

Environmental Assessment Document

Initial Environmental Examination

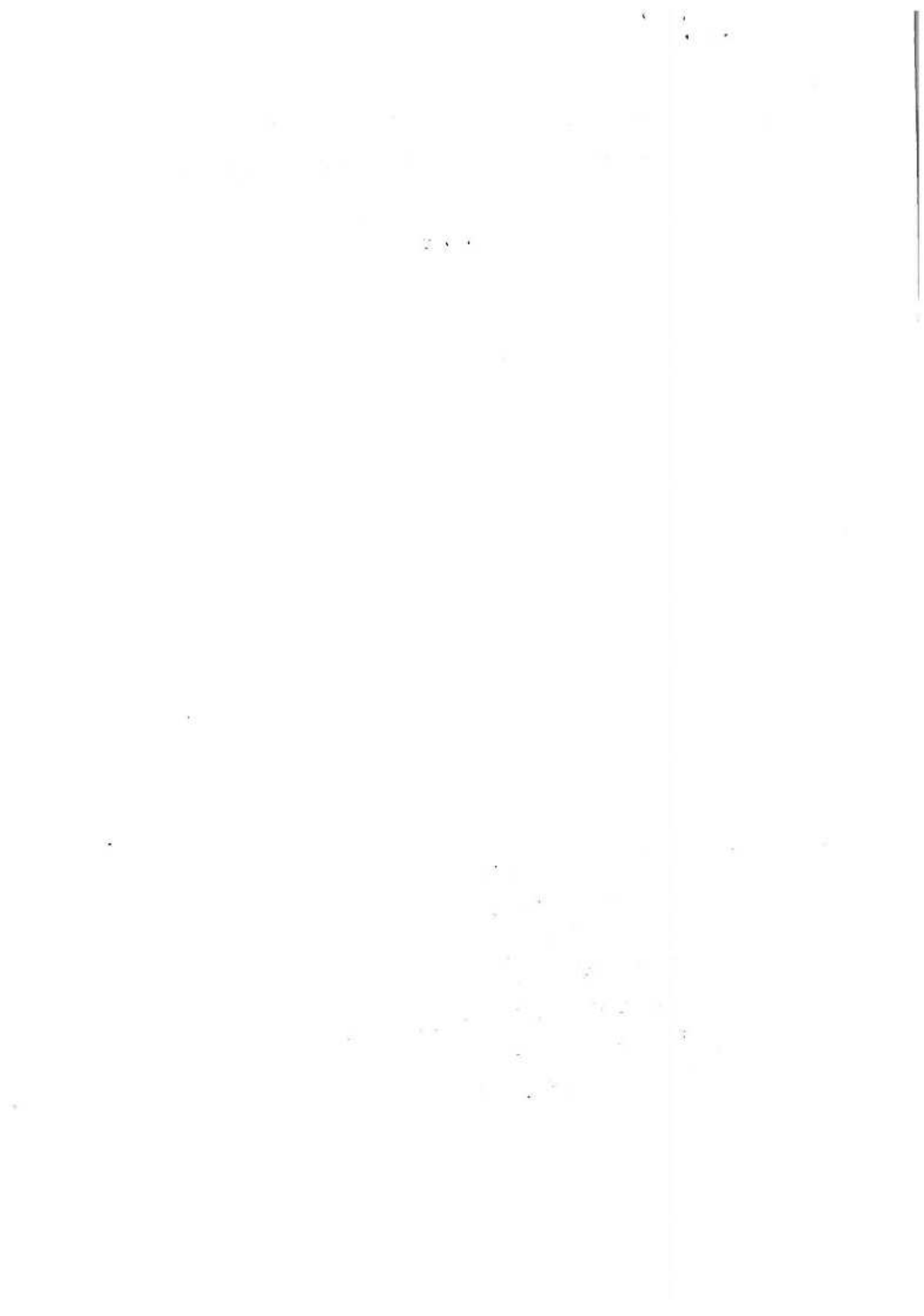
Loan: 3260

January 2017

Nepal: Earthquake Emergency Assistance Project (EEAP), Initial Environment Examination (IEE) Document Dolakha- Singati Road

Prepared by the Government of Nepal

The Environmental Assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.



Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Project Directorate (ADB)

Earthquake Emergency Assistance Project

ADB LOAN NO. 3260-NEP

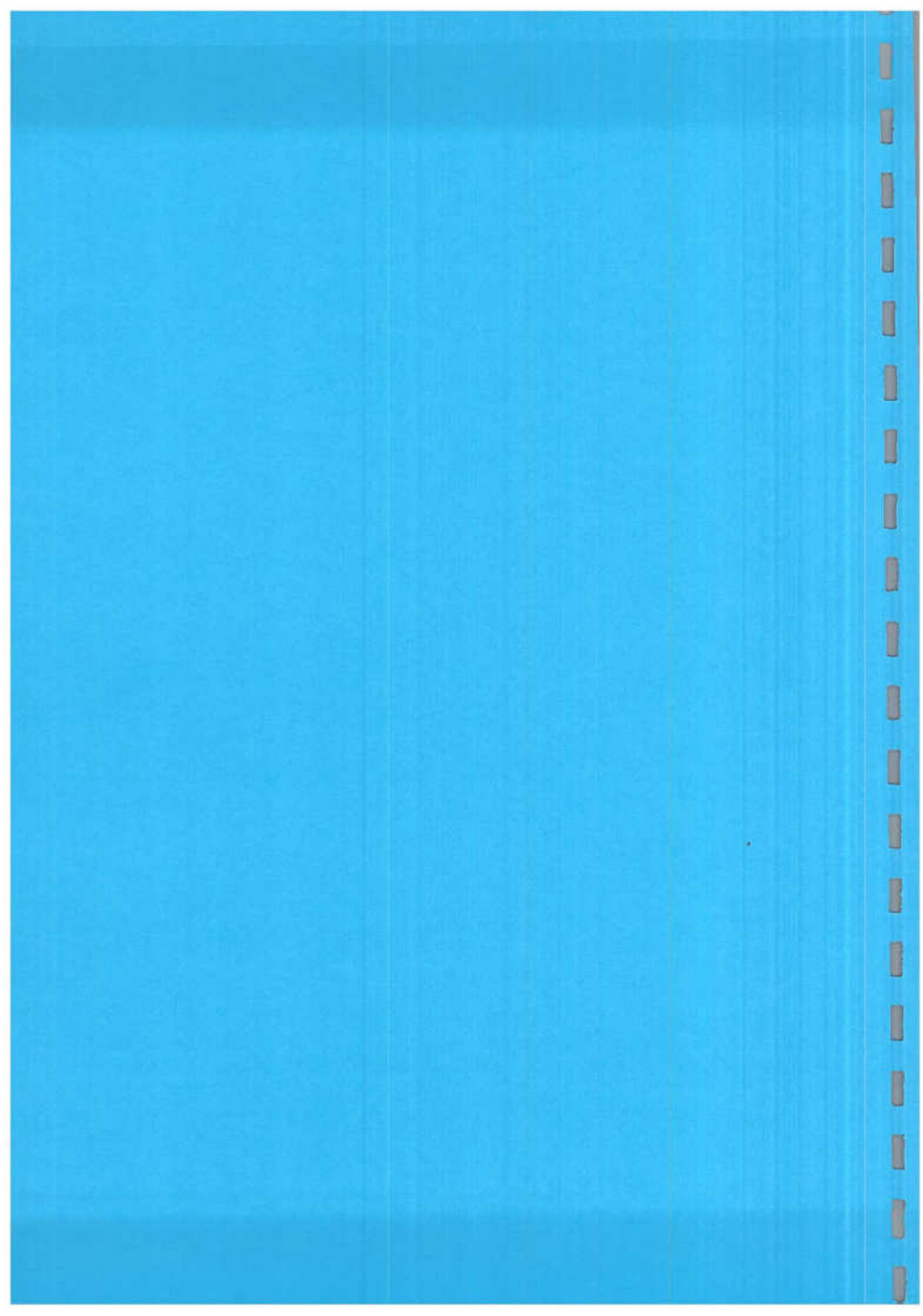
UPGRADING OF
Dolakha - Singati Road



Initial Environmental Examination Study
Final Report

Consultants: MMM Group, Canada, In association with ITECO Nepal (P) Ltd., Total Management Services Pvt. Ltd. and Material Test Pvt. Ltd. for Transport Project Preparatory Facility (TPPF), (ADB GRANT No. 0227-NEP)

