

Initial Environmental Examination – Main Report

Project No. 41155-013
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NEP: Electricity Transmission Expansion and Supply Improvement Project

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**NEPAL ELECTRICITY AUTHORITY
ENGINEERING SERVICE DIRECTORATE**



Photographs of proposed sub-station area located at Barhabise and public Consultation (Sindhupalchok)

**INITIAL ENVIRONMENTAL EXAMINATION
(IEE) REPORT OF
TAMAKOSHI-KATHMANDU 400kV TL PROJECT
(Vol. I- Main Report)**

**Submitted to:
Ministry of Energy
Singhadurbar, Kathmandu**

**Through
Department of Electricity Development
Anamnagar, Kathmandu**

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कार्यकारी सारांश

१. आयोजनाको प्रस्तावक तथा प्रारम्भिक वातावरणीय परिक्षण अध्ययनको क्रममा संलग्न संस्था

नेपाल विद्युत प्राधिकरण (ने.वि.प्रा.), प्रस्तावित तामाकोशी काठमाण्डौ ४०० के.भी. प्रसारण लाइन आयोजनाको प्रस्तावक हो। ने.वि.प्रा.को स्थापना वि.स.२०४२ साल भाद्र १ मा भएको हो र यो नेपाल सरकारको पूर्ण स्वामित्वमा रहेको एक संगठित संस्था हो। यस संस्था अन्तर्गतको वातावरण तथा सामाजिक अध्ययन विभागले प्रस्तावित ४०० के.भी. प्रसारण लाइन आयोजनाको प्रारम्भिक वातावरणीय अध्ययन (IEE) प्रतिवेदन तयार गरेको हो। उर्जा मन्त्रालयबाट यस आयोजनाको IEE प्रतिवेदन तयार गर्ने सर्वेक्षण अनुमतिपत्र प्राप्त भएको हो जसको अवधि २०७३/१/३० सम्म रहेको छ। उक्त अनुमतिपत्रको नविकरणको लागि विद्युत विकास विभाग मार्फत उर्जा मन्त्रालयमा निवेदन पेश गरिएको छ। यस IEE अध्ययनको मुख्य उद्देश्य भनेको प्रस्तावित तामाकोशी काठमाण्डौ ४०० के.भी. प्रसारण लाइन आयोजनाको निर्माण वातावरणीय मैत्री तरिकाले गराउने हो।

२. आयोजना सम्बन्धी विवरण

तामाकोशी-काठमाण्डौ ४०० के.भी. प्रसारण लाइन आयोजनाले तामाकोशी तथा त्यस क्षेत्रमा रहेका अन्य नदीहरूमा निर्माणधिन अवस्थामा रहेका विभिन्न जलविद्युत आयोजनाहरूबाट उत्पादित विद्युतलाई राष्ट्रिय प्रसारण लाईनमा जोड्ने लक्ष्य लिएको छ।

प्रस्तुत आयोजना २ खण्डमा विभाजन गरिएको छ खिस्ती-बाह्रबिसे र बाह्रबिसे-काठमाण्डौ। खिस्ती-बाह्रबिसे खण्डको प्रसारण लाईन रामेछाप जिल्लाको फुलासी गा.वि.स मा निर्माणधिन सबस्टेशनबाट शुरु भई दोलखा तथा सिन्धुपाल्चोक जिल्लाका विभिन्न नगरपालिका तथा गा.वि.सहरू पार गर्दै बाह्रबिसे सबस्टेशनमा गएर टुङ्गिने छ। प्रसारण लाईनको यस खण्डमा दोलखा जिल्लाको १ नगरपालिका तथा ७ गा.वि.स.हरू तथा सिन्धुपाल्चोक जिल्लाका ५ गा.वि.स. हरू पर्दछन्। समग्रमा प्रसारण लाईनको यस खण्डमा रामेछाप, दोलखा र सिन्धुपाल्चोक जिल्लाका १३ गाविस हरू तथा १ नगरपालिका परेका छन्। त्यसैगरि दोलखा जिल्लाको मागापौवा गाविस र सिन्धुपाल्चोक जिल्लाको ठौथली गाविस भएर प्रसारण लाईन आयोजना जानेछ तर उक्त गाविसहरूमा कुनैपनि एंगल टावरहरू रहने छैनन्।

त्यसैगरि बाह्रबिसे-काठमाण्डौ खण्डको प्रसारण लाईन सिन्धुपाल्चोक जिल्लाको बाह्रबिसे सबस्टेशन बाट शुरु भई सिन्धुपाल्चोक, काभ्रेपलाञ्चोक, भक्तपुर तथा काठमाण्डौ जिल्लाका विभिन्न गाविस तथा नगरपालिकाहरू पार गर्दै भक्तपुर जिल्लाको चाँगुनारायण सबस्टेशनमा गएर टुङ्गिने छ। प्रसारण लाईनको यस खण्डमा सिन्धुपाल्चोक जिल्लाको ८ गा.वि.स.हरू, काभ्रेपलाञ्चोक जिल्लाका ४ गा.वि.स. हरू, भक्तपुर जिल्लाका २ नगरपालिकाहरू तथा काठमाण्डौ जिल्लाको १ नगरपालिका पर्दछन्। समग्रमा प्रसारण लाईनको यस खण्डमा सिन्धुपाल्चोक, काभ्रेपलाञ्चोक, भक्तपुर तथा काठमाण्डौ जिल्लाका १२ गाविस हरू तथा ३ नगरपालिका हरू परेका छन्। प्रस्तावित प्रसारण लाइन आयोजनाको निर्माण अवधि ४० महिनाको रहने छ।

३. अध्ययन विधि

वातावरण संरक्षण ऐन, २०५३ (शंसोधन, २०६५/११/२६ सहित) र राष्ट्रिय वातावरणीय प्रभाव मूल्याङ्कन (EIA) निर्देशिका, २०५०को अधिनमा रही यस आयोजनाको प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गरिएको छ। नेपाल सरकारले विभिन्न समयमा लिएको कानूनी प्रकृया, स्थलगत अध्ययन, स्थानिय जनतासंगको अन्तरकृया आदि यस प्रतिवेदन तयारको सन्दर्भमा लिइएका सामग्रीहरू



अध्ययनको क्रममा भौतिक वातावरण अध्ययन अन्तर्गत हावापानी, भौगोलिक अवस्था, भू-उपयोग सम्बन्धी तथ्याङ्कको प्रयोग गरिएको छ भने जैविक वातावरणमा वन्यजन्तु र वनस्पति सम्बन्धी तथ्याङ्कहरू प्रयोग गरिएको छ । त्यस्तै सामाजिक आर्थिक तथा सांस्कृतिक वातावरणको अध्ययनको लागि जनसंख्या, धर्म, संस्कृति, जाति, पूर्वाधार आदि तथ्याङ्कहरूको सहायता लिइएको छ । यसका साथै सहभागीतामूलक ग्रामिण लेखाजोखा (PRA) र मुख्य सूचनादातासंग अन्तरवार्ता (KII) तथा अनौपचारिक छलफल जस्ता विधिहरूको पनि प्रयोग गरिएको छ । आयोजनाको बारेमा जानकारी सम्बन्धि सार्वजनिक सूचना गोरखापत्र दैनिकमा मिति २०७२/०४/०८ मा प्रकाशित गरिएको छ ।

४. वातावरण सम्बन्धी ऐन, नियम तथा कानुनी प्रावधानहरू

प्रस्तुत प्रतिवेदन तयार गर्ने क्रममा वातावरण संरक्षणसंग सम्बन्धित विद्यमान नीति, नियम, ऐन, कानून तथा निर्देशिकाहरूको पुनरावलोकन गरिएको छ । तसर्थ आयोजना कार्यान्वयन गर्दा प्रस्तावकले वातावरण संरक्षणसंग सम्बन्धित विद्यमान नीति, नियम, ऐन, कानून तथा निर्देशिकाहरूमा तोकिएका मापदण्डहरूलाई विशेष रूपमा ध्यान दिनेछ । यस बाहेक आयोजना कार्यान्वयनको क्रममा माथि उल्लेखित कानुनी प्रावधानका अतिरिक्त अन्य ऐन, नियमको आवश्यकता भएको खण्डमा आयोजना प्रवन्धकले सोको पनि पालना गर्ने छ । यस आयोजना अध्ययनको क्रममा विद्युत तथा जलश्रोत संग सम्बन्धित नीति, ऐन, नियमावली, तथा निर्देशिकाहरू जस्तै जलविद्युत विकास नीति २०४८, विद्युत ऐन २०४९, जलश्रोत नियमावली २०५०, विद्युत नियमावली २०५० आदिको पुनरावलोकन गरिएको छ । त्यसै गरी वातावरण संरक्षण ऐन २०५३, वातावरण संरक्षण नियमावली २०५४ (हालसम्मको संशोधित), जग्गा प्राप्ति ऐन, २०३४; वन ऐन, २०४९; वन नियमावली, २०५१; स्थानिय स्वायत्त शासन ऐन, २०५५; स्थानिय स्वायत्त शासन नियमावली, २०५६; वातावरणीय प्रभाव मूल्याङ्कन सम्बन्धी राष्ट्रिय निर्देशिका, २०४९; वन पैदावार संकलन तथा बिक्री वितरण सम्बन्धि निर्देशिका, २०५७; अन्तर्राष्ट्रिय श्रम संगठनको महासन्धि नम्बर १६९; आदि जस्ता महत्वपूर्ण ऐन, नियमहरू अध्ययन प्रतिवेदन तयार गर्ने क्रममा पुनरावलोकन गरिएको छ ।

५. आयोजना क्षेत्रको विद्यमान वातावरणीय अवस्था

५.१ भौतिक वातावरण

खिम्ती-बाह्रबिसे खण्ड

४२.६३८ किलोमीटर लामो प्रस्तावित प्रसारण लाइन आयोजनाको यस खण्ड नेपालको केन्द्रिय भागको मध्य पहाडी भूभाग भएर जान्छ । यस आयोजना क्षेत्रको उचाइ समुन्द्री सतहबाट ६३९ मीटर (शितली, फुलासी) देखि २७९९ मीटर (दोबाटे, लाकुरी डाँडा) सम्म रहेको छ । आयोजनाको उद्गमस्थल घुमाउने, फुलासीको उचाई ६५३ मीटर तथा अन्तिम बिन्दु सानो पलाटी, बाह्रबिसेको उचाई १४९५ मीटर रहेको छ ।

बाह्रबिसे-काठमाण्डौ खण्ड

५५.७२२ किलोमीटर लामो प्रस्तावित प्रसारण लाइन आयोजनाको यस खण्ड नेपालको केन्द्रिय भागको मध्य पहाडी भूभाग भएर जान्छ । यस आयोजना क्षेत्रको उचाइ समुन्द्री सतहबाट ७२३ मीटर (चण्देनी) देखि १८२० मीटर (बालुवापाटी, देउपुर) सम्म रहेको छ । आयोजनाको उद्गमस्थल सानो पलाटी, बाह्रबिसे को उचाई १४९५ मीटर तथा अन्तिम बिन्दु चाँगुनारायण नगरपालिकाको उचाई १३५२ मीटर रहेको छ ।

आयोजना क्षेत्रको जमिनको प्रकार मुख्यतः खेतीयोग्य जमिन, जंगल (सामुदायिक, सरकारी तथा निजी), चरण क्षेत्र, बाँझो जमिन आदि रहेको छ। यस प्रसारण लाईनले विशेष गरेर घना बस्ती, घना जंगल, मुख्य संरचनाहरू तथा संरक्षित क्षेत्रहरूलाई सकेसम्म छुलेको छ। त्यसैगरी प्रसारण लाईन क्षेत्रभित्र पर्ने अन्य जमिनका प्रकारहरूमा खोला तथा खोल्सीहरू, सडकहरू, खोलाका किनारा, प्रसारण तथा वितरण लाईनहरू आदि पर्दछन्। प्रसारण लाईन ६४.०६७% खेतीयोग्य जमिन, १८.२८३% जंगल तथा बाँकी १७.६५% बाँझो जमिन, भाडी, घासे मैदान, सडक तथा खोला भएर जान्छ।

५.२ जैविक वातावरण

आयोजनाको १२९ वटा एंगल टावर मध्ये २६ वटा जंगल क्षेत्रमा पर्दछ जसले ०.५८५ हे. जमिन ओगट्दछ। आयोजना क्षेत्रमा भौगोलिक अवस्था, हावापानी माटो आदिको भिन्नताको कारणले यहाँको वन र वनस्पतिमा पनि विविधता पाइएको छ। यस क्षेत्रमा उष्ण र समसितोष्ण क्षेत्रमा पाइने वन पाईन्छ। आयोजना क्षेत्रमा पाइने प्रमुख वनस्पतिहरूमा खोटे सल्ला, उत्तिस, चिलाउने, बाभ, साल, क्यामुनो, सल्ला, आदि रहेका छन् भने विभिन्न औषधीयुक्त बुट्यानहरू जस्तै लोकता, अर्गेली, कुरिलो, नागबेली, चिराइतो, अमला, आदि पनि आयोजना क्षेत्रमा प्रशस्त मात्रामा भेटिएका छन्।

वनस्पतिहरूको अतिरिक्त आयोजना क्षेत्रमा विभिन्न प्रजातिका जंगली जनावर, चरा, सरिसृप आदिको पनि पहिचान गरिएको छ। चितुवा, स्याल, लंगुर, रतुवा मृग, बँदेल, मलसाप्पो, बाँदर, जंगली विरालो, आदि यस क्षेत्रमा पाइने प्रमुख जंगली जनावरहरू हुन भने मैना, काग, ढुकुर, भँगेरा, तित्रा, कालिज, कोइली, सुगा, बाँज, गौथली, लामपुच्छे, आदी आयोजना क्षेत्रमा पाइने चराहरू हुन्। संरक्षित स्तनधारी जनावर सालक पनि यस आयोजना क्षेत्रभित्र पाईन्छ। त्यसैगरी प्रसारण लाईन आयोजना क्षेत्रभित्र पर्ने नदिहरूमा कत्ले र असला माछाहरू पाईएका छन्।

यस आयोजनाको ५ जिल्लाहरूमा कुल १६६७ वटा सामुदायिक वनहरू पर्दछ जसमध्ये ५१ वटा सामुदायिक वनहरू आयोजनाको एंगल टावर तथा RoW मा पर्दछन्। त्यसैगरी ४ सरकारी वनहरू सिन्धुपाल्चोक जिल्ला (२ वटा) तथा काभ्रेपलाञ्चोक जिल्ला (२ वटा) मा पर्दछन्।

५.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

प्रस्तुत आयोजना जनकपुर अञ्चलका २ जिल्लाहरू दोलखा र रामेछाप तथा बागमती अञ्चलका ४ जिल्लाहरू सिन्धुपाल्चोक, काभ्रेपलाञ्चोक, भक्तपुर तथा काठमाण्डौमा गर्दछ। ६ जिल्लाको कुल क्षेत्रफल १४६५१ वर्ग किलोमीटर रहेको छ। नेपालको जनगणना २०६८ अनुसार आयोजना प्रभावित जिल्लाहरूको कुल जनसंख्या ३१,०७,८२९ रहेको छ जसमा पुरुष १५,६९,५६९ तथा महिला १५,३८,२६० रहेको छ जुन राष्ट्रको कुल जनसंख्याको ११.७३% रहेको छ। आयोजना प्रभावित जिल्लाको कूल घरधुरी तथा औषत घरधुरी संख्या क्रमशः ७,४१,९८६ तथा ४.३७ रहेको छ। त्यसैगरी साक्षरता दर (६ वर्ष तथा माथिका) ७०% रहेको छ।

प्रस्तावित आयोजना क्षेत्रमा रहेका २६ गा.वि.स.हरू तथा ४ नगरपालिकाहरूको कुल जनसंख्या २१,५७८४ रहेको छ जसमध्ये पुरुष १०१८२३ र महिला ११३९६१ छन्। आयोजनाबाट प्रभावित ६ जिल्लाको कुल जनसंख्या मध्ये २६ गा.वि.स. तथा ४ नगरपालिकाहरूको जनसंख्या ६.९४% रहेको छ। त्यस्तै आयोजना क्षेत्रको कुल घरधुरी संख्या ५०३६७ रहेको छ भने औसत घरधुरी संख्या ४.२८ रहेको छ।

यस आयोजना क्षेत्रमा रहेका मुख्य जातजातीहरूमा क्षेत्री (२५.५४%), तामाङ (२१.३६%), नेवार (१९.७०%), बाहुन (१५.३४%) आदि रहेका छन् जसले आयोजना क्षेत्रको कुल जनसंख्याको महत्वपूर्ण हिस्सा (८१.९४%) ओगटेका छन्। यस क्षेत्रमा नेपालीभाषा बोल्नेको जनसंख्या सबैभन्दा बढि (६१.८२%) रहेको छ भने त्यसपछि तामाङ, नेवार, थामी, दनुवार तथा अन्य भाषा बोल्ने जनसंख्या पनि उल्लेखनिय मात्रामा रहेका छन्।

आयोजना क्षेत्रको औसत साक्षरता दर ६३.२९% रहेको छ जसमा पुरुष साक्षरता ७२.५४% तथा महिला साक्षरता ५५.४५% रहेको छ। प्रमुख पेशा जिविकोपार्जन तथा व्यवसायिक खेती रहेको छ। काभ्रेपलाञ्चोक जिल्ला खाद्यान्न बाली तथा तरकारी खेतीको लागि प्रसिद्ध छ।

५.३.१ आयोजना प्रभावित परिवारहरू

आयोजनाबाट प्रत्यक्ष प्रभावित हुने परिवारहरू मध्ये १९७ घरधुरीहरूको सामाजिक, आर्थिक तथा सांस्कृतिक अवस्था बारे विश्लेषण गरिएको छ। नमुना छनौट गरिएका १९७ घर परिवारको कूल जनसंख्या ११७० मध्ये ५९९ (५१.९७%) पुरुष र ५७१ (४८.०३%) महिला रहेका छन्। त्यस्तै औषत घरधुरी संख्या ५.९ रहेको छ।

आयोजनाबाट प्रभावित परिवारहरूको प्रमुख धर्म हिन्दु तथा बौद्ध रहेको छ जसमा हिन्दु धर्म मान्ने घरधुरी ८५.७९% तथा बौद्ध धर्म मान्ने घरधुरी १३.७१% रहेका छन्। सर्वेक्षण गरिएका कुल जनसंख्याको करिब ८४.१९% साक्षर जनसंख्या पाइयो जसमा पुरुष साक्षरता ८९.८२% र महिला साक्षरता ७८.२८% रहेको छ। नमुना अध्ययन गरिएका घरपरिवारहरू अधिकांश कृषि तथा कृषिसंग सम्बन्धित कार्यमा नै संलग्न रहेको पाइन्छ। यस क्षेत्रमा करिब ३५.७६% जनसंख्या कृषिमा आश्रित रहेको देखिन्छ भने बाँकी ६४.२४% गैह्रकृषी क्षेत्रमा आधारित छन्। त्यसैगरी कृषिका अतिरिक्त दैनिक ज्यालादारी तथा घरायसी काम विशेष गरेर महिलाहरूद्वारा गरिने नै अध्ययन क्षेत्रको प्रमुख कार्यको रूपमा रहेको छ। धान, मकै, कोदो तथा आलु उनीहरूको जग्गामा उत्पादन हुने प्रमुख बालीहरू हुन्।

आयोजना प्रभावित क्षेत्रको घरधुरी सर्वेक्षण अनुसार औसत वार्षिक आम्दानी रु. २,९९,७८३/- छ जहाँ आम्दानीको श्रोतमा कृषि तथा पशुपालन रहेको छ। आम्दानीको अन्य श्रोत अन्तर्गत रेमिट्यान्स, सेवा, व्यापार, दैनिक ज्याला मजदुरी तथा बृद्ध भत्ता आदि पर्दछन्। त्यसैगरी सर्वेक्षण गरिएको घरधुरीहरूको वार्षिक औषत खर्च रु. २,२९,२२०/- रहेको छ। आम्दानी र खर्चको तरिका हेर्दा वार्षिक औसत बचत प्रतिपरिवार रु. ७०,५६३/- देखिन्छ।

६. वातावरणीय प्रभाव

६.१ भौतिक वातावरण

आयोजनाको निर्माणको चरणमा स्थायी र अस्थायी रूपमा लिइने जग्गा नै प्रस्तावित आयोजनाको भौतिक वातावरणमा पर्ने प्रमुख प्रभावको रूपमा लिइएको छ। आयोजनाले कूल ४७०.९२१८ हेक्टर जग्गा टावर निर्माण, सबस्टेशन निर्माण, क्याम्प निर्माण, RoW तथा अन्य अस्थायी प्रयोजनको लागि अधिग्रहण गरिने छ। यसरी अधिग्रहण गरेको जमिन मध्ये २५.८५७५ हे. स्थायी रूपमा सबस्टेशन, तथा टावर प्याडको लागि लिनेछ भने बाँकी ४४५.०६४३ हे. प्रसारण लाईनको RoW को लागि लिइने छ। प्रसारण लाईन भरि जम्मा १३९ वटा एंगल टावर तथा १९८ वटा सस्पेन्सन टावरहरू निर्माण हुनेछन् र

