams are characterized by no flow during dry season. Much of the water available in these streams was observed to be used by local farmers for paddy plantation. In Birgunj and Simara areas which are characterized by industrial zones, the natural streams/nalas are polluted with the industrial effluents. Sirsiya River receives wastewater burden of more than 250 industries along Bara/Parsa industrial corridor and all the parameters except oil and grease were found within the generic standard (Shah and Pant, 2012). Similarly, the water quality of Lal Bakaiya River, between AP 10 and AP 11 of the proposed transmission line is given in table 5-5. Obtained results are within the range of National Drinking Water Quality Standard except Microbiological test.

Table 5-5: Water Quality of Lal Bakaiya River

Category	Parameters	Lal Bakaiya Khola	Standard value (NDWQS)
Physical	Turbidity (NTU)	<5	5
	Temp (°c)	28	
	pH	7.7	6.5-8.5
	TDS (mg/l)	187	1000
	Electrical Conductivity (µs/cm)	374	1500
Chemical	Iron (mg/l)	0.09	0.3
	Arsenic (mg/l)	0.02	0.05
	Ammonia (mg/l)	0.06	1.5

Category	Parameters	Lal Bakaiya Khola	Standard value (NDWQS)
	Nitrate (mg/l)	26.13	50
	Fluoride (mg/l)	0.07	1.5
	Calcium (mg/l)	142	200
Micro-biological	E-coli (CFU/100ml)	4	0
	Total coliform (CFU/100ml)	15	0 in 95% samples

Source: Lab Analysis Report, 2081

5.1.8 Watershed Conditions and Drainage Patterns

The watershed of the proposed TL is observed to be fairly intact and stable. The proposed alignment crosses Bagmati Irrigation Canal and Gandak irrigation Canal and streams at different sections. These streams are ephemeral in nature and water is collected only during wet seasons. So, there are no issues of high flood and bank erosions. The detail of water bodies crossing by the TL are listed in Appendix B, Table 5. There are no any streams and water bodies within the proposed substation area.

5.1.9 Soil Erosion and Land Stability

The site observation of the alignment revealed that the line traverses through mostly the flat terrain. No any landslide and unstable areas were observed along the alignment during the IEE field Study. AP 10 and AP 11 are close to the Bakaiya Khola and AP 45 is near the Dudhaura Khola. No other towers of the transmission lines are located in the flood plain of the any Khola.

5.1.10 Crossings of Other Utilities

The proposed TL starts from Proposed Nijgadh SS at Gujara Municipality ward no. 2 and 3 of Rautahat district to Pokhariya SS of Pokhariya Municipality-1 of Parsa district. This proposed TL crosses different features along its route. The detail of crossings along the TL is given below:

Table 5-6: Summary of crossings utilities by proposed TL

SN	Crossings		No. of times
1	Water Bodies	Khola/ Kholsi	41
		Canal/ Kulo	108
		Pond	17
2	Roads/ Footway/ Railway	Highway	3
		Local Roads	98
		E-W Railway	1
		Proposed Birgunj Kathmandu Railway	1
		Motihari-Amlekhganj Petroleum Pipeline	1
3	Transmission/ Distribution Lines	132 kV	2
		33 kV	5
		11 kV	26
		LT Lines	21

Source: Survey Report of KNTLP, 2081

5.1.11 Air Traffic

Nearest airport from proposed TL alignment is Simara airport and proposed Nijgadh Airport of Bara district. The Simara airport is about 5.3km North from the proposed Transmission Line and the Nijgadh airport is about 4.8 km north west from proposed Transmission Line. A request for consent was sent to Civil Aviation Authority of Nepal (CAAN) at Kathmandu regarding probable disturbance of the proposed TL to the flying route of airplane. Consent letter received from CAAN is attached in Appendix A-II.

5.2 Biological Environment

Though, there is Parsa National Park (PNP) in the PAD of NPTLP, the proposed NPTLP doesn't passes through PNP and its buffer zone and any other types of protected area. The alignment of transmission line is about 7 km in arial distance from the PAP and about 5km arial distances from the Chure Conservation Area (Figure 5-1). The Nijgadh Substation and section of TL from Nijgadh substation to AP 11 lies in the forest area. There is government managed forest, collaborative forest and community forest along the proposed route alignment.

The proposed alignment crosses some rivers/streams including Gandak and Bagmati irrigation canals. The alignment passes through rice field throughout the alignment. However, water is intermittent and the available only in the wet season. There are some fish ponds within the RoW of the TL. There are no any swamps and marshy lands or lakes nearby the project impact area.

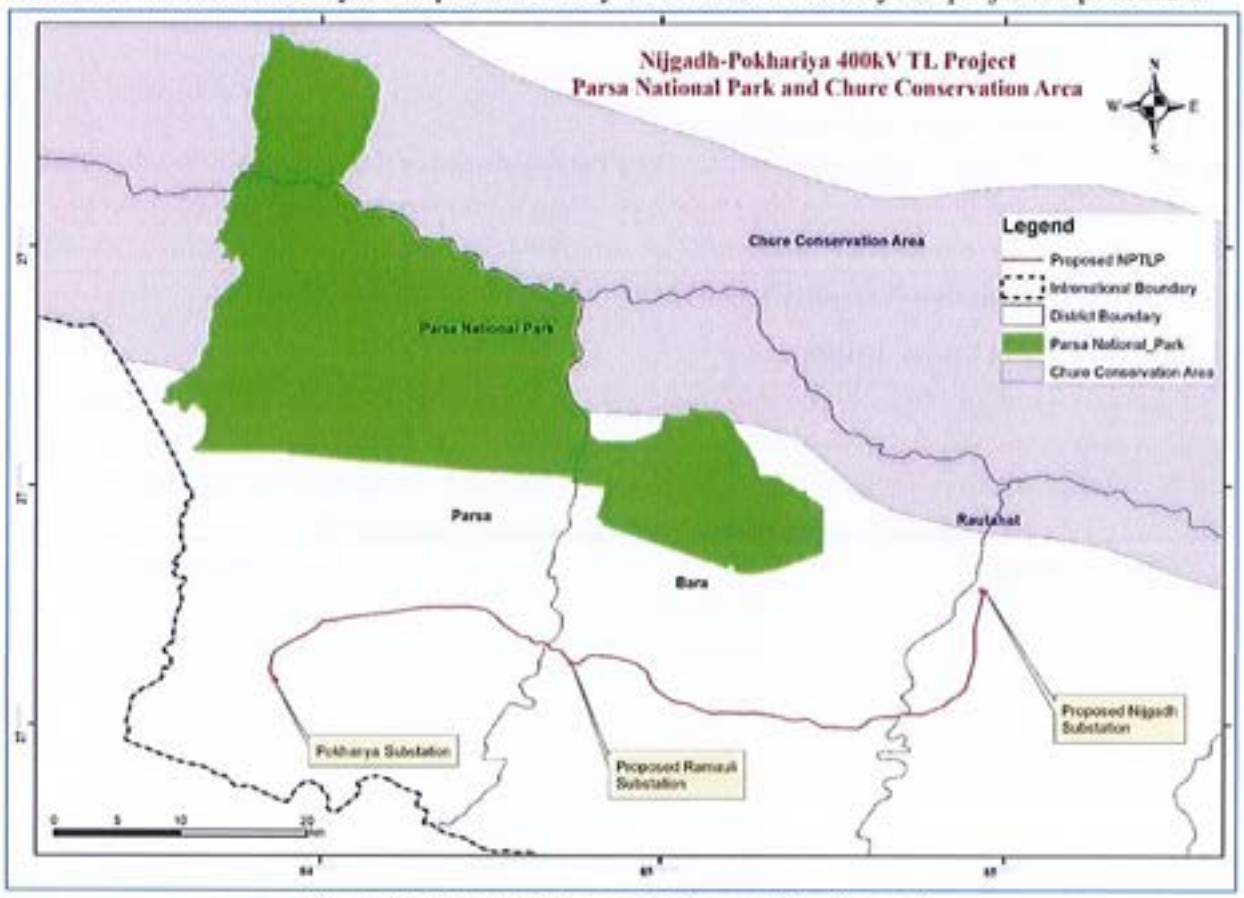


Figure 5-4: Protected Areas and Proposed TL alignment

5.2.1 Vegetation and Forest Resources

The vegetation and forest resources of the project affected district and area are discussed in the following subsections.

- **Project Affected District (PAD)**

The PADs have Tropical and Subtropical type of vegetation. Based on climate, the forest of PADs can broadly be categorized into Sal Forest, Terai-Mixed-Hardwood Forest and *Acacia catechu - Dalgerbia sissoo* Forest (DFO-Bara, 2077; DFO-Rautahat, 2079). There is 147,698 ha of forest area in the PADs. The details of the forest in the PAD are given in Table 5-7.

Table 5-7: Vegetation Cover of PADs

SN	PAD	Physiographic Region	Vegetation Cover Area (ha)			Other land (2) ha	Total area (1+2) ha
			Forest	Grass/Shrubland	Total (1) ha		
1	Rautahat	Churia	7,234	128	7,362	2619	9,981
		All	25,874	414	26,288	77528	103,816
2	Bara	Churia	15,177	219	15,396	5131	20,527
		All	45,981	647	46,628	80639	127,266
3	Parsa	Churia	51,282	96	51,378	5918	57,296
		All	75,843	387	76,230	64453	140,682
Total of PAD (ha)			**147,698**	**1448**	**149146**	**222620**	**371,766**
Percentage (%)			**39.73**	**0.39**	**40.12**	**59.88**	**100.00**

Source: DFRS 2014

Note: The elevation of the Churia varies from 93 to 1,955 meters above sea level.

- **Project Affected Area (PAA)**

The major tree species in the forest along the project alignment are: Saal (*Shorea robusta*), Jinger, Botdhanero (*Lagerstroemia parviflora*), Kusum (*Schleichera oleosa*), Karma (*Adina cordifolia*), Jamun (*Syzigium cumuni*), Tatari (*Dillenia pentagyna*), Asna (*Terminalia alata*), Tikul (*Mitragyna parviflora),* Satisal (*Dalbergia latifolia*), Kumbhi (Careya herbacea), Dabdabe (*Lannea coromandelica),* Barro (*Terminalia bellirica*), Simal (*Dalgerbia sissoo*), Ghurkut and other. Likewise, shrubs like Aank (*Calotropis gigantean*), Dhurseli (*Colebrokia oppositifolia*), Banmara (*Eupatorium odoratum*), Gaidakede (*Circium arvense),* Titepati *(Artemisia vulgaris),* Kans *(Saccharum spontaneum),* Gande *(Ageratum conyzoides),* Siru *(Imperata sp.)* and other are also found in the forest area.

5.2.2 Forest Management

- **Project Affected District (PAD)**

In the PADs, there are Government-Managed Forest, Community Forest, Collaborative Forest, Block Forest, Religious Forest and PNP. The details of the forest management in the PADs is given in Table 5.8 below.

Table 5-8: Forest Management in PADs

District	Parsa National Park	Forest Management Type							Block Forest Management	
		Govt Managed	Community		Collaborative		Religious			
		Area (ha)	Area (ha)	No.	Area(ha)	No.	Area(ha)	No.	Area (ha)	No.
Rautahat	-	8,830.16	7,565.54	43	11,927.97	3	51.72	4	1,152.91	1
Bara	15,911.0	12,912.27	9,691.3	41	8,587.43	4	-	-	-	-
Parsa			7.51	4	11,409.14	3	-	-	-	-

- **Project Affected Area (PAA)**

There are 11 local levels in the PAA of the proposed NPTLP. The 27.93 % of total area of PAA is occupied by the forest (Table 5-7). Jitpur Simara SMC has the highest area of forest coverage followed by Gujara and Parsagadhi Municipality respectively. Five local levels of the PAA doesn't have any forest area. The details of the forest area of PAA are given in Table 5-9 below.

Table 5-9: Forest Coverage of PAA

District	Local Level	Total Area (ha)	Forest Area (ha)	% of Forest area
Rautahat	Gujara Municipality	14,985	7,550	50.4
	Phatuwa Bijayapur Municipality	6,504	444	6.8

District	Local Level	Total Area (ha)	Forest Area (ha)	% of Forest area
Bara	Kolhabi Municipality	10,967	0	0.0
	Karaiyamai RM	4,755	0	0.0
	Jitpur Simara SMC	31,024	17,737	57.2
	Kalaiya SMC	10,967	0	0.0
Parsa	Birgunj MC	13,173	1,515	11.5
	Parsagadhi Municipality	9,942	3,964	39.9
	Pokhariya Municipality	3,239	0	0.0
	Sakhuwa Parsauni RM	7,408	1,607	21.7
	Jagarnathpur RM	4,518	0	0.0
Total		**117,482**	**32,817**	**27.93**

Source: DFRS, 2018

The Nijgadh substation and the section of TL from Nijgadh to AP 11/2 lies in forest area. The Nijgadh substation lies in Government-Managed Forest area. There is a Collaborative Forest between Nijgadh SS to AP7/2, and community forest (CF) from AP7/2 to AP10. Jangalsaiya Collaborative Forest, Pashupati CF and Anjuman CF are within the project impact area. There is 9.741 ha of Government Managed Forest, 26.398 ha of Jangalsaiya Collaborative Forest, 13.944ha of Pashupati CF and Anjuman CF in the project impact area.

- **Dependency on Forest**

During the field visit, it was found that local people in the project area are dependent on the forest for firewood and fodders. Many of the local people from the nearby community regularly visit to the forest area for the firewood and fodder collection. In addition, the community also depends on the forest area for the timber.

Picture 5-2: People collection forest produce in and around project area

- **Forest Fire**

During our field visit on May-2023 and April-2024, we found heavy forest fire in the project area. We noticed a number of forest fire patches in the section between Nijgadh Substation to AP 7). During our visit, forest fire was not seen in the section between AP 7 to AP 11.

- **Invasive species**

There is invasive plant species throughout the impacted forest patches. In Nijgadh substation area, *Chromolaena odorata* was widespread. In Pashupati and Anjuman community forest area, *Lantena camera* and *Mikania micrantha* are dense in the understory. Due to widespread distribution of invasive plants species in the impacted forest area, the impacts of project activities on its distribution will not be significant.

5.2.3 Wildlife

Some section of the proposed NPTLP lies in the forest area. Due to its vicinity to the Parsa National Park (PNP), some wildlife was reported in the project area. Out of the seven protected mammals of PNP (*Manis pentadactyla, Hyaena hyaena, Tetracerus quadricornis, Elephas maximus, Panthera tigris, Bos gaurus, Rhinoceros unicornis*: DNPWC, 2075) three are found in the proposed project area. The details of the baseline of wildlife in the project area is annexed in Appendix D as "Wildlife Survey Report".

- **Mammals**

The proposed TL passes through forest of Rautahat which are key wildlife corridors. The forest in the proposed area represents one of the last remaining forest patches connecting PNP to the eastern forests of Nepal. Its role as a corridor is particularly crucial due to the absence of forested areas beyond its southern border. The deforestation south of this patch has heightened its significance, making it the sole remaining forest connecting the forests in this region. However, the forest patch is heavily fragmented due to human disturbances. The collection of wood and other forest produce by the local people is quite intense. Further, forest fire is a recurrent event every year in the dry season.

During field visit, 6 wildlife species were sighted in the field. Altogether, 16 wildlife species are reported from the project area (Table 5-10). The forest area is key wildlife corridor for tigers and other wildlife. The division forest offices of both Rautahat and Bara stated that the forests were critical corridors for tigers, elephants and other wildlife. Our interviews with local communities also backed this claim as they noticed that the seasonal presence of different wildlife. Four nationally endangered species (*Melursus ursinus, Hyaena hyaena, Panthera tigris,* and *Elephas maximus*) and two globally Endangered species (*Panthera tigris* and *Elephas maximus*) of wildlife were recorded in the project area.

Table 5-10: Mammals encountered during field survey and presence gathered from other sources

SN	Species	Scientific name	Global Status*	National Status*	Evidence[1]
1	Golden Jackal	*Canis aureus*	LC	LC	DS
2	Rhesus Macaque	*Macaca mulatta*	LC	LC	DS
3	Indian Grey Mongoose	*Urva edwardsii*	LC	LC	DS
4	Nilgai	*Boselaphus tragocamelus*	LC	VU	DS
5	Terai Gray Langur	*Semnopithecus hector*	NT	LC	DS
6	Sloth Bear	*Melursus ursinus*	VU	EN	LT, IN
7	Jungle Cat	*Felis chaus*	LC	LC	LT
8	Large Indian Civet	*Viverra zibetha*	LC	NT	LT
9	Leopard Cat	*Prionailurus bengalensis*	LC	VU	LT, IN
10	Northern Red Muntjac	*Muntiacus vaginalis*	LC	VU	LT, IN
11	Masked palm civet	*Paguma larvata*	LC	LC	LT
12	Rhesus Macaque	*Macaca mulatta*	LC	LC	DS
13	Striped Hyaena	*Hyaena hyaena*	NT	**EN**	DS[2], LT
14	Tiger	*Panthera tigris*	**EN**	**EN**	IN, LT
15	Leopard	*Panthera pardus*	VU	VU	IN, LT
16	Asian Elephant	*Elephas maximus*	**EN**	**EN**	IN, LT

The global status is based on IUCN red list [2], and the national status is based on the National IUCN Red List assessment of mammals [3].

Picture 5-3: Wildlife spotted in project area

* LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered

[1] DS = Direct Sighting, IN = Interview, TS = Transect Survey, LT = Literature Review.

[2] Sighted by our support staff

- **Birds**

The farmland of Bara and Rautahat districts is lies in the Kohalbi and Baragadi Important Bird and Biodiversity Area (IBA) which support significant populations of Lesser Adjutant (BCN, DNPWC and DoFSC 2023).

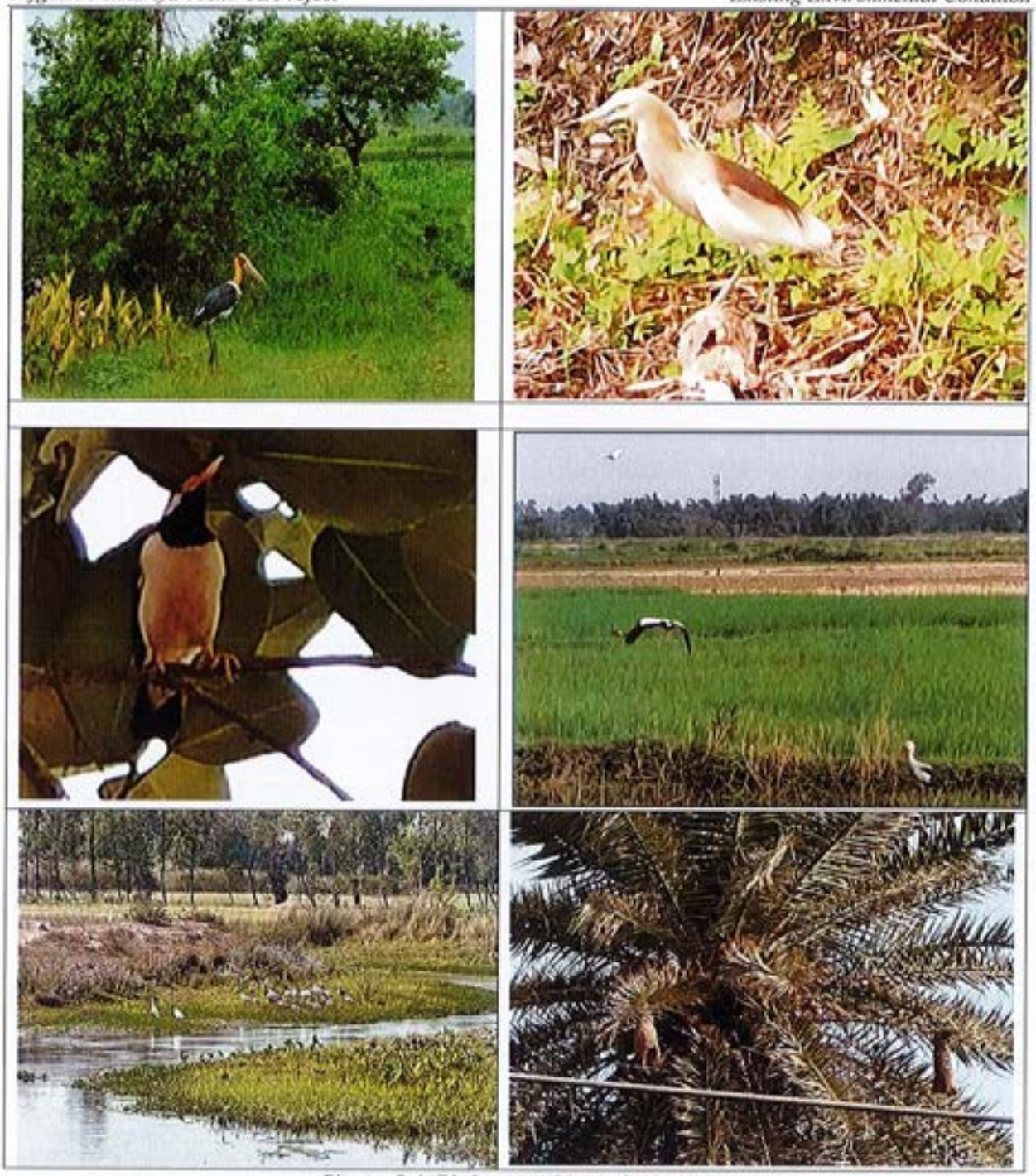
Study shows that House Crow was most common birds in the area which was recorded in the 18 lists out of 25 lists. Similarly, Black Drongo and Large-billed Crow were recorded in the 17 lists and Spotted Dove, Lesser Adjutant and White-throated Kingfisher were recorded in the 15 lists. These above-mentioned species are dominant species in the area. We recorded 38 specie in the single list only. It means the area is highly diversified in terms of bird species and the abundance is high in the farmland associated with the fish ponds and settlement. Some of the globally significant bird species from the area details in Table 5-11.

We have recorded two species of globally vulnerable species namely Indian Spotted Eagle (*Clanga hastate*) in the farmland (27.06411^{0}N, 85.20757^{0}E) near Lal Bakaiya River which is resident species of the area and White-throated Bushchat (*Saxicola nsignis*) in the sugarcane farmland (27.07671N, 85.03142^{0}E) and is the winter migrant in the region. We also recorded two Near Threatened species, Lesser Adjutant and Black headed Ibis. We also recorded four Nationally Threatened species. We recorded 13 species listed in the CITES. Among 121 recorded bird species, 102 species are resident, 11 species are summer migrant and 8 species are winter migrant (Annex D-V). The details of the baseline of birds in the project area is annexed in Appendix D-V as "Bird Survey along the Proposed Nijgadh-Pokhariya 400kV TL Project Area, Nepal".

Table 5-11: Conservation Significance bird species in the project area

English name	Scientific name	Nepali Name	IUCN Status	Reference/Source
White-rumped Vulture	*Gyps bengalensis*	डंगर गिध्द	CR	Satellite tagged movement
Lesser Adjutant	*Leptoptilos javanicus*	भुडिफोर गरूण	NT	Direct Observation
Great Hornbill	*Buceros bicornis*	राजधनेश	VU	https://ebird.org/region/NP
Bar-headed Goose	*Anser indicus*	खोयाहाँस	LC	Highest flying bird and long distance migrant (winter) https://ebird.org/region/NP
Himalayan Griffon	*Gyps himalayensis*	हिमाली गिध्द	NT	https://ebird.org/region/NP
Steppe Eagle	*Aquila nipalensis*	गोमायु महाचील	EN	https://ebird.org/region/NP
White-throated Bushchat	*Saxicola nsignis*	सर्तोकण्ठे महाचील	VU	Direct Observation
Indian Spotted Eagle	*Aquila hastata*	लघु महाचील	VU	Direct Observation

(CR- Critically Endangered, EN- Endangered, VU- Vulnerable, NT- Near Threatened, LC- Least Concern)



Picture 5-4: Birds spotted in project area

Vulture and Storks Nesting Status

Vultures and storks are large birds with longer breeding period which lasts for about six to seven months. In March/April is their fledgling leaving from nest. We surveyed within 1km buffer zone of propose transmission line's right of way. We could not record any nesting and even movement of the vultures in the project site. However, we recorded nesting of Lesser Adjutant (Globally Vulnerable previously but now down listed as Near Threatened) in the farmland of Kohalbi and Baragadi Important Bird and Biodiversity Area.