October 2016



TRANSPORT PROJECT PREPARATORY FACILITY (TPPF) PROJECT PREPARATORY CONSULTANT (PPC - 2)

Consultants:

MMM Group Limited, (Canada)

in association with

ITECO Nepal (P) Ltd., Total Management Services Pvt. Ltd.
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23 August 2016

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Mr. Keshab Kumar Sharma

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Department of Roads

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Nepal

Re: ADB Grant No.0227 NEP: Transport Project Preparatory Facility, Road Transport Project Preparatory Consultant-2 (PPC-2): Submission of Initial Environmental Examination Report (Final) for Dolakha - Singati Road (GoN)

Dear Sir,

We have pleasure of informing that compiling of Initial Environmental Examination (IEE) Final Report (GoN) of Dolakha - Singati road has been completed after incorporating the comments/suggestions received from the review committee of Ministry of Physical Infrastructure and Transport (MoPIT). Two hard copies are submitted herewith for your further action please.

We assure you our quality of services at all times.

Yours sincerely,

Lalit K. Sharma

Team Leader



Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Project Directorate (ADB)

Earthquake Emergency Assistance Project

ADB LOAN NO. 3260-NEP

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October 2016



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दोलखा-सिङ्गटी सडक स्तरोन्नति आयोजना को प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन

कार्यकारी सारांश

प्रस्ताव/प्रस्तावक:

यो प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन दोलखा जिल्लाको भिमेश्वर नगरपालिका को दोलखा बजार हुँदै लामिडाँडा गा.वि.स.को सिङ्गटी बजार मा जोड्ने ३४.४९० कि.मी. लामो दोलखा-सिङ्गटी सडक स्तरोन्नति गरी सबै मौसममा (बर्षा भरी) चल्ने मुख्य सहायक सडक (Main Feeder Road) बनाउन तयार पारिएको हो । भुकम्प आपतकालिन सहयोग आयोजना (एशियाली विकास बैङ्कको आर्थिक अनुदान) अन्तर्गत, यस आयोजनाको प्रस्तावक आयोजना निर्देशनालय-एडीबी, सडक विभाग, भौतिक पूर्वाधार तथा यातायात मन्त्रालय हो । दोलखा-सिङ्गटी सडक आयोजनाको प्रारम्भिक वातावरणीय परीक्षणको प्रस्तावक योजना तथा डिजाइन महाशाखा, भू-वातावरण तथा सामाजिक युनिट, सडक विभाग रहेको छ ।

पृष्ठभूमि:

भुकम्प आपतकालिन सहयोग आयोजना एशियाली विकास बैङ्कको आर्थिक अनुदानमा संचालित कार्यक्रम हो । आयोजनाको मुख्य उद्देश्य महा भुकम्प २०१५ बाट क्षति ग्रस्त सडक संरचना पुर्ननिर्माण तथा पुर्नस्थापना गर्नु, आर्थिक र रोजगारीको अवसरलाई बृद्धि गर्नु, ग्रामिण क्षेत्रमा बजार तथा सामाजिक सेवाको पहुँचमा बृद्धि गर्नु रहेको छ ।

प्रस्तावित सडक दोलखा बजार, चथली, सुस्पा क्षमावति, कटुवाचौर, सोति बजार, चौघरे, मेलडाँडा, सिसा गोलाई, थुम्का बजार, सिटका बजार, भदौरे, बन्वरे, चपलेटी, र सिङ्गटी बजारका बस्तीहरु भएर जान्छ भने बाकि खण्ड छरिएको बस्ती, खाली घडेरी भएको जग्गा, खेती भएको जमिन तथा चौर भएर जानेछ ।