प्रत्येक टावरले १५ मि. x १५ मि. अर्थात् ०.०२२५ हे. को क्षेत्रफल ओगट्ने छ। समग्रमा ९३ वटा एंगल टावर खेतीयोग्य जमिनमा, २६ वटा जंगलमा तथा बाँकी १० वटा अन्य ठाउँमा रहने छन्। १४२ वटा सस्पेन्सन टावर खेतीयोग्य जमिनमा तथा ४० वटा सस्पेन्सन टावर जंगलमा रहने छन् भने बाँकी १६ वटा अन्य भूभागमा पर्दछन्।

६.२ जैविक वातावरण

प्रसारण लाइन निर्माणको क्रममा जम्मा १२६.४ हेक्टर वन क्षेत्रको जग्गा आवश्यक पर्ने हुन्छ। आयोजनास्थलमा गरिएको स्थलगत निरीक्षणको आधारमा कूल १२९ एंगल टावरहरू मध्ये २६ एंगल टावर जंगल क्षेत्रमा पर्दछन् जसले ०.५८५ हे. जमिन ओगट्ने छ। तथा आयोजना निर्माणको चरणमा १८,२८४ पोलहरू, ७,७७७ रुखहरू तथा ६५,७३५ विभिन्न प्रजातीका विरुवाहरू कटान गर्नुपर्ने देखिन्छ। उक्त रुखहरूको काठको आयतन करीव २९५३ क्यूबिक मिटर (१०४,२४४ क्यू. फिट) को हुनेछ। हटाउनु पर्ने रुखका मुख्य प्रजातिहरूमा साल, सल्ला, चिलाउने, उत्तिस तथा क्यामुना, बोट घँयरो, आदि पर्दछन्। आयोजना निर्माण र संचालन अवधिमा त्यस क्षेत्रका वन्यजन्तु, पशुपंक्षीहरूको वासस्थान तथा संख्यामा पनि केही मात्रामा असर पर्ने जाने देखिन्छ।

६.३ आर्थिक, सामाजिक तथा सांस्कृतिक वातावरण

प्रस्तावित आयोजना निर्माण गर्दा उक्त आयोजनाले जमिन, वालीनाली घर तथा अन्य संरचनामा उल्लेख प्रभाव पर्ने देखिन्छ। कुल १९७ घरधुरीहरूको सर्वेक्षण गरिएकोमा आयोजनाको कार्यान्वयनबाट १८३ घरधुरीहरूलाई आयोजनाको विभिन्न पूर्वाधारहरूको निर्माणको क्रममा प्रत्यक्षरूपमा असर पर्ने देखिन्छ। सस्पेन्सन टावरको स्थान यकिन नभइ सकेकाले यी घरधुरीहरूमा सस्पेन्सन टावरको निर्माणबाट प्रभाव पर्ने घरधुरी समेटिएको छैनन्। सर्वेक्षण गरिएको घरधुरीहरू मध्ये २० घरधुरीहरूको ३० संरचनाहरू (२० घर तथा १० गोठ) हटाउनुपर्ने हुन्छ।

करीव ९८.३६ कि.मी. लामो प्रसारण लाईन आयोजनाले ३०८.४४६७ (६५.५४) हेक्टर खेतीयोग्य जमिन प्रभाव पार्नेछ। उक्त जमिन मध्ये २३.७८७५ हे. जमिन स्थायी रूपमा (एंगल टावर तथा सस्पेन्सन टावर तथा सबस्टेशन निर्माणको लागि अधिग्रहण गरिनेछ। आयोजनाले निर्माण गर्ने लागेको कूल १२९ एंगल टावर तथा १९८ सस्पेन्सन टावरहरू मध्ये कूल २३५ एंगल तथा सस्पेन्सन टावर व्यक्तिगत खेतीयोग्य जमिनमा पर्नेछन्। यी टावरहरूले ओगट्ने कूल ५.२८७५ हे. क्षेत्रफल ओगट्ने छन्। आयोजनाको निर्माण तथा सञ्चालनबाट आयोजनाले अधिग्रहण गर्ने जमिनबाट प्रभावित घरधुरीहरूको वार्षिक १२९.७४ मे. टन अन्नवाली क्षति हुने देखिन्छ भने कूल १५३१.७९ मे. टन अन्नवाली स्टीङ्कीड कार्य गर्दा नष्ट हुने देखिन्छ।

७. बैकल्पिक विश्लेषण

आयोजनाको बैकल्पिक विश्लेषण स्थलगत सर्वेक्षण अध्ययनको क्रममा गरिएको छ। आयोजनाको प्रसारण मार्गको छनौट गर्दा निम्न आधारहरूलाई प्राथमिकता दिइएको छ। खोला, नदी, राष्ट्रिय राजमार्ग, राष्ट्रिय प्रसारण लाइन, टेलिफोन लाइन, घना वस्तीहरू, वन क्षेत्र, ऐतिहासिक तथा सांस्कृतिक सम्पदाहरू तथा अन्य संवेदनशील आदि क्षेत्रहरूलाई सकेसम्म न्यून प्रभाव पर्ने गरी उत्तम बैकल्पको रूपमा यस प्रसारण मार्गलाई प्रस्ताव गरिएको छ।



८. प्रभाव न्यूनीकरणका उपायहरू

८.१ भौतिक वातावरण

भौतिक वातावरणमा पर्ने प्रभावलाई न्यूनीकरण गर्नको लागि सकभर कम जमिन तथा बस्तिहरूमा क्षति पुग्ने गरी आयोजनाको निर्माण गर्ने उपायहरूको अवलम्बन गरिने छ । टावर तथा सबस्टेशन निर्माणको क्रममा निस्किएको माटोलाई निर्माण पश्चात पूर्ववत् रूपमा राख्नुका साथै टावर निर्माणपूर्व सो स्थानको स्थिरताको पनि अध्ययन गरिनेछ । त्यसैगरी अति संवेदनशील स्थानहरूमा छुट्टै बनावट (design)को टावरहरूको निर्माण गरिनेछ । अस्थिर तथा भिरालो जमिनमा टावर निर्माण प्रतिबन्ध गरिनेछ भने पहिरोहरूबाट बच्न यस्ता स्थानहरूमा आवश्यकतानुसार वृक्षारोपण कार्य पनि गरिनेछ । त्यसैगरी आवश्यकतानुसार बायो इन्जिनियरिङ कार्य पनि गरिनेछ ।

८.२ जैविक वातावरण

आयोजना निर्माण गर्दा जैविक वातावरणलाई पनि असर गर्दछ । आयोजना निर्माण गर्दा वन क्षेत्रका रुखहरू हटाउनु पर्ने हुन्छ । यसबाट पर्ने नकारात्मक प्रभाव न्यूनीकरण गर्नको लागि खास गरी कम रुखहरू काटिने गरी आयोजनाको कार्य सम्पन्न गरिने छ भने काटिएका रुखहरूको क्षतिपूर्ती स्वरूप विभिन्न प्रजातिका विरुवाहरूको वृक्षारोपण गर्न वृक्षारोपण कार्यक्रम संचालन गर्नुपर्ने हुन्छ । यसको सम्पूर्ण लागत खर्च प्रस्तावक स्वयंले बेहोर्ने छ । आयोजनाका कारिन्दाहरूलाई अवैध शिकार निरुत्साहन गर्न कडा प्रतिबन्ध लगाइने छ भने बनजंगल तथा वन्यजन्तु संरक्षण, जैविक विविधता, र यसको महत्वको सम्बन्धमा सचेतना कार्यक्रम संचालन गरिनेछ ।

८.३ आर्थिक-सामाजिक तथा साँस्कृतिक वातावरण

जग्गाको क्षतिपूर्ती

स्थायी रूपमा अधिग्रहण वा उपयोग गरीने जमिनको क्षतिपूर्तिको लागि करीव रु ८६,५३,६२,०५७।-खर्च हुने देखिन्छ । आवश्यक जग्गा 'जग्गा प्राप्ती ऐन २०३४' तथा प्रभावित परिवार तथा आयोजनाविच को आपसी समझदारीमा अधिग्रहण गरिनेछ ।

उत्पादन क्षतिपूर्ती

आयोजना निर्माणको क्रममा वालीनालीहरूलाई क्षति पुग्ने देखिन्छ । जम्मा १६६१.५३ मे. टन खाद्यान्न नष्ट हुने देखिन्छ । उक्त खाद्यान्न क्षतिपूर्तिको लागि जम्मा रु ५,९०,८८,८५०।-खर्च हुने देखिन्छ ।

संरचना क्षतिपूर्ती

कतिपय घर र अन्य संरचनाहरू पनि आयोजना निर्माणको चरणमा हटाउनु पर्ने हुन्छ जम्मा ३० संरचनाहरू प्रस्तावित आयोजना कार्यन्वयन गर्दा हटाउनु पर्ने देखिन्छ । यसको लागि उचित क्षतिपूर्तीको व्यवस्था गरिने छ । प्रभावित परिवारहरूमा पर्ने असरलाई न्यूनीकरण गर्न अस्थायी रोजगारीको पनि व्यवस्था गरिनेछ ।



स्वास्थ्य, सरसफाई तथा सुरक्षा

आयोजनाबाट प्रभावित क्षेत्रको स्वास्थ्य, सरसफाई तथा सुरक्षा अवस्थामा पर्ने प्रभावको बारेमा सर्वसाधारणहरूलाई जानकारी दिनको लागि सचेतनामूलक कार्यक्रमहरू संचालन गरिनेछ।

क्षमता अभिवृद्धि कार्यक्रम

आयोजना प्रभावित परिवारहरूलाई विभिन्न क्षमता अभिवृद्धिमुलक कार्यक्रमहरू जस्तै वायरिङ, ड्राइभिङ, अटोमोबाइल रिपेरीङ, इलेक्ट्रिक तथा मेकानिकल तालिमहरू तिनीहरूकै समुदायमा दिएर उनीहरूको क्षमता अभिवृद्धि गर्न मद्दत गरिने छ।

विद्यालय सहयोग कार्यक्रम

प्रभावित क्षेत्रको एउटा माध्यमिक विद्यालयलाई वित्तीय सहयोग प्रदान गरिनेछ। यस्तो सहयोग कम्प्युटर खरिद, पुस्तकालय स्थापना, खानेपानीको व्यवस्था, महिला शौचालयको निर्माण तथा स्कूल खेल मैदानको विकास जस्ता कार्यहरूमा प्रदान गरिनेछ।

९. वातावरणीय अनुगमन

आयोजनाको प्रभावकारी निर्माण गर्नको लागि वातावरण न्यूनिकरणका कार्यक्रमहरू, अनुगमन योजना, सरोकारवालाले उठाएका विभिन्न समस्याहरू आदि समाधान गर्नको लागि वातावरणीय व्यवस्थापन इकाई (EMU) को गठन गरिनेछ। यस इकाईमा वातावरण तथा सामाजिक अध्ययन विभागका विभिन्न क्षेत्रका विशेषज्ञहरूको साथै आवश्यकता अनुसार स्थानीय स्तरमा रहेका व्यक्तिहरूलाई समेत संलग्न गरिनेछ।

१०. निश्कर्ष

यस प्रारम्भिक वातावरणीय अध्ययन प्रतिवेदनमा उल्लेख भए अनुसार आयोजनाको कार्यान्वयनको लागि ४७०.९२१८ हे. खेतीयोग्य जमिनको आवश्यकता पर्दछ। करिव १८,२८४ पोलहरू २७,७७७ रुखहरूकटान गर्नु पर्नेछ। कुल वातावरणीय व्यवस्थापन लागत रु १,०४,२७,५४,११८।-लाग्ने अनुमान गरिएको छ। जुन लागतमा न्यूनिकरणका कार्यक्रमहरूको साथसाथै अनुगमन कार्य पनि समावेश गरिएको छ। उक्त लागत आयोजनाको कूल लागतको ९.९३% ले हुन आउँछ।

प्रस्तुत प्रस्तावको कार्यान्वयन गर्दा माथि प्रस्तुत गरिएको न्यूनिकरणका उपायहरू र अनुगमन योजना अनुसार गरिएको खण्डमा यो आयोजना सामाजिक र वातावरणीय दृष्टिकोणले उपयुक्त देखिन्छ।

Executive Summary of IEE**1. Introduction**

The project proponent is the Nepal Electricity Authority (NEA). NEA is a public undertaking of the Government of Nepal and was established in August 16, 1985 (Bhadra 1, 2042 BS) under the Nepal Electricity Authority Act, 2041 BS. Environmental and Social Studies Department (ESSD) is responsible for conducting the IEE study of this project. The Ministry of Energy (MoEn) has granted a survey license for the feasibility study including the environmental study of the proposed project. The survey license was issued on B.S.2070/01/31 and is valid till B.S.2073/01/30. An application has been sent to MoEn through Department of Electricity Development (DoED) for renewal of license. The general objective of this study is to prepare an IEE report in order to implement the proposed Tamakoshi-Kathmandu 400 kV Transmission Line Project in an environmentally sound manner.

2. Project Description

Tamakoshi-Kathmandu 400 kV Transmission Line Project has been proposed for the power evacuation from the planned HEPs in Tamakoshi and others river in the project area. Current policies of Government of Nepal emphasize the need of environmentally sound and socially sustainable development of power projects in the country.

The project is divided into two sections. The TL of Khimti-Barhabise Section starts from substation at Phulasi VDC of Ramechhap District and immediately enters into Melung VDC of Dolakha District. In Dolakha District, the alignment passes through 7 VDCs and 1 Municipality, and 5 VDCs of Sindhupalchowk District. Altogether 13 VDCs and 1 municipality of 3 District (Ramechhap, Dolakha and Sindhupalchowk) are taken for IEE study. There are two VDCs namely, Magapauwa (Dolakha district) and Tauthali (Sindhupalchowk), from where alignment passes but AP not set on the land.

Similarly, the TL of Barhabise-Kathmandu Section starts from substation at Barhabise VDC of Sindhupalchowk District. The alignment passes through 8 VDCs of Sindhupalchowk, 4 VDCs of Kavrepalanchowk, 2 municipalities of Bhaktapur and 1 municipality of Kathmandu District. Altogether 12 VDCs and 3 municipalities of 4 districts (Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu) are taken for IEE study. The construction period is of 40 months.

3. Study Methodology

The IEE report is prepared as per Terms of Reference (ToR) approved by Ministry of Energy (MoEn) on 2072/01/06. The IEE process follows the Environment Protection Rules, 1997, and amendment made on 2009 (2065/11/26) and National EIA Guidelines, 1993. This IEE is prepared in accordance with the legal requirements of GoN, based on field studies and consultation with local people and officials in accordance with approved ToR. For the physical environment, data on climate, geology and land were taken. Likewise, in socio-economic and cultural environment data on population, ethnicity, religion and religious sites, infrastructure, etc. are used for the study. A public notice has been published in Gorkhapatra Daily in 2072/04/08. As well, an interaction meeting was held at the project site.

4. Review of Policy and Legal Provisions

The proponent will be responsible for fulfilling the provisions of all relevant acts, rules/regulations policies, guidelines and conventions while implementing the project. Water

Resources Act (1992), Electricity Act (1992), Water Resource Regulations (1993), Electricity Regulation (1993), Hydropower Development Policy (2001), etc. were studied while preparing the report. In addition, important Acts and Regulations like EPA (1996) and EPR (1997) and its amendments, Land Acquisition Act 1977, Forest Act (1993), and Forest Rules (1995), Local Self Governance Act (1999) and Regulation (2000), National Environmental Impact Assessment Guidelines (1993), Forest Produce, Collection and Sales Distribution Guidelines (2000), etc. were also extensively reviewed while preparing the report.

5. Existing Environmental Condition

5.1 Physical Environment

The project has been divided into two section and discuss and follows;

Khimti-Barhabise Section

The proposed route of this section of length 42.638km traverses through the Middle Mountain and hills. The alignment runs through several topographic features comprising of rugged hills with mild and steep slope, undulating land forms and flat terrain near those bajar. The altitudinal variation of the TL is between 2719 masl to 639 masl at Dobate, Lakuri Dada VDC and Sitali, Phulasi VDC respectively. The altitude of the starting point at Ghumaune, Phulasi VDC is 653 masl and terminal point of the TL at Sano Palati, Barhabise is 1415 masl.

Barhabise-Kathmandu Section

The proposed route of this section of length 55.722 km traverses through the Middle Mountain and hill. The alignment runs through several topographic features comprising of rugged hills with mild and steep slope, undulating land forms and flat terrain. The altitudinal variation of the TL is between 1820 masl to 723 masl at Baluwapati Deupur VDC and Chandeni VDC respectively. The altitude of the starting point at Barhabise VDC is 1415 masl and terminal point of the TL at Changunarayan Municipality is 1352 m.

The main land use pattern of the project area is cultivated land, forest (community, government and private), grazing land and barren land. The alignment avoids densely populated areas, major structures, protected areas and dense forests. The other land uses along the alignment consists of road crossings, rivers, rivulets, river beaches and TL. Along the alignment, approximately 64.067 % of the TL alignment passes through the cultivated land, 18.283% through forest and 17.65% through others (barren land, bush, grassland, cutting cliff, sand, water body, road crossings and river crossings, etc.).

5.2 Biological Environment

Tree species are well represented by the deciduous and evergreen types. Major plants species found are Khotasalla (*Pinus roxburghii*), Uttish (*Alnus nepalensis*), Chilaune (*Schima wallichii*), Bajh (*Quercus* spp.), Sal (*Shorea robusta*) Kyamuno (*Cleistocalyx operculata*), Patulasalla (*Pinus patula*) etc. Likewise, main non-timber forest products (NTFPs) including medicinal herbs found are Lokta (*Daphne bholua*), Argeli (*Edgeworthia grideni*), Kurilo (*Asparagus* sp.), Nagbeli (*Lycopodium* sp.), Chirayito (*Swertia chirayita*), Amala (*Embelia officinalis*), etc.

Mammals such as Salak (*Manis pentadactyla*), Barking deer (*Muntiacus muntjak*), Jackal (*Canis aureus*), Leopard (*Panthera pardus*), Porcupine (*Hystrix indica*), Rhesus Monkey (*Macaca mulatta*), Malsapro (*Martes flavigula*), Squirrel (*Fuina mbulaspalmorum*) etc. are reported in the forest of project affected area.



Kalij (*Lepidura leucomelana*), Common Myna (*Acridotheres tristis*), House Swift (*Apus affinis*), House Crow (*Corvus splendens*), Spotted Dove (*Streptopelia chinensis*) and House Sparrow (*Passer domesticus*). Cuckoo (*Eudynamis sp.*), etc. are reported bird species along the forest of project area. Katle (*Neolissocheilus hexagonolepis*) and Asla (*Schizothorax sp.*) are the fish found along the rivers where from TL RoW passes.

Based on the available detailed survey report of the proposed TL alignment, out of 129 angle points (APs) 26 are located in the forest which will require 0.585 ha forest area (area occupied by each tower pad = 15 m x 15 m approx.).

Total number of community forests (CFs) in five districts is 1,667, out of which there are 51 community forest along the AP and TL RoW. Likewise, leasehold forests (LHF) are affected in Sindhupalchok district only where total number of LHF is 396. In addition, there are 4 government forests in Sindhupalchok and KavrePalanchok districts (2 in each district) and 2 LHFs in Sindhupalchok district.

The project site does not fall in national park, environmentally sensitive area, wildlife sanctuary area, buffer zone and conservation area

5.3 Socio-economic and Cultural Environment

The total area of 6 districts is 14,651 Sq. km. According to CBS 2011, the total population of the six districts is 31,07,829 with 15,69,561 male and 15,38,268 female which occupies 11.73% of the total population of the country (2,64,94,504). The average population density of six districts is 1263 (persons/km²). There are 7,41,986 HHs and the average household size of the six districts is 4.37. Similarly, the average literacy rate of the six districts is 70%.

The proposed alignment traverses through the 26 VDCs and 4 municipalities of six districts of Central Development Region of Nepal. According to the National Population Census 2011, the total population of the project VDCs/ Municipalities is 215784 with 101823 (47.19%) males and 113961 (52.81%) females. The female population is higher as compared with the male population. The population of the project VDCs/Municipalities covers only 6.94% of the total population of the project affected districts (3107829). The total number of households is 50367 with average household size 4.28.

The main settlements of the VDCs/Municipalities through which the TL passes are Milti bazaar-Sitali, Tinkhoriyagau, Matyangribasti, Khanigaun, Kalleribasti, Kaichalegaun, Odaregaun, Gurunggaun, Kiratechhapbasti, Thapabasti, Syasi, Okhre, Gagrenbari, Swaragaun, Tallopakhagaun, Phulbarighumti, Kharidhunga, Beshitole, Kuwapanibasti, Kotabarigaun, Gairigaun, KamitarTole, ChimlingBesigaun and others. The dominant caste groups in the project area are Chhetri (25.54%), Tamang (21.36%), Newar (19.70%) and Brahmin Hill (15.34%) which covers 81.94% of the total population. Nepali (61.82%) is the main language widely spoken in the project area. Beside this, Tamang followed by Newar, Thami, Danuwar and others are main language used in project area.