There were eight active nests of Lesser Adjutant in Amab area which are about 1.8km far from the transmission line (AP 20). However, the nesting site in Dhodiya is just about 200m north from transmission line (AP 26). We recorded three active nests of Lesser Adjutant there. There is high risk of electrocution and collision if the transmission line passes close to the nesting site of large birds especially during landing and takeoff from the nest. At least 1km distance is consider safe. So, it is recommended to shift the transmission line in the northern site if possible or use bird reflector in the section from AP 25 to AP 27.

Picture 5-5: Lesser Adjutant nesting location in Dhodiya and nests

- **Herpeto-fauna**

Limited information is available on herpeto-fauna of the project area. Some of the species reported during field visit were Common Cobra (*Naja naja*), Dhaman (*Ptyas mucosa*), Common Krait (*Bungarus cacrateus*), House Gecko (*Hemidactylus frentus*), Common frog (*Rana tigrina*), Garden lizard (*Colotes versicolor*), Skink (*Mabuya carinata*) and Monitor lizard (*Varanus flaveens*).

- **Human Wildlife Conflict**

The most common conflict species in the area was Nilgai as they were quite abundant and regularly depredated on the crops of the local communities. Other conflict species were golden jackal, rhesus macaque, chital and leopard.

5.3 Socio-economic and Cultural Environment

5.3.1 Project Affected District (PAD)

Proposed NPTLP lies in the Rauthat, Bara and Parsa Districts of Madhesh province, Nepal. There are 21 RMs, 21 municipality, two Sub-Metropolitan (SMC) and one Metropolitan city (MC) in the PAD. The PAD covers an area of 3669 sq.km.

According to the Initial National Population and Housing Census (NPHC) 2021, total population of the PAD is 2,231,181with male 1136476 (%) and female 1094705 (%). Total number of families is 381352with average HH size 5.85 which is higher than national average (4.32). The average population density of PAD is 608.1 persons/sq. km; which is much higher than national density (198). Similarly, population growth of the PAD from the last decade is 1.15 which is higher than the national growth rate (0.93%). This may be due to the fact that the PAD has a fertile agricultural

land, employment opportunities in industries and commercial sector, and also have transportation and all physical facilities (infrastructures and services). Therefore in-migration to the district from hill area with the aspiration of getting benefited from these socio-economic opportunities and the cultural aspect of giving birth to comparatively higher number of children lead to high population growth rate in the PAD. The number of the urban population has increased from the last few years since the GoN of Nepal has declared new municipalities by incorporating existing VDCs. Details of the demographic characteristics of the PAD are given in table below.

Table 5-12: Demographic Characteristics of PAD

Demographic Characteristics	District			
	Rautahat	Parsa	Bara	Total/Average
Total Population	813573	654471	763137	2,231,181
Male	408403	338286	389787	1136476
Female	405170	316185	373350	1094705
Total Numbers of Households	137032	113080	131240	381352
Average Households size	5.94	5.79	5.81	5.85
Population Density (persons/ sq.km)	723	484	614	608.1
Sex Ratio (Male per 100 Females)	100.8	107.0	104.4	103.82
Annual population growth rate	1.63	0.82	1	1.15
Total Area of the District (sq. km)	1190	1353	1126	3669
Percent of District Population Compared with total national population	2.79	2.24	2.62	7.65

Source: NSO 2021, censusnepal.cbs.gov.np

5.3.2 Project Affected Area (PAA)

The proposed TL passes through 11 Local Levels (MC/SMC/Municipality/RM) of 3 districts (Rautahat, Bara and Parsa). These 11 Local Levels (MC/SMC/Municipality/RM) are considered as project affected area (PAA) in the report.

- **Demography**

Total population of PAA is 857,623 with 437,744 (51.04%) male and 419,879 (48.96%) female. The population of the PAA covers only 38.44% of the total population of the PAD. Similarly, there are 151,377families in the PAA and average family size is 5.67. The average population density of the project area is 735.41 persons/sq.km which is higher than the average population density of the PAD (608.1 persons/sq.km). Table below shows details of the demographic characteristics of the PAA.

Table 5-13: Demographic Characteristics of PAA

PAA (MC/SMC/RM/ Municipality*)	Population			Family No.	Sex Ratio	Av. Family Size	Area (km^2)	Population Density (person/km^2)	Literacy Rate
	Total	Male	Female						
Gujara*	51855	25772	26083	7937	98.81	6.53	150.3	1474	
Fatuwa Bijayapur*	42218	20975	21243	7354	98.74	5.74	65.24	647	54.68
Kohalbi*	51182	24862	26320	10561	94.46	4.85	157.4	325	65.74
Karaiyamai	29165	14651	14514	5051	100.94	5.77	47.69	612	65.18
Kalaiya SMC	136222	70358	65864	22125	106.82	6.16	108.9	1250	68.1
Jitpur-Simara SMC	127307	63927	63380	25650	100.86	4.96	309.7	408	71.67
Birgunj MC	272382	142195	130187	47114	109.22	5.78	75.24	2062	76.04
Prasagadhi*	41569	21011	20558	7632	102.2	5.45	99.69	417	64.5

PAA (MC/SMC/RM/ Municipality*)	Population			Family No.	Sex Ratio	Av. Family Size	Area (km^2)	Population Density (person/km^2)	Literacy Rate
	Total	Male	Female						
Sakhuwa Prasauni RM	35399	17697	17702	6295	99.97	5.62	74.27	477	61.81
Jagarnathpur RM	32649	16734	15915	5582	105.15	5.85	45.29	721	62.67
Pokhariya*	37675	19562	18113	6076	108	6.2	32.47	11.6	64.36
Total	**857623**	**437744**	**419879**	**151377**	**36.05**	**5.67**	**1166.19**	**735.41**	**65.48**

Source: NSO 2021, censusnepal.cbs.gov.np

- **Crop Production, Agricultural Income and Horticulture Farming**

The major crops grown in the project area are paddy, maize, wheat, barley. The cash crops of the project area include oilseed, potato, pulses, etc. The mango, litchi, banana and watermelon are the major fruit production in the project area. The cropping pattern of the non-irrigated khet is mostly dominated by two cropping systems comprising of maize and wheat or maize and paddy or other appropriate combination of leguminous plants. Most part of PAA have irrigation facilities all throughout the year. Fishery is also a major income generating source of the PAA.

Picture 5-6: Irrigation Facilities at PAA

Picture 5-7: Fish Farming Pond and Sunflower Farming at PAA

- **Agricultural Land Types and Cropping Pattern**

Most sections of the TL project travel through plain area. The cropping patterns and selection of crops depend on the land quality and availability of irrigation facilities. More fertile and year-round irrigated lands are cultivated twice or even thrice a year whereas non-irrigated lands are cultivated once a year. The major agriculture cultivation practices in the PAA depend upon monsoon. The paddy, maize, wheat are the major cereal crops. The sugarcane, oilseed, potato, pulses, seasonal/off-season vegetables, mango, litchi and banana are grown as cash crops.

Picture 5-8: Agricultural land (Maize and Paddy fields) of PAA

- **Road and Transportation**

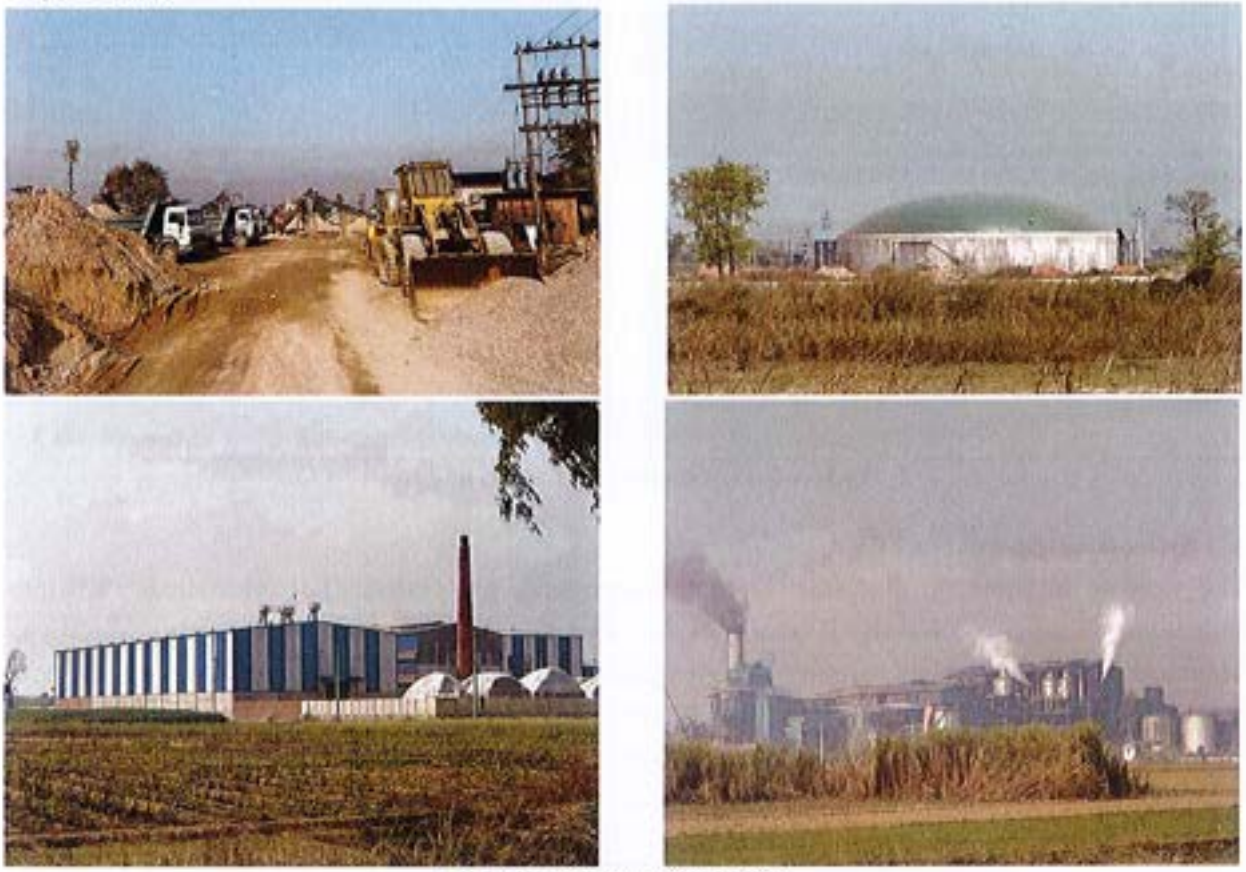
All the wards and nearby settlements of project affected area are well connected with motorable road, earthen road and feeder road to district headquarter and other places of the districts.

Picture 5-9: Road and Transportation Connection of PAA

- **Industrial and Commercial Activities**

The project affected area is known for the industrial hub of country. Birgunj is the main custom point for international trade between Nepal and India. Nepal being largely trade concentrated with India, Birgunj carries the major portion of imports and exports of whole international trade of the country. The PAA has large number of manufacturing and other industries producing range of products. Bara-Parsa industrial corridor having main industries of the nation lies in the PAA. Large number of vehicle movement carrying heavy loads can be observed in the Birgunj-Patlaiya road

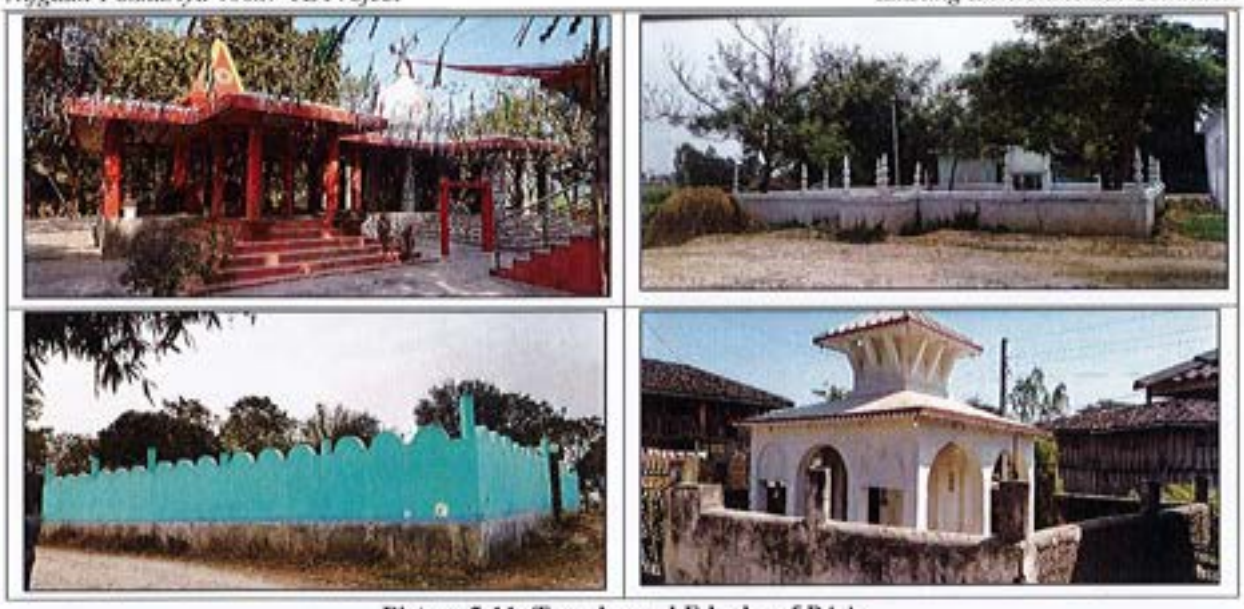
transporting commodities from the custom point to different parts of the country. As an import-based country only few trucks were seen with loads returning back to the custom point from Nepal's side.



Picture 5-10: Industries in PAA

- **Religious, Historical and Archeological Sites**

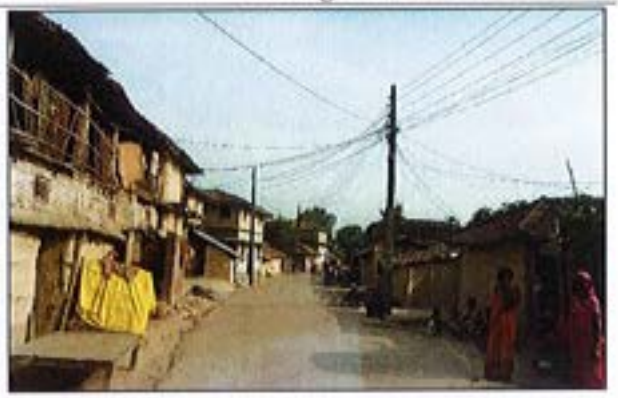
The project affected districts have some historical and important religious places. Gadhimai temple of Bara, Parsagadhi temple of Parsa are among the most popular religious places. There are many other small temples where various gods and goddess are worshiped. As there the project affected districts have dense population of Muslim people there are many Mosques all around the areas. Some religious places within RoW were identified in the study conducted as per the initial survey of the project. So, the TL alignment was shifted with new survey to avoid the impact on those religious area.



Picture 5-11: Temples and Edgaha of PAA

- **Nearest Settlements of PAA**

The nearest settlements from the project components are Gachhi Tol, Himalibas, Khaira, Batauliya, Belwa, Sirsagadi Bazzar, Pipra, Dhodhiya, Madhuban, Khamuwa, Medilwa, Majhauliya, Pipariya, Kanchanpur, Murgiyagoth, Ramauli, Gamargaun, Chhatapipara, Belwa, Basdilwf, Chhotaili, Harpur, Tikuliya, Phulbariya, Gulbariya, Beluwa, Madhopur, Sisiai, Bahuwai, Lamariya and Bankatwa which lie within 50 to 300m (approximately) from the project components. Some of the mentioned settlements are densely populated and some of them are scattered. Houses nearby settlements are mostly RCC, Khapada with mud and stone, stone-mud and galvanize roofed. Similarly, most of dwellers of nearby settlements are the follower of Hindu and Muslim religions. Awadhi and Nepali are major languages spoken by the people of nearby settlements. Agriculture, business, foreign employment, service, wage labor etc. are the major occupation adopted by the people of nearby settlements. Most of the HHs use handpump and piped water for drinking and other domestic purpose. All of the HHs use electricity for lighting. Though most of the household in the nearby settlement area have their toilet there are still some areas where the health and sanitation condition are found to be poor and below satisfactory level. In some areas it was found that people are using open spaces for toilet and children are often playing in dirty water and mud.

Picture 5-12: Nearest Settlement of PAA

5.3.3 Profile of the Project Affected Surveyed Households (HHs)

- **Population and Households**

Out of 199 directly affected HHs by the project (Substation, Angle Point including suspension towers), census survey of 173 HHs was carried out to collect socio-economic status of the PAHs. 26 HH's data were not collected because they were absent during field survey. All of surveyed HHs will lose their plot of land. The project will acquire 13.076 ha private land permanently from these households for the construction of substations and tower pads. The total population of surveyed HHs is 1339 including 664 (49.59%) male and 675 (50.41%) female. The sex ratio and average HHs size is 98.37 and 7.7 respectively.

Table 5-14: Demographic Features of PAFs

S N	PAA (MC/SMC/Municipality/RM)	Population				Household	
		Male	Female	Total	Sex Ratio	Total	Average HH Size
1	Birgunj MC	74	79	153	0.94	18	8.5
2	Fatawa Bijayapur Municipality	19	19	38	1.00	4	9.5
3	Jagannathpur RM	29	30	59	0.97	6	9.8
4	Jitpur Simara SMC	136	148	284	0.92	38	7.5
5	Kalaiya SMC	68	58	126	1.17	16	7.9
6	Karaiyamai RM	46	42	88	1.10	11	8.0
7	Kolhabi Municipality	106	105	211	1.01	34	6.2
8	Parsagadhi Municipality	85	91	176	0.93	20	8.8
9	Pokhariya Municipality	50	50	100	1.00	11	9.1
10	Sakhuwa Parsauni RM	51	53	104	0.96	15	6.9
	Total	**664**	**675**	**1339**	**0.98**	**173**	**7.7**

Source: Households Survey, 2080/81

The HHs survey shows, according to the broad age group classification, 62.43% of is economically active population (age group between 15 to 59) and 37.57% population is in-active population (population below age 15 years and senior citizen aged 60 years and above).

Table 5-15: Distribution of Population by Broad Age Group

PAA (MC/SMC/Municipality/RM)	Age Group						Total Population
	0-15		15-59		60 and above		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	43	28.10	91	59.48	19	12.42	153
Fatawa Bijayapur Municipality	12	31.58	21	55.26	5	13.16	38
Jagannathpur RM	23	38.98	26	44.07	10	16.95	59
Jitpur Simara SMC	76	26.76	178	62.68	30	10.56	284
Kalaiya SMC	33	26.19	78	61.90	15	11.90	126
Karaiyamai RM	18	20.45	58	65.91	12	13.64	88
Kolhabi Municipality	49	23.22	147	69.67	15	7.11	211
Parsagadhi Municipality	49	27.84	112	63.64	15	8.52	176
Pokhariya Municipality	29	29.00	60	60.00	11	11.00	100
Sakhuwa Parsauni RM	29	27.88	65	62.50	10	9.62	104
Total	**361**	**26.96**	**836**	**62.43**	**142**	**10.60**	**1339**

Source: Households Survey, 2080/81

- **Type of Family**

Nuclear type of family is main practice in the project affected HHs. Of the total 173 surveyed HHs, 77 HHs are categorized as joint type and the rest 96 are nuclear type.

Table 5-16: Distribution of Affected Households by Family Type

PAA (MC/SMC/Municipality/RM)	Family Type				Total (HHs)
	Joint		Nuclear		
	HHs	%	HHs	%	
Birgunj MC	10	55.56	8	44.44	18
Fatawa Bijayapur Municipality	1	25.00	3	75.00	4
Jagannathpur RM	5	83.33	1	16.67	6
Jitpur Simara SMC	16	42.11	22	57.89	38
Kalaiya SMC	7	43.75	9	56.25	16
Karaiyamai RM	6	54.55	5	45.45	11
Kolhabi Municipality	12	35.29	22	64.71	34
Parsagadhi Municipality	10	50.00	10	50.00	20
Pokhariya Municipality	5	45.45	6	54.55	11
Sakhuwa Parsauni RM	5	33.33	10	66.67	15
Total	**77**	**44.51**	**96**	**55.49**	**173**

Source: Households Survey, 2080/81

- **Caste/Ethnic Composition of HHs**

The household survey shows that the major five caste of project affected household were Tharu Yadav, Teli, Muslim and Kurmi consecutively. These five-caste group possesses almost 70% of the total surveyed households. Altogether there are 21 type of caste groups and so the reaming 16 caste types holds only around 30% in the caste and ethnic composition.

Table 5-17: Distribution of Affected Households by Caste/Ethnicity

SN	Caste	HHs	Percentage
1	Tharu	61	35.26
2	Yadav	27	15.61
3	Teli	12	6.94
4	Muslim	11	6.36
5	Kurmi	10	5.78
6	Dhanuk	8	4.62
7	Koeri	6	3.47
8	Halwai	5	2.89
9	Chamar	5	2.89
10	Brahmin (Hill)	4	2.31
11	Mallaha	4	2.31
12	Bhumihaar	3	1.73
13	Chhetri (Hill)	3	1.73
14	Rajbhar	3	1.73
15	Magar	2	1.16
16	Mandal	2	1.16
17	Terai Brahmin	2	1.16
18	Dalit (Hill)	1	0.58
17	Giri (Terai)	1	0.58
19	Makhi	1	0.58
20	Rajput	1	0.58
21	Sanyasi	1	0.58
	Total	**173**	**100.00**

- **Marital Status**

Of the total 1,339 population, 738 are married and 557 are unmarried. Similarly, the population of widow/widower is 41 and 3 are separated.

Table 5-18: Surveyed Persons by Marital Status

PAA (MC/SMC/ Municipality/RM)	Age Group								Total
	Married		Unmarried		Separated		Widow/widower		
	No.	%	No.	%	No.	%	No.	%	
Birgunj MC	82	53.59	64	41.83		0.00	7	4.58	153
Fatawa Bijayapur Municipality	18	47.37	19	50.00	1	2.63		0.00	38
Jagannathpur RM	32	54.24	25	42.37		0.00	2	3.39	59
Jitpur Simara SMC	157	55.28	117	41.20		0.00	10	3.52	284
Kalaiya SMC	68	53.97	55	43.65		0.00	3	2.38	126
Karaiyamai RM	48	54.55	38	43.18		0.00	2	2.27	88
Kolhabi Municipality	127	60.19	76	36.02	2	0.95	6	2.84	211
Parsagadhi Municipality	95	53.98	77	43.75		0.00	4	2.27	176
Pokhariya Municipality	51	51.00	45	45.00		0.00	4	4.00	100
Sakhuwa Parsauni RM	60	57.69	41	39.42		0.00	3	2.88	104
Total	**738**	**55.12**	**557**	**41.60**	**3**	**0.22**	**41**	**3.06**	**1339**

Source: Households Survey, 2080/81

- **Religion**

Majority people 158 of surveyed HHs in the PAHs are the followers of Hinduism. Likewise, 13 religious groups are found the followers of Muslim and 2 are Buddhism.