नेपाल सरकारले यो सडकको बिच बाट दुबैतिर प्रस्तावित स्तरोन्नतिको कोरीडोर अफ इम्प्याक्ट (Right of Way) अधिग्रहणको कार्य गरी सडक चालु गरेकाले यसलाई सुधार गर्दा त्यहाँको जमिनमा नगण्य नकारात्मक असर पर्ने देखिन्छ । सडकको सुधार वा चौडा पार्ने कार्यबाट त्यहाँको वातावरण तथा सामाजिक अवस्थामा पर्ने प्रभावलाई फलदायी तथा नकारात्मक गरी दुबैलाई लिन सकिन्छ ।

उद्देश्य:

यस प्रारम्भिक वातावरणीय परीक्षणको उद्देश्य प्रस्तावित आयोजनाको कार्यान्वयनबाट आयोजना क्षेत्रको भौतिक, जैविक तथा सामाजिक-आर्थिक तथा साँस्कृतिक वातावरणमा पर्न सक्ने सकारात्मक तथा नकारात्मक प्रभावहरुको अध्ययन गरी सकारात्मक प्रभावको बढोत्तरी तथा नकारात्मक प्रभावहरुलाई न्यूनीकरण गर्ने उपायहरु प्रस्ताव गर्नु हो । यो अध्ययन वातावरण संरक्षण ऐन, २०५३ (EPA) तथा वातावरण संरक्षण नियमावली, २०५४ (EPR) (संशोधित २०६४) को प्रावधान अनुसार तथा भौतिक पूर्वाधार तथा यातायात मन्त्रालयबाट वि.सं. २०७२/०९/१६ मा स्वीकृत गरिएको यसै

प्रस्तावको कार्यसूची (Terms of Reference) मा उल्लेख गरिएको अध्ययन पद्धतिको अनुसरण गरी तयार पारिएको छ।

प्रारम्भिक वातावरणीय परीक्षण अध्ययनको अन्य उद्देश्यहरु निम्नानुसार छन् :

- आयोजना क्षेत्रमा गरिने विभिन्न निर्माण कार्यहरुले गर्दा भौतिक, जैविक, सामाजिक, आर्थिक तथा सांस्कृतिक वातावरणमा पर्ने मुख्य असरहरु पत्ता लगाउनु।
- वातावरणमा पर्ने नकारात्मक प्रभावको न्यूनीकरणका उपायहरु र सकारात्मक प्रभाव बढाउने उपायहरु बारे सुझाव दिनुका साथै वातावरणीय अनुगमन योजना बनाई कार्यान्वयन गराउनु।
- प्रस्तावित सडक आयोजनाको लागि प्रारम्भिक वातावरणीय परीक्षण गरे पुग्छ भन्ने कुराको यकिन गर्न।
- आयोजना क्षेत्रको वातावरणको बारेमा आधारभुत तथ्याङ्कहरु उपलब्ध गराउनु।

आयोजनाको विवरण:

प्रस्तावित दोलखा-सिङ्गटी सडक स्तरोन्नति आयोजना नेपालको मध्यमान्चल विकास क्षेत्रको जनकपुर अन्चल अन्तर्गत दोलखा जिल्लाको दक्षिण पश्चिम क्षेत्रमा पर्दछ। यो सडक खण्ड दोलखा जिल्लाको भिमेश्वर नगरपालिका अन्तर्गत दोलखा बजार (बस पार्क) हुँदै लामिडाँडा गा.वि.स.को सिंगटी बजारमा गएर टुङ्गिन्छ। यस आयोजना क्षेत्रमा दोलखा बजार, चथली, सुस्पा क्षमावति, कटुवाचौर, सोति बजार, मेलडाँडा, सिसा गोलाई, सिटका बजार, भदौरे, सिङ्गटी बजार आदी मुख्य वस्तीहरु पर्दछन्। प्रस्तावित दोलखा-सिङ्गटी सडक सडक विभागको निर्देशिका अनुसार मुख्य सहायक सडक (Main Feeder Road) अन्तर्गत बर्गीकृत गरिएको छ। जसलाई हालको ग्राभेल सडक (राप्ती मौसममा चल्ने) बाट विटुमिन (कालोपत्र)- DBST (सबै मौसममा (वर्षा भरी) चल्ने)मा स्तरोन्नति गर्न प्रस्ताव गरिएको छ। यस आयोजनामा कुल ३४.४९० कि.मि. सडक फराकिलो तथा मजबुत पार्ने, पुलेसाहरु फेर्ने, पहिरोग्रस्त क्षेत्र सुधारने कार्यहरु पर्छन्। सबै किसिमका कार्यमा गरी कुल १२१,६६५ घन मी. माटोको कार्य गर्नुपर्नेछ। यस आयोजनाको कूल लागत करीब नेरु ११००,७८२,८४०.४९ र प्रति कि.मी नेरु ३१,९१६,०००.०० रहने अनुमान गरिएको छ। आयोजना को निमार्ण कार्य सन् २०१६ भित्र शुरु भई दुई (२) वर्षका लागि जारी रहने अपेक्षा गरिएको छ।