The average literacy rate of the project area is 63.29% consisting 72.54% male and 55.45% female literacy rate. Women literacy is very low in comparison in male. The major occupation of the people of the project area is subsistence as well as professional farming. Kavrepalanchowk district is the pocket area for food crops and vegetable farming. The rest of the people are engaged in remittance, business, government service, labor, agro-based industries, livestock and poultry farming, etc. Health service in the project area is delivered through the existing sub-health post and health post in VDC

5.3.1 Profile of the Project Affected Families

Households survey of 197 households from project affected VDCs/Municipalities have been conducted. The surveys reveal that the total population of the project affected sample household is 1170 of which 599 (51.97%) are male and 571 (48.80%) are female. Similarly, the average HH size and sex ratio of the project affected households are 5.9 and 1.05 respectively. Hinduism and Buddhism are the two main religions followed by project affected households. The majority of the project affected households 85.79% are Hindu followed by Buddhist 13.71%.

Agriculture is the main occupation of the surveyed households. About 35.76% of the surveyed households have adopted agriculture as a main occupation. The percentage of households occupied other than agriculture is service; inside the country (11.05%), Labour wage 18.07 % (9.88%, inside the country and 8.19%, outside the country), students (22.50%) business and small industry (6.11%) and households work (6.24%).

From the household survey, it is revealed that 84.19% of the surveyed populations are literate with male literacy rate 89.82 % and female literacy rate 78.28%. Households survey shows that hundred percent of the sampled households have their own land for cultivation. The average land holding size of the surveyed households is estimated to be 0.711ha

Households survey shows that the total average annual income of the surveyed households is NRs. 3,99,783. Of the total income share of agriculture and animal husbandry is highest i.e. NRs. 1,05,096 (26.29%) followed by remittance (23.11%), service (20.58%), business (15.33%), daily wages/porter (10.70%) and others. The average expenditure of the surveyed households is NRs. 3,29,220. The share of expenditure on non-food item is higher i.e. 51.33% as compared to food item (48.67%).

From the households' survey, the total production of paddy, maize, millet and potatoes are 186.180 MT, 70.040 MT, 36.460 MT and 151.470 MT respectively. Similarly, the average yield of paddy, maize, millet and potatoes are 3.06 MT/ha, 1.92 MT/ha, 1.17 MT/ha and 7.66 MT/ha respectively. On the average, 89.34% of the surveyed households have their own toilet for defecation. Similarly, nearby forest area and open field are used by only 10.66% households respectively. Management of solid waste disposal is seems to be satisfactory in the surveyed households

6. Impact Assessments

6.1 Physical Impacts

The land interference during construction of the project is related to the substation. This may result in the change in landscape. No other change in topography is envisaged during this phase. The project will require 470.9218ha land for the placement of tower pads (angle and suspension), substations and RoW of the TL and temporary facilities. Out of this, 25.8575 ha land will be permanently acquired and 445.0643 ha will be restricted as RoW. The total number of angle towers will be 129 and the number of suspension tower is estimated as 198. Towers will typically require an area of 15m x 15m which is equal to 0.0225 ha per tower. Altogether 93, 26 and 10 number of APs are located on cultivated land, forest area and others area whereas

142 suspension towers are located in cultivated land followed by 40 towers in forest and the remaining 16 towers are located in other land use.

During the construction period, water from nearby streams and irrigation canals will be used construction, and other purposes. Soil disturbances due to construction activities of tower pads, the generation of solid wastes and chemicals such as cement slurry, construction materials and human wastes may deteriorate the water quality of nearby river and streams

6.2 Biological Environment

The total forest area falling under the RoW of TL alignment including area occupied by APs is 126.4 ha. Based on the available detailed survey report of the proposed TL alignment, out of 129 angle points (APs) 26 are located in the forest which will require total 0.585 ha forest area (area occupied by each tower pad = 15 m X 15 m). Based on the total enumeration of forest vegetation in AP and under RoW of TL, total of 18,284 poles; 7,777 trees and 65,735 regeneration of different species will be removed. Main dominant species are Sal (*Shorea robusta*), Salla (*Pinus roxburghii*), Chilaune (*Schima wallichii*) and Uttis (*Alnus nepalensis*). Other trees species are Kyamuna (*Cleistanthus perculata*), Bot dhayaro (*Lagerstroemia sp.*) etc. Estimated volume of timber and fuel wood from the removal of forest vegetation will be 104,244 cubic feet (equivalent to 2,953 cubic meter) and 130 chatta respectively during the project construction period

Since there will be small number of outsider work force involved in the project construction, collection and sale of NTFPs by workers will be negligible. The possible adverse impacts on wildlife and avifauna population during the project construction phase are possibility of hunting and poaching by labor force and disturbance in the migratory movement of mammals and birds.

6.3 Socio-economic and Cultural Environment

Household survey of 197 HHs has been conducted. Out of these 183 HHs will be affected by the project and remaining 14 HHs fall under the RoW but they were demolished due to the earthquake of April, 2015. Out of total surveyed HHs, 20 households will lose their structures. A total of 30 structures (20 houses, 10 cow shed) will be affected due to implementation of the project.

The project will acquire 308.4467 (65.5%) ha of cultivated land along 98.36 km route. Out of total, 23.7875 ha is permanent land (land required for angle tower, suspension towers and substation area). Out of total towers (angle and suspension towers), 235 towers will be located in cultivated land. Area occupied by these towers is 5.2875 ha. All the three Substations are located in cultivated land. On the basis of this, total annual crop loss of project affected HHs due to the acquisition of land is 129.74 MT. Similarly, about 1531.79 MT of crops (paddy 708.80 MT, maize 307.531 MT, millet 190.19 MT and potato 325.27 MT) will be lost due to the stringing of TL.

7. Alternative Analysis

Some of the major alternatives considered during the feasibility and IEE studies were: which have minimal environmental impact, improvement of reliability of the power system, avoid build up swampy and unstable areas, provide easy access for construction and maintenance works and avoid settlements as far as possible.

8. Mitigation and Enhancement Measures

8.1 Physical Environment

Proper management of the excavated volume will be done. The excavated muck generated during the excavation of tower pads and substation will be used for backfilling and the area will be restored. The stability of the tower locations will be examined before excavation and special foundation design will be selected for the susceptible locations. Erection of tower foundation in the unstable land and/or in steep slopes will be avoided. Re-vegetation and slope maintenance will be carried out in the disturbed areas to avoid erosion. Bio-engineering with combination of retaining structures will be done as per the requirement. The construction and operation of the TL will not have significant impact on the air quality of the project impact area. Vehicle utilized for construction will be complied with GoN mass emissions standards.

8.2 Biological Environment

Plantation program will be carried out as compensation of tree felling along the RoW and Awareness raising program will be conducted for local people, workers and CFUG members of the project area about the importance of biodiversity, forest, wildlife and bird conservation, plantation and economic importance of forest and its role in rural livelihood improvement, existing rule regulations etc. The project proponent will provide kerosene to the project workers to minimize the loss of forest. The project workers will strictly be prevented from hunting and poaching and any other kind of illegal activities related to hunting and poaching. Informative and warning sign will be placed at relevant construction sites.

8.3 Socio-economic and Cultural Environment

Compensation for land

The total compensation for the land to be acquired and utilized by the project is estimated to be NRs. 86,53,62,057. The required land will be acquired according to the Land Acquisition Act, 2034 BS and with mutual understanding between the affected families and the proponent.

Compensation of loss of crops

The total compensation for the loss of 1661.53MT is estimated to be NRs. 5,90,88,850 only.

Compensation for structures

Compensation for 30 structures will be compensated and short-term employment opportunity will be given to local people to reduce the impact due to influx.

Health, Sanitation and Safety Program

An awareness program will be conducted in the project area to alert local people to the potential dangers related to health, sanitation and safety. This program will be targeted to the people residing in and around the vicinity.

Skill Development Program

About 60 project affected people will be benefited from skill development program on house wiring, driving, masonry, automobile repairing and maintenance in their own localities. The total budget for skill development program is estimated as NRs. 38,18,000.

School Support Program

Financial support will be provided to the schools located in the vicinity of the project area. Support will be provided for purchase of computer, library establishment, drinking water facility, ladies toilet construction, and extension of school play-ground. The total budget for school support is estimated as NRs. 50,00,000.



9. Environment Monitoring

In order to implement the project smoothly, the mitigation program, monitoring plan, issues of public concern and other relevant issues, an Environmental Monitoring will be done. Under this plan a Unit will be formed which will do the day to day monitoring works. The Unit will consist of experts from ESSD and other qualified personnel from the local market if required.

10. Conclusion:

The total cultivated land requirement will be approximately 470.9218ha. There shall be some direct impact on biological environment as a total of 18,284 poles; 7,777 trees and 65,735 regeneration of different species will be removed. In terms of the loss of land and assets various mitigation and enhancement measures have been proposed during the construction and operation phase of the project. The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs 1,04,27,54,118 which is 9.93% of the total project cost. The IEE study concludes that construction of the proposed Tamakoshi-Kathmandu 400 kV Transmission Line Project is environmentally and socially feasible if the proposed mitigation measures and monitoring plans are implemented.

ABBREVIATIONS AND ACRONYMS

AP	: Angle Point
BS	: Bikram Sambat (Nepali Era)
CBO	: Community Based Organization
CFUG	: Community Forest Users' Group
CITES	: Convention on International Trade of Endangered Species of Wild Fauna and Flora
DDC	: District Development Committee
DIA	: Direct Impact Area
DoED	: Department of Electricity Development
EIA	: Environmental Impact Assessment
EMF	: Electromagnetic Field
EMP	: Environmental Management Plan
EPA	: Environment Protection Act, 1997
EPR	: Environment Protection Rules, 1997
ESSD	: Environment and Social Studies Department
GoN	: Government of Nepal
GIS	: Geographical Information System
GRC	: Grievance Redress Cell
GRM	: Grievance Redress Mechanism
HHs	: Households
IIA	: Indirect Impact Area
KII	: Key Informant Interview
kV	: Kilovolt
LHF	: Lease Hold Forest
MW	: Mega Watt
MoEn	: Ministry of Energy
MoFSC	: Ministry of Forest and Soil Conservation
MoSTE	: Ministry of Science, Technology and Environment
NEA	: Nepal Electricity Authority
NGO	: Non Governmental Organization
PAF	: Project Affected Family
PRA	: Participatory Rural Appraisal
RoW	: Right of Way
RRP	: Resettlement and Rehabilitation Plan
SPAF	: Seriously Project Affected Family
TL	: Transmission Line
ToR	: Terms of Reference
VDC	: Village Development Committee



TL project is of 400 kV capacity, it needs an IEE for execution. Further, about 126.4 ha of forest land will be affected due to the project implementation.

The project area does not lie in the national park, wildlife reserve, buffer zone, conservation Area, wetlands, historically and archaeologically important sites and or environmentally sensitive/ fragile areas.

1.4 Objective of IEE Study

The general objective of the study is to prepare an IEE report in order to implement the proposed Tamakoshi-Kathmandu 400 kV Transmission Line Project in an environmentally sound manner. The specific objectives of the study are:

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

1.5 Structure of the Report

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

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

2 PROJECT DESCRIPTION

2.1 Project Location

The proposed project is located in Central Development Region of Nepal (Figure 2.1). The project is located in Middle Mountain and Hilly region of Nepal. The TL of Khimti-Barhabise Section starts from substation at Phulasi VDC of Ramechhap District and immediately enters into Melung VDC of Dolakha District. In Dolakha District, the alignment passes through 7 VDCs and 1 Municipality, and 5 VDCs of Sindhupalchowk District. Altogether 13 VDCs and 1 municipality of 3 District (Ramechhap, Dolakha and Sindhupalchowk) are taken for IEE study. There are two VDCs namely, Magapauwa (Dolakha district) and Tauthali (Sindhupalchowk), from where alignment passes but Angle Point (AP) not set on the land.

Similarly, the TL of Barhabise-Kathmandu Section starts from substation at Barhabise VDC of Sindhupalchowk District. The alignment passes through 8 VDCs of Sindhupalchowk, 4 VDCs of Kavrepalanchowk, 2 municipalities of Bhaktapur and 1 municipality of Kathmandu District. Altogether 12 VDCs and 3 municipalities of 4 Districts (Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu) are taken for IEE study. The VDCs along the TL route are listed in salient features (Table 2-1) below and TL route alignment map has been presented in Figure 2.2 and Figure 2.3. Similarly, 132kV TL from Changunarayan Substation will be connected to Tower no. 014 SS-M (at Duwakot) through 4km four circuit line named as looped in/ looped out line.

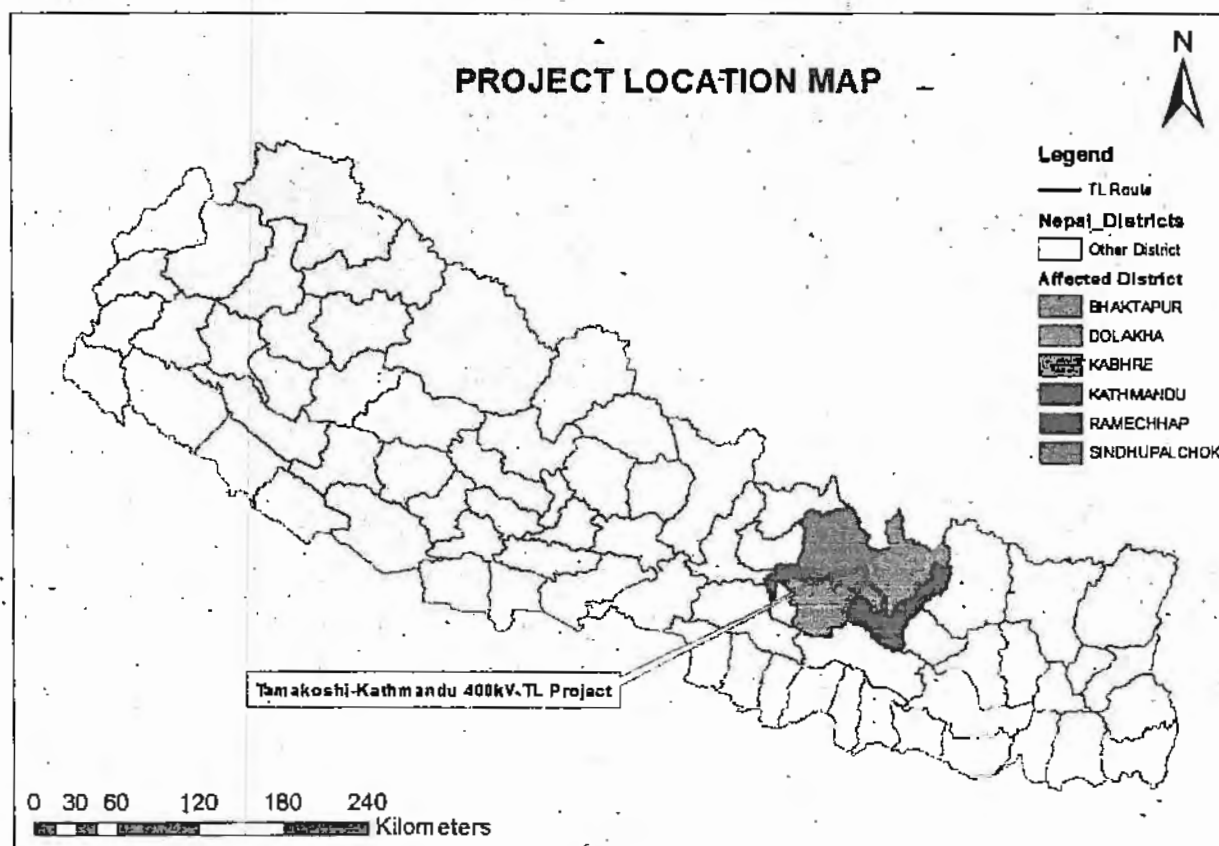


Figure 2.1: Project Location Map

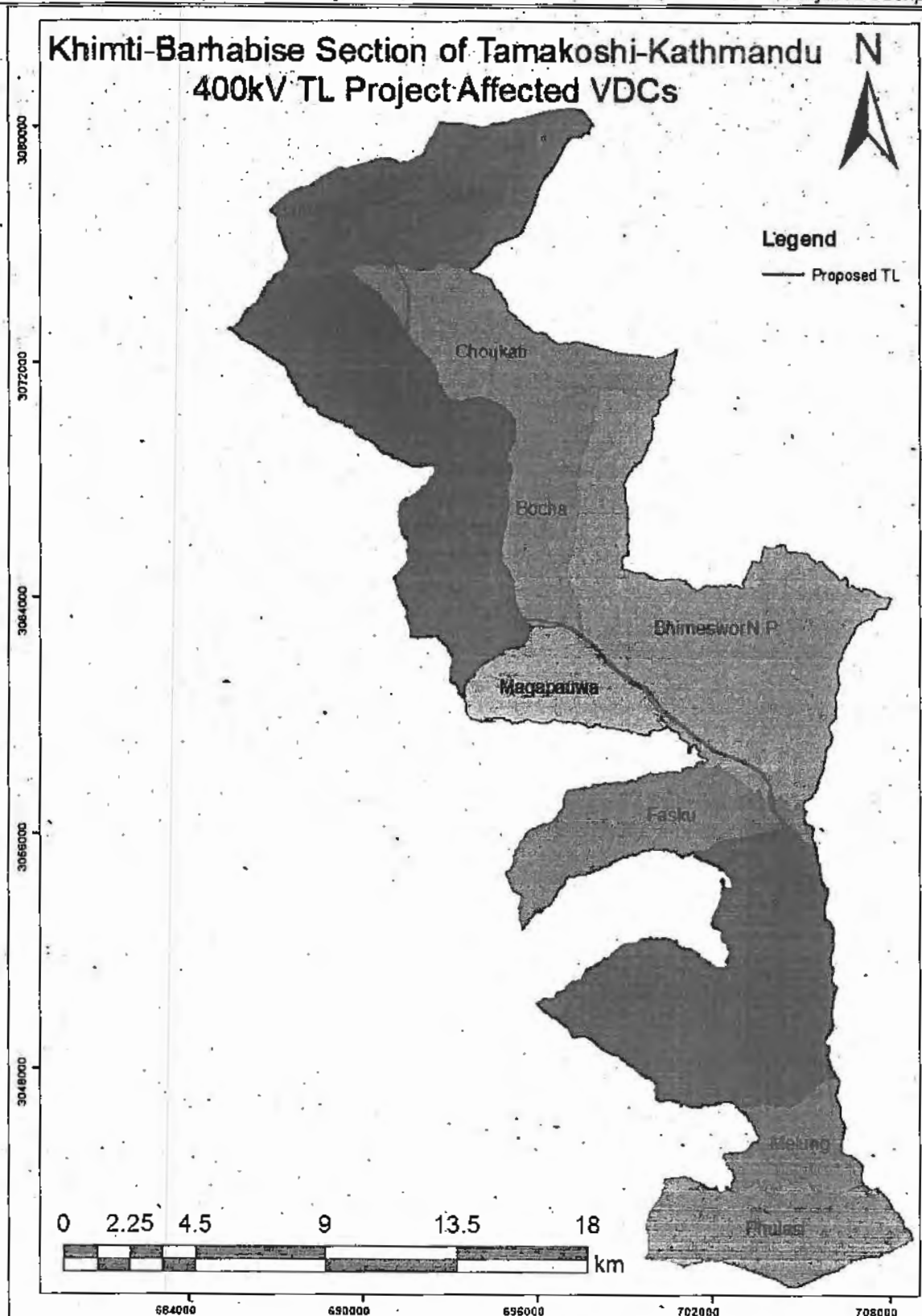


Figure 2.2: Project Affected VDCs of Khimti-Barhabise Section

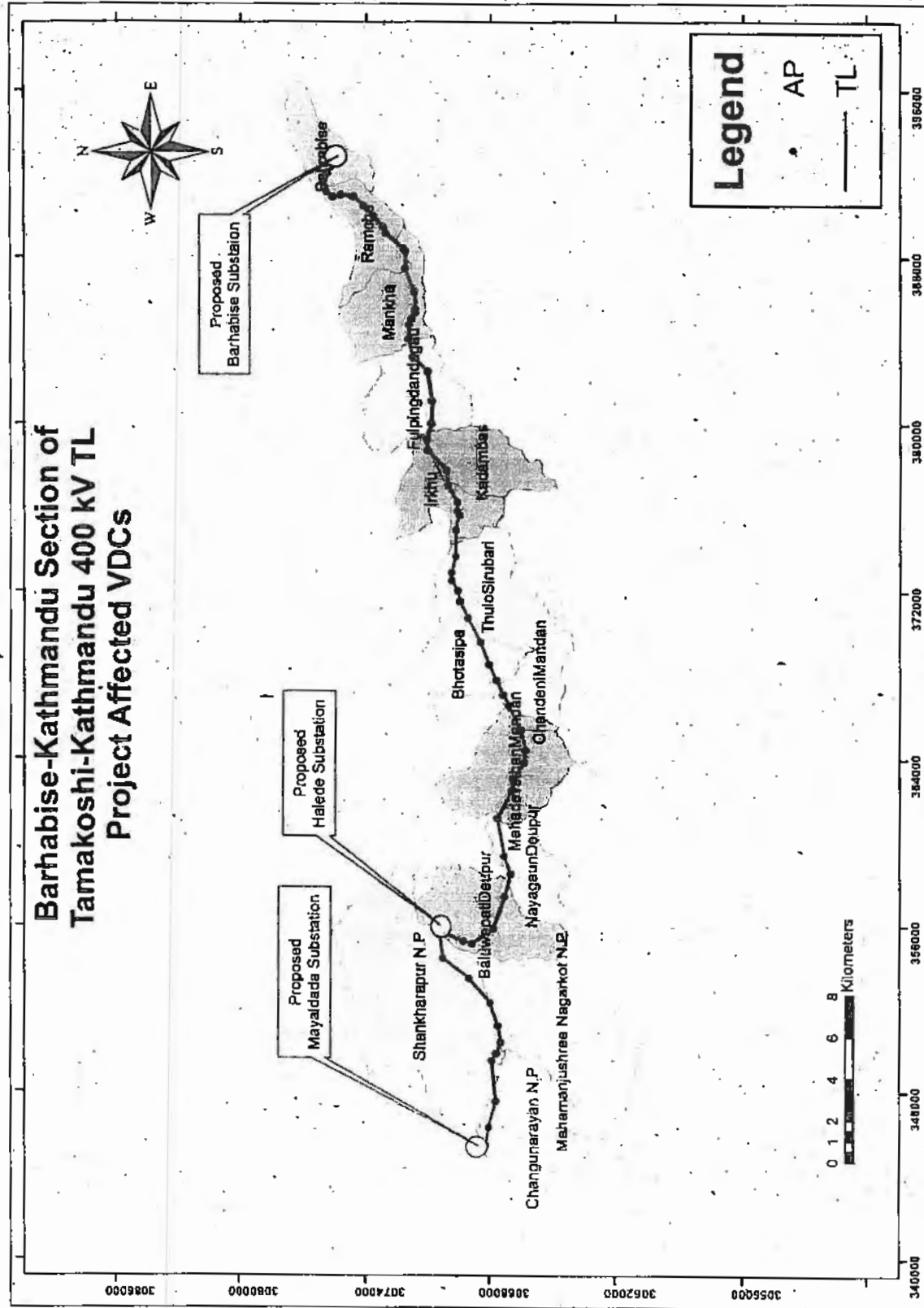


Figure 2.3: Project Affected VDCs Barhabise-Kathmandu Section



Submitted To:
NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
MAHARAJGANGA PROJECT