Table 5-19: Surveyed Households Classification by Religion

PAA (MC/SMC/Municipality/RM))	Religion						Total (HHs)
	Hinduism		Muslim		Buddhism		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	15	83.33	3	16.67		0.00	18
Fatawa Bijayapur Municipality	4	100.00		0.00		0.00	4
Jagannathpur RM	6	100.00		0.00		0.00	6
Jitpur Simara SMC	36	94.74	2	5.26		0.00	38
Kalaiya SMC	13	81.25	3	18.75		0.00	16
Karaiyamai RM	9	81.82	2	18.18		0.00	11
Kolhabi Municipality	32	94.12		0.00	2	5.88	34
Parsagadhi Municipality	20	100.00		0.00		0.00	20
Pokhariya Municipality	11	100.00		0.00		0.00	11
Sakhuwa Parsauni RM	12	80.00	3	20.00		0.00	15
Total	158	91.33	13	7.51	2	1.16	173

Source: Households Survey, 2080/81

- **Mother Tongue**

Abadhi (58.54%) is the major spoken language of surveyed HHs. Likewise, people speak Tharu language (31.71%), Nepali (7.32%) and Urdu language (2.44%) in the surveyed Household.

- **Occupation**

Agriculture is the main occupation of the surveyed people. It seems largest than other profession. Around 47.12% people involved in agriculture followed by service (in country 9.52%), labor wage (7.76%), business and small industries (5.29%), foreign employment (4.00%), Household work (5.5%). Similarly, 21.27% people are students.

Table 5-20: Occupational Composition of Surveyed Population (15-59 years) by Sex

Major Occupation	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
Agriculture	121	28.14	280	66.51	401	47.12
Business /Small Industry	43	10.00	2	0.48	45	5.29
Labor wage (In country)	61	14.19	5	1.19	66	7.76
Foreign Employment	29	6.74	5	1.19	34	4.00
Service (Inside country)	70	16.28	11	2.61	81	9.52
Student	102	23.72	79	18.76	181	21.27
Household Work	4	0.93	39	9.26	43	5.05
Total	**430**	**100.00**	**421**	**100.00**	**851**	**100.00**

Source: HH Survey, 2080/81

- **Literacy**

From the HHs survey, it is revealed that 83.95% of the surveyed populations are literate with male literacy rate 92.68% and female literacy rate 75.08%. Literacy status of the surveyed female is also low than the male.

Table 5-21: Literacy Status (5 years and above) of Surveyed Population

Literacy Status	Male		Female		Total	
	No.	%	No.	%	No.	%
Illiterate	45	7.32	151	24.92	196	16.05
Literate	570	92.68	455	75.08	1025	83.95
Total	**615**	**100**	**606**	**100.00**	**1221**	**100**

Source: HH Survey, 2080/81

Of the literate population, percentage of literately only, pre-primary level, basic level (class 1 to 8) secondary level (class 9 to 12) and higher level (bachelor and above level) are 7.51, 1.76, 41.76, 39.32 and 9.66 respectively.

Table 5-22: Educational Attainment among the Literate Population of Surveyed HHs

Educational Attainment	Male		Female		Total	
	No.	%	No.	%	No.	%
Literate only	48	8.42	29	6.37	77	7.51
Pre-Primary Level	11	1.93	7	1.54	18	1.76
Basic Level	204	35.79	224	49.23	428	41.76
Secondary	233	40.88	170	37.36	403	39.32
Higher (Bachelors and above)	74	12.98	25	5.49	99	9.66
Total (Literate)	**570**	**100.00**	**455**	**100.00**	**1025**	**100.00**

Source: HH Survey, 2080/81

- **Land Holding Size by Land Type**

The HHs survey shows all of the affected HHs have their own land for cultivation. These HH have been classified on the basis of different landholding categories such as marginal, small, medium, and large. Out of surveyed HHs, 3.513% are categorized as marginal type families having land 12.334 Hectare (ha). Likewise, 22.085% are categorized as small type families having land 23.617 hectare. 28.282% of HHs as medium type families having land 99.306 ha. In the same way 46.121% HH are large type families having land more than 161.942 ha. Below table shows the HHs having land based on holding size and category. In the same way it also shows the average land holding size per hectare by the type of land.

Table 5-23: Distribution of Surveyed HHs by Landholding size

Landholding Categories		Households		Total Area	
Category	Size of holding(ha)	HHs	%	Area(ha)	%
Marginal	Up to 0.5	41	23.70	12.334	3.513
Small	0.5 - 1.0	35	20.23	23.617	6.726
	1.0 - 1.5	27	15.61	32.731	9.322
	1.5 - 2.0	13	7.51	21.196	6.037
Medium	2.0- 4.0	35	20.23	99.306	28.282
Large	>4	22	12.72	161.942	46.121
Total	-	**173**	**100.00**	**351.126**	**100.000**

Source: HH Survey, 2080/81

- **Food Sufficiency**

Since the project area has sufficient fertile irrigated agriculture land, majority of the surveyed HHs have round year sufficient food for them to survive. Out of the surveyed HHs, 133 HHs (76.88%) have sufficient food throughout the year whereas only 40 HHs (23.12%) have not sufficient food throughout the year from their own production.

Table 5-24: Deficient HHs from Own Production

PAA (MC/SMC/Municipality/RM)	Sufficiency				Total (HHs)
	Yes		No		
	HHs	%	HHs	%	
Birgunj MC	16	88.89	2	11.11	18
Fatawa Bijayapur Municipality	3	75.00	1	25.00	4
Jagannathpur RM	5	83.33	1	16.67	6
Jitpur Simara SMC	23	60.53	15	39.47	38
Kalaiya SMC	12	75.00	4	25.00	16
Karaiyamai RM	8	72.73	3	27.27	11
Kolhabi Municipality	25	73.53	9	26.47	34
Parsagadhi Municipality	19	95.00	1	5.00	20
Pokhariya Municipality	9	81.82	2	18.18	11
Sakhuwa Parsauni RM	13	86.67	2	13.33	15
Total	**133**	**76.88**	**40**	**23.12**	**173**

Source: HH Survey, 2080/81

Among surveyed HHs, 40 HHs have stated that food is not sufficient from their own field production. Out of these 40 HHs, 16 HHs have food deficiency of less than 3 months, 13 HHs have food deficiency of 3 to 5 months; 8 HHs have deficiency of 6 to 9 months and remaining 3 HHS have food deficiency of over 9 months.

Table 5-25: Households with Food Deficiency from Own Production

PAA (MC/SMC/ Municipality*/RM)	Food Deficiency (in months)								Total
	<3		3-5		6-9		>9		
	HHs	%	HHs	%	HHs	%	HHs	%	
Birgunj MC		0.00	2	100.00		0.00		0.00	2
Fatawa Bijayapur*	1	100.00		0.00		0.00		0.00	1
Jagannathpur RM	1	100.00		0.00		0.00		0.00	1
Jitpur Simara SMC	6	40.00	4	26.67	3	20.00	2	13.33	15
Kalaiya SMC	1	25.00	3	75.00		0.00		0.00	4
Karaiyamai RM	1	33.33		0.00	2	66.67		0.00	3
Kolhabi *	3	33.33	2	22.22	3	33.33	1	11.11	9
Parsagadhi *		0.00	1	100.00		0.00		0.00	1
Pokhariya *	1	50.00	1	50.00		0.00		0.00	2
Sakhuwa Parsauni RM	2	100.00		0.00		0.00		0.00	2
Total	**16**	**40.00**	**13**	**32.50**	**8**	**20.00**	**3**	**7.50**	**40**

Source: HH Survey, 2080/81

- **Debt Status**

Debt status is a major component to see the socio-economic status of the surveyed HHs. From the HHs survey, it is revealed that only 99 HHs (57.23%) have the burden of debt whereas 74 HHs (42.77%) have no debt burden. The survey also reveals that these people take loans for different

purpose like house repair 24.24%, for purchase land 19.19 %, for education 31.31 % and for foreign employment 25.25 percentage.

Table 5-26: Affected Households Having Debt

PAA (MC/SMC/ Municipality/RM)	Debt Status				Total (HHs)
	Yes		No		
	HHs	%	HHs	%	
Birgunj MC	9	50.00	9	50.00	18
Fatawa Bijayapur Municipality	3	75.00	1	25.00	4
Jagannathpur RM	4	66.67	2	33.33	6
Jitpur Simara SMC	23	60.53	15	39.47	38
Kalaiya SMC	11	68.75	5	31.25	16
Karaiyamai RM	8	72.73	3	27.27	11
Kolhabi Municipality	21	61.76	13	38.24	34
Parsagadhi Municipality	12	60.00	8	40.00	20
Pokhariya Municipality	2	18.18	9	81.82	11
Sakhuwa Parsauni RM	6	40.00	9	60.00	15
Total	**99**	**57.23**	**74**	**42.77**	**173**

Source: HH Survey, 2080/81

Table 5-27: Affected Households Purpose of Debt

Type of Loan	HHs	Percentage
House Maintenance	24	24.24
Purchase land	19	19.19
Education	31	31.31
Foreign Employment	25	25.25
Total	**99**	**100.00**

Source: Households Survey, 2080/81

- **Business/Cottage Industry**

From the HHs survey, it is revealed HHs have no any cottage industries. However, 40 HHs (23.12%) reported of having their own small business; like tea shops, General shop, poultry faming, and vegetable farming. The remaining 133 HHs (76.88%) do not have any business and they either depend upon agriculture or other sources of income such as foreign employment, service or labor wage.

Table 5-28: Affected Households Having Business/Cottage Industry

PAA (MC/SMC/ Municipality/RM)	Business/Cottage Industry				Total (HHs)
	Yes		No		
	HHs	%	HHs	%	
Birgunj MC	5	27.78	13	72.22	18
Fatawa Bijayapur Municipality	1	25.00	3	75.00	4
Jagannathpur RM	4	66.67	2	33.33	6
Jitpur Simara SMC	5	13.16	33	86.84	38
Kalaiya SMC	4	25.00	12	75.00	16
Karaiyamai RM	9	81.82	2	18.18	11
Kolhabi Municipality	6	17.65	28	82.35	34
Parsagadhi Municipality	1	5.00	19	95.00	20
Pokhariya Municipality	4	36.36	7	63.64	11
Sakhuwa Parsauni RM	1	6.67	14	93.33	15
Total	**40**	**23.12**	**133**	**76.88**	**173**

Source: HH Survey, 2080/81

- **Income and Expenditure Patterns**

The average annual income of the surveyed HHs is estimated to be NRs. 572,798. The source of income is agriculture as well as non-agriculture sector. Non-agriculture sector consists service, business, daily wage, remittance, pension/old-age pension and house rent. Among the different sources of income, non-agriculture contributes about 74.72%. Income from agriculture and livestock contribute 25.28% respectively. The average annual income from different sources of the surveyed is given in the following figure.

Table 5-29: Income sources of Surveyed HHs (%)

Income Source	Average Income (NRs.)	Percentage (%)
Agriculture and animal husbandry Income	144809	25.28
Service	212312	37.07
Business	93757	16.37
Daily Wages/Porter	52185	9.11
Pension/Briddha Bhatta	19908	3.48
Remittance	49827	8.70
Total Average Income	**5,72,798**	**100.00**

Source: HH Survey, 2080/81

- **Drinking Water**

All the surveyed HHs (173 HHs) have sufficient water (drinking and HHs uses) throughout the year. The major source is tube well for 91.33% people. Rest of other 15 HHs (8.67% HHs) use piped water.

Table 5-30: Sources of Drinking Water

PAA (MC/SMC/Municipality/RM)	Sources of Drinking Water				Total (HHs)
	Piped Water		Tubewell		
	HHs	%	HHs	%	
Birgunj MC	3	16.67	15	83.33	18
Fatawa Bijayapur Municipality	2	50.00	2	50.00	4
Jagannathpur RM	-	0.00	6	100.00	6
Jitpur Simara SMC	4	10.53	34	89.47	38
Kalaiya SMC	2	12.50	14	87.50	16
Karaiyamai RM	1	9.09	10	90.91	11
Kolhabi Municipality	3	8.82	31	91.18	34
Parsagadhi Municipality	-	0.00	20	100.00	20
Pokhariya Municipality	-	0.00	11	100.00	11
Sakhuwa Parsauni RM	-	0.00	15	100.00	15
Total	**15**	**8.67**	**158**	**91.33**	**173**

Source: HH Survey, 2080/81

- **Source of Cooking and Lighting Energy**
- **Cooking**

Firewood is the main sources of energy for cooking food among the surveyed HHs. About 51.45% HHs use firewood as the source of cooking food. Followed by 30.06% LP Gas and 18.50% HHs use cow dung. The source of energy adopted by the surveyed HHs is shown in the following table.

Table 5-31: Sources of Cooking Energy

PAA (MC/SMC/Municipality/RM)	Cooking Energy Type						Total (HHs)
	Fuelwood		LPG		Cow dung		
	HHs.	%	HHs	%	HHs	%	
Birgunj MC	6	33.33	8	44.44	4	22.22	18
Fatawa Bijayapur Municipality	1	25.00	3	75.00		0.00	4
Jagannathpur RM	2	33.33	1	16.67	3	50.00	6
Jitpur Simara SMC	22	57.89	12	31.58	4	10.53	38
Kalaiya SMC	8	50.00	3	18.75	5	31.25	16
Karaiyamai RM	5	45.45	4	36.36	2	18.18	11
Kolhabi Municipality	23	67.65	6	17.65	5	14.71	34
Parsagadhi Municipality	9	45.00	7	35.00	4	20.00	20
Pokhariya Municipality	7	63.64	2	18.18	2	18.18	11
Sakhuwa Parsauni RM	6	40.00	6	40.00	3	20.00	15
Total	**89**	**51.45**	**52**	**30.06**	**32**	**18.50**	**173**

Source: HH Survey, 2080/81

Since the project area is connected with the national grid of electricity and all HH have access to electricity for lighting.

- **Health and Hygiene Condition**

All of the surveyed HHs are aware about their hygiene and careful towards hygiene related problems, however surrounding sanitation and hygiene condition of some HHs was not satisfactory during field survey. There is no any viral disease detected in the surveyed population. Although some health problems like heart problem, respiration related problem, stomachache, headache, blood pressure high, ear/eye infection and major sickness problems like sugar, mental disorders, cardiovascular, skin diseases, etc. are detected in 33.53% HHs.

In regards to the solid waste management, 39.02% HHs dump their solid waste at the safe location, where 17.07% HHs burn the waste nearby their home and 43.9% buried their household waste at their own land. Some of the surveyed HHs throw waste around their houses, nearby open places and bank of road/bank of the river. The following table shows solid waste management practiced by surveyed HHs.

Table 5-32: Sickness of Surveyed Households during Last Year

PAA (MC/SMC/Municipality/RM)	Sickness				Total (HHs)
	Yes		No		
	HHs	%	HHs	%	
Birgunj MC	6	33.33	12	66.67	18
Fatawa Bijayapur Municipality	1	25.00	3	75.00	4
Jagannathpur RM	2	33.33	4	66.67	6
Jitpur Simara SMC	14	36.84	24	63.16	38
Kalaiya SMC	5	31.25	11	68.75	16
Karaiyamai RM	3	27.27	8	72.73	11
Kolhabi Municipality	9	26.47	25	73.53	34
Parsagadhi Municipality	7	35.00	13	65.00	20
Pokhariya Municipality	4	36.36	7	63.64	11
Sakhuwa Parsauni RM	7	46.67	8	53.33	15
Total	**58**	**33.53**	**115**	**66.47**	**173**

Source: Households Survey, 2080/81

- **Description of the house of the Surveyed HHs**
  - **By wall type**

All the surveyed HHs have made their own house for residence. The wall of house is usually constructed by mud, stone, brick, cement with wood furniture and structure. About 61.85% of houses of the surveyed HHs are made up of brick, cement and stone. Likewise, 2.89% of HHs are made up with Stone, mud and brick and 35.84% are made up with bamboo/mud. The details types of walls have been presented in the following table.

Table 5-33: Houses by Type of Wall

PAA (MC/SMC/Municipality/RM)	Type of Wall						Total (HHs)
	Brick/Cement/ Stone		Bamboo/ Mud		Brick/Mud/ Stone		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	13	72.22	4	22.22	1	5.56	18
Fatawa Bijayapur Municipality	4	80.00	1	20.00		0.00	5
Jagannathpur RM	4	66.67	2	33.33		0.00	6
Jitpur Simara SMC	20	52.63	17	44.74	1	2.63	38
Kalaiya SMC	7	8.00	9	56.25		0.00	16
Karaiyamai RM	5	45.45	6	54.55		0.00	11
Kolhabi Municipality	21	61.76	10	29.41	3	8.82	34
Parsagadhi Municipality	15	75.00	5	25.00		0.00	20
Pokhariya Municipality	8	72.73	3	27.27		0.00	11
Sakhuwa Parsauni RM	10	66.67	5	33.33		0.00	15
Total	**107**	**61.85**	**62**	**35.84**	**5**	**2.89**	**173**

Source: Households Survey, 2080/81

- **By roof type**

There is no similarity in type of roof of the surveyed PAFs. HHs survey reflects that most of the HHs (57.80%) have RCC of roof, 38.15 % of HHs have made with Zinc roof and only 4.05% have Khapada.

Table 5-34: Houses by Type of Roof

PAA (MC/SMC/Municipality/RM)	Type of Roof						Total (HHs)
	RCC		Zinc		Tile		
	HHs.	%	HHs	%	HHs	%	
Birgunj MC	13	72.22	1	5.56	4	22.22	18
Fatawa Bijayapur Municipality	3	75.00		0.00	1	25.00	4
Jagannathpur RM	4	66.67		0.00	2	33.33	6
Jitpur Simara SMC	19	50.00		0.00	19	50.00	38
Kalaiya SMC	5	8.00	2	12.50	9	56.25	16
Karaiyamai RM	5	45.45		0.00	6	54.55	11
Kolhabi Muncipality	17	50.00	4	11.76	13	38.24	34
Parsagadhi Municipality	16	80.00		0.00	4	20.00	20
Pokhariya Municipality	8	72.73		0.00	3	27.27	11
Sakhuwa Parsauni RM	10	66.67		0.00	5	33.33	15
Total	**100**	**57.80**	**7**	**4.05**	**66**	**38.15**	**173**

Source: Households Survey, 2080/81

- **By floor type**

Mud and cement are commonly used on floor by the surveyed HHs. About 37.57% of surveyed HHs use mud on their floor where majority of HHs 62.43% HHs have used cement on the floor of their houses.

Table 5-35: Houses by Floor Type

PAA (MC/SMC/Municipality/RM)	Type of Floor				Total (HHs)
	Cement		Mud		
	HHs	%	HHs	%	
Birgunj MC	13	72.22	5	27.78	18
Fatawa Bijayapur Municipality	4	100.00	0	0.00	4
Jagannathpur RM	4	66.67	2	33.33	6
Jitpur Simara SMC	18	47.37	20	52.63	38
Kalaiya SMC	9	56.25	7	43.75	16
Karaiyamai RM	5	45.45	6	54.55	11
Kolhabi Municipality	22	64.71	12	35.29	34
Parsagadhi Municipality	15	75.00	5	25.00	20
Pokhariya Municipality	8	72.73	3	27.27	11
Sakhuwa Parsauni RM	10	66.67	5	33.33	15
Total	**108**	**62.43**	**65**	**37.57**	**173**

Source: Households Survey, 2080/81

- **By Number of Story**

One story house is common among the surveyed HHs. About 85.55% of the HHs have their house with one story where 11.56% and 4.88% of HHs have two floors and 2.89% three stories houses respectively.

Table 5-36: Houses by No. of Story

PAA (MC/SMC/Municipality/RM)	No. of Storey's						Total (HHs)
	One		Two		Three		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	11	61.11	5	27.78	2	11.11	18
Fatawa Bijayapur Municipality	2	50.00	2	50.00		0.00	4
Jagannathpur RM	6	100.00		0.00		0.00	6
Jitpur Simara SMC	34	89.47	3	7.89	1	2.63	38
Kalaiya SMC	15	8.00		0.00	1	6.25	16
Karaiyamai RM	7	63.64	4	36.36		0.00	11
Kolhabi Municipality	32	94.12	1	2.94	1	2.94	34
Parsagadhi Municipality	17	85.00	3	15.00		0.00	20
Pokhariya Municipality	9	81.82	2	18.18		0.00	11
Sakhuwa Parsauni RM	15	100.00		0.00		0.00	15
Total	**148**	**85.55**	**20**	**11.56**	**5**	**2.89**	**173**

Source: Households Survey, 2080/81

- **Information and Attitude Regarding the Project**
- **Information**

Only 39.31% had the information about the project, whereas majority of the population (60.69%) had no idea or real information about this proposed project. According to the surveyed HHs, the main sources of information about the project activity are through the neighbors and NEA employers. About 73.53% of the HHs got information from NEA/Surveyors, 13 % HHs got information through neighbors and 5% got information through newspaper.

Table 5-37: Households Knowledge about the Project

PAA (MC/SMC/Municipality/RM)	Knowledge about the Project				Total (HHs)
	Yes		No		
	HHs	%	HHs	%	
Birgunj MC	6	33.33	12	66.67	18
Fatawa Bijayapur Municipality	1	25.00	3	75.00	4
Jagannathpur RM	2	33.33	4	66.67	6
Jitpur Simara SMC	23	60.53	15	39.47	38
Kalaiya SMC	7	43.75	9	56.25	16
Karaiyamai RM	4	36.36	7	63.64	11
Kolhabi Municipality	10	29.41	24	70.59	34
Parsagadhi Municipality	6	30.00	14	70.00	20
Pokhariya Municipality	4	36.36	7	63.64	11
Sakhuwa Parsauni RM	5	33.33	10	66.67	15
Total	**68**	**39.31**	**105**	**60.69**	**173**

Source: Households Survey, 2080/81

- **Attitude**

About 50.29% of HHs have shown their positive attitude towards the proposed project while 38.15% of the HHs are against the project activities, 11.56% HHs are neutral. The main reason of people exposed negative attitude towards the project and its lengthy process for compensation, land price under the RoW and in the vicinity of RoW, especially near to the highway and built-up areas will be reduced significantly.

Table 5-38: Attitude towards Project

PAA (MC/SMC/Municipality/RM)	Attitude of the Surveyed HHs						Total (HHs)
	Positive		Negative		Neutral		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	10	55.56	6	33.33	2	11.11	18
Fatawa Bijayapur Municipality	3	75.00	1	25.00		0.00	4
Jagannathpur RM	3	50.00	2	33.33	1	16.67	6
Jitpur Simara SMC	22	57.89	11	28.95	5	13.16	38
Kalaiya SMC	7	8.00	8	50.00	1	6.25	16
Karaiyamai RM	6	54.55	4	36.36	1	9.09	11
Kolhabi Municipality	14	41.18	15	44.12	5	14.71	34
Parsagadhi Municipality	11	55.00	7	35.00	2	10.00	20
Pokhariya Municipality	5	45.45	5	45.45	1	9.09	11
Sakhuwa Parsauni RM	6	40.00	7	46.67	2	13.33	15
Total	**87**	**50.29**	**66**	**38.15**	**20**	**11.56**	**173**

Source: Households Survey, 2080/81

- **Expectation from the Project**

Good compensation for the acquired land and property, employment and local development are the expectations of the surveyed HHs. However, majority of the HHs (72.83%) have shown their interest for good compensation from the project, likewise 20.81% HHs have expectations for employment, and 6.36% HHs have expectations for local development of their area.

Table 5-39: Expectation from the Project

PAA (MC/SMC/Municipality/RM)	Expectation of the Surveyed HHs						Total
	Good Compensation		Employment		Local Development		
	HHs	%	HHs	%	HHs	%	
Birgunj MC	12	66.67	5	27.78	1	5.56	18
Fatawa Bijayapur Municipality	4	100.00		0.00		0.00	4
Jagannathpur RM	5	83.33	1	16.67		0.00	6
Jitpur Simara SMC	27	71.05	8	21.05	3	7.89	38
Kalaiya SMC	12	8.00	3	18.75	1	6.25	16
Karaiyamai RM	9	81.82	2	18.18		0.00	11
Kolhabi Municipality	22	64.71	9	26.47	3	8.82	34
Parsagadhi Municipality	16	80.00	3	15.00	1	5.00	20
Pokhariya Municipality	8	72.73	2	18.18	1	9.09	11
Sakhuwa Parsauni RM	11	73.33	3	20.00	1	6.67	15
Total	**126**	**72.83**	**36**	**20.81**	**11**	**6.36**	**173**

Source: Households Survey, 2080/81

6 Environmental Impacts

This chapter assesses the likely adverse impacts during the construction and operation of the NPTLP, which will result in perturbations in the existing baseline conditions. The general discussions are organized in three categories namely; physical, biological and socio-economic and cultural environment and divided into construction and operation phases.