विद्यमान स्थिति:

भौगोलिक रूपमा प्रस्तावित दोलखा-सिङ्गटी सडक आयोजना मध्य पहाडी खण्डमा अवस्थित छ। यो प्रस्तावित सडक भिमेश्वर नगरपालिका को दोलखा बजारमा समुद्री सतहदेखि १,७४१.४७ मी. को उचाईबाट शुरु भएर लामिडाँडा गा.वि.स.को सिंगटी बजारमा समुद्री सतहदेखि ९६७.४० मी. उचाईमा गएर टुङ्गिन्छ। प्रस्तावित सडक उपोष्ण जलवायु भएको क्षेत्रमा रहेको छ। आयोजना क्षेत्रको तापक्रम अधिकतम र न्यूनतम क्रमश २८ र ७ डिग्री सेल्सीयस रहेको छ भने औसत वार्षिक वर्षा १,६१५ मी.मी रहेको छ। यो सडक खेती गरिएको जमीन, बाँझो जग्गा बस्ती र वन क्षेत्र भएर जान्छ। यस सडक खण्डमा विभिन्न प्रकारका चट्टानहरु जस्तै क्वार्टजाइट, फिलाइट, सिष्ट पाईन्छन्। एलुभियल, कोलुभियल तथा रेजीड्युयल प्रकारका माटोहरु सडक खण्डमा पाइन्छन्। सडक खण्डमा पानीका मुख्य स्रोतहरुमा विभिन्न खहरे खोला सहित अन्य पानीका मुलहरु स्रोतका रूपमा रहेका छन्। प्रस्तावित सडक क्षेत्रको वायु तथा पानी को स्तर सफा नै रहेको देखिन्छ साथै ध्वनि प्रदुषणको खासै समस्या छैन। यस सडक खण्ड मा ६ वटा सिँचाइका

पाईपहरु (Irrigation pipe crossing, चेनेज १३+९९०, १६+६७०, १६+८००, २८+०१५, २८+७७० र २८+९५०) पर्दछन् ।

यस सडक खण्डको प्रभावित क्षेत्रमा पाइने रुखहरुको प्रजातिहरुमा उत्तिस, चिलाउने, कटुस, सल्ला आदि तथा गैर काष्ठ वन पैदावारमा अमला, चुत्रो, टिमुर, चिराइतो आदि पर्दछन् । यो सडक ९ वटा सामुदायिक वनक्षेत्रबाट गुज्रिन्छ । चितुवा, स्याल, दुम्सी, भालू बाँदर बन्धु जन्तुका साथै काग, कालिज पंक्षीहरु यो सडक भएर जाने वनमा पाइन्छन् । यो सडक संरक्षित वा मध्यवर्ती क्षेत्रमा पर्दैन ।