Submitted By:
SIRESTHA CONSULTANT PVT. LTD.
BANGALORE, INDIA

TAMAKOSHI (KHM) - KATHMANDU 220 KV/400 KV TRANSMISSION LINE PROJECT
Revised Barabise - Kathmandu
400 KV Transmission Line Survey

Scale 1:25000
Date: January 2015

Route Alignment Map
of
Detailed Survey

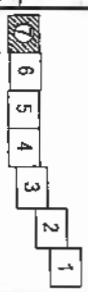
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717

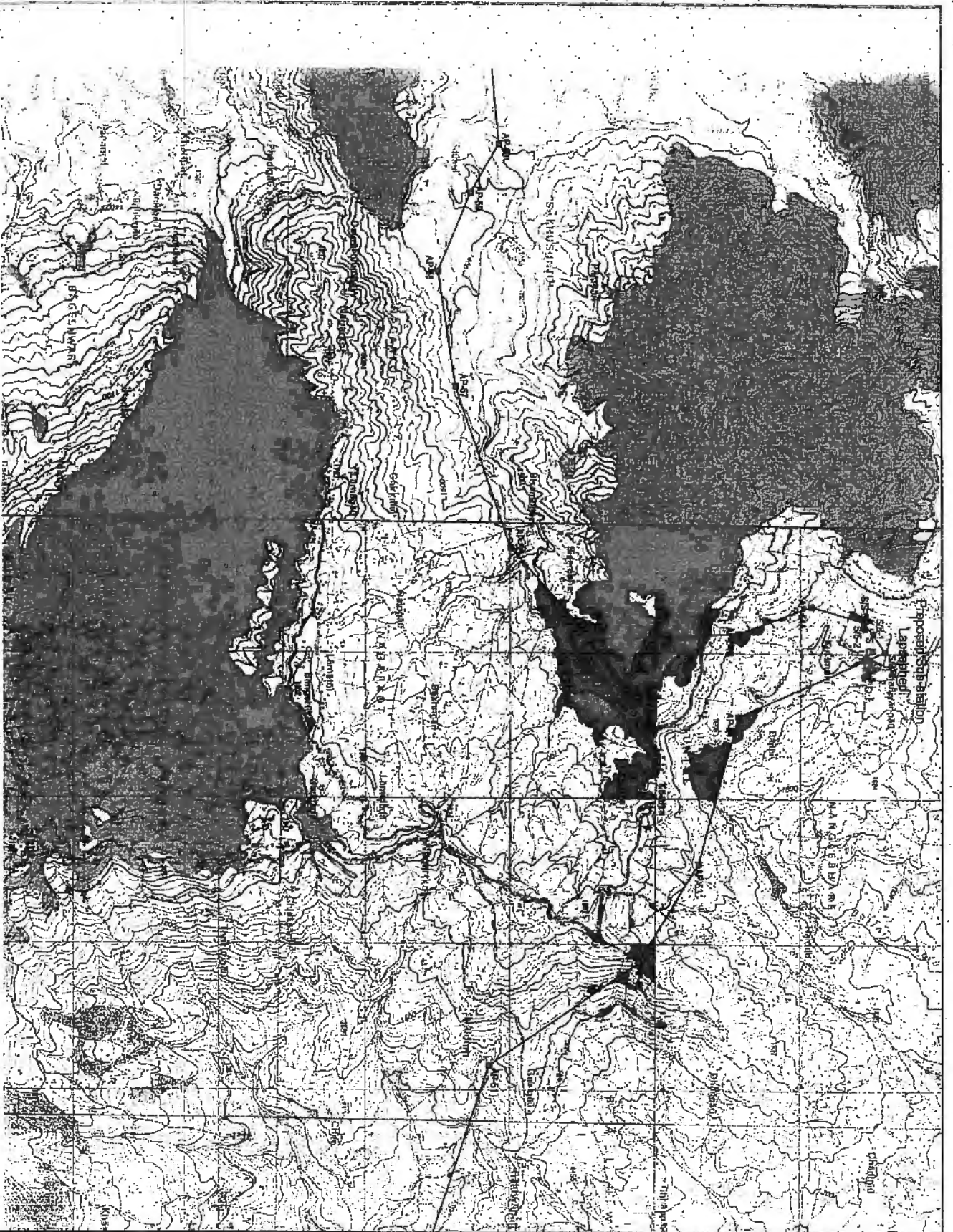


Legend

- SUBSTATION BRIDGE
- WOODEN BRIDGE
- ROAD
- RAIL
- FOOTPATH
- 33 KV TL
- GABION WALL
- MASONRY WALL
- GAUGE STATION
- DRILL HOLE
- SMALL TREE
- BAMBOO TREE
- CULTIVATED LAND
- TREE
- GROUND CONTROL POINT
- TEMPLE
- TAPE
- HOUSE
- GOTH
- BOLDER
- LANDSLIDE
- 33 KV Line
- 11 KV Line
- 220 V LT
- ANGLE POINT
- DIRECTION POINT
- BI AP 1
- R2

Sheet Index





Legend



Khola

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Khola

Khola

Suspension Bridge

Wooden Bridge

Road

Drain

Footpath

33 KV TL

Garrison Wall

Masonry Wall

Gauge Station

Drill Hole

Small Tree

Bamboo Tree

Cultivated Land

Tree

Ground Control Point

Temple

Tap

House

Goth

Boulder

Landslide

23 KV TL

11 KV TL

220 V LT

Angle Point

Direction Point

AP-1

AP-2

AP-3

AP-4

AP-5

AP-6

AP-7

AP-8

AP-9

AP-10



7 6 5 4 3 2 1



Submitted To:
NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
MAJOR TRANSMISSION LINE PROJECT 200 KV

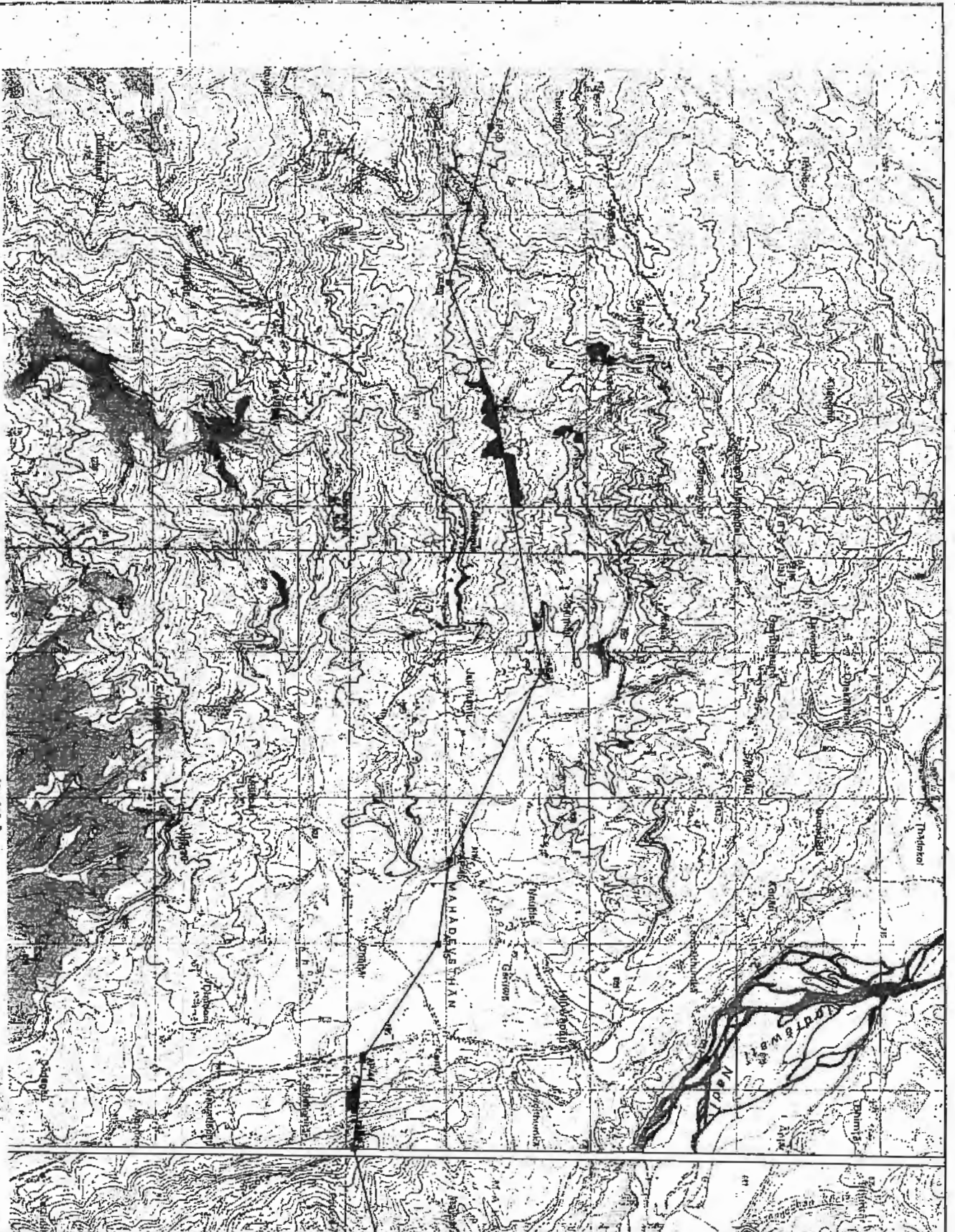
Submitted By:
SHRESTHA CONSULTANT PVT. LTD.
BANKIM, KATHMANDU

TAMAKOSHI-KHIMTI - KATHMANDU 220 KV/ 400 KV TRANSMISSION LINE PROJECT
Revised Bernabise - Kathmandu
400 KV Transmission Line Survey

Scale 1:25000
Date: January 2018

Title
Route Alignment Map
of
Detailed Survey

Sheet No.
6/7



Legend

KHOLA
RIVER

HTL

SUSPENSION BRIDGE

WOODEN BRIDGE

ROAD

DEAM

FOOTTRACK

20 kV TL

CADON WALL

MASONRY WALL

GAUGE STATION

DRILL HOLE

SMALL TREE

SAMROO TREE

CULTIVATED LAND

TREE

GROUND CONTROL POINT

TELEPHONE

TAP

HOUSE

GOIN

BOULDER

LANDSLIDE

33 kV LINE

11 kV LINE

230 V LT

ANGLE POINT

DIRECTION POINT

BP 1

R2

Sheet Index

7 6 5 4 3 2 1

Route Alignment Map

of

Detailed Survey

Sheet No.

5/7

Date: January-2016

Scale: 1:25000

0 250 500 750 1000 1250m

Submitted By:

Submitted To:

NEPAL ELECTRICITY AUTHORITY

TRANSMISSION DIRECTORATE

400 kV TRANSMISSION LINE PROJECT 200 kV

SHRESTHA CONSULTANT PVT. LTD.
BHAKTAPUR
TAMAKOSHI-KHIMT - KATHMANDU 220 kV 400 kV TRANSMISSION LINE PROJECT
Revised Barabise - Kathmandu
400 kV Transmission Line Survey

Legend

- RIOLA
- RIOLSI
- HFL
- SUSPENSION BRIDGE
- WOODEN BRIDGE
- ROAD
- DRAIN
- FOOTTRACK
- 33 KV TL
- GARDEN WALL
- MASONRY WALL
- GAUGE STATION
- DRILL HOLE
- SUAL TREE
- BAMBOO TREE
- CULTIVATED LAND
- TREE
- GROUND CONTROL POINT
- TEMPLE
- TAP
- HOUSE
- GOUTH
- BOULDER
- LANDSLIDE
- 33 KV Line
- 11 KV Line
- 220 VLT
- ANGLE POINT
- BI AP 1
- DIRECTION POINT
- BI 62



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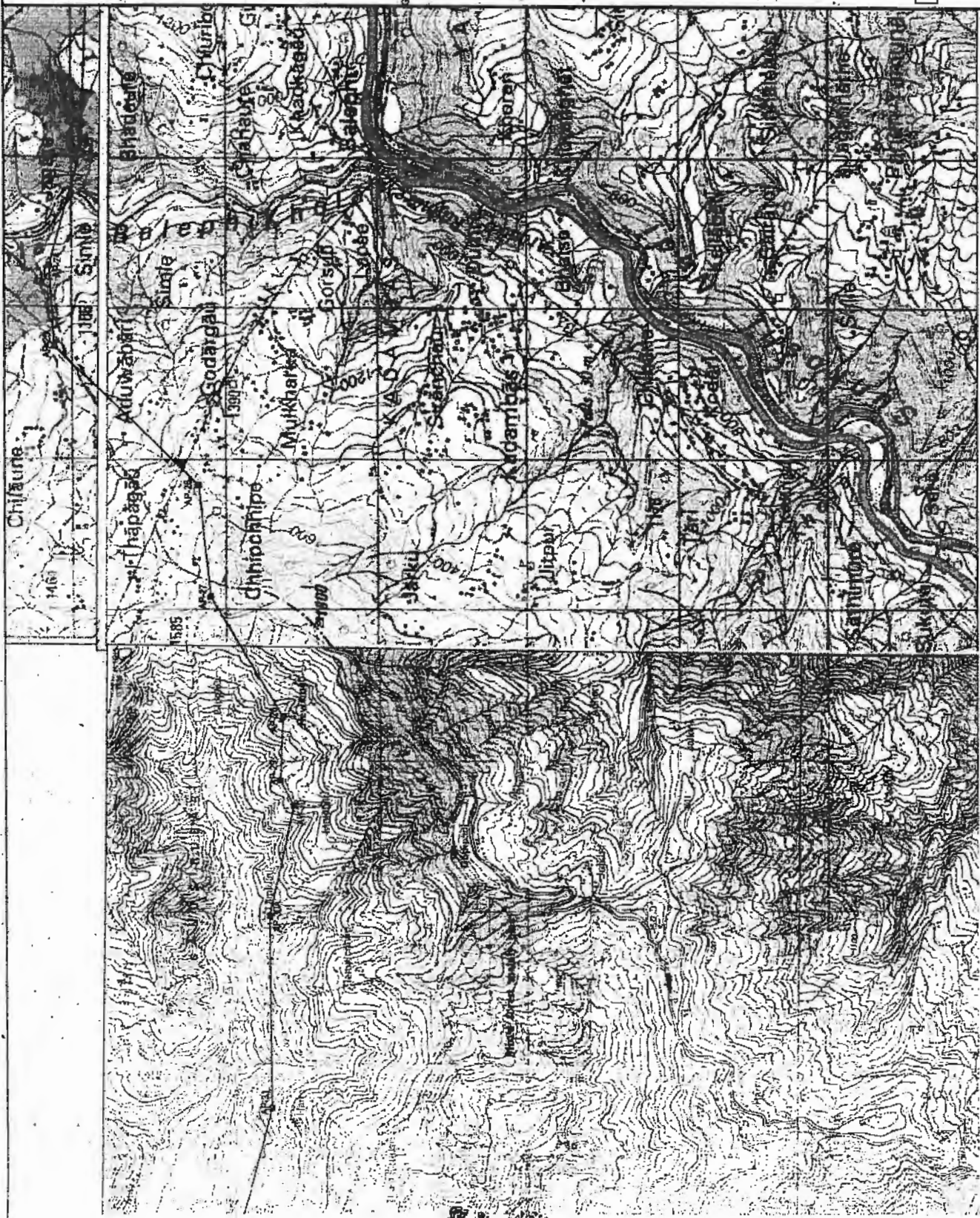
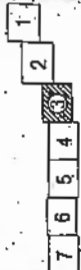
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	Scale: 1:2000 Date: January-2016				

Legend

- KYOLA
- KYOL
- KFL
- SUSPENSION BRIDGE
- WOODEN BRIDGE
- ROAD
- DRAM
- FOOTTRACK
- 33 KV TL
- GABION WALL
- MASONRY WALL
- GAUGE STATION
- DRILL HOLE
- SHAL TREE
- BAMBOO TREE
- CULTIVATED LAND
- TREE
- GROUND CONTROL POINT
- TEMPLE
- TAP
- HOUSE
- GOTH
- BOULDER
- LANDSLIDE
- 33 KV LG
- 11 KV LG
- 220 VLT
- ANGLE POINT
- DIRECTION POINT



Sheet Index



NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
MAJOR TRANSMISSION LINE PROJECT 200 KV

Submitted To:

SHRESTHA CONSULTANT P.M. Ltd.
EKANTAKUNA, LAITPUR

Submitted By:

TAKAKOSHI(KHIMTI) - KATHMANDU 220 KV/ 400 KV TRANSMISSION LINE PROJECT
Revised Barabise - Kathmandu
400 KV Transmission Line Survey