6.1 Physical Environment

The main physical impacts on the environment are those associated with land take for stringing of the line, construction of tower foundation and changes in drainage patterns. The major impacts anticipated during the construction and operation phase are discussed in the sections below.

6.1.1 Topography

a. Construction Phase

The land interference during construction of the TL is related to the tower foundation, substation and lack of restraint of the RoW. This may result in the change in landscape. No other change in topography is envisaged during this phase. The visualized impact on topographic changes is considered to be moderate in magnitude, site specific and for long term.

b. Operation Phase

No impact on topography is expected during the operation phase except for the impact on natural scenery. The Impact is moderate in magnitude, local and for long term.

6.1.2 Land Use and Land Take

a. Construction Phase

The land use changes will be basically due to the permanent and temporary land acquisition under the RoW and for the construction of tower foundation. The project will require 310.647ha land for the placement of tower foundations (angle and suspension), substation and RoW of the TL and temporary facilities. The alignment passes through mostly the cultivable land and forest and crosses some river/streams. The district wise landuse of the project is given I Table Table 6-1. The impact can be classified as High in magnitude, local in terms of extent and of long term of duration.

b. Operation Phase

The impact on the land use changes of the permanent land take for the towers and substation is expected to be high. The land under the RoW will be restricted for the erection of any type of public and private structures and any type of tall trees species. However, cultivation will be allowed. All temporary land acquired will be converted to its original use or agreed new uses towards the end of the construction period and handed over to their owners. The impact can be classified as high in magnitude, local in extent and of long-term in duration.

Table 6-1: District Wise Land Requirement (ha)

	Forest				Cultivation		Pond	Barren Land		Canal	Road	Total
	National	Collaborative	CF	Water Body	Gov	Pvt.	Pvt.	Govt.	Pvt.			
Rautahat	9.741	26.398	13.944	3.865	0	12.156	0	0	0	0.115	0.607	66.826
Bara	0	0	0	2.877	7.894	117.169	3.519	0.798	0.687	0	1.599	134.543
Parsa	0	0	0	4.388	1.808	95.268	4.011	0.497	1.35	0.745	1.205	109.277
Total	9.741	26.398	13.944	11.131	9.701	224.594	7.530	1.295	2.041	0.860	3.411	310.647

Source: GIS Analysis and Field Study 2080/81

6.1.3 Air and Noise Quality

a. Construction Phase

The construction activities consist of site clearance, excavation for the tower foundation, concreting and stringing of the line. These activities will generate dust in the surrounding area. Apart from these activities, movement of transporting vehicles carrying the construction materials along the earthen/gravel roads will generate fugitive as well as combustion emissions and will cause temporary impact on air quality. Since the construction activities are limited to small area, the impact on the ambient air quality will be low in magnitude, site specific in terms of extent and of short duration.

The emission of noise and vibrations are inevitable during construction though only insignificant interruption in noise quality has been expected for TL project. The settlements which are close to the APs and STs will feel the disturbances due to vehicular movement and construction activities. Noise pollution will be temporary and will not be different from the prevailing conditions due to low traffic movement along the roadside. The impact is expected to be low in magnitude, site specific and for a short duration.

b. Operation Phase

No any impact on air quality is envisaged during the operation phase. However, a kind of humming sound may be created at the substation area. The transmission overhead lines do create some noise in certain circumstances; for example, during minor surface damage, dirt or change in weather conditions can cause the lines to crackle or hum slightly. This is due to a phenomenon called Corona effect. The effect of corona is conspicuous during rain. The impact is expected to be low in magnitude, long termed and site specific.

6.1.4 Water Quality

a. Construction Phase

During the construction period, water will be used from nearby water bodies. Therefore, there is possibility of water pollution especially in sectors where the line crosses the canals and stream. Soil disturbances associated with construction activities of tower foundations, the improper disposal of solid wastes and chemicals such as cement slurry, construction materials, and human wastes into the canal may deteriorate the water quality of the canal and other water bodies in the construction area. The impact is expected to be moderate, site specific and for a short duration.

b. Operation Phase

The operation and maintenance activities of the TL will not have impact on the water quality in the project impact area.

6.1.5 Watershed and Drainage Condition

a. Construction Phase

The TL traverses through the flat terrain of terai region. Most of the tower foundations and substation are located on the agricultural land. Though, the TL crosses Bagmati and Gandak irrigation canals and streams, it's interference with the drainage system will be minimum. In addition, there is no any water bodies within the direct impact zone of the proposed substation. No any direct and indirect impact is predicted from the substation structures on the drainage of the area. Therefore, the impact of the TL on watershed and drainage condition is expected to be site specific, low in magnitude and for a short duration.

b. Operation Phase

No significant impact on the watershed and natural drainage is expected during this phase.

6.1.6 Soil Erosion and Slope Instability

a. Construction Phase

The proposed TL alignment lies in the flat terrain of the terai region. AP 10 and AP 11 are close to the Bakaiya Khola and AP 45 is near the dudhaura khola and thera may be instability issues in those areas during flood time. So, the impacts related to the soil erosion and land stability is less significant in the project area. The impact will be medium in magnitude, site specific and for long duration.

b. Operation Phase

There will be no any issues of soil erosion and land stability in the project area during this phase.

6.1.7 Crossing of Other Utilities and Interferences

a. Construction Phase

During the TL wire stringing, there will be some disturbances on road and distribution line crossings. Vehicle movement will be blocked in the TL crossing section for a short duration of time. The impact will be high in magnitude, site specific and for short duration.

b. Operation Phase

The proposed TL crosses roads, canals and TL of different voltages. The proposed TL mostly passes away from the settlement areas, the magnitude of the impact is considered to be insignificant. The impact will be low in magnitude, site specific and for short duration.

6.1.8 Waste and Spoil Generation

a. Construction Phase

The spoil generated due to the excavation of foundation is also detrimental to land and water quality of the area. There will be no muck from tower pad since the excavated volume will be used for compaction and restoration of natural ground level. Muck volume generated at substation area will be used for land preparation by back filling and compaction at the site and also will be used for feeder road gravelling and retaining wall. The magnitude of impact is considered to be low; extent is site specific and for a short duration of time.

b. Operation Phase

During this period, there may be some leakage of oil and lubricants in the substation area. This impact is considered to be low; extent is site specific and for a long duration of time. For the substation operation, there will be 3-4 staffs working on shift basis as substation will have automation system. So, there will not be any issues of solid waste generation.

6.1.9 Storage of Construction Material and Camps

a. Construction Phase

Storage of construction material and construction camp are proposed within the proposed substation and about 2.000ha private land is used temporarily in this project. The impact of construction camp and material storage yard will be low in magnitude, site specific and for short duration.

b. Operation Phase

No impact is expected during the operation and maintenance period.

6.1.10 Air Traffic

a. Construction Phase

In the construction phase of the project, the proposed TL may impact on the fly route of aeroplanes and helicopters as proposed Nijgadh Airport is nearby the transmission line route. This will have site specific impacts of medium magnitude for a short duration of time.

b. Operation Phase

The proposed TL may impact on the fly route aeroplanes and helicopter as proposed Nijgadh Airport is nearby the transmission line route. This may have impact on low flying helicopter during the foggy days. This will have site specific impacts of medium magnitude for a long duration of time. Impacts on air traffic will be mitigated in accordance with the CAAN recommendation in the Chapter 8.

Table 6-2: Physical Environment Impact Assessment Matrix

SN	Issues	Impacts	Identification and Evaluation of Impact						
Construction Phase			D	IND	M	E	Du	Sum of Impact Value	Significance of Impact
1.	Topography	Topography of the tower site will be changed due to excavation, fill and cut for leveling the foundation area leading to the change in landscape.	D		M	SS	LT	50	Significant
2.	Land Use and Land Take	The project will require 310.647ha of land for placement of foundation, substation and RoW of TL.	D		H	SS	LT	90	Highly Significant
3.	Air Quality	Different construction activities and vehicular movements will generate dust/ smoke and affect air quality in the surrounding area	D		L	SS	ST	25	Less Significant
4.	Noise Level	Use of Construction equipment and vehicles will increase noise level.	D		L	SS	ST	25	Less Significant
5.	Water Quality	There is possibility of water pollution especially in sectors where the line crosses the rivers and streams leading to deterioration of river water quality and other existing water bodies around the construction area.	D		M	SS	ST	35	Less Significant
6.	Watershed and Drainage	No APs are located near the river or streams, the probability of the disruption of natural drainage does not appear.	D		L	SS	ST	25	Less Significant
7.	Soil erosion and Land stability	The proposed TL alignment lies in the flat terrain of the terai region and three towers are located near flood plain.	D		M	SS	LT	50	Significant
8.	Crossing of utilities	some disturbances on road and distribution line crossings.	D		H	SS	ST	75	Significant
9.	Waste and spoil generation	The improper disposal of solid waste like cement bags, iron bar and other leftover construction materials, kitchen waste and waste generated by the temporary labour camp might cause adverse impact to the environment.	D		L	SS	ST	25	Less Significant
10.	Storage of Construction Material	Lead to land degradation and damage of the particular area; within the substation area and about 2.000 ha private land	D		L	SS	ST	25	Less Significant
11.	Air Traffic	Impact on the fly route of aeroplanes and helicopters.	D		M	SS	ST	35	Less Significant
Operation Phase									
1	Topography	Impacts on natural scenery	D		M	L	LT	50	Significant
2	Land Use & Land Take	land use changes of the permanent land take for the towers and substation	D		H	SS	LT	90	Highly Significant

SN	Issues	Impacts	Identification and Evaluation of Impact						
2	Noise Level	A kind of humming sound may be created at the substation area and corona effect might cause.	D		L	SS	LT	40	Less Significant
3	Crossing of other utilities & interference	No any impacts on crossing and other utilities	D		L	SS	ST	25	Less Significant
4	Waste and spoil disposal	Some leakage of oil and lubricants	D		L	SS	LT	40	Less Significant
5	Air Traffic	Impact on the fly route of aeroplanes and helicopters.	D		M	SS	LT	50	Significant

Note: D: Direct, IND: Indirect

Magnitude (M)	L= Low (10)	M= Medium (20)	H= High (60)
Extent (E)	SS= Site Specific (10)	L= Local (20)	R= Regional (60)
Duration (Du)	ST= Short Term (05)	MT= Medium Term (10)	LT= Long Term (20)

The number in the bracket refers to Impact value as per National EIA Guidelines, 1993. The sum of impact values provides a maximum of 140 and minimum of 25.

Significance of impact: sum of impact values: more than 75 → Highly Significant, 50-75 → Significant and less than 50 → Less Significant

6.2 Biological Environment

The implementation of the project will affect the existing ecosystems in the project impact area multi-dimensionally and the effects may be both adverse and positive. The major impacts on the biological environment will include the loss of individual trees and loss of vegetation cover due to site clearance; increased demand of fuel wood and timber and impact on wildlife and birds.

6.2.1 Forest/ Vegetation Loss

a. Construction Phase

As far as standing trees are concerned, a total of 14,795 tree including poles of 23 different species from 61.214 ha (including 11.131 ha of river and flood plain) of forest land was estimated to be cleared from impacted community forests (Anjuman and Pashupati), Collaborative Forest and Government managed forest (Table 6-3). There are 28 transmission line tower proposed in the forest area which will impact 1.5095 ha of land permanently. Additionally, substation, tower and RoW will impact 7.971ha, 1.509ha and 40.603ha respectively. It is estimated that 11,095 saplings and 645,264 seedlings will also be impacted by the project activities from the forest area.

Tree Loss From Private Land

There are about 649 trees/poles, and 39 bamboo patches in the private lands within The RoW of the proposed TL. During the project construction, all the trees and bamboo patches within the RoW need to be felled. It will have site specific and short-term impact.

b. Operation Phase

During the operation phase of the project, only trees which grow under the RoW after some years might need to be cleared. No any tall trees will be allowed to grow within the Row of the line. This will have site specific impact of low magnitude for a long period of time.

6.2.2 Changes of Demand for Fuel Wood and Timber

a. Construction Phase

Local people in the project area are dependent on the nearby forest for timber, firewood and fodders. Therefore, felling of 14,795 (4,182 trees and 10,613 poles) number of standing trees will have impact on the livelihood of the forest dependent people of the area. This will help to fulfill the firewood and timber demand of local people for the short period of time. However, in the long run, forest production of the impacted forest area will be lost and will have impact on forest dependent people.

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. Similarly, the influx of construction workers can increase the possibility of fire hazard to the local forest. This is more specific in those temporary labour camps which will be, during the construction phase, located near the forest. The improper handling of firewood or cooking fuel can induce such impact. So, the impact will be low in magnitude, site specific and short-termed.

b. Operation Phase

No any impact is anticipated during this period.

Table 6-3: Details of trees in Impacted Forests

SN	Name	Location	Area in RoW (ha)	Trees (no.)	Pole (no.)	Sapling	Seedling	Remarks
1	GMF	Substation and Gantry	7.1557	735	2,242	1,336	133,096	0.8892ha Nijgadh substation area lies under the RoW of existing 132kV TLP
2	Jangalsahiya Collaborative Forest	Dead End Gantry to AP 7/1	26.398	2,710	8,271	4,928	491,003	
3	Anjuman CF	AP7/1 to AP7/3	2.2464	119	16	642	3,410	
4	Pashupati CF	AP7/3 to AP 9/1	11.6979	618	84	3,342	17,756	
5	GMF	AP10 to AP 11/1 and Dead-end Gantry	1.6959	0	0	848		
6	River and flood plain	Throughout the alignment	11.131	0	0	0	0	0
		Sub-Total	61.214	4,182	10,613	11,095	645,264	
		Total	**61.214**	**14,795**		**11,095**	**645,264**	

Source: Field Study, 2024

6.2.3 Impact on Wildlife and Avifauna

a. Construction Phase

During the period, the project activities will have following impacts on wildlife (Refer Wildlife Survey Report for detail given in Appendix D-IV).

- **Habitat fragmentation**: The proposed TL will fragment the habitat during construction due to the presence of workers and heavy machinery.
- **Noise pollution**: The operation of heavy machinery and presence of people is going to cause noise pollution which is going to have negative impact on the wildlife.
- **Disruption of migration patterns**: Due to the construction work, wildlife will avoid the areas. This is going to impact migratory species in the area.
- **Disturbance of sensitive wildlife**: Some species, such as tigers and elephants, are more sensitive than others that are going to be impacted more than the disturbance tolerating species such as Nilgai.
- **Increased Human-wildlife conflict**: The displacement of wildlife from their habitat during the construction is going to increase human-wildlife conflict in the area.

During the period, the project activities will have following impacts on Birds (Refer Bird Survey Report for detail given in Appendix D-V).

- **Felling of birds preferred trees**: In the section from Nijgadh Substation to AP9 and between AP 68-AP 69, there are large trees (bird preferred for nesting and roosting) within RoW of the TL. Felling of these trees will have impacts on bird.
- **Impact on Lesser Adjutant**: Between the section AP 25 to AP 27 of the NPTLP, nest of Lesser Adjutant was observed during the field study. During the breeding season (from September to March), Lesser Adjutant will make nests, incubate eggs, and rear chicks. The nearby construction activities of the NPTLP will impact the bird.
- **Hunting**: Construction Workers may involve in hunting of birds in the project area.
- **Impact on IBAs**: Area from AP 10 to AP 30 lies within the Kohalbi and Baragadi Important Bird and Biodiversity Area.

b. Operation Phase

During the period, the project activities will have following impacts on wildlife (Refer Wildlife Survey Report for detail given in Appendix D-IV).

- **Electrocution**: Arboreal species such as monkeys and langurs have the probability of being electrocuted in the transmission line.
- **Barrier effect**: The clearing of forest under the transmission line is going to create a barrier effect especially for small mammals and ungulates that require cover.
- **Impact on infrastructure**: The presence of large mammals such as Asian elephants mean these species can impact the transmission line by either intentionally colliding with them or by using them as rub stations.
- **Risk of collision**: large mammals, such as Asian elephants and Nilgai can collide with the tower when they are on flight mode or in any excitement. This can also be true for predators.

During the period, the project activities will have following impacts on wildlife (Refer Bird Survey Report for detail given in Appendix D-V).

Collusion and Electrocution: Many migratory birds take the path of river and river valley during their migration journey. River also brings down carcasses along with the flood that attract the vultures and other raptors. The NPTLP crosses Lal Bakaiya River (AP 10 to AP11), Pasahah River (AP 32 to AP 33) and Dudhwa River (AP45 to AP46). During the field visit, number of raptors and storks' movement in the river corridor was recorded. So, in the river crossing, there will be potential electrocution and collision of Vulture, Storks and Water birds. Additionally, there are small wetland area in between AP20 to AP21 where significant number of globally Near Threatened Black-headed Ibis and Lesser Adjutant with Asian Openbill were recorded. So, there will be potential electrocution and collision such birds in the area.

6.2.4 Impact on Endangered Species

a. Construction Phase

There will be barrier effect and increased human-Wildlife conflict on the Endangered species of wildlife due to the project activities. The detail of the potential impacts on each endangered species is given in Table 6-4.

Table 6-4: Project Impacts on Endangered Species

Common Name	Impacts
Tiger	• Increased Human-Wildlife Conflict
Striped Hyaena	• Barrier effect • Increased Human-Wildlife Conflict
Asian Elephant	• Risk of collision • Impact on infrastructure
Sloth Bear	• Barrier effect • Increased Human-Wildlife Conflict

b. Operation Phase

There will be barrier effect, risk of collision and increased human-wildlife conflict on the Endangered species of wildlife due to the project. The detail of the potential impacts on each endangered species is given in Table 6-4.

6.2.5 Loss of Forest Ecosystem services

The proposed project activities (tree felling in RoW and substation) will have impacts on the following ecosystem services:

a. Construction Phase

- Provisioning services: there will be huge volume of timber and firewood generated from the RoW clearance. So, the project activities will have positive impacts on the provisioning services of the forest.
- Regulative services: After RoW clearance and substation clearance, the regulating services (climate regulation, flood protection, air quality regulation, etc.) will be lost to some extent.
- Cultural Services: After the tree felling, cultural services (walking in the forest, cycling in the forest, etc.) of the forest will be lost to some extent.
- Supportive Services: After tree felling, the supportive services (store carbon, improve water quality, reduce effect of flood) of the forest ecosystem will be impacted.

During the construction period, the forest ecosystem services will be lost and the impact will be medium, extent will be local and last for short duration of time.

b. Operation Phase

c. Provisioning services: landuse of the project impact area will be changed. So, except grass and fodder, the provisioning services of the ecosystem will be lost.

d. Regulative services: Regulating services (climate regulation, flood protection, air quality regulation, etc.) will be lost to some extent.

e. Cultural Services: Cultural services (walking in the forest, cycling in the forest, etc.) of the forest will be lost to some extent.

f. Supportive Services: After tree felling, the supportive services (store carbon, improve water quality, reduce effect of flood) of the forest ecosystem will be impacted.

During the operation period, the forest ecosystem services will be lost and the impact will be medium, extent will be local and last for long term.

6.2.6 Possibility of Fire hazard

The risk of fire hazard is mainly associated technical failures and lightning strikes. In addition, there is also the chances of setting fire in the camp facilities.

a. Construction Phase

Before the construction tower foundation and stringing of wire, all the vegetation within the impact area has to be clearly felled and removed. If the dry biomass after felling cannot be managed properly, or biomass thus removed from the forest cannot be managed properly, there may be the chances of setting fire. In addition, burning of firewood or LP gas in the labour camp and other project facilities also increase the risk of fire hazard. As, forest fire was also observed in the area during the study, there is high chances of forest fire during the project construction. Considering those facts, fire hazard by the project activities is predicted to be of medium magnitude, extent will be local and last for short period of time.

b. Operation Phase

During the operation stage of the project, due to technical failure and/or lighting strikes, there may be chances of fire. Transformer failure could also result fire. In addition, residue after the periodic maintenance of RoW if not manage properly may also lead fire. Since accidental safety measures are adopted, the impact is likely to be low, site-specific and long term.

Table 6-5: Biological Environment Impact Assessment Matrix

SN	Issues	Impacts	Identification and Evaluation of Impact					Sum of Impact Value	Significance of Impact
			D	IND	M	E	Du		
Construction Phase									
1	Loss of Forest area and Tree	Impact on 61.214ha of forest including 11.131 ha of river/flood plain and removal of 14,795 trees from the forest area	D		H	L	MT	90	Highly Significant
2	Changes of Demand for Fuel Wood and Timber	There will be increase in demand for fuel wood and timber.			L	SS	ST	25	Less Significant
3	Impact on Wildlife	Habitat fragmentation, disturbance to wildlife and increased human wildlife conflict.	D	IND	M	L	ST	45	Less Significant
4	Impact on Birds	Felling of Birds preferred trees, impact on Lesser adjutant, impact on IBAs and possible hunting of birds.	D	IND	M	L	ST	45	Less Significant
5	Impact on Protected Species	Increase in human wildlife conflict		IND	M	L	ST	45	Less Significant
6	Possibility of fire hazard/forest fire	Fire risk related to construction activities in forest land. Uncontrolled activities of labor force could light fire to the adjoining forest basically during the dry season		IND	M	L	ST	45	Less Significant
7	Ecosystem Services	Ecosystem services of the forest will be lost	D	IND	M	L	ST	45	Less Significant
Operation Phase									
8	Loss of vegetation	Felling of trees that grows within the RoW of the TL.	D		L	SS	LT	40	
9	Impact on wildlife	Chances of Electrocution to arboreal species, barrier effect and risk of collision.	D	IND	M	L	LT	60	Significant
10	Impact on Birds	Collision and Electrocution of Birds	D		M	L	LT	60	Significant
11	Impact on Protected Species	Increase in human wildlife conflict		IND	L	L	LT	50	Significant
12	Forest fire	Technical failure may trigger fire which could spread to the nearby forest		IND	L	SS	LT	40	Less Significant
13	Ecosystem Services	Ecosystem services of the forest will be lost	D	IND	M	L	LT	60	Significant

Note: D: Direct, IND: Indirect

Extent (E)	SS= Site Specific (10)	L= Local (20)	R= Regional (60)
Magnitude (M)	L= Low (10)	M= Medium (20)	H= High (60)
Duration (Du)	ST= Short Term (05)	MT= Medium Term (10)	LT= Long Term (20)

The number in the bracket refers to Impact value as per National EIA Guidelines, 1993. The sum of impact values provides a maximum of 140 and minimum of 25. Significance of impact: sum of impact values: more than 75 → Highly Significant, 50-75 → Significant and less than 50 → Less Significant.

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

a. Construction Phase

Households losing land and structure

The implementation of the proposed project will affect 199 HHs. These HHs will be affected due to the construction of different project components such as tower pads and substation. There are two proposed substations to be constructed under this project out of which one (Nijgadh) substation lies completely within the forest land and the other (Ramauli) substation is proposed on cultivated land. One shed will be affected by the TLP.

Table 6-6: HHs Affected by the Project

SN	Project Component	Type of Asset	PAA	HHs	
				Total	Surveyed
1	Towers only	Land only	Birgunj SMC	19	18
			Fatawa Bijayapur Municipality	7	5
			Jagarnathpur RM	9	6
			Jitpur Simara SMC	23	20
			Kalaiya SMC	19	16
			Karaiyamai RM	13	11
			Kolhabi Municipality	37	34
			Parsagadhi Municipality	22	20
			Pokhariya Municipality	13	12
			Sakhuwa Prasauni RM	17	15
2	Substation	Land only	Jitpur Simara SMC	19	17
3	RoW	Structure (Shed)	Pokhariya Municipality	1	-
Total				**199**	**173**

Source: HH Survey, 2023/024

Implementation of project will affect 199HHs, out of which the survey of 173HHs was conducted. All of the surveyed HHs will lose their land only with the construction of towers and substation. Out of the total surveyed HHs, 69.36%HHs will lose less than 10% of their land, where 20.81%HHs will lose 10 to 25%, 4.62% HHs lose 25 to 50% and 5.20% HHs will lose more than 50% of their land. Table given below shows the detail of the land loss.