यो सडक खण्डको प्रभावित क्षेत्र भित्र दोलखा जिल्लाको भिमेश्वर नगरपालिका, सुस्पा क्षमावति, सुन्दरावति, सुनखानि र लामिडाँडा गा.वि.स.हरु को ११ वटा प्रमुख वस्तीहरु पर्दछन् । यहाँ जम्मा घरधुरी संख्या ९,८५६ वटा र जनसंख्या ३७,६४७ रहेको छ र सरदर परिवार संख्या ३.८२ छ । यहाँ बसोबास गर्ने विभिन्न जात जातिका मानिसहरुमा मुख्य गरी बाहुन, क्षेत्री, थामी (आदिबासी जनजाती), तामाङ्ग, दमाई, कामी आदि पर्दछन् । यहाँका बासिन्दाहरुको मुख्य पेसा कृषि, पशुपालन (२८.३७%) हो । यातायातको राम्रो सुविधा नभएको तथा पहाडी क्षेत्र भएकोले कृषि उब्जनीले मात्र जीवन निर्वाहका लागि पर्याप्त नहुने हुँदा यहाँका अधिकांश मानिसहरु अन्य पेशामा मजदुरी तथा भरियाको रूपमा काम गर्ने (७.६०%), केहि मानिसहरु सरकारी तथा अन्य संस्थामा काम गर्ने (६.८८%), थोरै मानिसहरुले (९.६०%) व्यापार व्यवसाय गर्ने गर्दछन् । साथै जनसंख्याको उल्लेखनीय प्रतिशत मानिसहरु खेतीपातीको काम नहुने समयमा काठमाडौं तथा भारतका विभिन्न ठाउँमा रोजगारीको लागि जाने गर्दछन् जुन जीविकोपार्जनको मुख्य आधार हो ।

प्रस्तावको सान्दर्भिकता तथा अध्ययन प्रकृया:

लामोसाँघु-जिरी सडक दोलखा जिल्ला सदरमुकाम चरिकोट भएर गएको छ र यस सडकसँग सदरमुकाम चरिकोट लगायत अन्य बजार केन्द्रहरु शाखा सडकले जोडिएका छन् साथै जिल्लाको दक्षिण पश्चिमी क्षेत्र लाइ दोलखा-सिङ्गटी सडकले लामोसाँघु-जिरी सडक सँग जिल्ला सदरमुकामा जोडेको छ । प्रस्तावित सडकको पुर्ननिर्माण पुरा भएपछि सदरमुकाम चरिकोट लगायत अन्य बजार केन्द्रहरु (सुस्पा, भदौरे, सिङ्गटी र विशेष गरी दक्षिण पश्चिमी क्षेत्रलाई राजधानी काठमाडौंसम्मको बजार र यातायातको सुबिधामा सहज पहुँच पुर्‍याउन मद्दत गर्नेछ । यसले समयको बचत हुनुका साथै आय आर्जनका संभावनाहरु बढ्नजाने तथा बजारसम्मको पहुँच सजिलो भई व्यवसायका अवसरहरु बढ्नेछन् । सडक निर्माण हुँदा स्थानीय बासिन्दाले छोटो अवधिको लागि रोजगारीका अवसर पाउने छन् । यस्ता प्रत्यक्ष फाइदा दिने कार्यक्रमबाट त्यस क्षेत्रको आर्थिक गतिविधि बढ्नुको साथै अन्य रोजगारीका अवसरहरु श्रृजना हुने छन् ।

प्रस्तावित दोलखा-सिङ्गटी सडक खण्डको स्तरोन्नती कार्य नेपाल सरकारको वातावरण संरक्षण ऐन, २०५३ तथा वातावरण संरक्षण नियमावली २०५४ (पछिल्लो संशोधन २०५५) को नियम ३ सँग सम्बन्धित अनुसूची १(ई)(६) ले आकृष्ट गरे बमोजिम मुख्य सहायक सडक, राजमार्ग अथवा राष्ट्रिय राजमार्गहरु स्तरोन्नती कार्य गर्ने सँग सम्बन्धित भएकोले प्रस्तावको प्रारम्भिक वातावरणीय परीक्षण कार्य गर्नु आवश्यक भएकोले सो बमोजिमको यो प्रतिवेदन तयार गरीएको हो ।

जनवरी २०१६ (पुष/माघ २०७२) मा फिल्ड सर्वेक्षणबाट लिइएका तथ्याङ्क तथा अन्य उपलब्ध तथ्याङ्कहरुको साथै सामाजिक तथा प्राविधिक टोलीबाट पुर्नवास कार्यको सर्भेक्षणको लागि संकलन गरेका तथ्याङ्कहरु केलाएर प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन तयार गरी निष्कर्ष तथा