Title

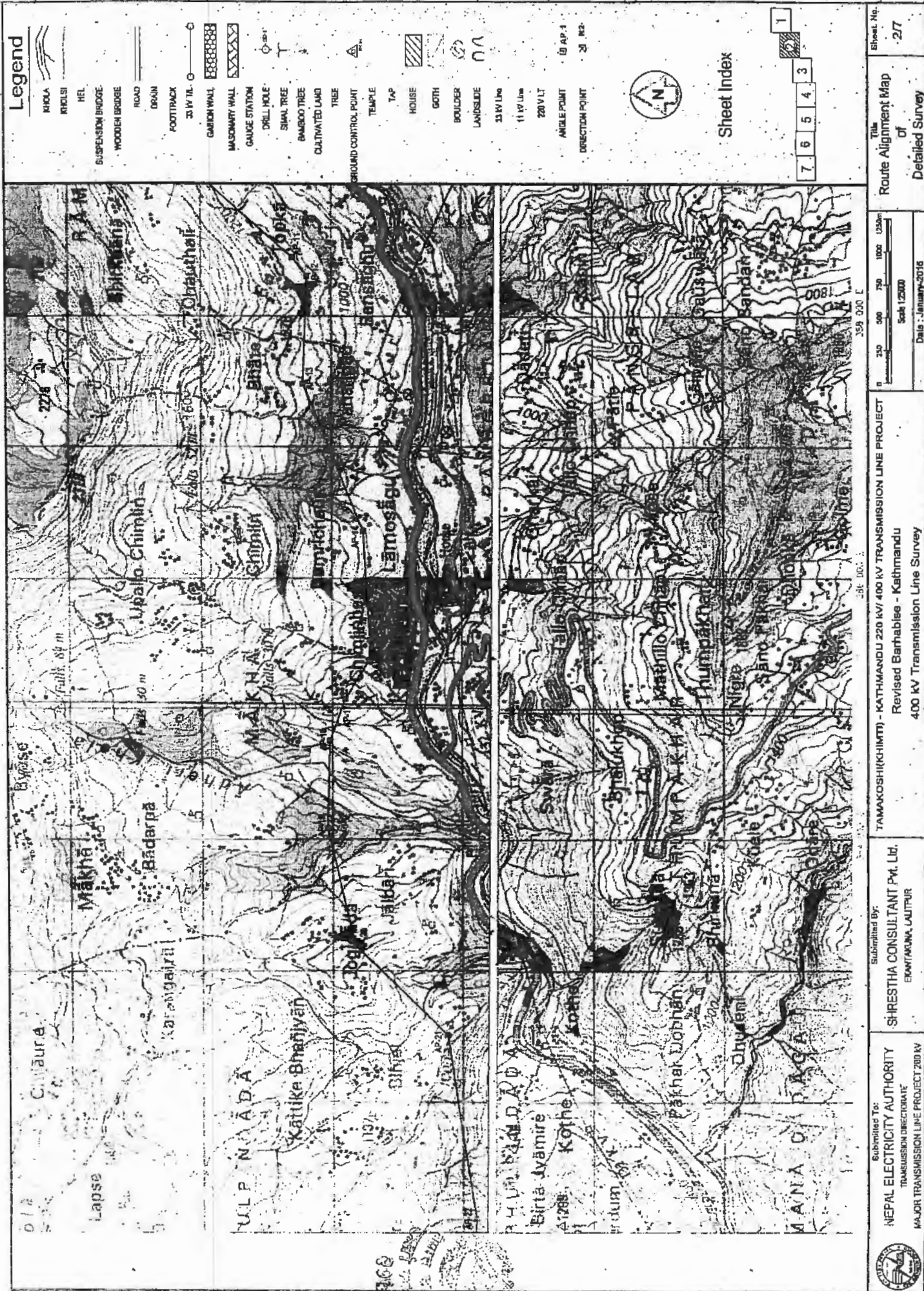
Route Alignment Map
of
Detailed Survey

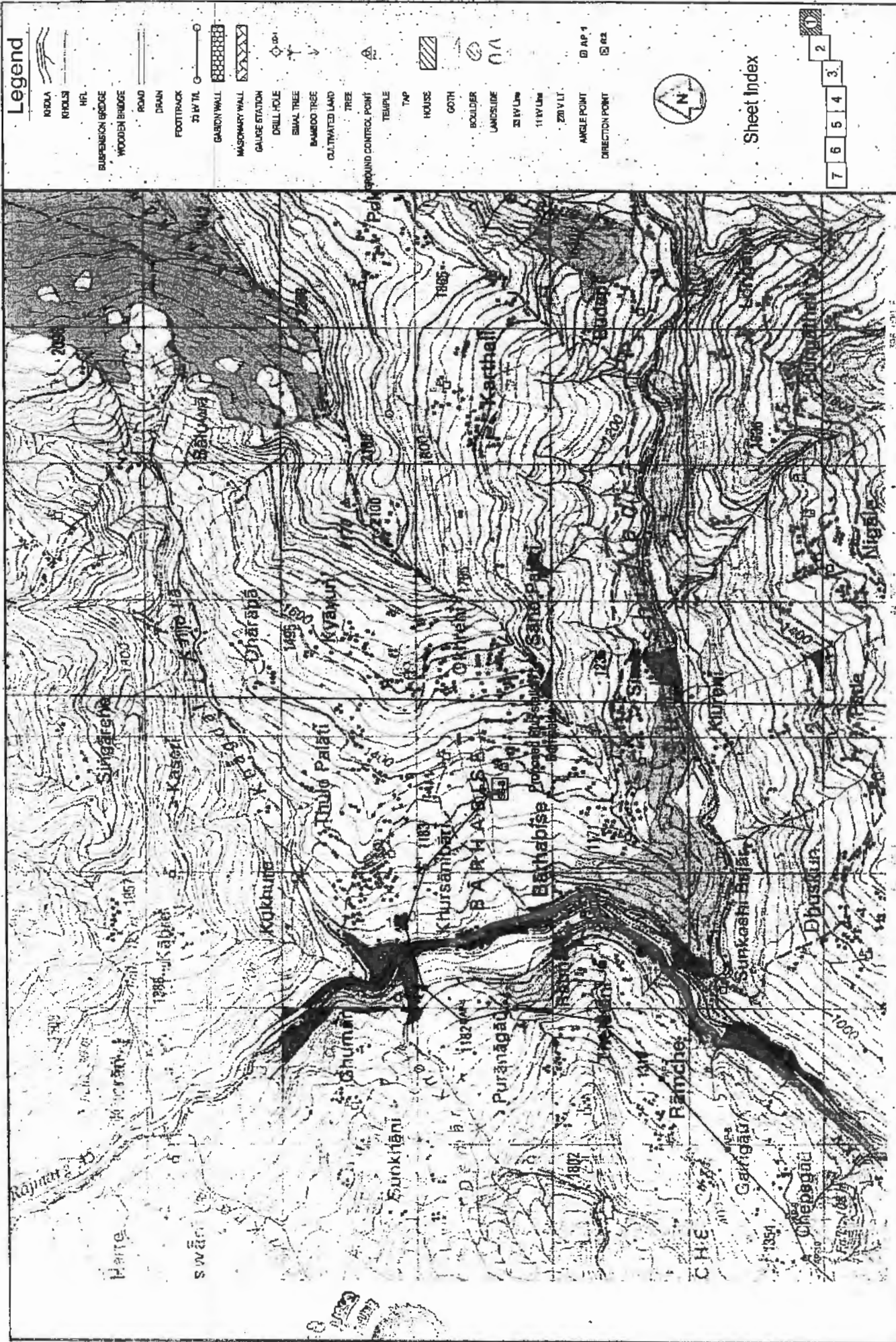
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Scale 1:5000

Date : January-2016



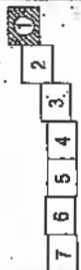


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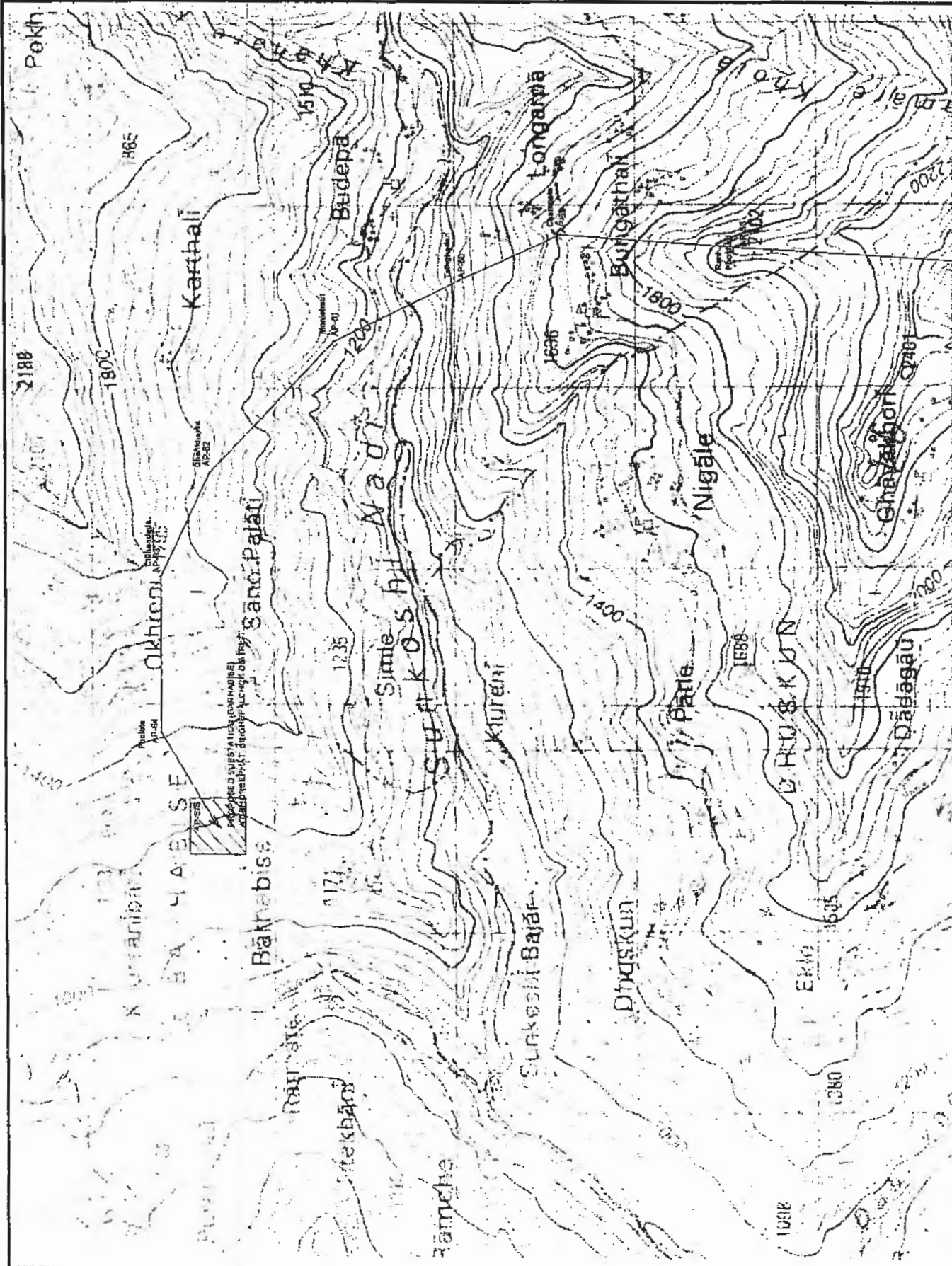
- RIOLA
- KHOLS
- NEL
- SUSPENSION BRIDGE
- WOODEN BRIDGE
- ROAD
- DAIN
- FOOTTRACK
- 25 KV TL
- GARDEN WALL
- MASONRY WALL
- GAUGE STATION
- DRILL HOLE
- SMALL TREE
- BAMBOO TREE
- CULTIVATED LAND
- TREE
- GROUND CONTROL POINT
- TEMPLE
- TAP
- HOUSE
- GOTH
- BOULDER
- LANDSLIDE
- 33 KV Line
- 11 KV Line
- 230 V LT
- ANGLE POINT
- DIRECTION POINT

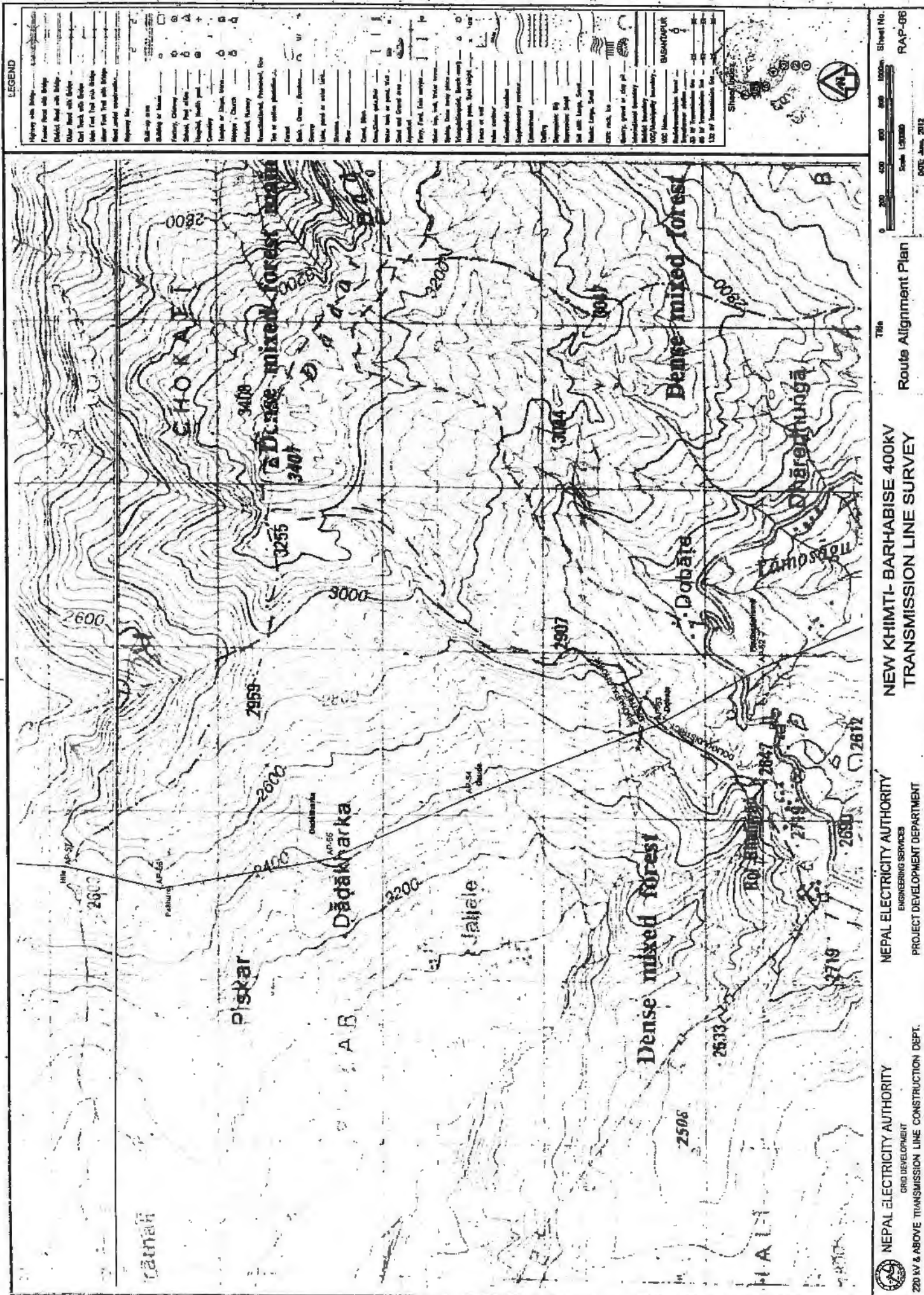


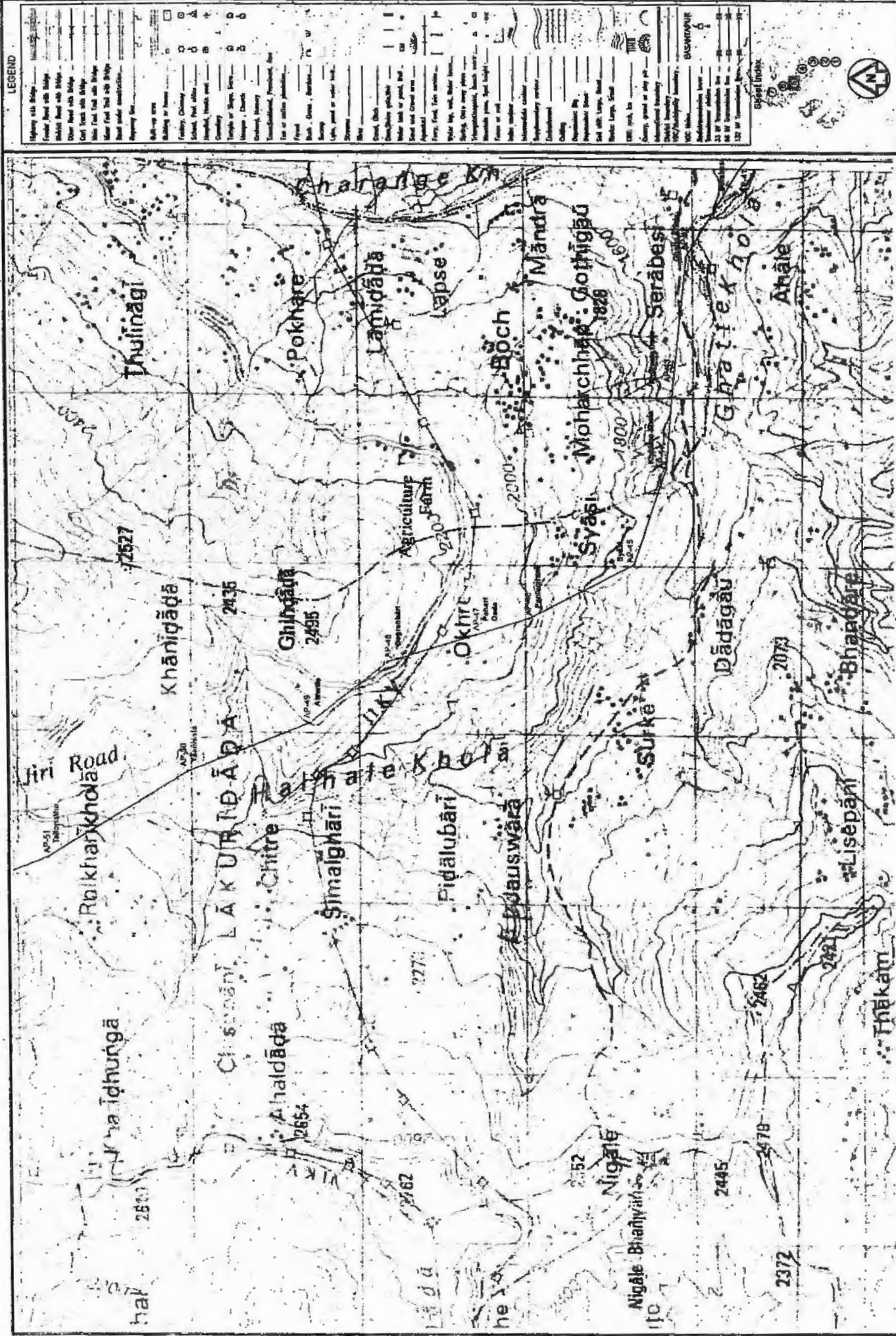
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	Submitted To:	Submitted By:	TAMAKOSHI(KHIMTI) - KATHMANDU 220 KV 400 KV TRANSMISSION LINE PROJECT Revised Barabise - Kathmandu 400 KV Transmission Line Survey Date: January-2018
	NEPAL ELECTRICITY AUTHORITY	SHRESTHA CONSULTANT PVT. Ltd.	
	TRANSMISSION DIRECTORATE	EXAMINATION UNIT	
MAJOR TRANSMISSION LINE PROJECT 220 KV		This Route Alignment Map of Detailed Survey Sheet No. 1/7	

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Tamakoshi-Kathmandu 400 kV TL Project

Project Description

Some storage projects like Indrawati (91.2 MW), Tamakoshi-3 (330 MW) and Sunkoshi-3 (536 MW) are proposed in and around the project area. The dam sites of proposed Indrawati and Tamakoshi-3 storage hydroelectric projects are located at upstream of the proposed transmission line whereas Sunkoshi-3 Storage project lies downstream of the alignment. According to Nationwide Master Plan Study on Storage Type Hydroelectric Power Development in Nepal (2014), the Full Supply Level of the project with dam height of 140m is at 700m creating total reservoir area of 30.1 km². The proposed alignment crosses the reservoir area of Sunkoshi-3 storage project at the back water area which is between AP 39 and AP 40 of Barhabise-Kathmandu section. The elevations of AP 39 and AP 40 are 789m and 723m respectively which is higher than the elevation of water level of reservoir (700m). In addition to this, the tower height (of approximately 45m) further increases the clearance. Thus the clearance between transmission line and water level of reservoir is about 68m, which is more than minimum ground clearance as mentioned in salient features of Table 2-1. The following map shows Tamakoshi-Kathmandu 400 kV TL alignment with respect to the proposed dam site of Sunkoshi-3 and Tamakoshi-3 Storage Project.