Table 6-7: Affected HHs by Land Loss (Surveyed HHs)

SN	Percentage of loss of land	Type	
		HHs	%
1	< 10	120	69.36
2	10 - 25	36	20.81
3	25 – 50	8	4.62
4	>50	9	5.20
Total		**173**	**100.00**

Source: HH Survey 2023/024

- **Land Requirement**

The project will acquire and utilize 234.165 ha of private land including 8.024ha land for tower pads, 5.341 ha land for substation and 218.800 ha land for RoW. Details of the land use is given in the table 2-2. Among total 185 towers (85 APs and 100 STs), 150 towers will be erected in private land. The land under the RoW of TL will be restricted permanently for construction of any types of structures and plantation of big timber size trees. However, there will be no restriction on agricultural farming after the construction work is over. The detail loss of land of project affected is given in Appendix K.

Table 6-8: Private land required by Project Components (ha)

SN	Project Component	Cultivation (Pvt.)	Barren	Pond	Total
1	Land under RoW excluding tower pads and SS	209.729	1.541	7.530	218.800
2	Land for tower pads	8.024			8.024
3	Substation	5.341			5.341
4	Storage	1.5	0.5		2.0
	Total Private Land	**224.549**	**2.041**	**7.530**	**234.165**
	Total Permanent Private Land Acquisition	**13.365**			13.365
	Total Private Land Restriction (RoW)	**209.729**	1.541	7.530	218.800
	Total Temporary Land Utilization	**1.5**	0.5		2.0

- **Households Losing Structures**

One HH will lose one structure (shed). The area of the shed is about 378 square feet.

b. 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 the 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, the magnitude of impact is moderate, extent is site specific and duration is long term.

6.3.2 Loss of Crops

a. Construction Phase

- **Permanent Loss of Crops**

The major crops cultivated in the project area are paddy, wheat, maize and sugarcane. Total crop loss of the project affected HHs due to the permanent acquisition land for one season is estimated to be 61.69MT. The following table shows the details. The magnitude of this impact is considered to be high; extent is site specific and duration is long termed. Details of production loss due to land acquisition is presented in Table 6-9 below.

Table 6-9: Estimated Annual Loss of Agricultural Production of Surveyed HHs

SN	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)
1	Paddy	7.077	31.28	4.42
2	Wheat	2.018	5.57	2.76
3	Maize	3.161	10.21	3.23
4	Sugarcane	376	14.63	38.92
		Total	**61.69**	

- **Temporary Loss of Crops**

There will be loss of standing crops along TL RoW during the construction phase. The impact will depend upon the timing of the construction and cropping in the impacted area. Preferably the construction of TL will be carried out during clean season so that standing crops are not damaged or minimum damaged. However, the adjoining of RoW may be disturbed due to the movement of vehicles and stringing of line.

The Project will require 218.800ha of private land for RoW, out of this 209.729ha is agriculture land. Total crop loss of the project affected HHs due to the permanent utilization land (RoW) for one season is estimated to be 1086.45MT.

Table 6-10: Annual Loss of Agriculture Production (Land Utilization)

SN	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)
1	Paddy	123.675	546.64	4.42
2	Wheat	28.137	77.66	2.76
3	Maize	51.348	165.85	3.23
4	Sugarcane	7.613	296.30	38.92
		Total	**1086.45**	

b. Operation Phase

Tower 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 for loss of crops in permanent land. Whereas, there is no such impact on temporary land.

6.3.3 Impact on Fish Pond

a. Construction Phase

Implementation of project will affect 7.53ha of fish pond area as 18 ponds lie within the RoW. During the stringing of TL, there is risk of impact on fish and other aquatic animal. The magnitude of impact is considered to be low; extent is site specific and duration is short term.

b. Operation Phase

No impact is anticipated during operation phase.

6.3.4 Tree Loss From Private Land

a. Construction Phase

There are about 649 trees/poles in the private lands within The RoW of the proposed transmission line. During the project construction, all the trees and bamboo patches within the RoW need to be felled. It will have site specific and short-term impact.

b. Operation Phase

During the operation phase of the project, only trees which grow under the RoW after some years might need to be cleared. No any tall tree will be allowed to grow within the RoW of the TL. This will have site specific impact of low magnitude for a long period of time.

6.3.5 Impact on Livelihood

a. Construction Phase

The HH survey shows that the PAFs do not rely on only single income source; instead, they maintain their daily life involving on various occupations like foreign employment, service, farming and livestock, pension and so on. Similarly, the proposed TL alignment will acquire fertile land and the proposed Ramauli substation will acquire some hectare of fertile cultivated land so some HHs will lose their cultivated land permanently which causes, to some extent, scarcity of food permanently on their daily living; however, they do not fully depend on their agricultural income. So, the overall magnitude of impacts on livelihood is considered to be moderate, extent is site specific and duration is long term.

b. Operation Phase

In the operational phase of the project the HHs loosing land can purchase land elsewhere or can generate income through other means by using the compensation amount. So, the impact on livelihood will be low, medium term and site specific.

6.3.6 Health, Water Supply and Sanitation

a. Construction Phase

- **Health and Sanitation**

The local people may come regular undesirable contact with the outsiders so, the likely increase of the outsiders' influence during this phase may add further stress on the local health and sanitation situation. The concentration of labor force may encourage prostitution, which could lead to the spread of sexually transmitted disease. There could lead the spread of other communicable diseases such as diarrhea, worm, and respiratory diseases and so on too. However, the impact is considered to be low, site specific and for short-term considering the small number of manpower and their short-term mobility at one site. 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 camp sites. The lack of proper sanitary measures and increase wastes and water pollution may lead to the outbreak of epidemic diseases. However, the impact is considered to be low, site specific and for short-term considering small number of manpower and their short-term mobility at one site.

- **Drinking Water**

With the increase in population along with the construction activities of substation, 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 for short period, increase pressure on the existing water supply system, increase in disease vectors, and reduced water quality due to increased sanitation problems etc. However, the impact on water supply and sanitation shall be low, short term and site specific but the pressure on water supply and sanitation will be long term in substation.

b. Operation Phase

The same impact is anticipated during the operation phase.

6.3.7 Occupational Hazards and Safety

a. Construction Phase

During construction of the TL, 185 double circuit towers will be constructed. This job involves moderate risks mainly in the form of falling from height or being pulled by the cable and vehicle accidents. If careless, there will be possibility of injury or even deaths of the workers become a reality. Inadequate provision of health safety equipment such as hard hats, boots etc. may create health hazard. The magnitude of impacts is considered to be moderate; extent is local and duration is long term.

b. Operation Phase

During the operation phase, the people residing in the vicinity of the TL will be vulnerable to electrical hazards such as fire, electrical shocks or even electrocution. Similarly, lack of operation and maintenance skill and unavailability of the essential safety equipment 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. These risks have low probability of occurrences. The overall magnitude of impacts is considered to be low; extent is local and duration is long term.

6.3.8 Impact on House, Settlements and Social Infrastructure

a. Construction Phase

Three APs of the proposed TL is to be constructed within the range of nearby settlement area and houses (>200m). So, the magnitude of impact on above mentioned infrastructures are low, extent is local and duration is long term.

b. Operation Phase

The impact on settlements and community structures remains same in this period also. The magnitude of impact is low, extent is local and duration is long term.

6.3.9 Impact on Communal Resources

a. Construction Phase

The construction workers might use the communal resources such as water, forest products, and any other resources used by the communities. There may be increased flow of outsiders in the health-post and hospital of the area. In addition, there may be the pressure on collection and use of forest produces. Such impact is predicted to be low in magnitude, local in extent and short-term n duration.

b. Operation Phase

There is no impact on communal resources during operation of the TL.

6.3.10 Impact on PAF due to Alteration of Land and Property Values

a. Construction Phase

The land and property values under RoW and close to house and settlement will be devalued due to construction of TL. Even though there is no loss of land due to the transmission line itself, there will be some negative effects as there will be different conditions for the sale of the land in the jurisdiction of the power line and for the land to be taken as collateral for loan in the bank. The nature of impact is expected to be high, local and long termed.

b. Operation Phase

The same impact is anticipated during the operation phase.

6.3.11 Restriction of Future Land Use Development near to Settlement

a. Construction Phase

No impact is anticipated during this phase.

b. Operation Phase

The proposed TL mostly passes through rural area. Due to implementation of TL, land nearby settlement and road will be affected. It restricts land use potentiality of the area mostly in Jitpur, Chhatapipara, Karaiya, Gawargaon, Pokhariya where the area may spread as market area in future. Plan and programs proposed by concerned RM/Municipality/SMC/MC will be affected. Hence, impact is expected on future land use development. The nature of impact is high, local in extent and long term.

6.3.12 Disturbance to Radio, Television and Mobile/Cell Phone Reception

a. Construction Phase

During construction period, there will be no impact on radio, television, telephone or cell phone.

b. Operation Phase

There is some interference with the radio, television and cell phone waves with the Electromagnetic Field (EMF) of the TL within the RoW, however, there are no findings of impact due to high voltage TL outside RoW. Hence, the nature of impact is expected to be low, site specific and long termed.

6.3.13 Electric and Magnetic Field Effect

a. Construction Phase

No impact is anticipated during construction phase.

b. Operation Phase

Electric powered TL creates electric and magnetic field together is known as EMF. 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 TL but none has proved and quantify about the health risks. Scientific research on the effects of EMFs on public health has not demonstrated clearly the existence of a significant risk, nor has it proven the complete absence of risk. 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 term.

6.3.14 Gender and Vulnerable Groups

a. Construction Phase

People will be, during the project construction, employed as unskilled, semi-skilled and skilled manpower on daily wages for excavation, transportation of construction materials and other construction related works. In equal value of work, the contractor, especially the sub-contractors, may discriminate the women and vulnerable group while hiring the worker. It is assumed that most of the labor force required for the construction of the TL 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, extent is local and the duration is short term.

b. Operation Phase

Most of the population involved directly or indirectly in the project work will be deprived from the job after the completion of the project which will make the female population to look for alternative source of income. This may add extra burden to their normal daily activities. This impact is expected to be medium in magnitude of impact is local and long term in duration.

6.3.15 Economic Activities

a. Construction Phase

Most of the section of the TL passes close to the rural roads which are considered as the semi-urban area. The interaction among different people/stakeholders and ethnic group may attract rural people towards money-oriented short-term consumption activities. The experience with other project has revealed the fact 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 low, extent is local and duration is short term.

b. Operation Phase

Project induced economic opportunities will be beneficial for the local people. However, these opportunities will be closed and the workers will lose their job after the project completion. Demand for local agricultural production and local commodity transactions will be reduced. The decrease or withdrawal in economic activity during operation phase may affect the habitual life of local people of spending more like the construction phase. They will face difficulty in managing the lifestyle. However, due to the linear nature of the project, the local labors can 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 long term.

6.3.16 Religious, Historical and Archeological Site

a. Construction Phase

Though there are numbers of temples, religious and cultural sites in the project area, none of the religious, historical and archaeological sites fall under the RoW.

b. Operation Phase

No impact is expected during the operation phase.

6.3.17 Social and Cultural Practices

a. 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.

b. 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.

6.3.18 Law and Order

a. Construction Phase

The contractor will, during the construction period, employ labor from different places with different religion and faiths, so there will be possibilities of conflict of interest that may affects the law-and-order situation. The past experience reveals the fact that local people have misunderstanding with the employers and contractor's staff. Since the project is of linear type and the number of local labors 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 term.

b. Operation Phase

No impact is anticipated during operation phase.

6.3.19 Impacts On Aesthetics

Impacts to aesthetics are examined in terms of changes between the existing landscape character and proposed actions, sensitivity of viewing points available to the general public, their viewing distances and visibility of proposed changes.

a. Construction Phase

During this phase, the felling down of trees, excavation of substation and tower pads, transportation and storage of construction materials will affect aesthetics or the natural scenery of the project area. However, the impact will be of low in magnitude, extent will be site specific and last for short duration.

b. Operation Phase

The existence of towers and TL will likely to create aesthetic impact on natural environment and scenery. The magnitude of impact will be low, site specific and long term in nature.

6.4 Beneficial Impacts

a. Construction Phase

- **Local Employment**

During the construction phase, one of the major beneficial impacts of the project is the creation of employment opportunities that, to some extent, may check out migration of the project area and promote in-migration. The project will itself require 654 number of workforces in construction phase and 69 workforces in operation phase. Project will give priority to locally available workforce as far as possible for those job opportunities. In this regard, this contributes to poverty alleviation to some extent. The availability of reliable power in this part of the country, which is known for industrial zone, will assist in establishing new industries. This will generate more employment for the local people. The magnitude of impact is considered to be moderate; extent is local and duration is short term.

- **Local Economy**

During construction period, the source of income of local people will be employment opportunity, income from house rental, rental/lease of land, shops, increased demand for fresh vegetables, fruits and meat. Furthermore, local contractor and local people can 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 growth in business can 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 can have opportunity to sell their products to construction workforce and project 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.

b. Operation Phase

- **Regional Economy**

The reliability in power distribution will enhance the production of the industries and boost the economic activity in the South-Eastern Nepal (mainly Madhesh Province).

- **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 to the locals in the project, the unemployed people of the area and HHs depend upon labor will benefit immensely. 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.

Table 6-11: Socio-economic and Cultural Environment Impact Assessment Matrix

SN	Issues	Impacts	Identification and Evaluation of Impacts						
			D	IND	M	E	Du	Sum of Impact Value	Significance of Impact
Construction Phase									
1	Acquisition and utilization of land and structures	234.165 ha private land will be acquired and utilized impact on one structure (shed).	D		H	SS	LT	90	Highly Significant
2	Loss of crops	Loss of 1148.14MT food crops from permanent land acquisition and RoW.	D		H	SS	LT	90	Highly Significant
3	Fishing ponds	Impact on 7.53ha of fish pond	D		L	SS	LT	40	Less Significant
4	Private trees	Loss of 649 trees/poles	D		L	SS	ST	25	Less Significant
5	Impact on Livelihood	Likely impact on livelihood to the PAFs.	D		M	SS	LT	50	Significant
6	Health, Water Supply and sanitation	Likely impact on health, water supply and sanitation	D		L	SS	ST	25	Less Significant
7	Occupational Hazards and safety	Likely increase in construction related accidents.	D		M	SS	LT	50	Significant
8.	Impact on house, settlement and social infrastructure	Likely impacts on house, settlements and social infrastructures.	D		L	SS	LT	40	Less Significant
9.	Impact on PAF due to alteration of land and property values	Likely impact on PAF due to alteration of land and property values	D		H	L	LT	100	Highly Significant
10.	Gender and Vulnerable group	Likely discrimination while hiring workers, compensation or other project related benefits.	D		L	L	ST	35	Less Significant
11.	Economic Activities	Likely increase in economic activities as well as unproductive spending.	D		L	L	ST	35	Less Significant
12.	Social and Cultural Practices	Likely impact on social and cultural practices		IND	L	L	ST	35	Less Significant
13.	Law and Order	Likely increase in pressure to maintain the law and order		IND	L	L	ST	35	Less Significant
14	Impact on Aesthetics	Likely impacts on Aesthetic values	D		L	SS	ST	25	Less Significant
15	Communal resources	Pressure on communal resources like forest produces, flow in health-post, and other	D		L	SS	ST	25	Less Significant
Operation Phase									
1.	Acquisition of Land and Structures	No significant impacts are expected on Land acquisition. Houses and other structures are not allowed to be constructed within RoW.	D		M	SS	LT	50	Significant

SN	Issues	Impacts	Identification and Evaluation of Impacts						
			D	IND	M	E	Du	Sum of Impact Value	Significance of Impact
2.	Loss of Crops	Placement of tower at center of field pose difficulty for the cultivation which further increase production cost	D		L	SS	LT	40	Less Significant
3.	Impact on Livelihood	Likely impact on livelihood to the PAFs.	D		L	SS	MT	30	Less Significant
4.	Occupational health and safety	Likely increase risks with safety regards.	D		M	SS	LT	60	Significant
5.	Impact on House, Settlements and Social Infrastructures	Likely impacts on house, settlements and social infrastructures.	D		L	SS	LT	40	Less Significant
8.	Impact on PAF due to alteration of land and property values	Land and property values under RoW will be devalued.	D		H	L	LT	100	Highly Significant
8.	Impact due to restriction of future land use development	Restriction on the multipurpose land use potentiality for the growing up market area.		IND	H	L	LT	100	Highly Significant
9.	Disturbances to radio, television and cell phone reception	Likely disturbances to radio, television and mobile/ cell phone reception		IND	L	SS	LT	40	Less Significant
10.	Electric and magnetic field	Electromagnetic impact due to long term exposure		IND	L	SS	LT	40	Less Significant
11.	Gender and Vulnerable group	Male population become jobless; this will compel extra burden to female population.	D		M	L	LT	60	Significant
12.	Economic Activities	Withdrawal of economic activities. Negative impacts on locals.	D		L	L	LT	50	Significant
13.	Impact on Aesthetics	Likely impacts on Aesthetic values	D		L	SS	LT	40	Less Significant

Note: D: Direct, IND: Indirect

Magnitude (M)	L= Low (10)	M= Medium (20)	H= High (60)
Extent (E)	SS= Site Specific (10)	L= Local (20)	R= Regional (60)
Duration (Du)	ST= Short Term (05)	MT= Medium Term (10)	LT= Long Term (20)

The number in the bracket refers to Impact value as per National EIA Guidelines, 1993. The sum of impact values provides a maximum of 140 and minimum of 25. Significance of impact: sum of impact values: more than 75 → Highly Significant, 50-75 → Significant and less than 50 → Less Significant

7 Alternative Analysis

7.1 Introduction

The IEE described all alternatives that were examined in the course of developing the proposed project and identify other alternatives which would achieve the identified objectives of the project. The alternatives were examined in order to minimize adverse impacts and maximize the benefits in the context of cost effectiveness, labor intensiveness and low risks of environmental hazards.

The IEE compared the alternatives in terms of potential environmental impacts, location, designs and technologies. Further alternatives in terms of methods, operation procedures and the materials to be used during construction were also considered. The alternatives considered in the IEE are discussed below.

7.2 Alternatives

Some of the major alternatives that were considered during IEE are:

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

7.2.1 Route Alternatives

Three alternative routes for this alignment were considered for IEE. Comparative studies for the feasibility of the different routes were done on the basis of the following guidelines:

- Access facility
- Located on geologically stable ground
- Total length of the line
- Minimum number of APs
- Avoid highly productive land or expensive RoW
- Minimum number of river crossing, national highways, and overhead power line and telecommunication lines.
- Avoid settlements areas or densely populated area; minimum number of affected HHs
- Avoid forest crossing and wildlife habitats.

Table 7-1: Alternative Analysis for NPTLP

SN	Item	Route-1	Route-2	Route-3
1.	Total length (km)	80.5 km	64.604 km	67.38 km
2.	Number of APs	73	85	90
3.	Access facility	Access facility is good for many sections of the project alignment except in some	Access facility is good for all sections of the alignment	Access facility is good for all sections of the alignment

SN	Item	Route-1	Route-2	Route-3
		sections of forest area.		
4.	Crossing of existing lines (HT & LT)	57	54	61
5.	Water Body (Khola) Crossing	40	41	43
6.	No. of settlement nearby the alignment	many	many	many
7.	No. of highway crossing	3	3	3
8.	No. of local roads crossing	99	98	95
9.	Forest along the route (km)	27km	13km	16km
10.	Marshy and unstable area	Not seen	Not seen	Not seen
11.	Any other impact	None	None	None
12.	Any other permanent structure	None	None	None
13.	Advantages	Alignment is short and far from settlement.	Alignment is short, good access.	Good accessibility
14.	Disadvantages	Lies in dense forest and Buffer zone forest, and closer to Nijgadh Airport.	Lies in forest and Agricultural land.	More road crossings, agricultural land and settlement areas. More angle points for this alternative.
15.	Order of Priority	3	1	2

Out of these three alternatives, Route-2 (64.604km) was selected as the best alternative from environmental and social perspectives as this route has better accessibility facility, passes through less settlement area, appropriate location of angle points and less elevation difference between consecutive points.

7.2.2 Route Alternatives in Forest Area

Initially, the Nijgadh substation was proposed at Nijgadh Municipality-7, which is about 300m east from the Nijgadh Bazzar. Later on, Nijgadh-Harniya 400kV line has also been proposed from the Nijgadh substation and was aligned parallel to the NPTLP in the forest area. Realizing the cumulative impacts of two separate 400kV line in the same forest area (with RoW of 46m each), both 400kV lines are merged together in the forest area with the replacement of double circuit tower by multi-circuit towers. With the change of double circuit tower to multi-circuit, the tower height was increased up to 78m. (Figure 7-1).

Table 7-2: Alternative Routes within Forest Area

SN	Characteristics	Alternative routes within Forest Area			
		Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
	Technical Features				
	Configuration	Double circuit line of NPTLP with substation in Bara	Two separate TLs (Double Circuit Line of NPTLP and Double Circuit Line of NHTLP) with substation in Bara	Multi-circuit line of NPTLP and NHTLP with proposed SS in Bara	Multi-circuit line of NPTLP and NHTLP with proposed SS in Rautahat
	Total length of TL (km)	64.07	96.15 (64.07+32.08)	68.61	64.604
	Maximum Tower Height (m)	60.00	60.00	78.02	78.02
	Estimated forest area loss including river/banks (ha)	60.002	109.289 (NPTLP-60.002ha and NHTLP 49.287ha)	80.534	61.214
	Estimated loss of trees (no.)	27,058	48,677	28,872	14795
	Advantages	Shortest route and better access even in the forest area	better access even in the forest area	Less impact on forest area as compared to alternative 2, but less than alternative 4	Least impact on forest area in comparison to other alternatives
	Disadvantages	Less energy evacuation compared to other alternatives	Requires two RoW of 46m each, almost parallel in the forest area, most destructive alternative	Shorter line length than alternative 2 but longer that alternative 4.	Less accessible forest area compared to other alternatives
	Priority of Selection	III	Least prioritized	II	I

However, consent for the multi-circuit tower, of height 78m, could not be received from the CAAN (Appendix A-II). Therefore, the project decided to go for double circuit tower configuration for the NPTLP. Following are the reasons (given by project) for shifting from multi-circuit tower configuration to double-circuit tower configuration:

- **Non-Approval of the Multi circuit Tower height (above 60m) from CAAN**

The Nepal Electricity Authority (NEA) has requested CAAN for the consent to construct 400 kV Multi Circuit transmission line towers with a maximum height of 84 meters. However, CAAN declined this request, stating that the exact boundary of the proposed Nijgadh International Airport has not been finalized, which could impact the tower's permissible height due to aviation safety concerns.

In an earlier communication, CAAN had approved transmission line towers up to a height of 60 meters. Since the proposed Multi Circuit towers exceed this height, NEA can only proceed with a

400 kV double circuit transmission line that uses towers below the 60-meter limit, as this height falls within the approved guidelines set by CAAN.

- **High Cost of Mult circuit Transmission Line in compared to Double Circuit Transmission Line**

With the increase in tower height, there will be significant increases of the tower's materials (i.e. weight) and towers foundations. This construction cost of the multi (four) circuit transmission line is around four times the construction cost of the double circuit transmission line.

Thus, in view of the construction, we have saved around two times cost in the construction while doing individual double circuit 400 kV transmission line instead of multi (four) circuit transmission line. However, there is increase social and environment cost due to the individual ROW of the two double circuit transmission line instead of the single ROW of the multi–Circuit Transmission Line. Overall, despite the added ROW impact, the dual double-circuit setup offers notable cost savings.