सुभावहरू दिइएका छन् । सार्वजनिक छलफल प्रभावित नगरपालिका र गा.वि.स.का बस्तीहरूमा स्थानिय नेता, स्थानिय व्यक्ति, सामुदायिक वन उपभोक्ता समुह, शिक्षक आदि संग गरिएको थियो

सकारात्मक प्रभावहरू:

यातायातको सुविधाले स्थानिय बासिन्दाहरूको जीवनमा थुप्रै सकारात्मक प्रभाव पर्दछन् । सडक स्तरोन्नति निर्माण कार्य गर्दा स्थानीय बासिन्दाहरूले श्रमिकको रुपमा रोजगारीका (३८,००० दक्ष श्रमिक दिन र १६०,००० अदक्ष श्रमिक दिन) अवसरहरू प्राप्त गर्ने र प्राविधिक सीप तथा ज्ञान समेत प्राप्त गर्ने छन् ।

सडक निर्माण भई संचालनको अवस्थामा त्यस क्षेत्रमा खाद्यान्नको आपूर्ति सुचारु हुन गई आर्थिक तथा सामाजिक स्थायित्व बढ्न जानेछ । साथै सडक यातायातले गर्दा ग्रामीण भेगबाट बजार क्षेत्र र बजार क्षेत्रबाट ग्रामीण भेगमा सेवा तथा सामानहरूको ओसार पसार छिटो, छरितो, सुलभ तथा सस्तो हुन जानेछ । बजारमा पहुँच भएको कारण कृषि उत्पादन बढाउन कृषकहरू उत्साही हुनेछन् । यसले गर्दा उत्पादकत्वमा वृद्धि भई अन्ततोगत्वा ग्रामीण भेगका बासिन्दाको जीवनस्तरमा सुधार हुन जाने छ । स्तरोन्नति भएको सडक संचालन हुँदा व्यापार व्यवसायमा वृद्धि हुन जानेछ । त्यस क्षेत्रमा बजार लगायतका वस्तीमा व्यापार क्षेत्रको विकास भई यहाँका बासिन्दाहरूको जीवन स्तरमा सुधार हुन जानेछ । बजार क्षेत्रको विकासले गर्दा जग्गाको मूल्यमा समेत वृद्धि हुन जानेछ ।

नकारात्मक प्रभावहरू:

सडक स्तरोन्नति/पुननिर्माण कार्य गर्दा भौतिक वातावरणमा पर्ने नकारात्मक प्रभावहरूमा भू-स्वामित्वको प्रयोगमा बदलाव, भिरालो जग्गामा पहिरो जाने, वायु तथा पानीमा प्रदुषण, खनेको माटो फालिँदा पर्ने प्रभावहरू मुख्य छन् । यस्तै प्रकार जैविक प्रभाव अन्तरगत विभिन्न जातका गरी करिब १५० वटा रुखहरू सामुदायिक वनक्षेत्रबाट र निजी जमीन बाट ५० वटा रुखहरू काटिने हुन सक्दछ । साथै सडक निर्माण क्रियाकलापबाट जीवजन्तुलाई असर पर्न जानेछ । आर्थिक तथा सामाजिक प्रभाव अन्तर्गत सडक स्तरोन्नति/पुननिर्माण गर्दा करीब ३२ वटा निजी संरचना तथा २ वटा सामुदायिक संरचना (मन्दिर) लाई हटाउनु पर्ने हुन सक्दछ यसका साथै श्रमिक तथा अन्य बासिन्दाहरूको स्वास्थ्यमा सडक निर्माण हुँदा प्रतिकुल असर पर्न जानेछ । प्रस्तावित दोलखा-सिङ्गाटी सडक खण्ड स्तरोन्नती गर्दा निजी जग्गा अधिग्रहण गर्नु नपर्ने देखिन्छ ।