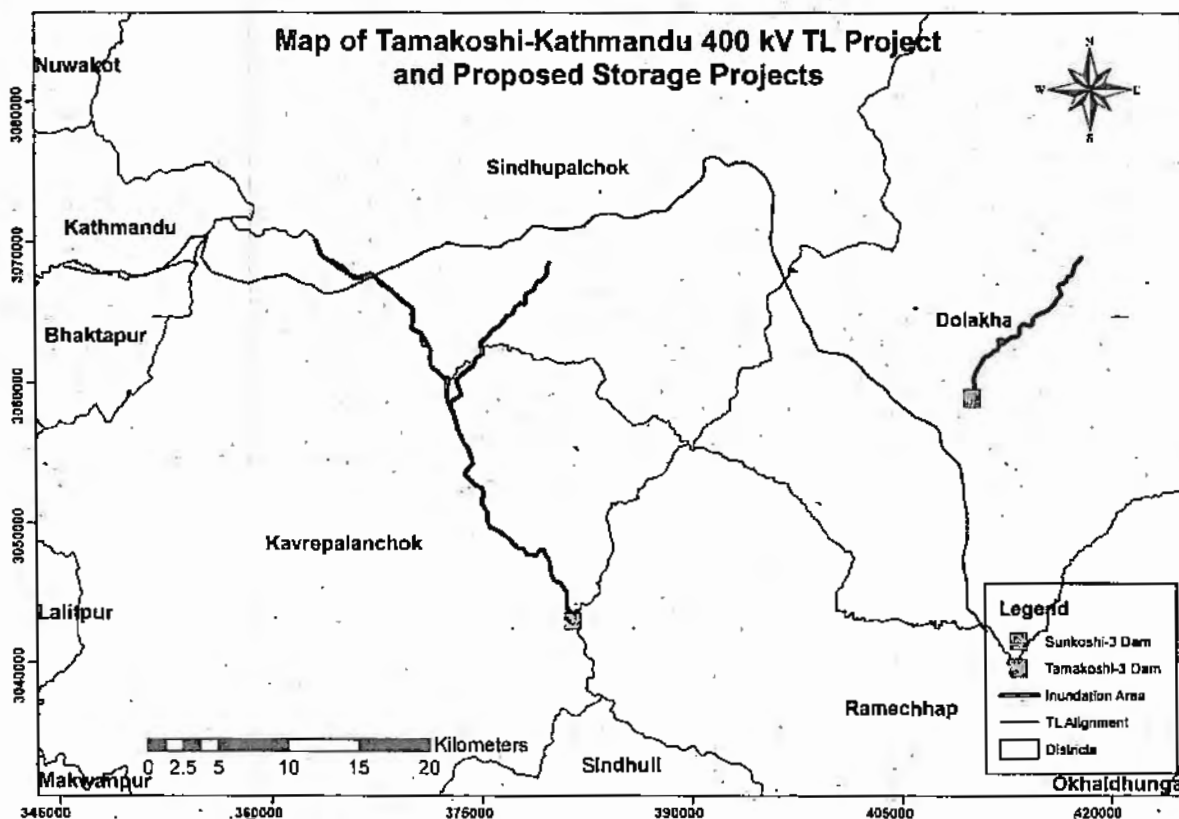


Figure 2.4: Map of Tamakoshi-Kathmandu 400 kV TL Project and Proposed Storage Projects

2.2 Salient Features

The total length of the proposed Khimti-Barhabise Section TL and Barhabise-Kathmandu Section TL is 42.638 km and 56.722 km respectively and the voltage level will be 400kV. The proposed TL will be double circuit. The vertical double circuit configuration tower will have an average height of 40m and the standard tower base dimensions will be 15m x 15m (for 400kV) from center to center of each tower leg foundation/ footing. Steel tower leg and body extensions

will be utilized to reduce foundation excavation on slopes and provide greater tower foundation structural security. The right of way (RoW) of the proposed transmission line is 23 meters on each side from the centerline for 400kV applied in NEA as per the Electricity Regulation, 2050 (1993). The TL design features are given in Table 2-1 below:

Table 2-1: Project Features of Tamakoshi-Kathmandu TL Project

Features		Description	
General			
Name of Project		Tamakoshi-Kathmandu 400 kV TL Project	
Development region		Central Development Region	
Impact Area	Zone	Districts	VDCs/ Municipality*
	Janakpur	Ramechhap	Phulasi (फुलासी)
		Dolakha	Melung (मेलुङ्ग), Bhedapu (भेदपु), Ghang Sukathokar (घ्याङसुकाठोकर), Pawati (पवटी), Fasku (फास्कु), Magapauwa (मागापौवा), Bhimeswor (भिमेस्वर)*, Bocha (बोच), Lakuri Dada (लाकुरीडाँडा)
	Bagmati	Sindhupalchowk	Piskar (पिस्कर), Chokati (चोकटी), Karthali (कारथली), Tauthali (ताथली) , Barhabise (बाहबिसे), Ramche (राम्चे), Mankha (मन्खा), Fulping Danda (फुलपिनडाँडा), Kadambas (कदम्बास), Irkhu (इर्खु), Thulo Sirubari (ठूलोसिरुबारी), Bhotasipa (भोटसिपा)
		Kavrepalanchowk	Chandeni Mandan (चण्डेनी मण्डन), Mahadevsthan Mandan (महादेवस्थान), Nayagaun (नयाँ गाँउ), Shankharapur (शङ्खरापुराटी)
		Bhaktapur	Mahamanjushree-Nagarkot (महामन्जुश्री-नगरकोट)*, Changunarayan (चाँगुनारायण)*.
		Kathmandu	Shankharapur (शङ्खरापुर)*
Initial point		AP 0 lies at Ghumaune village, Phulasi VDC, Ramechhap District for Khimti-Barhabise Section and AP 0 lies at Sano Palati village, Barhabise VDC, Sindhupalchowk District for Barhabise-Kathmandu Section	
Terminal point		New Substation proposed at Barhabise VDC of Sindhupalchowk District and New Substation proposed at Mayaldada substation at Changunarayan Municipality, Bhaktapur District.	
Looped in/ Looped out line		4km length from Changunarayan SS to Tower No. 014 SS-M (at Duwakot), four circuit 132kV	
		Approx. 10km length from Japshedi to Changunarayan SS, double	

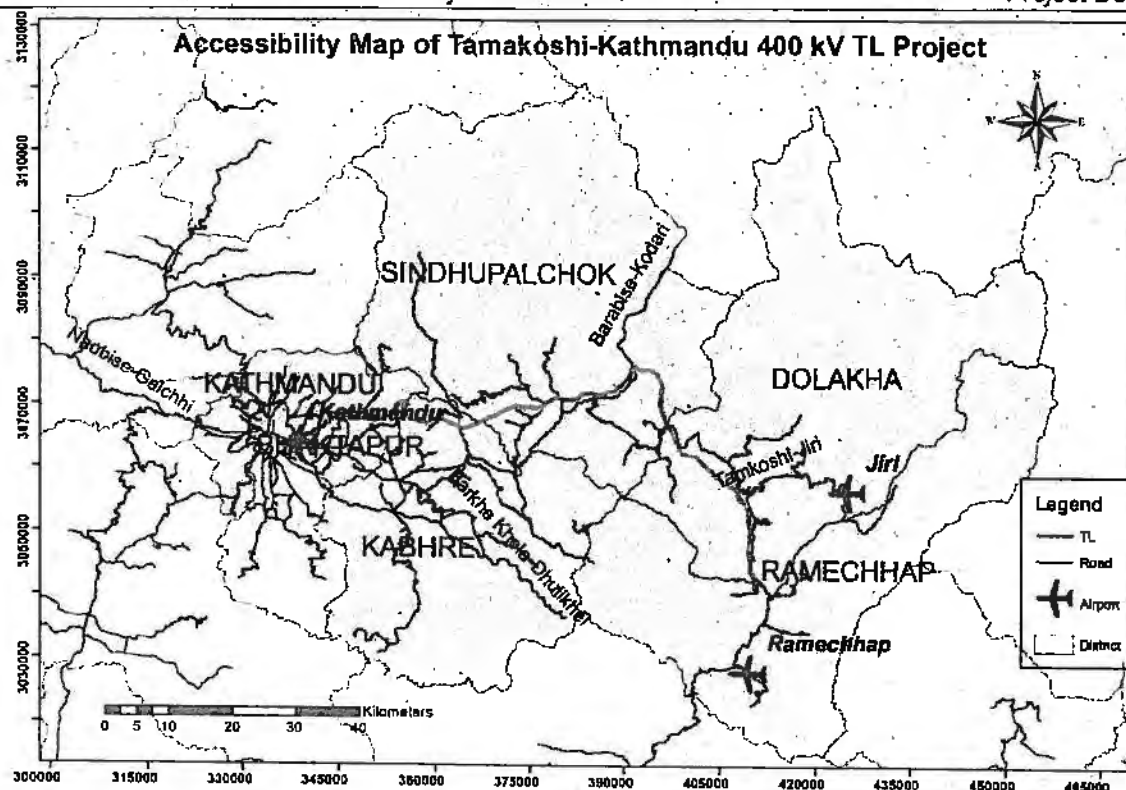


Figure 2.5: Accessibility Map of Tamakoshi-Kathmandu 400 kV TL Project

2.4 Project Components

The Tamakoshi-Kathmandu 400kV TL Project consists of two major project components- the transmission line route and the substations. The TL route is divided into two sections- i) Khimti-Barhabise section and ii) Barhabise- Kathmandu Section. The total length of the route, including both the sections, is 99.36 km. The other major project component is the substation. The project comprises of three sub-station which are to be constructed at three different districts- Barhabise VDC of Sindhupalchowk; Shankharapur Municipality of Kavrepalanchowk and Changunarayan Municipality of Bhaktapur district. These project components are discussed in the following sections in detail:

2.4.1 Transmission Line Route

The proposed route of Khimti-Barhabise Section, which is 42.638 km in length will commence from the Substation of Khimti at Phulsi VDC, Ramechhap District and terminate at proposed new Barhabesi Substation at Barhabise VDC of Sindhupalchowk District. Likewise, the proposed route of Barhabise-Kathmandu Section, which is 56.722 km in length will commence from the proposed Barhabise Substation at Barhabise VDC, Sindhupalchowk District which joins at proposed Lapsipedi substation at Shankharapur Deupur VDC, Kavrepalanchowk District and terminate at proposed Mayaldada Substation at Changunarayan Municipality, Bhaktapur District. The alignment of Tamakoshi-Kathmandu 400 kV TL has been selected avoiding the settlement areas, inbuilt structures, religious places, schools and other community infrastructures wherever possible. The description of the proposed route has been discussed below.

2.4.1.1 Khimti-Barhabise Section**AP 0 to AP 1 (Phulasi Section)**

The alignment starts from station AP 0 located at the right bank of Tarakoshi River at Phulasi VDC of Ramechhap district. From AP 0 the alignment heads North West towards AP 1 which is situated on a cultivated land at same village. The length of the alignment between AP 0 and AP 1 is 0.313 km.

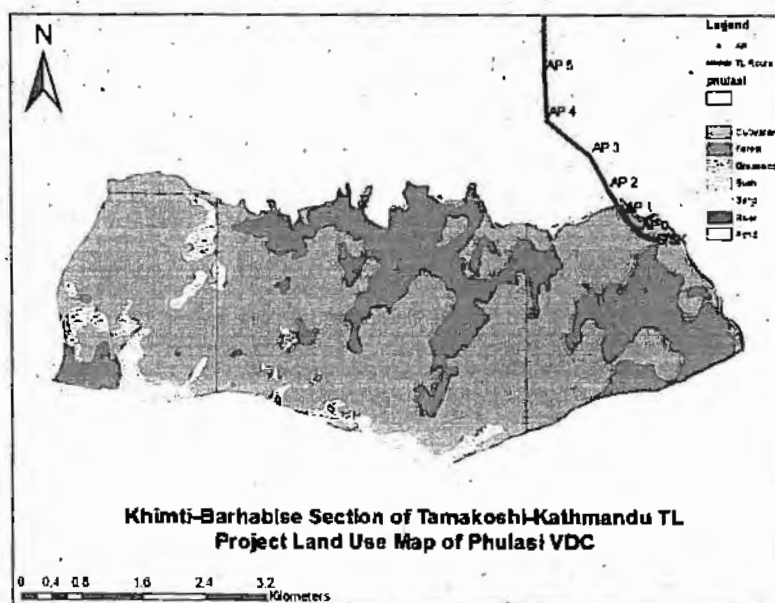


Figure 2.6: Land Use Map of Phulasi VDC

AP 3 to AP 7 (Melung Section)

From AP 1, the alignment almost heads straight towards North West and meets AP 2 located on cultivated land. There are total of 6 APs located within Melung VDC. The length of the alignment between AP 2 and AP 7 is 3.516 km.

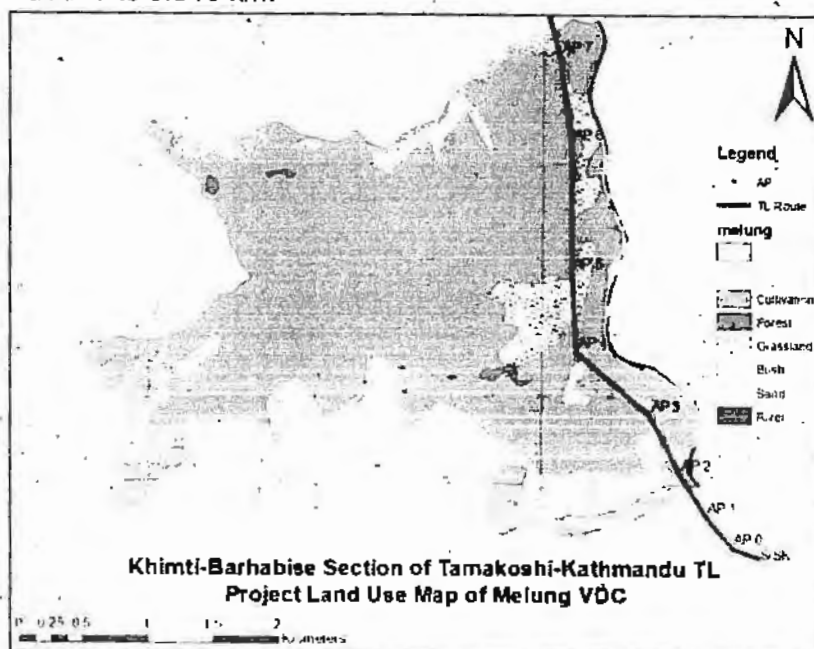


Figure 2.7: Land Use Map of Melung VDC



AP 8 (Bhedapu Section)

From AP 7, the alignment turns left more towards North West and meets AP 8 located on cultivated land. There is only 1 AP located within Bhedapu VDC.

AP 9 to 12 (Ghang Sukathokar Section)

From AP 8, the alignment almost heads straight towards North and meets AP 9 located on cultivated land. There are total of 4 APs located within Ghang Sukathokar VDC. The length of the alignment between AP 9 and AP 12 is 2.009 km.

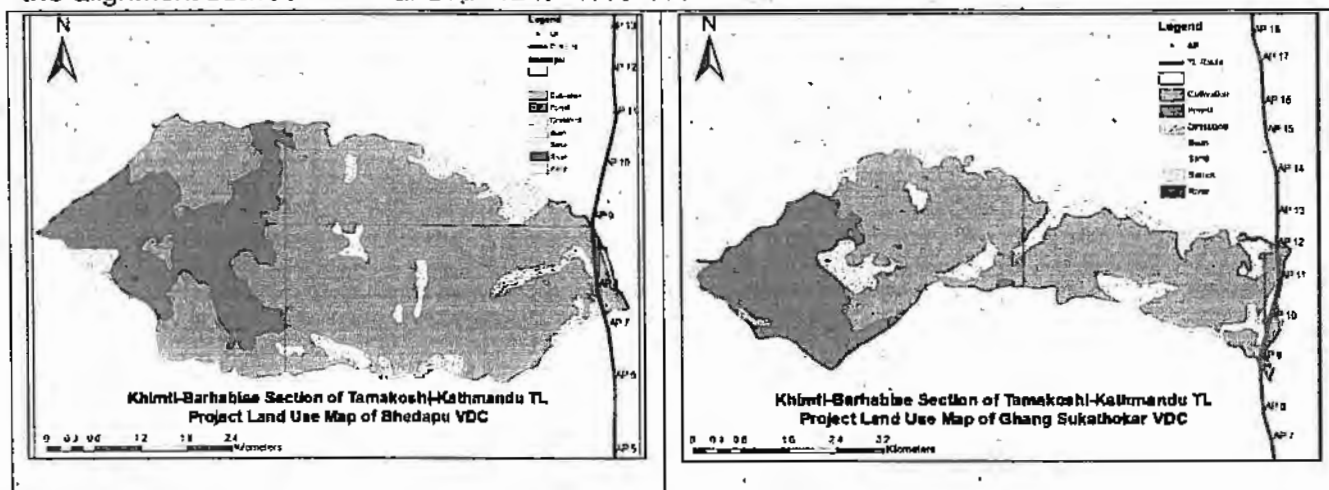


Figure 2.8: Land Use Map of (a) Bhedapu VDC and (b) Ghang Sukathokar VDC

AP 13 to AP 20 (Pawati Section)

From AP 12, the alignment almost heads straight towards North and meets AP 13 located on cultivated land. There are total of 8 APs located within Pawati VDC. The length of the alignment between AP 13 and AP 20 is 4.175 km.

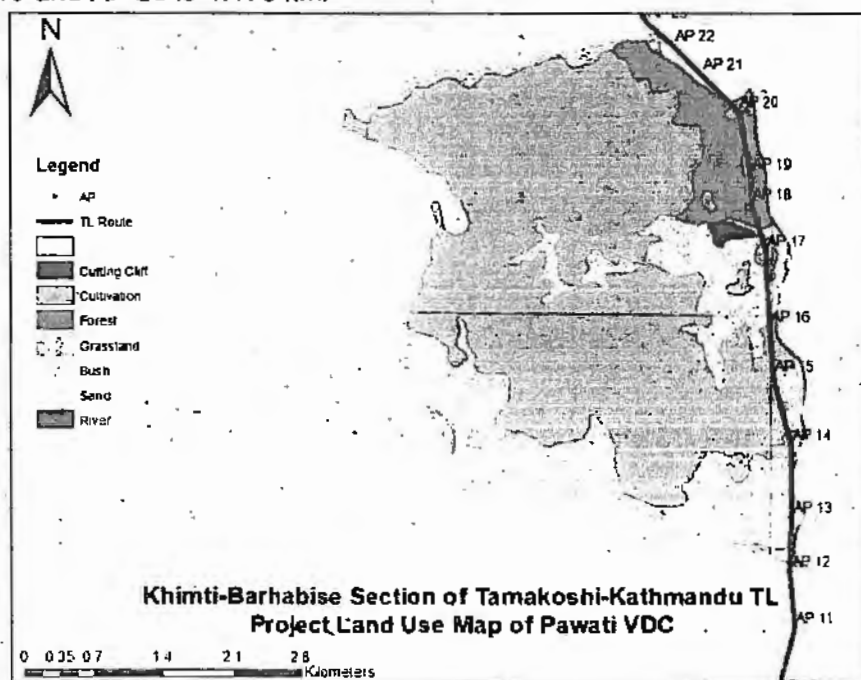


Figure 2.9: Land Use Map of Pawati VDC

AP 21 to AP 24 (Fasku Section)

From AP 20, the alignment turns left towards North West and meets AP 21 located on Saute Community Forest. There are total of 4 APs located within Fasku VDC. The length of the alignment between AP 21 and AP 24 is 1.439 km.

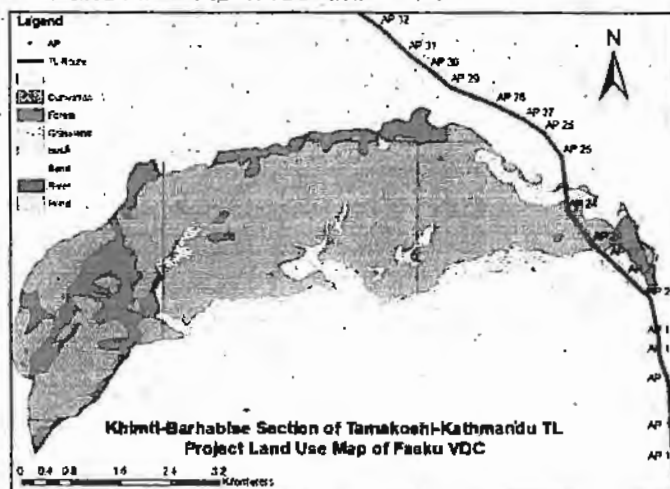


Figure 2.10: Land Use Map of Fasku VDC

AP 25 to AP 40 (Bhimeswor Section)

From AP 24, the alignment turns right towards North and meets AP 25 located on Barren Land. There are total of 16 APs located within Bhimeswor Municipality. The length of the alignment between AP 25 and AP 40 is 7.976 km.

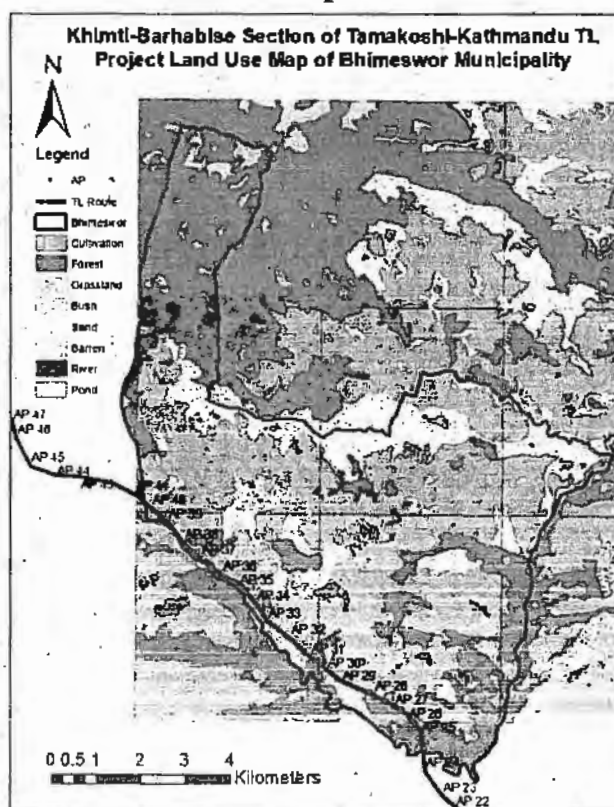


Figure 2.11: Land Use Map of Bhimeswor Municipality

AP 41 to AP 44 (Bocha Section)

From AP 40, the alignment turns left towards North West and meets AP 41 located on Cultivated Land. There are total of 4 APs located within Bocha VDC. The length of the alignment between AP 41 and AP 44 is 1.847 km.