- **Reduction of Electricity Transmission Reliability in Mult circuit in compared to Double Circuit**

Double-circuit transmission lines, consisting of two circuits on the same tower, provide a good balance of reliability and cost. If one circuit fails, the other can continue to carry the load, ensuring uninterrupted power supply. Maintenance is simpler, as only two circuits need to be managed, and the risk of simultaneous failure is lower. However, if the shared infrastructure (e.g., towers) is damaged, both circuits could be affected, leading to a potential outage.

Four-circuit transmission lines, with four circuits on a single tower, offer more redundancy by distributing the load across more circuits. However, they come with increased risks. A common-mode failure, such as a storm or structural damage, can impact all four circuits simultaneously. The added complexity of managing four circuits increases thermal and electrical stresses, requiring more sophisticated load management. Maintenance becomes more challenging and expensive, and the overall reliability may not improve significantly compared to double-circuit lines. Despite the extra redundancy, the cost, complexity, and higher failure risk often make double-circuit systems the preferred choice.

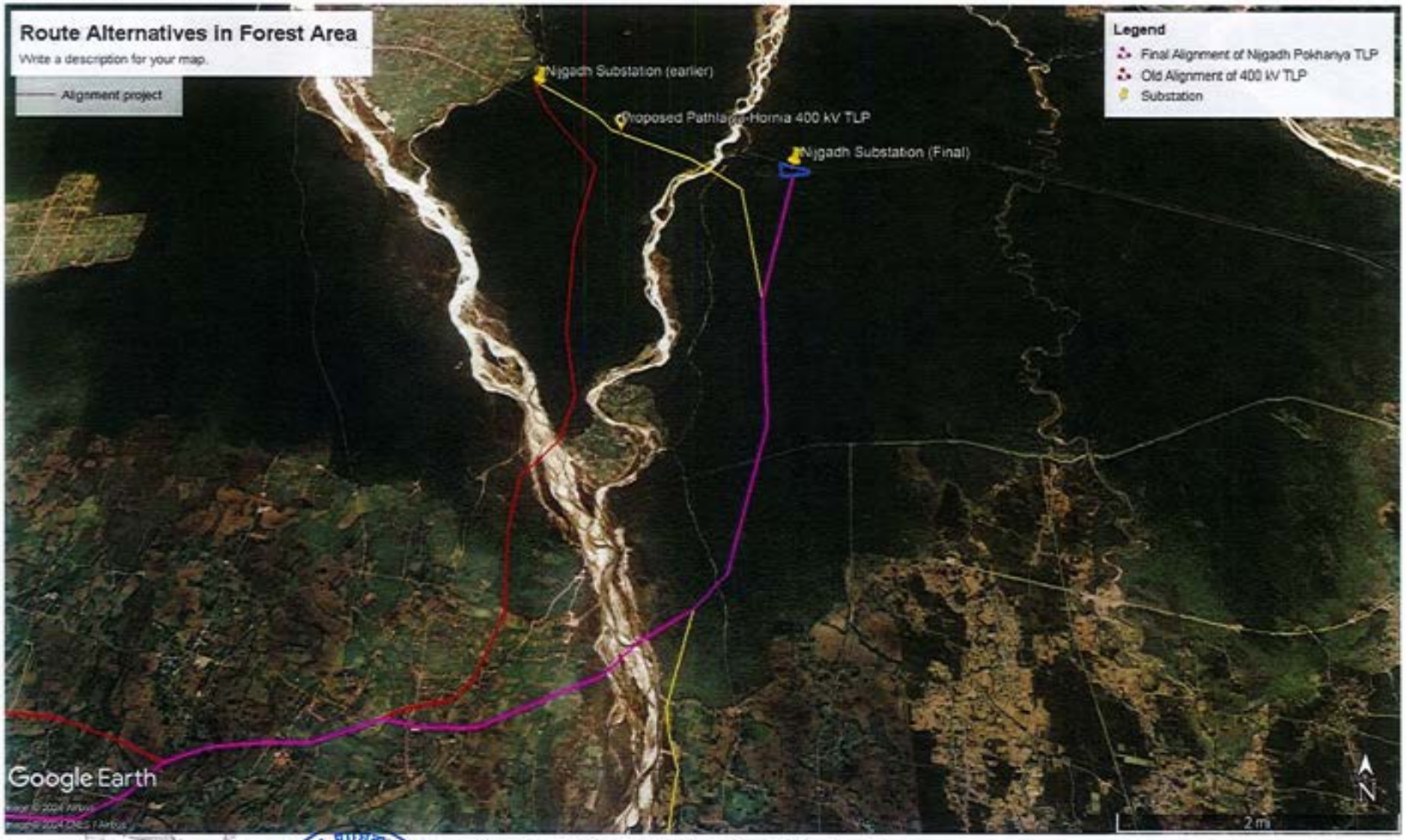


Figure 7-1: Alignment Alternatives in the forest area.

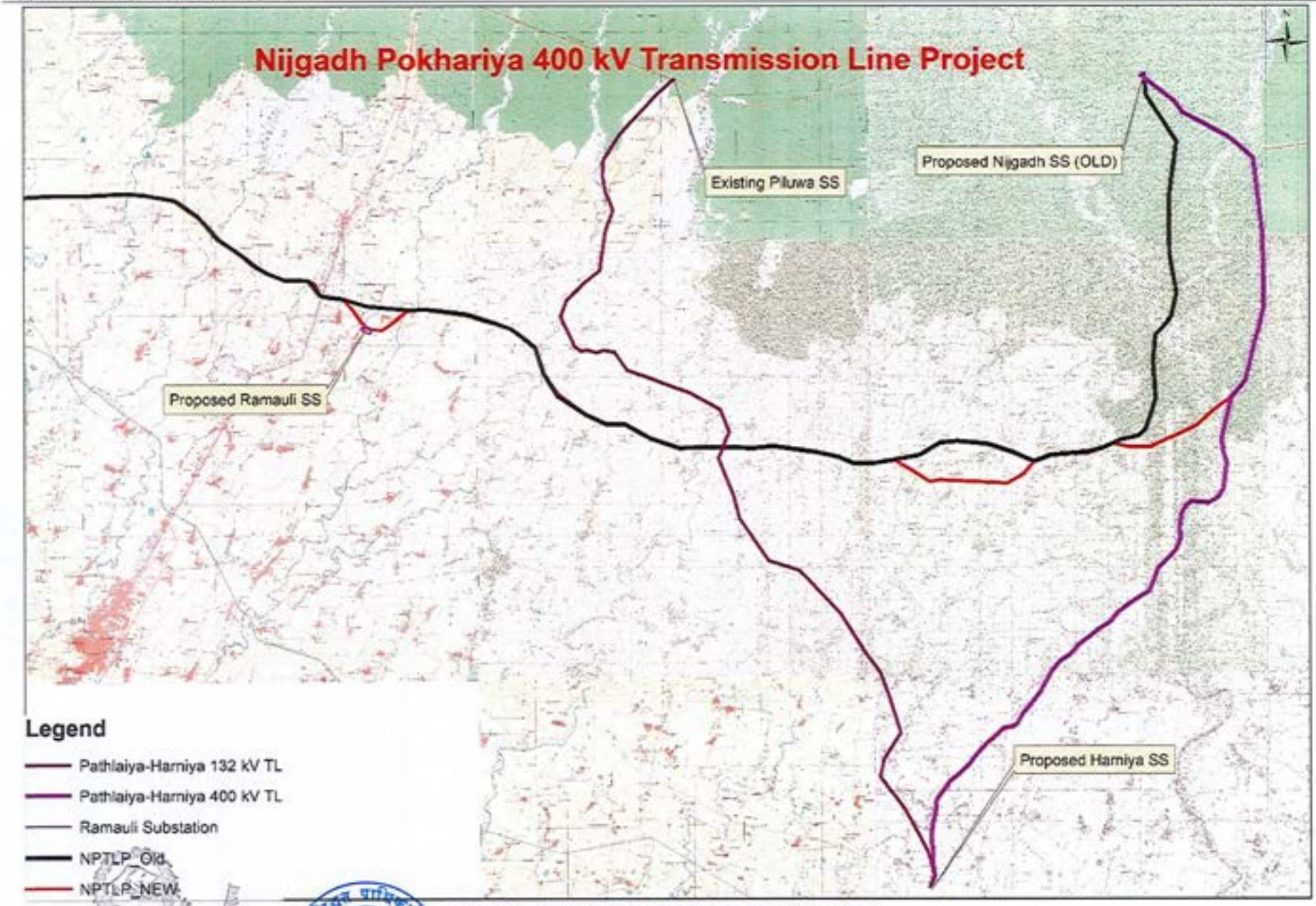


Figure 7-2: TL Routes proposed in the Project Area

7.2.3 Design Alternatives

Different design alternatives for tower structure, tower foundation and its protection, ruling span and voltage level have been also carried out during the feasibility. In order to simplify the erection procedures and make the project cost-effective Lattice type of tower has been selected. Lattice type of towers is appropriate for the terrain and conditions of Nepal since they do not require large flat surface. The design of the tower and foundation design are very much dependent on the selection of ruling span. The number of towers will be minimized by increasing the ruling span but it leads to heavier and higher tower structures to maintain the necessary ground clearances whereas shorter ruling span means increased number of towers which will further lead to increase land acquisition.

7.2.4 Construction Alternatives

Manual excavation will be given priority since it provides opportunity for the local employment and will have less impact on topography, low disturbance to surrounding areas and does not require wider access road. Mechanical excavation requires motorable access roads and cause more impact to environment including air and noise pollution. However, concreting will be done using mixer and vibrator in order to maintain the quality. Erection will be done manually. Helicopter stringing is an alternative but such method would be costly. Moreover, use of helicopter will create noise pollution and may disturb the fauna of the area. Internationally accepted standard technology will be applied for the installation and procurement of the goods and equipment.

7.2.5 No Project Option

If the proposed project is not implemented then there will be no project induced loss/effect on vegetation, cultivated area and other environmental and socio-economic impacts. But such 'No Action' alternative would result in deficit of power and energy in Rautahat, Parsa and Bara district and the industrial corridor of the area. Besides, the construction of the proposed project will also reduce system loss and provide reliable power to the load centers of Rautahat, Parsa and Bara. Socio-economic conditions of the local people are likely to be increased through employment opportunities and income generation activities.

7.2.6 No Forest/Vegetation Option

Taking the under-construction Hetauda-Dhalkebar-Duhabi 400kV TL as a source, the NPTLP, aims to provide electricity in the Parsa, Rautahat and Bara area. For this, a 400kV capacity substation will have to be built nearby the Hetauda-Dhalkebar-Duhabi 400kV TL. It is not possible to construct NPTLP in the west of Nijgadh Bazzar, as, there is a proposed Nijgadh Airport and the dense forest of PNP. In the east, there is continuous patch of forest up to the Bagmati River. In case if the line starts from east of Bagmati, the TL length will be too long and will have high social impacts. So, there is no 'No Forest/Vegetation Option' for NPTLP.

8 Mitigation and Enhancement Measures

The mitigation and enhancement measures outlined in this chapter have been proposed to curtail potential adverse impacts and enhance beneficial impacts identified during the study. Those adverse and beneficial impacts not identified or predetermined during the study if later discovered during the construction phases will be explicitly mitigated or enhanced by the project. The discussion is organized into three categories of physical, biological, and socio-economic and cultural aspects, and has been split into construction and operation phases in an equivalent manner as per Chapter 6- Impact Assessment. Issues raised by public during the consultation meetings and public hearings have been considered in the mitigation measures proposed in this report. The issues related to compensatory plantation in coordination with affected CFUGs, safety measures during construction works, awareness related to forest management, river erosion protection works have been addressed in this study.

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

8.1 Physical Environment

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

8.1.1 Topography, Land Use and Land Take

a. Construction Phase

The permanent land use changes due to foundations construction cannot be mitigated. However, the land under the RoW will not be restricted for the current use except that the construction of any permanent structure will be prohibited. The construction area will be reinstated to the present condition by backfilling the excavated site and removing the muck after the construction is over.

b. Operation Phase

The impact on the landuse changes under the RoW and permanent land take for the towers will remain forever. Restriction on construction of any type of structure under the RoW and plantation of trees cannot be mitigated. However, cultivation will be allowed.

8.1.2 Watershed and Drainage Condition

a. Construction Phase

Proper management of the muck volume will be done. The muck generated during the excavation of foundation and substation will be used for backfilling of Nijgadh and Ramauli Substation and the area will be restored. The following mitigation measures will be anticipated during the construction phase:

- Vegetation clearing and ground disturbances will be confined within the foundation and required RoW.

- Proper compaction of the excavated soil will be done.
- Adequate surface and subsurface drainage will be provided at all the APs area and at substation area to drain away the excess water and prevent water logging.
- Excavation will be done in phases with higher number of laborers so that the required target stretch is completed on time.
- Restoration of the area around the tower foundation for cultivation.
- Erection of tower and stringing of line will be carried out in dry season if possible.

b. Operation Phase

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

8.1.3 Air and Noise Quality

a. Construction Phase

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

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

b. Operation Phase

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

8.1.4 Water Quality

a. Construction Phase

Dumping of any type of waste including cement slurry, construction material, leakages of oils and grease from substations and human waste in the nearby water bodies will be strictly prohibited. Any types of construction tools used for the cement conceit work will not be washed in the water bodies.

b. Operation Phase

No any mitigation measures will be required in the phase.

8.1.5 Waste and Spoil Disposal

a. Construction Phase

The domestic waste will primarily consist of organic food waste because this is easily biodegradable and non-hazardous. It will be managed by burying in pits at reasonable distance from water bodies and subsequently covering with soil. Waste generated from construction activities are usually inert material which are non- biodegradable e.g. empty cement bags and containers, rejected material, plastic, wooden planks. These waste materials will be stored out and kept separated instead of throwing haphazardly elsewhere. Some of these items (cement bag, plastic drum etc.) can be sold in the markets following the legal provisions of government of Nepal. The contractor will be responsible for the establishment of the waste management system at the construction and camp areas.

b. Operation Phase

Collection pit will be provisioned in the possible area of oils and lubricants leakage. Oils and lubricants collected in the pit will be managed properly.

8.1.6 Soil Erosion and Slope Instability

a. Construction Phase

River training structures will be constructed to protect the towers near the Lal Bakaiya river and Dudhaura khola.

b. Operation Phase

Regular monitoring of river training structures will be done during flooding season.

8.1.7 Crossing of Other Utilities and Interference

c. Construction Phase

Pole and bamboo frame will be used for support of conductor wire during stringing while crossing existing roads, transmission and distribution lines, if necessary. Distribution line will also be shut down when required.

d. Operation Phase

All crossings of existing transmission and distribution lines will be designed with standard safe vertical and horizontal clearances. Design clearances for communication lines will be maintained. For this, the standards referred by the Electricity Regulation 1993 (Rule 48, 49, 50 and 55) shall be followed. Further, the color marker balls will be placed in river crossings and other areas as recommended by CAAN (Appendix A-II).

8.1.8 Storage of Construction material

a. Construction Phase

Substation area and private land will be temporarily used for the storage of construction materials in order to mitigate the land degradation.

b. Operation Phase

There are no impacts on storage of construction material on operation phase, hence no mitigation measures are proposed.

8.1.9 Air Traffic

a. Construction Phase

During the stringing of conductor, red marker balls will be placed at river crossings, road and railways crossings. Further, obstacle marking will be done on pylons as required.

b. Operation Phase

Red marker balls will be placed at the top of the conductor wire while crossing highways and rivers. If the proposed TL creates any disturbances to the aviation security and aviation route in the future, the proponent shall bear all the cost of required remedy measures. Further, obstacle marking will be done on pylons as required.

The consent for this TL was initially received from CAAN on 2079/04/26 where the maximum tower height was 60m. However, with the change in tower configuration from double circuit to multi circuit, and the eastward shift of the TL the maximum tower height proposed is 78m. Due to these changes, a request letter was resent to the CAAN for obtaining the consent. However, the consent was not received for 78m heigh multi-circuit tower. Therefore, the project decided for the double circuit configuration with tower height less than 60 meters and requested CAAN for the consent. The consent on the new configuration was received on 2081/08/17 (Appendix A-II). The following table presents the suggestions received for the final alignments

Table 8-1: Suggestions received from CAAN for the double-circuit options

SN	Suggestions	Remarks
For double-circuit Options (Initial Alignment)		
1	Heights of Pylons should not exceed 60m.	Line alignment is shifted away from the proposed airport.
2	While crossing highways and rivers, red marker balls must be placed on the top conductor.	Section 8.1.7 and Section 8.1.9
3	When connecting the conductor on the pylon, do not connect it directly from one hill to another, but connect it from the top of one hill to the bottom and then connect it to the top of the other hill. If this is not possible, direct connection between pylons of two hills can be done, however, red marker balls must be placed on the top conductor.	Since the TL is proposed in the plain Terai region, this suggestion is not applicable.
4	If the proposed transmission line will impact on future aviation security and flying of aeroplanes, the NEA need to remove or shift the TL on its own cost.	Section 8.1.9

8.1.10 Physical Environment Mitigation and Enhancement Cost

For the mitigation measures of physical environment, NRs **13,000,000** is estimated **(Table 8-2).**

Table 8-2: Mitigation Cost for Physical Environment

Mitigation Program	Quantity	Unit Rate	Total Amount (NRs)
Stone bound in galvanizing wire netting including excavation back filling with compaction for river bank protection/ tower protection as per site requirement.	2000 m^3	NRs 6500	13,000,000
		Total	**13,000,000**

8.2 Biological Environment

The mitigation measures that will be adopted for the impact on biological environment including floral and faunal resources during the project construction and operation phases are as follows:

8.2.1 Management of Forest Products of RoW and Substation

a. Construction Phase

The project will fell 14,795 trees/poles from the forest area. All the forest products (timber, firewood) extracted from the project impact area will be stockpile in coordination with the DFO and forest user groups. Cost required for the tree felling, logging, and transportation to the stockpile area will be managed by the project. The selling/management of tree products will be the done as per the provisions of forest Act 2076 and Rules 2079.

b. Operation Phase

In the operation phase, RoW of the transmission line will be regularly trimmed for any growth of tall trees. So, there remains seedlings, saplings, bushes and grasses. The user community in coordination with DFO and the project can use the land for the growth of fodders and other plants.

8.2.2 Compensatory Plantation and Forest Land Replacement

c. Construction Phase

Loss of forest is unavoidable in this project with project development options. In line with the Forest Act, 2076 and Forest Rules, 2079; compensatory plantation and forest land replacement will be done. Compensatory plantation will be done for 14,795 trees/poles. So, 147,950 seedlings will be planted as compensatory plantation at ratio 1:10.

The project will use 61.214 ha of forest land including river/flood plain. So, the project shall purchase/compensate same area of land in another place. For compensating of 61.214 ha of land, NRs 214,249,000 (NRs 3,500,000/ha as per Forest Rules-2079) is estimated. The land will be purchased in coordination with DFO and forest users' groups (FUGs). Before handing over, the afforestation will be done in such land (at the standard ratio of 1,600 seedlings per ha). In replaced forest land, 97,942 seedlings (1,600 seedlings per ha) will be planted. In total 245,892 number of seedlings will be planted as compensatory plantation.

For compensatory plantation, due attention will be given to local species suitable to the area, species cut down by the project as far as possible, species preferred by the local communities and species which contribute to the improvement of habitats for available birds and mammals. The plantation sites will be finalized in coordination with the members of FUGs and officials of DFO.

Plantation designs for each specific sites identified will be developed after consultation and interaction with the concerned stakeholders.

d. Operation Phase

There shall also be the provision of replacement plantation after one year of tree plantation based on the mortality rate of seedlings. The project proponent will take care of planted site for the period of 5 years and handover to the concerned FUGs and DFO. Alternatively, the plantation area can be managed by the local community with support from the project for five years.

8.2.3 Compensation Cost for Private Trees

a. Construction Phase

The trees removed from the private land will be compensated as per prevailing rates. Consultation will be made with the concerned DFOs and stakeholders while determining the rate. The cost of compensation will be given directly to the tree owners. Seedlings of fruit bearing and other types of trees will be provided to project affected people for plantation. The selection of tree species for plantation will be done in coordination with the affected people.

b. Operation Phase

No mitigation measure will be required.

8.2.4 Supply of Fuel to Workers

a. Construction Phase

If practically feasible, construction workers will be prevented from the use of fuel wood for cooking their food items. The project proponent will provide kerosene/LPG to the extent possible to project workers staying at temporary/permanent labour camps to minimize fuel wood demand.

b. Operation Phase

There will not be the issue of fuel wood management to workers.

8.2.5 Controlling Encroachment of Nearby Forest

a. Construction Phase

The contractor and the proponent will make sure that there will not be any encroachment in the forest/public/private land for the project facilities. The contractor will strictly prohibit their labour force for any type of encroachment of forest/public/private land. The proponent in coordination with DFO office and CFUGs follow or cause to strictly follow all the legal provision.

b. Operation Phase

No mitigation measure will be required.

8.2.6 Wildlife

a. Construction Phase

Following mitigation measures are proposed to minimize the impacts on wildlife (refer Appendix D-IV: Wildlife survey report for detail):

- **Efficient and timely project completion**: This is going to be critical to minimizing the impacts on wildlife and their movement during the construction phases. So, the project shall be completed in time.
- **Limit noise pollution:** Use of heavy machinery will be limited to day time and non-breeding seasons (Spring).
- **Temporary halting of construction to allow migration:** If any wildlife is recorded using the construction site for migration, this site would be temporarily halted for construction to allow migration.
- **Human-wildlife conflict management plan:** Community Forest user groups and Division Forest Offices will be involved to prepare human-wildlife conflict management plan to address any potential issues that can come up during the construction phase.
- **Public awareness and education:** Raising the awareness of local communities about wildlife will have benefits in both long-term and short-term. This will be done through public workshops, schools, awareness camps.
- **Construction Disturbances:** RoW of the line will be cleared during the non-breeding and non-migratory seasons of wildlife.

b. Operation phase

Following mitigation measures are proposed to minimize the impacts on wildlife (refer Appendix D-IV: Wildlife survey report for detail):

- Insulation to mitigate electrocution: This is going to be especially helpful to reduce electrocution of birds and arboreal mammals.
- **Markers to minimize risk of collision:** The markers will be used on towers to reduce collision risk for large terrestrial mammals.
- **Establishment of immediate response and rescue facility for electrocution:** Since the area is home to sensitive and endangered wildlife, there will be training to the local community and forest user groups to create immediate response and rescue groups for wildlife in case of electrocution.
- **Water Ponds for Wildlife:** Water ponds will be constructed in the impacted forest area and handed over to the forest user group for its operation.

8.2.7 Birds

a. Construction Phase

Following mitigation measures are proposed to minimize the impacts on wildlife (refer Appendix D-V: Birds survey report for detail):

- **Examine tree before felling:** In the forest area, trees will be examined to ensure if there are any birds nests or not during the tree clearance. If birds' nest with eggs or hatchlings are found, those trees will be marked and will not be felled down until the rearing period of birds is completed.
- **Sufficient Spacing of Live Wires:** As recommended by Bird survey report, the gap between the two live conductors must be wide enough for the birds (Himalayan Griffon vulture wing span is about 3m) to fly through them without touching those conductors at the same time.

However, for this 400 kV TL, the minimum gap between the two conductors is 8.4m (Appendix B-IV) for double circuit DB tower (Appendix B-IV).

- **Schedule Construction Work:** Construction work will not be done in section between AP 25-AP27 during the breeding season of the Lesser Adjutant (From September to March).
- **Bird deflectors in Wire:** To minimize and avoid the incidents of bird collision on transmission line wire, bird flight divertor of dynamic type consisting warning disc and clamps and connectors will be placed on the NPTLP wire at river crossing and other bird sensitive areas.

b. Operation Phase

- **Awareness Program:** awareness program to the community forest user groups along the TL will be implemented in close coordination with DFOs, local NGOs, CBOs and other concerned agencies.