AP 45 to AP 53 (Lakuri Dada Section)

From AP 44, the alignment turns right towards North West and meets AP 52 located on Barren Land. There are total of 9 APs located within Lakuri Dada VDC. The length of the alignment between AP 45 and AP 53 is 5.493 km.

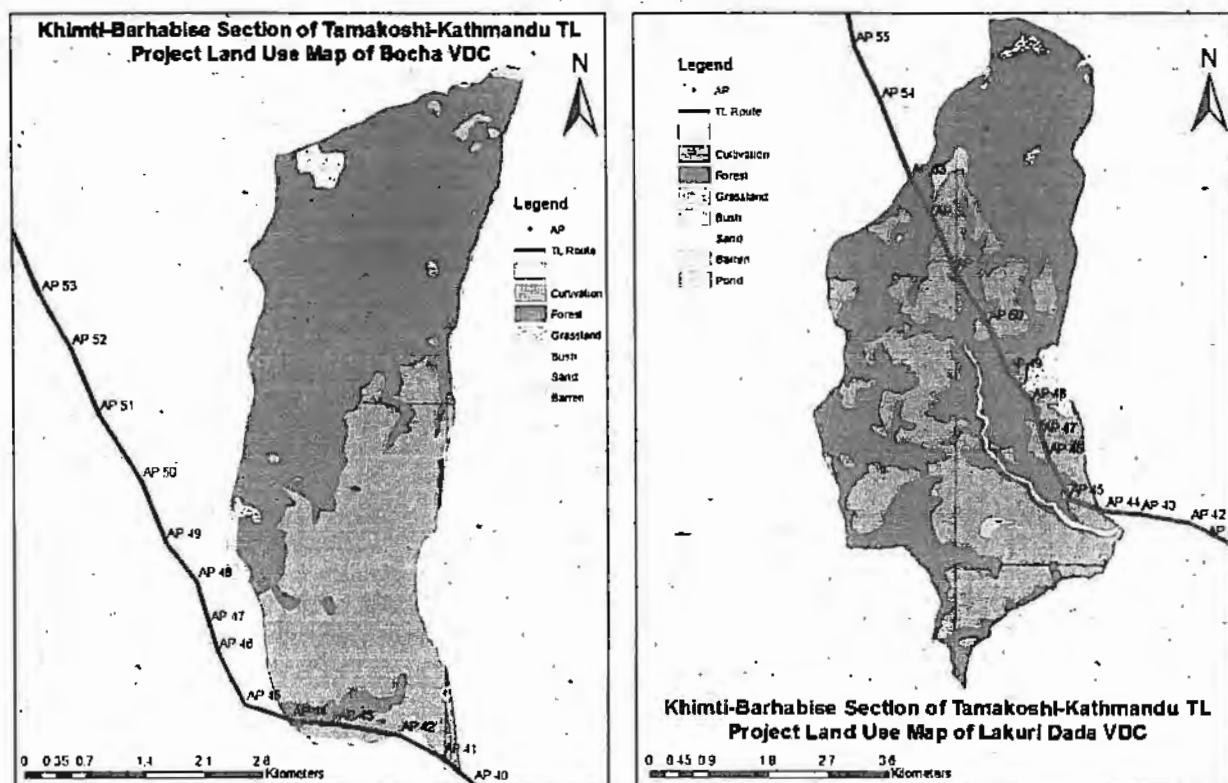


Figure 2.12: Land Use Map of (a) Bocha VDC and (b) Lakuri Dada VDC

AP 54 to AP 56 (Piskar Section)

From AP 53, the alignment heads straight towards North West and meets AP 54 located on Cultivated Land. There are total of 3 APs located within Piskar VDC. The length of the alignment between AP 54 and AP 56 is 1.99 km.

AP 57 (Dhuskun Section)

From AP 56, the alignment turns right towards North and meets AP 57 located on Barren Land. There is only 1 AP located within Dhuskun VDC.



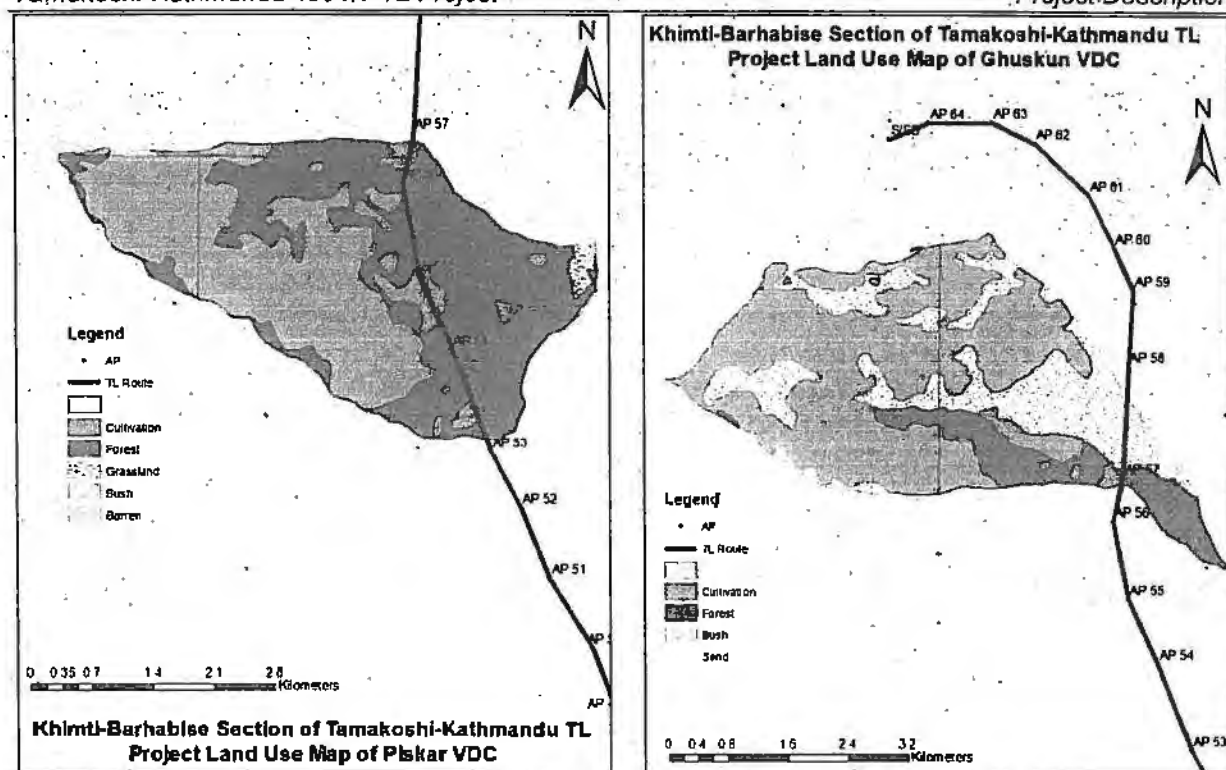


Figure 2.13 Land Use Map of (a) Piskar VDC and (b) Dhuskun VDC

AP 58 to AP 60 (Chokati Section)

From AP 57, the alignment heads straight towards North and meets AP 58 located on Cultivated Land. There are total of 3 APs located within Chokati VDC. The length of the alignment between AP 58 and AP 60 is 1.618 km.

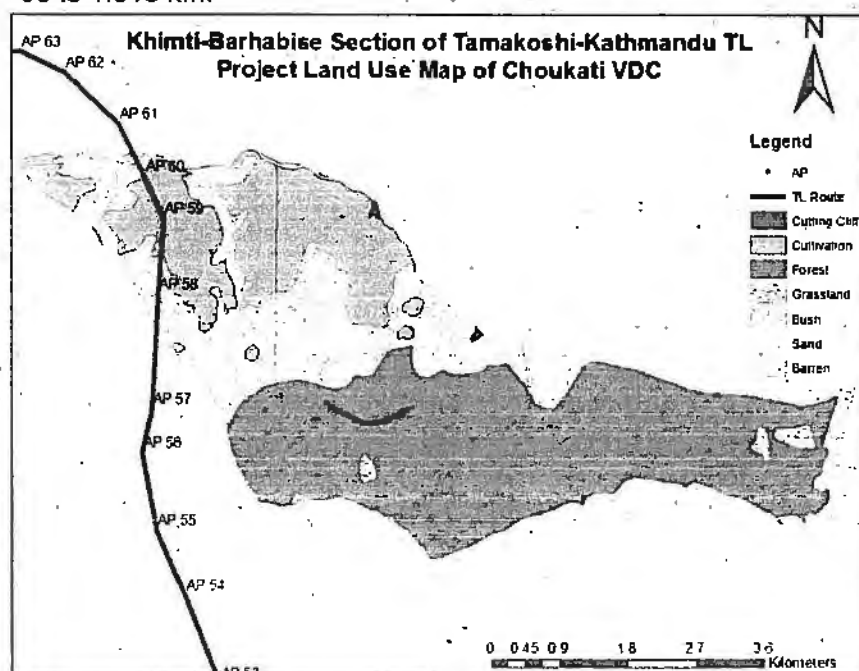


Figure 2.14: Land Use Map of Chokati VDC

AP 61 to AP 62 (Karthali Section)

From AP 60, the alignment heads straight towards North West and meets AP 61 located on Cultivated Land. There are total of 2 APs located within Karthali VDC. The length of the alignment between AP 61 and AP 62 is 1.002 km.

AP 63 to AP 64 (Barhabise Section)

From AP 62, the alignment turns left towards West and meets AP 63 located on Cultivated Land. There are total of 2 APs located within Barhabise VDC. The length of the alignment between AP 63 and AP 64 is 0.856 km. Substation also lies within this VDC.

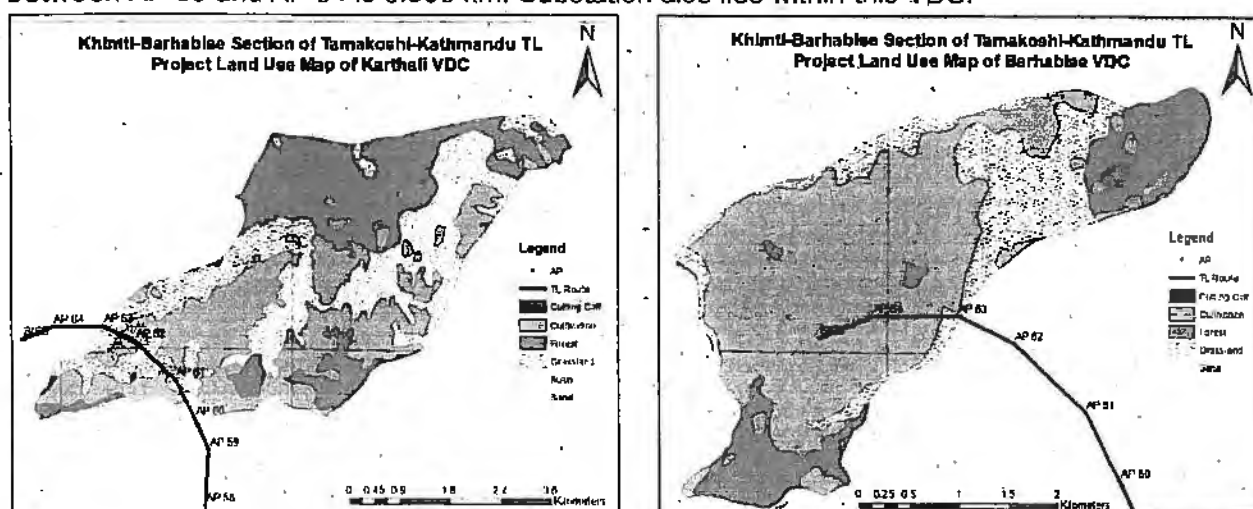


Figure 2.15: Land Use Map of (a) Karthali VDC and (b) Barhabise VDC

2.4.1.2 Barhabise-Kathmandu Section Barhabise Section

The alignment starts from proposed substation located at Barhabise, Sindhupalchowk District. From S/S, the alignment heads towards North by crossing cultivated land to AP 2 that is also situated on a cultivated land. The length of the alignment in this section is 1.481 km.

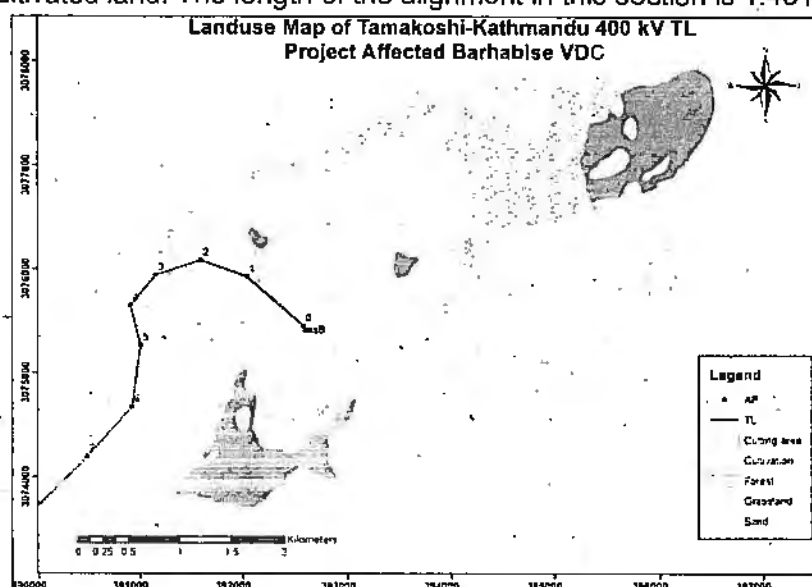


Figure 2.16: Land Use Map of Barhabise VDC

Ramche Section

From AP 2, the alignment heads towards South-West and crosses Araniko highway and Bhotekoshi River and meets AP 3 located on cultivated land. There are total of 9 APs located within Ramche VDC. The alignment in this section crosses cultivated land and grassland. The length of the alignment in this section is 5.048 km.

Mankha Section

From AP 10, the alignment turns left more towards South-West and meets AP 11 located on cultivated land. There are all together 8 APs located within Mankha VDC. The alignment length in this section is 4.69 km.

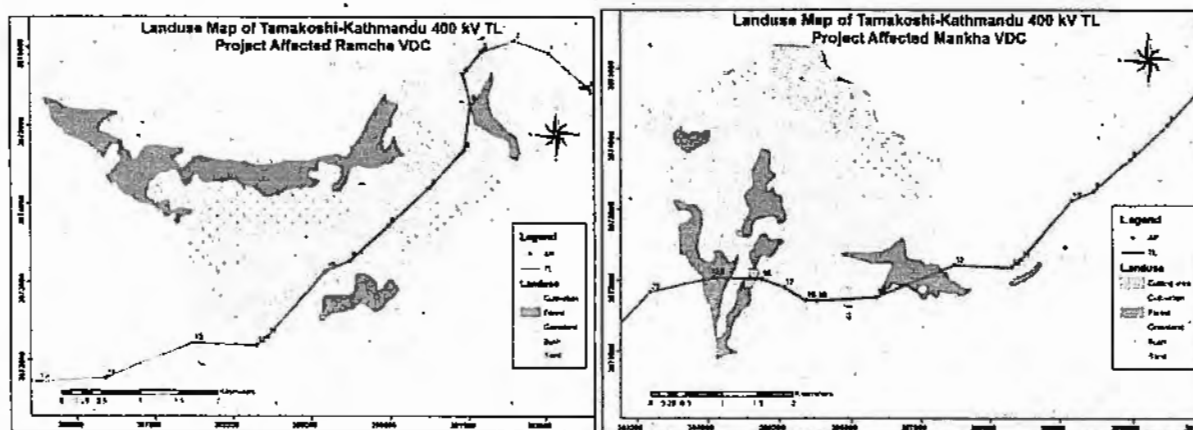


Figure 2.17: Land Use Map of (a) Ramche VDC and (b) Mankha VDC

Fulping Dandagau Section

From AP 19, the alignment almost heads straight towards West and meets AP 20 located on cultivated land. There are total of 4 APs located within Fulping Dandagau VDC. In this section, the alignment crosses cultivated land and forest which finally joins at AP 23 located at forest. The length of the alignment along the section is 4.505 km.

Kadambas Section

From AP 23, the alignment almost heads towards North-West and only TL traverse along Kadambas VDC. The length of the alignment in this section is 1.342 km.



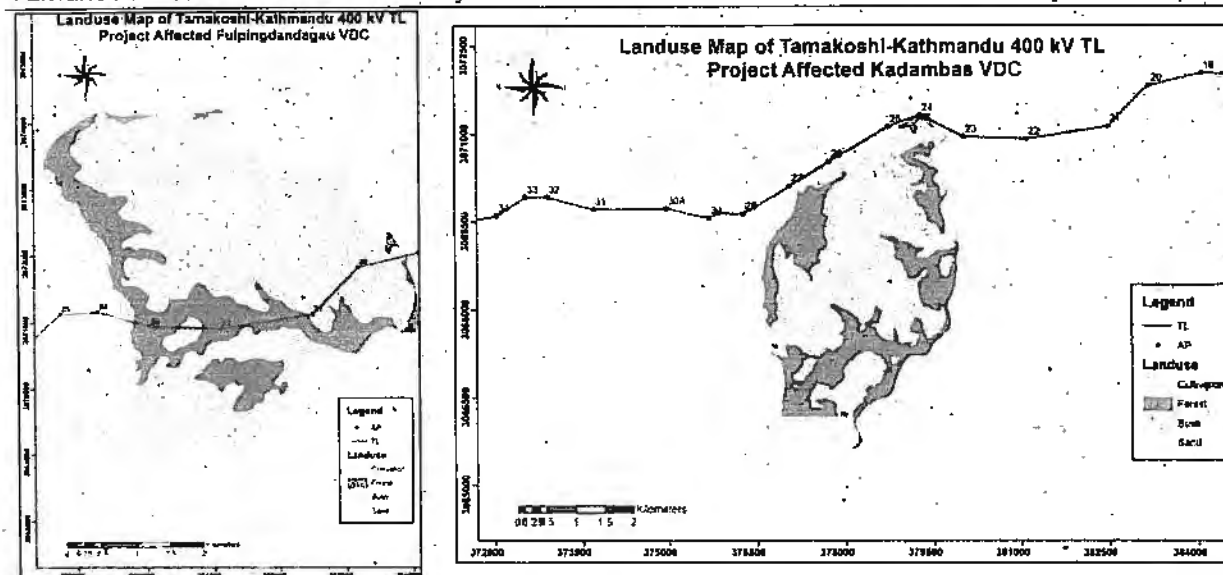


Figure 2.18: Land Use Map of (a) Fulping Dada VDC and (b) Kadambas VDC

Irkhu Section

From AP 23, the alignment turns right towards South-West and meets AP 24 located on cultivated land. There are total of 8 APs located within Irkhu VDC. The length of the alignment in this section is 4.647 km.

ThuloSirubare Section

From AP 30A, the alignment head towards West and meets AP 31 located on Cultivated Land. There are total of 6 APs located within ThuloSirubare VDC. The length of the alignment in this section is 5.022 km.

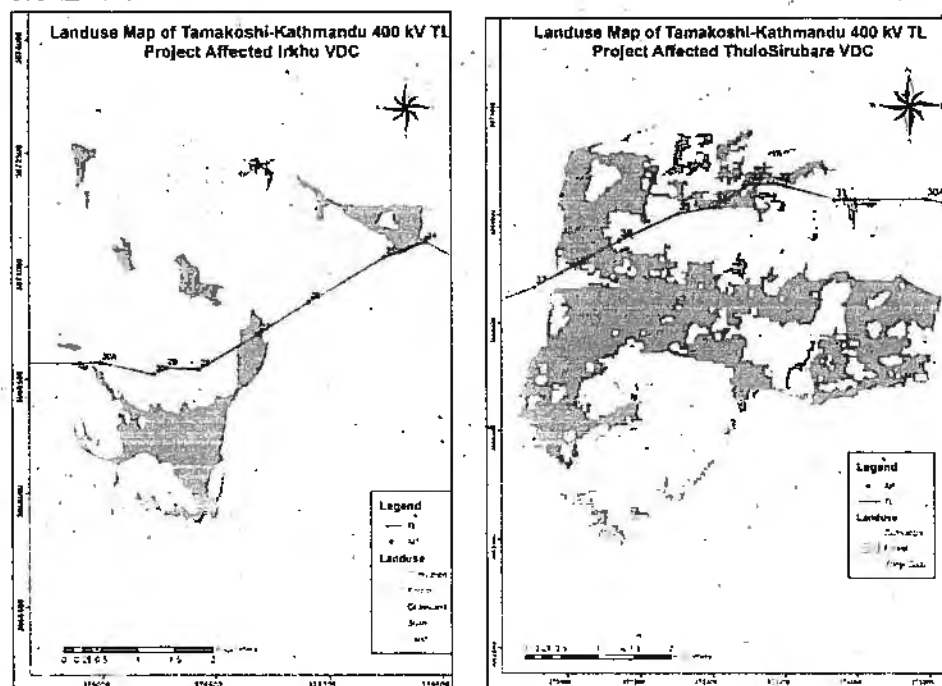


Figure 2.19: Land Use Map of (a) Irkhu VDC and (b) ThuloSirubare VDC

Bhotasipa Section

From AP 36, the alignment moves straight towards South-West and meets AP 37 located on Cultivated Land. There are total of 3 APs located within Bhotasipa VDC. The length of the alignment in this section is 2.352 km.