8.2.8 Ecosystem services

Impact on forest ecosystem services will be mitigated through the plantation work. As a mitigation, the project will plant 10 saplings for each tree felled and the plantation site will be managed for 5 years. In total, 147,950 seedings will be planted, which will help to develop additional 92.40ha (1600/ha) of the forest land.

8.2.9 Fire Hazard

Dry biomass from the forest area after the forest clearance will be properly managed. The contractor shall aware the labour force on potential sources of fire hazard and will train on use of fire-fighting. Contractor will manage fire fighters to every labour camp.

8.2.10 Enhancement Measures

Enhanced measures proposed in this section aims to enhance the beneficial impacts of the project and either prevent or minimize the negative impacts of the project. As an enhancement measure, awareness raising program on wildlife will be conducted. NRs 3,220,000/- is allocated for the enhancement measure for the following program. Awareness program on wildlife will be carried out at two different places. Table 8-3 shows the estimated cost for carrying out such awareness programs.

Table 8-3: Cost Estimate for awareness raising program

S. N.	Description	Unit	Day	Quantity	Rate (NRs)	Total Amount (NRs)
1	Program coordinator	No.	5	1	5,000	25,000
2	Participants	No.	5	10	1,500	75,000
3	Training expert	No.	5	2	5,000	50,000
4	Training material and logistic	LS				200,000
5	Assistance	LS				10,000
Total Cost for conducting one program						**360,000**
Grand Total for conducting 2 programs						**720,000**

8.2.11 Biological Mitigation and Enhancement Cost

The total biological mitigation (including land cost) and enhancement cost is estimated to be NRs **297,591,428** (Table 8-4).

Table 8-4: Mitigation and Enhancement Cost

SN	Mitigation Program	Unit/ Rate	Total Amount (NRs)
1	Plantation of 245,892 seedlings (including seedling purchase, site preparation, pitting, transplanting, composting, mulching and replacement plantation based on mortality of seedlings)	NRs 200	49,178,400
2	Management/ take care of planted site for 5 years (@ 1.2 man-month / ha)	15 man-month	13,500,000
3	Support for fencing at specific planted sites (Rs 75000 /ha)	LS	11,526,188
4	Placement of informative and warning signs for forest management and wildlife conservation	LS	1,000,000
5	Replacement plantation (10% of plantation cost)	LS	4,917,840
6	Cost of buying land in replacement of permanently acquired area in reservoir and access road in forest area (61.214ha)	3500000/ha	214,249,000
7	Awareness on Forest Management and Wildlife Conservation	LS	720,000
8	Prepare and Implement Human-Wildlife conflict management plan.	LS	1,500,000
9	Construction of water ponds and support in operation	LS	1,000,000
Sub Total-1 (including Land Cost)			**297,591,428**
Sub Total-1 (excluding Land Cost			**83,342,428**

8.3 Socio-economic and Cultural Environment

Mitigation as well as enhancement measures for all identified significant impacts on socio-economic and cultural environment have been considered in this section of IEE report. In the same way, Community Support Program (CSP) of the project sector has been identified and discussed briefly here.

8.3.1 Mitigation Measures

Each of the identified impacts during construction as well as operation phase has been evaluated in detail and cost-effective mitigation measures are suggested to minimize the impacts. The cost of mitigation measures is calculated and mentioned in different titles below.

- **Acquisition of Land and Structure**

a. Construction Phase

- **Compensation for Permanently Acquired Land**

The proponent will provide appropriate compensation to all of the PAFs at the prevailing market price. According to the GoN laws and regulations, it is mandatory to provide cash compensation for the acquired land and property. The project will require 13.365ha of private land (land required for APs, STs, substation). The project will provide direct cash compensation for the permanent land to be acquired. Land price varies, according to proximity of service facilities, road link and market centers. The average land price in the area is considered for the estimate of compensation. Cost for permanently acquired land is estimated to be NRs 356,220,000. However, the require land will be acquired according to the 'Land Acquisition Act, 2034 B.S.' and the compensation rate of the land to be acquired will be fixed by Compensation Determination Committee (CDC).

Table 8-5: Estimated Cost for Land Acquisition

S.N.	Project Components	Area (ha)	Amount (NRs.)
1	APs and STs	8.024	204,660,000
2	Substation	5.341	151,560,000
	Total	**13.365**	**356,220,000**

Note: The average price per ha of the land is based on the market survey and public consultation.

- **Compensation for Restricted Land (RoW)**

The land used for TL alignment (RoW) is considered as restricted land. The total of 218.800ha private land falls under the proposed TL alignment (RoW). As per NEA practice, project will provide certain percentage (up to 20%) of the total land value for land restriction (RoW). Cost for land under RoW is estimated to be NRs. 1,183,917,600.

Table 8-6: Estimated Cost for Land Utilization

Project Components	Area (ha)	Amount (NRs.)	20% of Total Amount
RoW	218.800	5919588000	1,183,917,600
		Total	**1,183,917,600**

Note: The average price per ha of the land is based on the market survey and public consultation

- **Compensation for Leased Land**

Project will use 2.0ha of land for camp/storage for 2 years. Cost for temporarily use of land is NRs. 480,000.

- **Compensation of Structure Loss**

Compensation of one structure (shed) is estimated to be NRs. 500,000.

- **Compensation for Loss of Standing Crops**

a. Construction Phase

- **Crops Loss in Permanent Land**

The total production loss of different crops of the project affected HHs is calculated as 61.69MT and the total compensation for the loss is estimated to be NRs. 1,789,561. 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 following table.

Table 8-7: Estimated Annual Loss of Agricultural Production of Surveyed HHs

SN	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Rate (NRs. /MT)	Amount (NRs.)
1	Paddy	7.077	31.28	4.42	35000	1094812
2	Wheat	2.018	5.57	2.76	38000	211648
3	Maize	3.161	10.21	3.23	38000	387981
4	Sugarcane	0.376	14.63	38.92	6500	95120
					Total	**1789561**

Source: HH Survey, 2080/81

- **Crops Loss in RoW**

The total loss of crops is estimated as 1086.45MT (Paddy: 546.64MT, Wheat: 77.66MT, Maize 165.85MT and sugarcane 296.3MT) which value is estimated to be NRs. 30,311,730 for one season. The crop wise area allocation, production and value is shown in following table.

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

S.N.	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Rate (NRs/MT)	Amount (NRs.)
1	Paddy	123.675	546.64	4.42	35000	19132400
2	Wheat	28.137	77.66	2.76	38000	2951080
3	Maize	51.348	165.85	3.23	38000	6302300
4	Sugarcane	7.613	296.3	38.92	6500	1925950
		Total				**30311730**

Note: Crops loss is calculated based on two crops cycle in a year in the case of paddy and wheat farming area and one crop cycle in oilseed and maize is farming area.

Source: HH Survey, 2080/81

- **Fish Ponds**

a. Construction Phase

The project shall conduct the construction activities of TL (basically stringing of conductors) with utmost care and safe way that no harm will be caused to the fish ponds and fish as well as other aquatic animal. Any loss occurred due to project construction will be borne by the project itself.

b. Operation Phase

No mitigation measures required during this phase.

- **Private Trees**

c. Construction Phase

The trees removed from the private land 649 will be compensated as per prevailing rates. Due consultation will be made with the concerned DFO and stakeholders while determining the rate.

d. Operation Phase

During the operation phase, this issue will no longer exist. Hence no mitigation measure will be adopted.

- **Health, Water Supply and Sanitation**

a. Construction Phase

- **Health and Sanitation**

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. First aid kits will be maintained for preliminary treatment in emergencies. The solid waste generated by project activities will be managed as per the local level solid waste management guidelines.

A joint awareness program on health and sanitation will be launched in association with the existing NGOs and other local communities during the construction phase. Health check-up of workers and documentation of health status will be made periodically. The project will ensure adequate safety gears for workers (Personal Protective Equipment, accommodation, First Aid box, etc.). It will arrange the training for contractors and workers.

- **Drinking Water**

To minimize the impact on water supply drinking water supply system will be installed at proposed substation site to cope with the demand of the drinking water supply for the labors and technicians. The water supply of the project area will be strengthened by installation of new tube-well/pipe lines, keeping taps at a regular interval, and by improving the storage of water at the source.

b. Operation Phase

No mitigation measures are required during this phase.

- **Occupational Hazards**

a. Construction Phase

The construction area will be cleared up and all the necessary precaution and warning signs will be placed at construction site. This area will be restricted for the entry of unauthorized people. The project proponent will provide safety helmet, eye glass, safety boots, 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 TL and potential risks associated with TL construction will also be implemented. The project workers involved in construction work will also be trained for health and occupational measures. Total cost for such trainings will be NRs. 1,500,000. In addition, there will also be the provision of accidental insurances of the construction workers on contract document.

b. Operation Phase

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

- **House, Settlements and Social Infrastructures**

a. Construction Phase

No mitigation measures are required during this phase.

b. Operation Phase

Altogether 3 APs are proposed to be constructed within the range of 100m to 300m from the existing house, settlements, and social infrastructures. Protection measures will be applied in around the tower footprints and construction area after the consultation with local people/stakeholders. Fencing, sign and other appropriate tools of public awareness will be adopted to reduce the likely impact on people, their property and public infrastructures.

Furthermore, following points will be considered:

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

- **Crossing of Power Cables, Communication lines, Foot Trails, Roads**

a. Construction Phase

The proposed TL crosses East-West Highway, Pathlaiya-Birgunj Highway, Piluwa-Kalaiya Road. Further the TL crosses the inter-connected gravel road/earthen road/foot trails several times. Similarly, the alignment crosses11kV/33/132kV lines and Eastern Gandak Irrigation canal.

b. Operation Phase

There will be impact due to crossing over of power cables, foot trails and rural earthen roads on local infrastructures and facilities. As mitigation measures, following points will be considered:

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

- **Communal Resources**

a. Construction Phase

The TL pass through the forest area, feeder road, rural agricultural road and foot tracks. Such structure will be impacted due to the construction activities of the project. Placement of signboard indicating the construction time and community awareness program will be carried out in order to ease the mobility of people and vehicles.

b. Operation Phase: No mitigation measures are required during this phase.

- **Impact on PAFs due to Alteration of Land and Property Value**

a. Construction Phase

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

b. Operation Phase: No mitigation measures are required.

- **Impact due to Restriction of Future Land Development close to Settlement**

a. Construction Phase

Coordination with the project affected HHs, RM/Municipality', District Coordination Committee (DCC) and concern stakeholders will be done during the construction phase. Land Use Policy-2072 will be followed while implementing the project.

b. Operation Phase

No mitigation measures are required.

- **Electro-Magnetic Field Effect**

a. Construction Phase

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

b. Operation Phase

In order to reduce the impact of EMF effect, phase split in either of the circuit will be considered during the Detail Design Stage. Market centers are far from the TL, will itself reduce the impact of EMF to certain extent. However, for the safeguard of the local people, an awareness program about the concept EMF and the risk of neglecting the maintenance of the RoW will be conducted.

- **Gender and Vulnerable Group**

a. Construction Phase

The project will ensure not to discriminate the local people based on their gender, caste, color and place of origin. Similarly, priority for jobs will be given to the vulnerable group as per their ability and skills and willingness to work in the project area. Child labor will be prohibited in the project area. The project proponent will consult with local authorities to monitor and regulate any activities related to gender and vulnerable groups and maintain law and order. Child Labor Act, 2056 will be effectively implemented during construction period.

b. Operation Phase

No mitigation measures required during operation phase.

- **Economic Activities**

a. Construction Phase

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

- Compensation for the hindrance due to use of private land for the TL shall be done through negotiation. Replacement value will be added to the average value of the land to bring it closer to or at par with the prevailing market rate. The disturbance allowances will be provided to the affected HHs;
- To minimize the impacts of loss of agricultural products due to the land acquisition, and any effect on the occupation will be compensated through appropriate agricultural extension program, livelihood skill training programs, etc.

- Maximum job opportunities will be provided to the local people in prudential order and assistance to local communities into the planning through coordination with district level and local government office of the respective district.

b. Operation Phase

No mitigation measures required during operation phase.

- **Religious, Historical and Archeological Sites**

a. Construction Phase

None of other structures are affected and need to be relocated due to the proposed pylon and TL construction. No mitigation measures are required.

b. Operation Phase

No mitigation measures are required.

- **Social and Cultural Practice**

a. Construction Phase

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

- Prohibiting all the outside labors to live outside construction camps.
- Prohibiting the use of alcohol in the project site, camp and nearby villages.
- No child labour or forced labour would be engaged by the project proponent.
- The project proponent will demonstrate its concerns about health and safety of the workers as well as the community through awareness programmes and grievance redressed.
- The workers will be briefed about the health risk of communicable diseases due to unhygienic environment as well as sexually transmitted diseases.
- Respecting the rights, properties and practices of local people

The labor force will be instructed about the conducts and manners to be maintained while working along the TL. No discrimination in terms of salary or nature of job among local and migrant workers will be allowed. Management of the short-term influx of the labors during construction and stringing phases will include communication about the technical aspect of the construction and operations, and to allay fears about any apprehensions of perceived accidents during the operational phase of the project.

b. Operation Phase

No mitigation measures are required during this phase.

- **Law and Order**

a. Construction Phase

During the construction of the TL, labor from different places with different religions and faiths with their own norms and values will be employed by the project contractor and there may conflict of interest between locals and the outsiders affecting law and order situation in the project area. Local employment, wage/ labor rate, working hours, use of local resources by the project workers, etc. are the major factors that may create conflict in the project area which may pose threat to law-

and-order situation. The proponent will implement a strict code of conduct for the workforces. In case any worker is found as a drunkard or soliciting prostitution and gambling etc. should be penalized and terminated too. The existing facilities of GoN from affected district will be used to maintain the law-and-order situation as when required basis. The proposed awareness program will also minimize this impact to some extent.

b. Operation Phase

No mitigation measures are required at this phase.

- **Aesthetic Value**

a. Construction Phase

No mitigation is required at this phase.

b. Operation Phase

The impact of TL and towers on aesthetic value cannot be mitigated completely. The stringing of the 400kV TL will cause minor visual change to the existing landscape and scenery.

Summary of Social Mitigation Cost

The total socio-economic mitigation cost is calculated to be NRs 1,574,718,891 (including land cost). The detailed cost analysis is shown in the following table.

Table 8-9: Mitigation and Rehabilitation Cost

SN	Mitigation Measures	Unit	Quantity	Amount (NRs)
1	Compensation			
	Land Acquisition	ha	13.365	356,220,000
	RoW	ha	218.800	1,183,917,600
	Structure	No.	1	500,000
2	Land Utilization (Camp/Storage)	ha	2.000	480,000
3	Compensation for loss of crops			
	Permanent loss of crops in acquired land Permanent loss of crops in land restriction	MT		1,789,561 30,311,730
4	Safety Training	LS		1,500,000
	Total excluding land cost			**34,101,291**
	Total including land cost			**1,574,718,891**

8.3.2 Enhancement Measures

In order to enhance the living standard and socio-economic status of the project affect people various training programs shall be conducted. Following training programs with detailed cost estimation are proposed under this topic. The training programs can be changed or altered on the needful basis with the consultation of stakeholders mainly the project affected people.

- **Mushroom Farming Training**

To increase the mushroom farming in the project affected area, improved techniques and methods need to be introduced. Training program on improved 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 less than 50% in the assumption that they can improve production and productivity by applying new methods and

techniques. Total cost for the micro-enterprise creation training is estimated NRs. 2,428,000 including cost for trainee's expenses, expert, training materials, logistic support, etc.

Table 8-10: Cost for Mushroom Farming Training

SN	Description	Unit	Day	Quantity	Rate per Unit (NRs)	Amount NRs.
1	Program Coordinator	Day	7	1	5000	35,000
2	Resource persons	Day	5	4	3500	70,000
3	Transportation and other expenses to Participants	Person	5	20	500	50,000
4	Training materials to participants	Person		20	600	12,000
5	Tea/snacks (participants and others)	Person	5	20	300	30,000
6	Multimedia	Day	5	1	5000	25,000
7	Hall rent	Day	5	1	3000	15,000
8	Report preparation	LS				10,000
9	Field Assistant					20,000
10	Transportation for training	LS				40,000
11	Assistance to participants	LS				3,00,000
	Total Cost for 1 Program					**6,07,000**
	Total Cost for 4 Programs					**2,428,000**

** Note: Training cost will include participant's allowance for accommodation, food and others. The topics of skill training and number of participants may change than specified above depending upon demands from PAFs.*

- **Micro Enterprise Creation Training**

Micro Enterprise Creation Training programs like crafting, making sanitary pads etc. will be provided to the PAFs particularly for women and selection of such programs will be finalized based on the consultations with the local people. Four programs covering 80 participants in each and 5 days duration will be conducted. Total cost for the micro enterprise creation training is estimated NRs. 2,428,000 including cost for trainee's expenses, expert, training materials, logistic support, etc. The main objectives of training are:

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

Table 8-11: Micro-Enterprise Creation Training

SN	Description	Unit	Day	Quantity	Rate per Unit (NRs)	Total Amount NRs.
1	Program Coordinator	Day	7	1	5000	35,000
2	Resource persons	Day	5	4	3500	70,000
3	Transportation and other expenses to Participants	Person	5	20	500	50,000
4	Training materials to participants	Person		20	600	12,000
5	Tea/snacks (participants and others)	Person	5	20	300	30,000
6	Multimedia	Day	5	1	5000	25,000
7	Hall rent	Day	5	1	3000	15,000
8	Report preparation	LS				10,000

SN	Description	Unit	Day	Quantity	Rate per Unit (NRs)	Total Amount NRs.
9	Field Assistant			LS		20,000
10	Transportation management for training			LS		40,000
11	Assistance to participants			LS		300,000
					Total Cost for 1 Program	**607,000**
					Total Cost for 4 Programs	**2,428,000**

** Note: Training cost will include participant's allowance for accommodation, food and others. The topics of skill training and number of participants may change than specified above depending upon demands from PAFs.*

- **Light Vehicle Driving Training**

Skill development related training programs such as driving and automobile (special focus for those households who lose land more than 10% and HHs who lose their residential structure) will be conducted to tackle the adverse impact of the project. Duration of training will be 390 hours as per the CTEVT standard. Total cost for driving training is estimated NRs. 4,000,000.

Table 8-12: Proposed Skill Development Training

SN	Name of Training	Basic Contents	Duration		Cost/ Person/ month	No. of Trainee	Total Cost (NRs)
			Hour	Month			
1	Light Vehicle Driving	Understanding vehicle, function of parts and its controls, Basic driving skills: road signs, signal lights, and road markings, Rules of the road: speed limits, railroad crossings, and laws on texting and cell phone use. Sharing road with pedestrians, bicyclists, commercial vehicles, motorcyclists, and wildlife	180	1	40000	20	800000
2	Heavy Vehicle Driving	Understanding vehicle, function of parts and its controls, Basic driving skills: road signs, signal lights, and road markings, Rules of the road: speed limits, railroad crossings, and laws on texting and cell phone use. Sharing road with pedestrians, bicyclists, commercial vehicles, motorcyclists, and wildlife	390	3	80000	20	1600000
3	Hospitality Management	Equipment, tools and security, personal hygiene, workspace cleanliness and food security, preparation, continental cuisine	390	3	80000	20	1600000
						Total	**4000000**

- **Social Awareness (Health, Sanitation and Safety) Program**

Four awareness programs will be conducted in the PAA (one in each RM/Municipality/SMC) 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 project components. Awareness

program on construction related safety issues and electrocution will also be given to the local residents. Community safety awareness program about the TL will be implemented. The cost for social awareness program on health, sanitation and safety program is estimated NRs. 3,500,000 (35 places @NRs. 100,000 per place).

- **Placement of Hoarding Boards**

To alert the local people, hoarding boards (informative sign) regarding health and sanitation will be prepared and installed in the nearby settlements where the TL passes through. The installed hoarding boards will have effective slogans regarding health, sanitation and safety. The cost for the placement of hoarding boards is estimated NRs. 1,000,000 (40 hoarding boards at 40 different places NRs. 25,000/per hoarding board).

- **Summary of Enhancement Measures**

The total enhancement measure cost for the socio-economic and cultural environment is NRs. 13,356,000.

Table 8-13: Summary of Cost for Enhancement Measures

SN	Description	Amount (NRs)
1	Mushroom Farming Training	2,428,000
2	Micro Enterprise Creation Training	2,428,000
3	Skill Development Training	4,000,000
4	Social Awareness on health, sanitation and safety	3,500,000
5	Placement of Hoarding Boards	1,000,000
	Total	**13,356,000**

8.3.3 Community Support Program (CSP)

As a community support, the proponent has allocated some amount for the betterment of local people. Project also aims to support to people/stakeholders of each project affected wards/ RM/Municipality/SMCs/MC in the infrastructures and service facility sector. Support will be provided for furniture, toilet and other education support to school, renovation of community buildings, health centers (support for medicine), temples near to the TL alignment, play-ground for the community, strengthening public meeting place in ward offices, mothers group buildings etc. For this NRs. 70,000,000 has been proposed.

8.3.4 Summary of Socio-economic Mitigation, Enhancement and CSP Cost

The socio-economic mitigation and enhancement cost including CSP cost for implementing various mitigation and enhancement measures mentioned above is estimated to be NRs. **1,658,074,891**. The cost breakdown is given in the table below;

Table 8-14: Cost Estimate for Social Mitigation and Enhancement

SN	Mitigation Measures	Unit	Quantity	Amount (NRs)
A	Mitigation Measures			
I	Compensation for Land			
	Land Acquisition	ha	13.365	356,220,000
	RoW	ha	218.800	1,183,917,600
	Land Utilization (Camp/Storage)	ha	2.0	480,000
2	Structure	No.	1	500,000
3	Compensation for loss of crops			
	Permanent loss of crops in acquired land	MT		1,789,561
	Permanent loss of crops in land restriction	MT		30,311,730
4	Safety Training	LS		1,500,000
	Sub-total excluding land cost (A*)			**34,101,291**
	Sub-total including land cost (A)			**1,574,718,891**
B.	Enhancement Measures			
	Mushroom Farming Training			2,428,000
	Micro Enterprise Creation Training			2,428,000
	Skill Development Training			4,000,000
	Social Awareness on health, sanitation and safety			3,500,000
	Placement of Hoarding Boards			1,000,000
	Sub-total (B)			13,356,000
C.	Community Support Program			70,000,000
Sub-Total (C)				**70,000,000**
Grand total excluding land cost (A*+B+C)				**117,457,291**
Grand total including land cost (A+B+C)				**1,658,074,891**

8.4 Summary of Environmental Mitigation, Enhancement and CSP Cost

The total environmental mitigation and enhancement and CSP cost excluding land cost for implementing various mitigation and enhancement measures mentioned above for physical, biological and socio-economic and cultural environment is estimated to be NRs 217,019,719/- which is only 1.32% % of the total project cost. The cost breakdown is given below in the following table.

Table 8-15: Cost Estimate for Environmental Mitigation, Enhancement and CSP

SN	Environment	Description of Cost	Amount (NRs)	Remarks
1	Physical	Mitigation/Enhancement	13,000,000	Table 8-2
2	Biological	Mitigation (excluding land cost)	83,342,428	Table 8-4
		Enhancement (excluding land cost)	3,220,000	
3	Socio-economic and Cultural	Mitigation	34,101,291	Table 8-14
		Enhancement	13,356,000	
		CSP	70,000,000	
		Total excluding land cost	217,019,719	
		Total Project Cost	16,500,000,000	
		% of Environmental mitigation, enhancement & CSP cost excluding land cost	**1.32%**	

9 Environmental Monitoring

9.1 Environmental Monitoring

This section discusses the environmental monitoring programs likely to be associated with the implementation of the EMP for NPTLP. It also assists to ensure compliance with environmental laws and in ameliorating or eliminating adverse impacts.