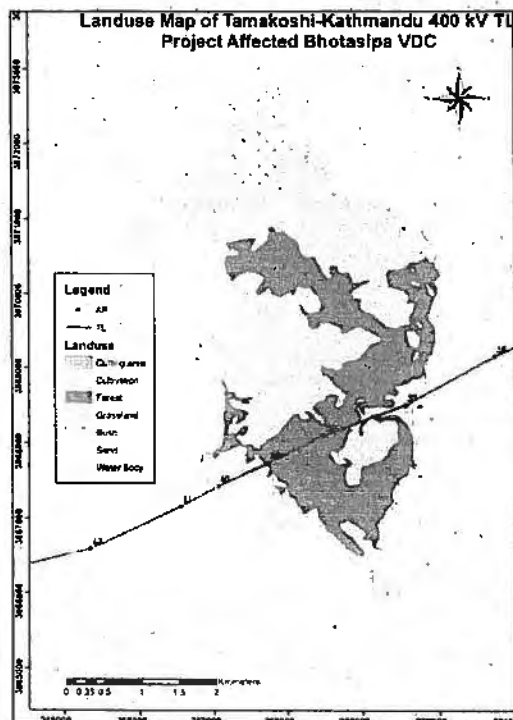


Figure 2.20: Land Use Map of Bhotasipa VDC

ChandeniMandan Section

From AP 39, the alignment moves straight towards South-West and meets AP40 located on Cultivated Land. There are 2 APs located within ChandeniMandan VDC. The alignment crosses Indrawati River and Cultivated Land. The length of the alignment in this section is 1.528 km.

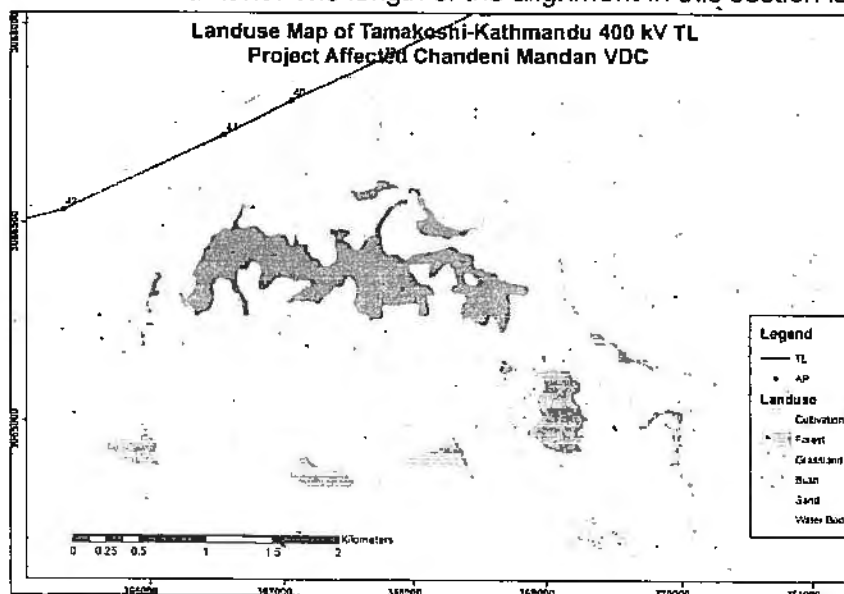


Figure 2.21: Land Use Map of ChandeniMandan VDC

MahadevsthanMandan Section

From AP 41, the alignment heads straight towards South-West and meets AP 42 located on Cultivated Land. There are total of 6 APs located within MahadevsthanMandan VDC. The length of the alignment in this section is 5.403 km.

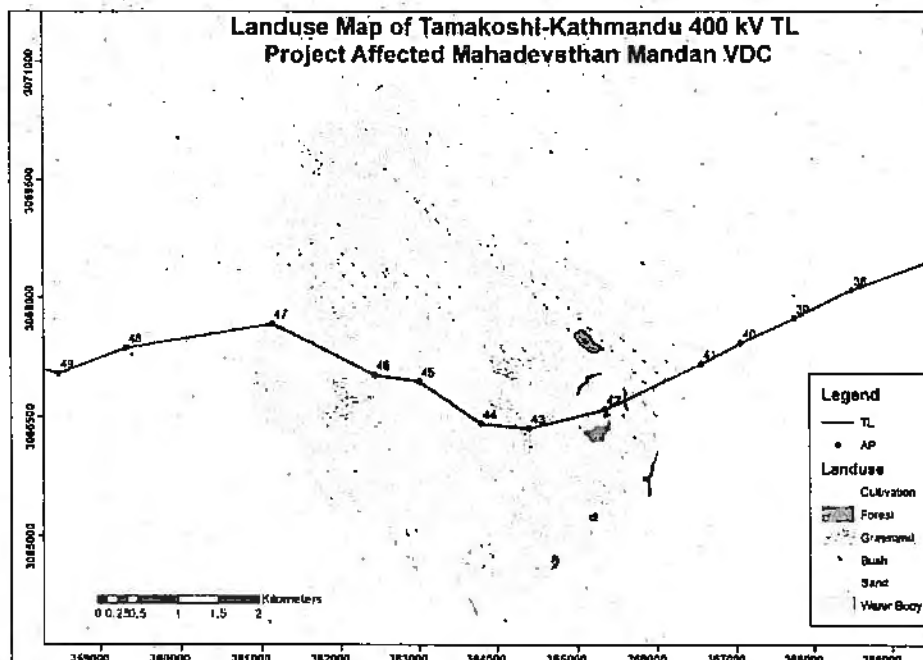


Figure 2.22: Land Use Map of MahadevsthanMandan VDC

NayagaunDeupur

From AP 47, the alignment turns left towards South-West and meets AP 48 located on Cultivated Land. There are 2 APs located within NayagaunDeupur VDC. The length of the alignment in this section is 2.828 km.

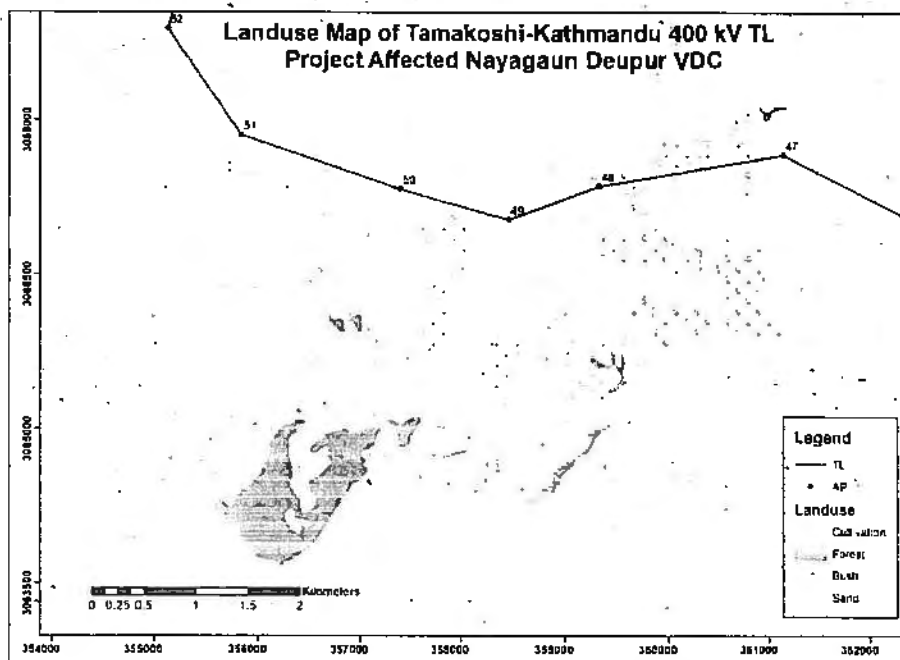


Figure 2.23: Land Use Map of NayagaunDeupur VDC

ShankharapurDeupur Section

From AP 49, the alignment heads towards North-West and meets AP 50 located on Cultivated Land. There are total of 4 APs and 2 SS point located within ShankharapurDeupur VDC. The length of the alignment in this section is 5.58 km.

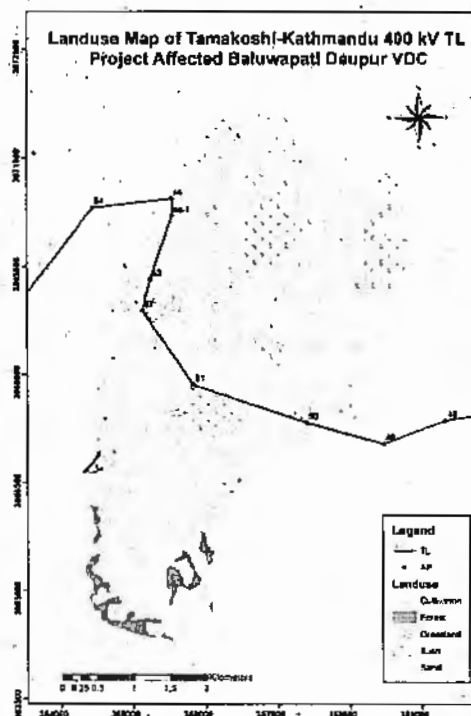


Figure 2.24: Land Use Map of ShankharapurDeupur VDC

Shankharapur Section

From AP SS, the alignment heads towards West and meets AP 54 located on Cultivated Land. There are total of 4 APs located within Shankharapur Municipality. The length of the alignment within this section is 6.324 km. This municipality was recently formed by merging six VDCs (Nanglebhare, Lapsipedi, Suntole, Pukhulachi, Bajrayogini and Indryani).

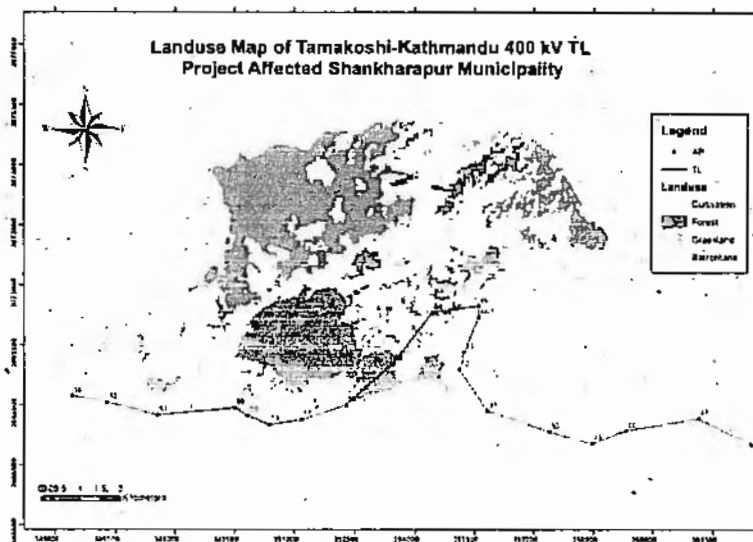


Figure 2.25: Land Use Map of Shankharapur Municipality



Mahamanjushree-Nagarkot Section

From AP 55, the alignment heads towards South-West and meets AP 56 located on Cultivated Land. There are total of 3 APs located within Mahamanjushree-Nagarkot Municipality. The length of the alignment is 2242 km. This municipality was recently formed by merging four VDCs (Tathali, Sudal, Bageshewari and Nagarkot).

Changunarayan Section

From AP 60, the alignment heads towards South-West and meets AP 61 located on Barren Land. There are total of 2 APs and 1 SS point located within Changunarayan Municipality. The length of the alignment within this section is 2.729 km. This municipality was recently formed by merging four VDCs (Chhaling, Jhaukhel, Changunarayan and Duwakot).

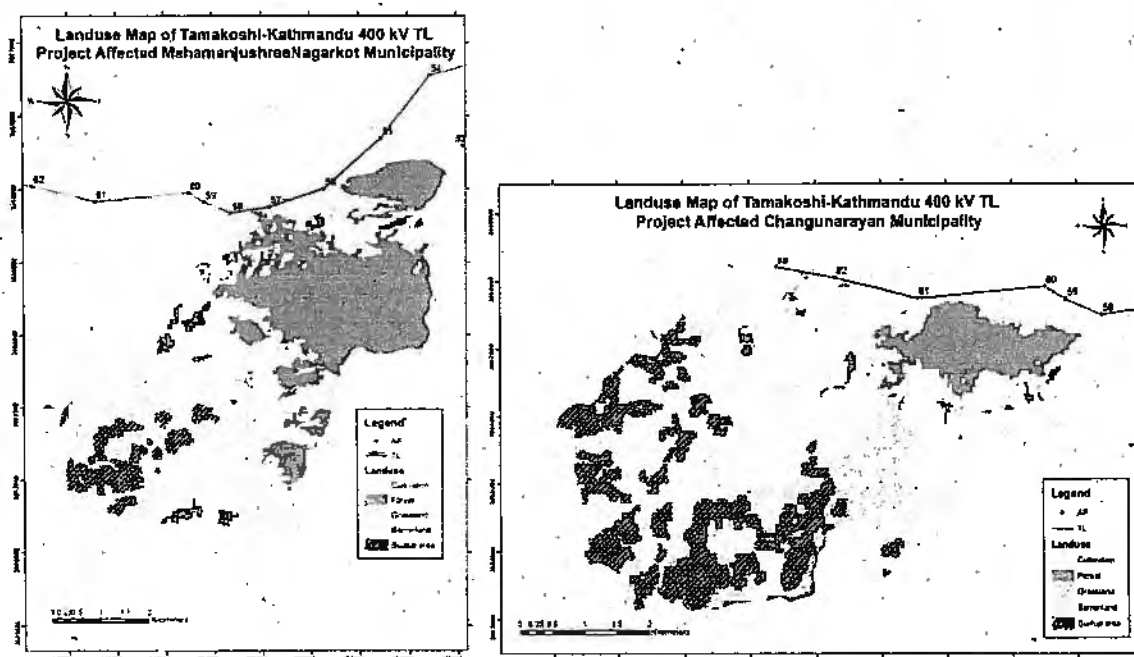


Figure 2.26: Land Use Map of (a) Mahamanujushree-Nagarkot Municipality and (b) Changunarayan Municipality

2.4.2 Substation

The Tamakoshi-Kathmandu 400kV TL starts from the proposed New Khimti substation at Phulasi VDC of Ramechhap and joins the Barhabise Substation at Barhabise VDC of Sindhupalchowk district. From Barhabise substation, the TL connects with the Lapsipedi Substation at Shankharapur Municipality of Kathmandu district which has been proposed at Haledi and moved to Lapsipedi due to geological instability and finally terminates at Changunarayan substation in Changunarayan Municipality of Bhaktapur district. Out of these four substations, the Tamakoshi-Kathmandu 400kV TL Project comprises only three substations (Barhabise, Lapsipedi and Changunarayan). The remaining New Khimti Substation is a component of Khimti-Dhalkebar 220kV TL Project and shall be constructed accordingly. Barhabise SS can be accessed through Barhabise-Sano Palati earthen road, Lapsipedi SS accessed through Sankhu-Melamchi Gravel road and Changunarayan SS through Sankhu road.

The Barhabise substation shall acquire about 8 ha of land whereas Lapsipedi substation and Changuarayan Substation shall acquire 7.5 ha and 3 ha respectively. All of these substation are located on cultivated land.

2.5 Project Area Delineation

For the IEE of the proposed project, the project area is defined as the area for the construction of a 400kV TL alignment, and a Substation as well as the area that will be impacted due to the construction and operation of the project. This area mainly includes 1 VDC of Ramechhap, 7 VDCs and 1 municipality of Dolakha and 5 VDCs of Sindhupalchowk district respectively of Khimti-Barhabise Section and 8 VDCs of Sindhupalchowk, 4 VDCs of Kavrepalanchowk, 2 Municipalities of Bhaktapur and 1 municipality of Kathmandu of Barhabise-Kathmandu Section. The project area does not lie in the national park, wildlife reserve, buffer zone, conservation area, historically and archaeologically important sites and/or environmentally sensitive/ fragile areas. The study area is divided into two parts on the basis of the proximity and magnitude of impacts.

2.5.1 Core Project Area

The "Core Project Area" consists of the 46m Right-of-Way (RoW), encompassing 23m on each side of the alignment measured from its center line. The nearest settlement from the TL alignment and area occupied by the substations are also considered as the core area. This area is also defined as the "direct impact zone".

2.5.2 Surrounding Area

The term "Surrounding Area" indicates a greater area, which will directly or indirectly get influenced by the construction and operation of the project. This area includes all alignment encompassing VDCs and Municipalities of Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu districts excluding areas mentioned under core project area. This area is also defined as the "indirect impact zone".

The term "project" indicates the Tamakoshi-Kathmandu 400kV TL and "Area" refers to the core project area and the surrounding area. The term "project area" is also referred to as the study area for the IEE. The affected VDCs are shown in Figure 2.2 and Figure 2.3.

2.6 Construction Planning

The implementation of proposed project comprises the construction of a new substation, tower foundation and erection of towers, stringing of conductor, testing and commissioning of the 99.36 km of 400kV TL.

2.6.1 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.

2.6.2 Erection of Galvanized Steel Towers

Galvanized steel lattice towers manufactured in the factory will be transported to the individual tower locations and will be erected manually by employing pulleys, wenchers, etc. into the tower foundations.

2.6.3 Insulator Fittings, Conductor and Ground Wire Stringing

Conductors, Optical Ground Wires (OPGW), insulators, hardware and necessary accessories will be transported manually to the tower locations. The fitting of insulators on the tower will be carried out manually. Stringing of conductors and OPGW will be carried out with the help of tensioners and other pulling devices as per the design requirements.

2.6.4 Transportation

Primary site access for the project construction will be gained from Jiri and B.P Highway for Khimti-Barhabise Section and from Pipalbot-Sakhu road, Dolalghat-Chautara road and Araniko Highway for Barhabise-Kathmandu Section. No permanent access roads will be constructed to tower sites from existing road. Existing feeder roads and tracks will be used for construction and maintenance where available. The construction material up to the nearest road head will be carried out through vehicle and later it will be transported manually up to the individual tower location.

2.6.5 Spoil Dumping Site

Since the construction of TL towers requires clearing and excavation of fairly small areas at tower locations, construction work will not require spoil dumping sites. The spoil will be filled up and compacted in the tower base area. Similarly, spoil generated from the substation construction will be used to the switchyard location where borrowed earth materials have to be filled and compacted for the site grading.

2.6.6 Construction Materials

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

- Steel reinforcement
- Cement
- Coarse aggregate
- Fine aggregates (sand)

The main materials required for construction works related with the transmission line 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. Coarse aggregates will be produced at site from excavated materials or purchased from the nearby market. Likewise, fine aggregates will be collected from major quarries along riverbanks, the excavated foundation material can be used as a backfill material required for the foundation construction. Approximately, 5998.3 metric tons of cement shall be required for this project. Similarly, coarse



and fine aggregates required for this project shall be taken from Tamakoshi River, Sunkoshi and Indrawati River or nearby sources. About 9587.52 cubic meters of fine aggregates and 19175.04 cubic meters of coarse aggregates shall be necessary for the project. Steel is required for construction of substation, quarters, tower foundations and tower itself. About 16467.5 metric tons of steel shall be required for this project.

2.6.7 Employment

Local people those are affected by the project implementation will be encouraged for employment. As far as possible, local semi-skilled and unskilled labor will be used for construction activities and transportation of materials. Altogether about 400 people will be employed during the construction of the project, which includes unskilled, semi-skilled and skilled manpower.

2.7 Project Schedule

The estimated completion period of the project including both section is 40 months. The construction work of TL will primarily be carried out during the dry season when ground conditions are essentially dry and river flows low to allow easy movement of materials and construction of towers. Construction activities during the monsoon season will primarily be restricted to stringing of conductors, although this activity may also be restricted by the weather. However, the construction work of the substation will be conducted throughout the year.

Table 2-2: Construction Schedule

S.N o.	Activities	Time									
		FY 2072/73			FY 2073/74			FY 2074/75			FY 2075/76
		Jan.- Apr.	May- Aug.	Sept.- Dec.	Jan.- Apr.	May- Aug.	Sept.- Dec.	Jan.- Apr.	May- Aug.	Sept.- Dec.	Jan.- Apr.
1	Completion of IEE										
2	Preparation of Bid documents and publication of IFB										
3	Selection and mobilization of Contractor										
4	Land acquisition for substation										
5	Check Survey by Contractor, tower spotting of TL										
6	Clearance from forest authority for tree cutting										
7	Design, drawing approval and Construction of TL										
8	Approval of design, drawings by Project and Construction of substation										
9	Testing, commissioning of Transmission Line and substation										
10	Project Handover										
11	Project Operation										