As per the provision made in Rule 45 (1 and 2) of EPR 2077, the NPTLP is responsible for the monitoring of the environmental impacts of the project implementation every six months and submit the monitoring report to the concerned agencies. In addition to that, as per the provision made in Article 39(1) of EPR -2077, Ministry of Forests and Environment (MoEWRI), and DoED monitor the implementation of IEE report made under the act.

9.2 Objectives of Monitoring

Environmental monitoring is carried out with the following objectives;

- to ensure compliance of mitigation and enhancement program, tender clauses related to environment and social issues,
- to assess the actual impacts of these measures as well as the emerging impacts during different phases of the project,
- to comprehend environmental condition in project area prior to implementation of project;
- to ensure compliance status of implementation of mitigation measures and regulatory standards;
- to ensure the effective compliance of tender clauses as per contract document;
- to check the effectiveness of mitigation and enhancement measures implemented by different project parties; and
- to verify the accuracy of IEE predictions and assess the emerging and cumulative environmental problems.

9.2.1 Environmental Monitoring Plans

Environmental monitoring is required to ensure compliance of the mitigation and enhancement program, tender clauses related to environment and social issues and to assess the actual impacts of these measures as well as the emerging impacts during different phases of the project a monitoring program, required for the project to evaluate the application and effectiveness of mitigation measures, is formulated in three phases.

- **Baseline Monitoring**

The primary concern during this phase will be to implement field data collection programs needed to enhance the knowledge of baseline conditions. Focus will be on the gathering of scientific and sociological information needed to verify and update the data provided by this IEE process. The land acquisition, compensation, rehabilitation measures will be disclosed to people and common consensus will be made. It will be ensured that mitigation and monitoring requirements associated with contractor are dually incorporated in tender document and contract agreement.

- **Compliance Monitoring**

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

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

In this monitoring, the GoN licensing entity (MoEWRI/DoED) oversees and ensures the implementation of the required mitigation measures according to GoN guidelines and approved mitigation plan. The NPTLP-ESMU will be delegated the day-to day responsibilities in this respect. This monitoring will be conducted during project construction as well as operation phase.

- **Impact Monitoring**

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

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

This monitoring will be conducted during project construction as well as operation phase. The monitoring of the NPTLP will include:

Physical Environment

- Land use/Topography
- Stability of the area around tower pads

Biological Environment

- Wildlife/Birds
- Tree and forest loss

Socio-economic and Cultural Environment

- Land Acquisition and compensation
- Employment monitoring
- The economic status of the affected people and relocated people
- Public safety and security monitoring
- Health and sanitation monitoring
- Compensation

The full Environmental Management Program will be elaborated during the construction phase of the project, reflecting the final design and alignment considerations made by the project and approved by the Project. The following table summarizes the monitoring plan and schedule for all three types of monitoring: baseline, compliance and impact.

8.5 Public Concerns and Addressal

Public of project affected areas have raised concerns about losing private land and facing financial and other negative impacts due to the construction of the 400 kV Transmission Line (TL). The minutes of meeting and addressal of issues are presented in details Appendix F and Appendix G3 respectively.

In some section of the TL including Pokhariya-2, local community and project affected people have demanded the shifting of the proposed TL. Residents of Lamariya village, Ward No. 2, Pokhariya Municipality, Parsa, A formal letter dated 2081/02/08, signed by local residents and the ward chairman, requests rerouting the TL away from the settlement area. However, land for Pokhariya Substation has already been acquired under Parwanipur-Pokhariya 132kV TL, and a 132/33/11 kV substation is under construction to meet the growing industrial power demand. The 400kV TL is proposed to connect to this substation. To minimize the impact on valuable land, structures, and religious areas in Pokhariya-2, the alignment was re-surveyed in coordination with the ESSD and the project team, after field verification during ToR. The revised route includes nine towers (seven angle towers and two suspension towers) and crosses two canals with gravel roads and one additional gravel road. The final alignment was selected as the optimum route, as detailed in Chapter 7. In the meantime, upon the request of DoED, the recommendation letter from the Pokhariya Municipality was received. The project will fully comply the suggestions provided by the municipality.

To address public concerns, the following measures will be adopted. Nevertheless, during the construction and operation of this transmission line, dissatisfaction of Pokhariya Municipality ward no. 2 of Parsa district and any such dissatisfaction of local affected community's concerns shall be addressed and managed in appropriate manner by the proponent with sole responsibility.

A. Public Consultation & Information Disclosure

Consultation, information disclosure and participation are essential for transparency and addressing community concerns and therefore, the following actions will be taken throughout the project life cycle;

- Consultations with Stakeholders: Engage all stakeholders, including affected residents, at different project stages to understand and address their concerns.
- Information Sharing: Disseminate project details, including the approved IEE report, at the local, district, and central levels to keep all stakeholders informed about mitigation and enhancement measures.
- Ongoing Engagement: Continue consultations throughout the construction and operation phases to address emerging issues and ensure affected communities remain involved in decision-making.

B. Involvement of Top Management and Decision Makers

Since some community concerns may not be fully addressed through the above measures, it is recommended that top management be involved in decision-making to address genuine issues. Since, the management of RoW is a subject of national concern, appropriate policy measures need to be taken by the government/regulating authority so as to address such concerns in the long run.

9.3 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, three tiers of Grievance Redress Cells (GRCs) will be established to address the environmental issues associated with the project. The first tier of such cell will be formed at project level- in house resolution process. At this level, the concern or issues raised by stakeholders through project community representatives, grievance boxes placed around the project nearby settlements, over the phone, through email, or in person at the environmental monitoring unit office shall be attempted to resolve by the in-house committee formed by the project manager. This committee will be responsible for managing documentation and response process of such grievances and issues. The issues will be received, heard, and resolved internally through this mechanism. If this tier of GRC cannot resolve the issue satisfactorily, such issues will be passed on to next tier of local grievance committee.

At this second tier of GRM process, local grievance committee will be formed including expert from the project, project representative, ward level official and community representative. The community members will be appointed in consultation with the stakeholders. This tier of GRC will handle those issues which are and satisfactorily resolved at the in-house cell. Any issues which are beyond the capacity of this cell will be handled by the third tier of GRM named district level grievance committee.

The district level grievance redress cell will have representation from the project, local administration, civil society and the PAFs. The GRC will look into complaints and concerns about ownership disputes, inheritance of assets, distribution of compensation among heirs, missing affected assets and persons in the census etc. The GRC will seek to resolve the issues quickly in order to expedite the receipt of compensation, without resorting to expensive and time-consuming legal actions. The budget for setting up the grievance cell will be provided by the Project Manager Office itself.

In addition to the above, if there are any grievances related to environmental management issues in the project area, the district level GRC will record these grievances and suggestions and pass it on to the relevant authorities for necessary action and follow-up. At any time, stakeholders have the option of entering the formal judicial system through lodging a complaint in the judicial district court. The organizational setup for environmental management of NPTLP is presented in the following figure.

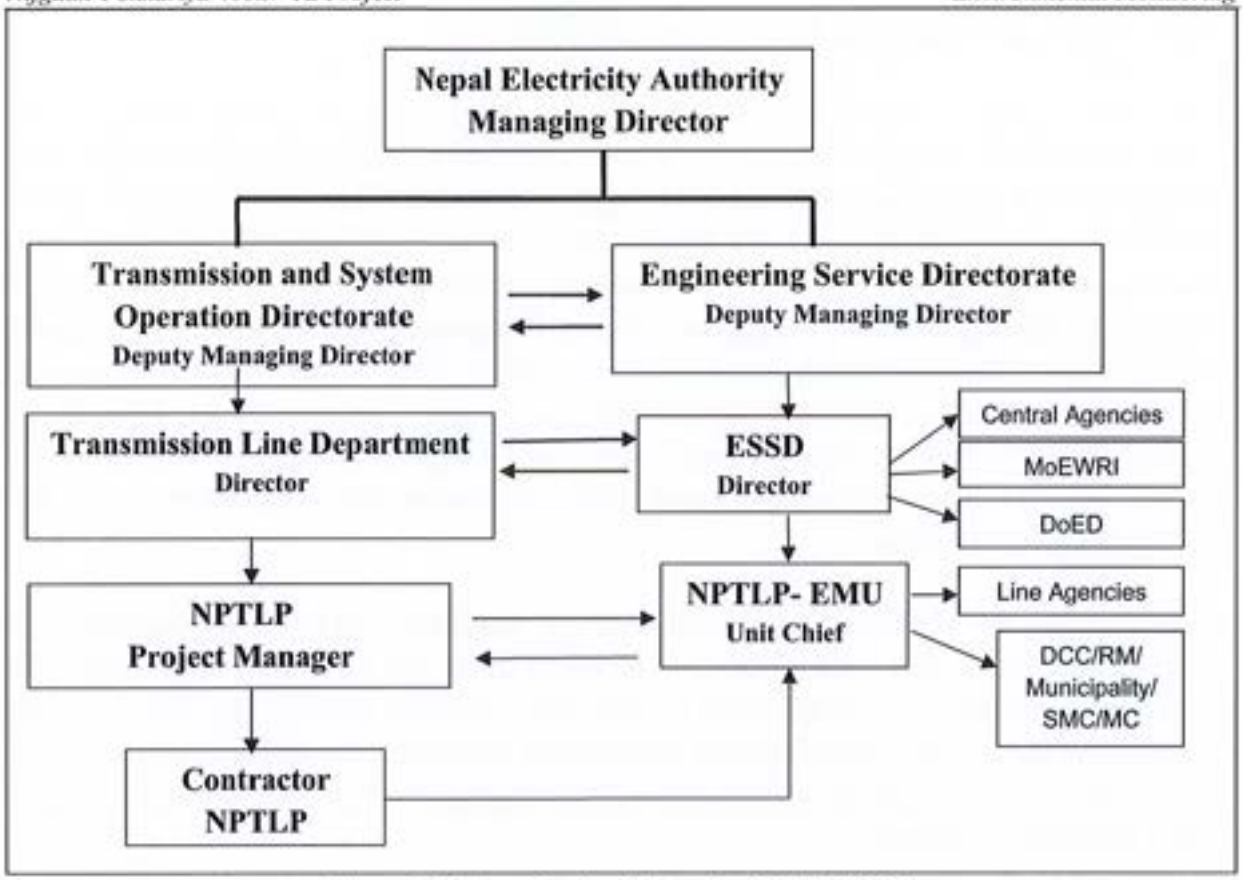


Figure 9-1: Organizational Setup for NPTLP-EMU

Table 9-1: Monitoring Plan and Agencies to be Consulted

SN	Parameter	Indicators	Method	Location	Schedule	Agencies to be Consulted	Responsibility
A	**Baseline Monitoring**						
Physical Environment							
1	Land Use	Changes in land use pattern	Site observation	RoW and nearby areas	Once during construction and operation phase		Proponent/ESSD DoED/MoEWRI
2	Stability	Stability at Tower foundation	Site observation	Near Tower foundation	Before/after rainy season prior to construction		Proponent/ESSD DoED/MoEWRI
3	Air and Noise Quality	PM10, PM2.5 TSP, NO_2 and SO_2 Leq, L max and Lmin of noise	Field measurement	Ramauli Substation	Once before construction	Local Community	DoED/MoEWRI DoED/MoEWRI
4	Water Quality	Physio-chemical parameters as per Table 5-5	Field measurement	Bakaiya River	Once before construction	Local Community	Proponent/ESSD DoED/MoEWRI
5	Crossing of Utilities	Water bodies crossing, Road, railway crossing, and TL crossing	Field observation and recording	Throughout the alignment	Once before construction	Local Community	DoED/MoEWRI DoED/MoEWRI
6	Airport	Airport and its distance from the TL alignment	Field observation	Proposed Nijgadh airport and Simara airport	Once before construction	Local Community	Proponent/ESSD DoED/MoEWRI
Biological Environment							
1	Forest	Type of forest management, Length of TL in forest, forest type and dependency in the forest	Field Measurement	Nijgadh substation to AP 11	Once before construction	Local Community	Proponent/ESSD DoED/MoEWRI
2	Wildlife/Birds	Available birds and wildlife; Wildlife corridor; Vultures, Strokes and other birds' nest; birds flying route	Observation, discussion with local people and literature review	project area	Once before construction	Local Community and forest users group	Proponent/ESSD DoED/MoEWRI
3	Human wildlife conflict	Any evidences of human wildlife conflict	Consultation with local community	Project impacted forest	Once before construction	Local Community and forest users group	Proponent/ESSD DoED/MoEWRI
Socio-economic and Cultural Environment							
1	Local level	Local level along the TL Route	Route alignment review	Project area	Once before construction	Proponent	Proponent/ESSD DoED/MoEWRI

SN	Parameter	Indicators	Method	Location	Schedule	Agencies to be Consulted	Responsibility
2	Economic activities of PAA	Croppig pattern, animal husbendary, industrial activities	Site observation and community consultation	Project area	Once before construction	Local community	Proponent/ESSD DoED/MoEWRI
3	Settlement/ infrastructure	Increased settlements/ infrasturucture, migration	Discussion with local people, RMs/Municipalities/SMCs/MC; observation	Project affected RMs/ Municipalities/SMCs/MC	Once each prior to construction and operation	Project affected RMs/ Municipalities/SMCs/MC	Proponent/ESSD DoED/MoEWRI
4	Religious and Cultural sites	Temple, Mosque, Churches and any other religious sites	Public Discussion, observation, review	PAAs	Once prior to construction	Project affected RMs/ Municipalities/SMCs/MC	Proponent/ESSD DoED/MoEWRI
5	Socio-economic status of PAF	Indicators as per the section 5.3.3	Sample questionnaire survey	Project area	Once prior to construction	PAF	Proponent/ESSD DoED/MoEWRI
B	**Impact Monitoring**						
Physical Environment							
1	Land use	Stability/ landuse changes from the baseline	Observation	Around the tower area and substation	During Construction		Proponent/ESSD DoED/MoEWRI
2	Pollution	Air, Noise and Water quality parameters	Observation/measurement	Ramauli Substation, Bakaiya River and along the project alignment	Monthly, During Construction	Local community	Proponent/ESSD DoED/MoEWRI
3	Soil erosion	Erosion from substation and tower foundation area	Observation	Substation and tower pad	Monthly, During Construction	Local community	Proponent/ESSD DoED/MoEWRI
4	Impact on utilities	Blockage/disturbance on traffic, impact on canal and rivers	Observation and consultation	Utilities crossing area	Monthly, During Construction	Local community and related stakeholders	Proponent/ESSD DoED/MoEWRI
5	Waste disposal	Unpleasant odour and visual impact	Observation	Mobile camp/ construction sites	Weekly during construction		Proponent/ESSD DoED/MoEWRI
6	Air traffic	Impact of Air traffic	Discussion with related authority	Project area	During construction	related stakeholders	Proponent/ESSD DoED/MoEWRI
Biological Environment							
1	Impact on forest	Name of the forest impacted, area of forest impacted and no. of trees felled	Record inspection	Forest area	Once, During construction	related stakeholders	Proponent/ESSD DoED/MoEWRI
2	Changes in demand of fuel wood and timbre	Demand record of the nearby forest users	Record of community forest and collaborative forest inspection	Project impacted forest area	Once, during construction	Impacted forest	Proponent/ESSD DoED/MoEWRI

SN	Parameter	Indicators	Method	Location	Schedule	Agencies to be Consulted	Responsibility
3	Wildlife/birds	Wildlife encountered; nests of birds found; killing of wildlife and birds by the construction workers;	Consultation and record of DFO inspection	Project impacted forest area	Monthly, during construction	Impacted forest	Proponent/ESSD DoED/MoEWRI
4	Forest Fire	Incidence of forest fires and its causes	Consultation	Project impacted forest area	Monthly, during construction in dry season	Impacted forest	Proponent/ESSD DoED/MoEWRI
Socioeconomic and Cultural Environment							
1	Land Loss	Acquisition of land, lease of land and temporary disturbances in land	Cross checking the compensation list	Tower foundation, RoW and leased area	Quarterly during construction and once during operation	PAAs	Proponent/ESSD DoED/MoEWRI
2	Crop loss	Temporary and permanent crop loss due to the TL	Record inspection of compensation estimation (crop loss included or not)	Row of the TL and substation	Quarterly during construction and once during operation	PAAs and location	Proponent/ESSD DoED/MoEWRI
3	Health issues	Types of Diseases and record of outbreak of diseases	Record of diseases, inspection of camps and local community	Project area and construction camps	Continuous during construction period	District hospital and local health posts	Proponent/ESSD DoED/MoEWRI
4	Safety	No. of accidents and casualties	Records of accidents	Project area	Continuous during construction period/operation phase	District hospital and local health posts	Proponent, MoEWRI Local Levels
5	Employment	No. of local people employed by project	Records kept by management	Project area	Continuous during construction period and annually during operation		Proponent, MoEWRI Local Levels
6	Impact on Women/ Children	Status of women children	Record of women employment; children education; Inspection on child labor	Project area	Continuous during construction period		Proponent, MoEWRI Local Levels
C	**Compliance Monitoring**						
1	Incorporation of recommendations of IEE into project documents	Yes/No	Review/cross checking of tender and design documents	Kathmandu Office	During/after the project design stage completion of tender documents	NPTLP/ TL Department	Proponent, Contractor, MoEWRI
2	Incorporation of Environmental considerations mentioned in tender documents in the contractors	Yes/No	Review of proposed work plan submitted by the contractor	Kathmandu Office/site office	During contract negotiations	NPTLP/ TL Department	Proponent, Contractor, MoEWRI

SN	Parameter	Indicators	Method	Location	Schedule	Agencies to be Consulted	Responsibility
	proposed work plans						
3	Integration of mitigation measures in the detail design and contract document	Yes/No	Review process	Kathmandu office	During project approval	NPTLP/ TL Department	Proponent, Contractor, MoEWRI
4	Allocation of adequate budget for implementation of environmental mitigation measures and monitoring works		Review, inquiry and consultation	Kathmandu office	During detail design and contract agreement	NPTLP/ TL Department	Proponent, Contractor, MoEWRI
5	Clean-up and reinstatement of the project area	Muck disposal, drainage around the tower	Site observation, and inspection	Around tower area, substation area	At the end of construction period		Proponent, Contractor, MoEWRI
6	Land/property acquisition procedures	Compliance with national legal requirements	Discussions with local people	Affected RMs/ Municipalities/ SMCs/MC /site office	At the time of acquisition	Project Affected RMs/ Municipalities/SMCs/MC and wards	Proponent, Contractor, MoEWRI
7	Trainings and trainees	Number of trainings and trainees	Survey/observation	Project affected area/ RMs/ Municipalities/SMCs/MC	Periodic during construction and operation	Project Affected RMs/ Municipalities/SMCs/MC and wards	Proponent, Contractor, MoEWRI
8	Compensation	Compensation given to PAFs	Record inspection	Affected local people	Regularly for at least three years following land acquisition	Project Affected RMs/ Municipalities/SMCs/MC and wards	CDC, Proponent, MoEWRI, Local Levels
9	Forest land replacement and compensatory plantation	Area of forest land replaced number of saplings planted as compensatory plantation	Record inspection	Impacted forest area	Monthly, During construction	DFO and impacted forest user's group	Proponent, Contractor, MoEWRI
10	CAAN recommendation	Terms and condition of CAAN	Record inspection	Project area and facilities	Monthly, during construction	CAAN and contractor	Proponent, Contractor, MoEWRI

9.4 Monitoring Cost

The monitoring costs have been estimated in the table given below. The total cost for the monitoring activities (for preconstruction and construction phase) has been estimated as NRs. 1,99,25,608.

Table 9-2: Monitoring Cost of the Proposed NPTLP

SN	Item	Man-month	Rate/Month (NRs.)	Amount (NRs.)
A. Pre-construction Phase				
1	*Manpower*			
	Sr. Environmental Expert	1	64,446	64,446
	Coordinator	2	48,737	97,474
	Socio-economist	1	46,219	46,219
	Support Staff	2	37,743	75,486
2	*Out of Pocket Expenses*			
	TA/DA		LS	120,000
	Field Assistant		LS	70,000
	Transportation		LS	150,000
	Report Production		LS	40,000
	Miscellaneous		LS	20,000
Total of Pre-construction Phase				1205,155
B. Construction Phase				
1.	*Manpower*			
	Sr. Engineer	2	64446	128,892
	Sr. Environment Expert	4	64446	257,784
	Coordinator	12	48737	584,844
	Civil Engineer	6	46219	277,314
	Environmentalist	6	46219	277,314
	Socio-economist	6	46219	277,314
	Electrical Engineer	6	46219	277,314
	Liaison Officer	2	43689	87,387
	Support Staff	30	37743	1,132,290
			Sub-total	3,300,453
2.	From Outsourcing			
	Environment Safeguard Officer	30	120000	3,600,000
	Social Safeguard Officer	30	120000	3,600,000
	Support Staff site office -1	30	40000	1,200,000
	Data Expert	1.5	80000	120,000
			Sub –total	8,520,000
3.	Out of Pocket Expenses			
	TA/DA		LS	800,000
	Transportation			
	Vehicle/motorbike purchase/hire and maintenance		LS	2,000,000
	Fuel for vehicle		LS	800,000
	Report Production		LS	150,000
	Site Office			
	Office Rent	30	30000	900000
	Electricity, Drinking water and communication		LS	100,000
	Site office furnishing		LS	200,000
	Computer and Printer		LS	150,000
	Community Consultation		LS	200,000

SN	Item	Man-month	Rate/Month (NRs.)	Amount (NRs.)
	Office accessories and operation cost (site office)		LS	200,000
	Institutional Strengthening		LS	1,200,000
	Miscellaneous		LS	200,000
			Sub-Total	6,900,000
	Grand Total (Pre-construction and construction monitoring)			**19,925,608**

9.5 Agencies Responsible for Environmental Monitoring

As per the EPR, MoEWRI will be responsible for monitoring. However, the project proponent NEA will have the prime responsibility for carrying out the monitoring activities. ESSD of NEA will be the organization responsible for preconstruction and construction phase monitoring of the proposed project. The NPTLP-EMU comprising the staff from ESSD will be established for the construction phase of monitoring of the project. The Unit will be responsible for compliance and impact monitoring works. The organizational setup for environmental management of NPTLP is presented in Figure 9-1.

9.6 Summary of Cost Assessment

The total environmental cost (mitigation-including land cost, enhancement, CSP, and monitoring costs) of the proposed project is estimated to be NRs 236,945,327 which is 1.44 % (including land cost) of the total project cost. The summary of environmental cost benefit analysis is shown in the table given below. The proponent has obligation to carry out the mitigation, enhancement and monitoring activities of the project.

Table 9-3: Environmental Cost Analysis

SN	Environment	Description of Cost	Amount (NRs)	Remarks
1	Physical	Mitigation/Enhancement	130,000,000	Included in project cost
2	Biological	Mitigation (excluding land cost)	83,342,428	Table 8-2
		Enhancement (excluding land cost)	3,220,000	Table 8-4
3	Socio-economic and Cultural	Mitigation	34,101,291	Table 8-14
		Enhancement	13,356,000	
		CSP	70,000,000	
4	Environmental Monitoring		**19,925,608**	Table 9-2
		Total excluding land cost	236,945,327	
		Total Project Cost	16,500,000,000	
		% of Environmental mitigation, enhancement & CSP cost excluding land cost	**1.44**	

10 Conclusion and Commitment

10.1 Conclusion

The environmental issues/impacts identified during the IEE can be mitigated and are 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 is low/medium/high, local and short term.

With proper implementation of proposed mitigation and enhancement measures, this IEE concludes that the NPTLP will not have significant impacts on physical, biological and socioeconomic and cultural environment of the project area; hence the proposed project is environmentally and socially feasible. No any additional study is required for this project. The estimated cost of the environmental mitigation of the project including monitoring cost is NRs 236,945,327 which is 1.44 % (including land cost) of the total project cost.

10.2 Commitment

All the measures proposed in this report will be fully implemented during the project construction and operation period. Wherever possible, efforts will be made to limit adverse impacts on the environment. Those impacts/issues not predicted/ documented in this IEE report but might appear later; will be also undertaken during the construction phase. The proponent 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 road and so on, contract documents.

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