सडक संचालनको दौरान भौतिक वातावरणमा पर्ने नकारात्मक असरहरूमा भिरालोपनको स्थायित्व र यसको व्यवस्थापन, वायु तथा ध्वनि प्रदुषण तथा सडक सुरक्षाका समस्याहरू पर्दछन् । यसै प्रकार जैविक प्रभावमा वन्य श्रोत घट्नु, वन्यजन्तुहरूलाई अप्ठेरो पर्ने हुन् भने सामाजिक तथा आर्थिक प्रभावहरूमा नयाँ बस्ती र बजारको अव्यवस्थित विस्तार, सामाजिक व्यवहारमा परिवर्तन हुनु आदि पर्दछन् ।

सकारात्मक प्रभाव बढाउने तथा नकारात्मक प्रभाव न्यूनिकरणका उपायहरू

यस सडकको निर्माणबाट सकारात्मक तथा नकारात्मक दुवै प्रकारका प्रभावहरू पर्ने देखिन्छन् । सकारात्मक प्रभाव बढाउने उपायहरू तथा नकारात्मक प्रभाव न्यूनिकरण गर्ने उपायहरूको प्रभावकारी कार्यान्वयनले गर्दा सकारात्मक प्रभाव बढ्न जानुका साथै नकारात्मक प्रभाव न्यून गर्न सकिने वा हटाउन सकिने छन् । प्रभावहरूको आकलनको आधारमा सडक निर्माण तथा संचालन दुवै चरणमा सकारात्मक प्रभाव बढ्ने उपाय र नकारात्मक प्रभाव घटाउने उपायहरू उल्लेख गरिएका छन् ।



सकारात्मक प्रभाव बढाउने उपायहरू

कामदार हरूको जीविकोपार्जन सुधार गर्नको लागि विभिन्न शीपमूलक तालिमहरू (आय आर्जन, इन्जिनियरिंग संरचनाको निर्माण तथा जैविक प्रविधिका कामहरू सम्बन्धी) दिइने छन् । सहकारीको विकास गर्न तथा वित्तिय संस्था तथा बैंक संग व्यवसाय विस्तार गर्न, खेतीबाट भएको उब्जनी वृद्धिको लागि थप कृषि विकासका कार्यक्रम गर्न र बजार संगको सम्बन्ध विस्तार गर्न जागरण ल्याउने कार्य गरिनेछ । साथै बजार क्षेत्रमा नालि निर्माण तथा अन्य आधारभूत सुविधा हरूको विस्तारको लागि सहयोग गरिने छ । सडक निर्माणका कममा ४०% महिला सहभागिता गराईने कार्यमा जोड दिइने छ।

नकारात्मक प्रभाव न्यूनीकरणका उपायहरू

श्रममा आधारित, बातावरणीय मैत्री तथा सहभागीता मूलक अवधारणा को अवलम्बन गरी वातावरणमा पर्ने प्रभावहरूको न्यूनीकरण गरिने छ । यस अनुरूप खन्ने र पुर्ने माटोको आयतनमा सन्तुलन मिलाउनु को साथै खनीएका बस्तुहरूको पुनः प्रयोग तथा जैविक प्रविधि (वायो इन्जिनियरिंग) को प्रयोग गरिने छ । भिरालो जग्गाको व्यवस्थापनको लागि पर्याप्त प्रावधानहरू सडक आयोजनाको डिजाईनमा राखिने छन् । खानी संचालन (Quarries Operation) अस्थिर (कमजोर) क्षेत्रहरू, भूक्षय हुने क्षेत्रहरू, वन, बस्तीहरू तथा उर्वरा जमीनमा गैरिने छैन । स्थानीय वासिन्दालाई आफ्नो निजी जग्गामा वृक्षारोपण गराउन प्रोत्साहन गराईने छ । यसै प्रकार, सामुदायिक वन लाई ४,१२५ रुखहरू र स्थानीय वासिन्दालाई १,३७५ रुखहरू (अनुमानित लागत नेरु. ३९१,६७५.००) वृक्षारोपण गराउन गर्न सहयोग दिइनेछ जसले गर्दा रुखहरूको क्षती लाई परिपूर्ति गर्न सकिने छ ।

वन्य जन्तु र चराहरूलाई कम मात्रामा अवरोध होस भन्नाको लागि वनको छेउ छाउमा निर्माण कार्य गर्दा व्यवस्थित तरिकाले गरिने छ । सडकमा परेको जग्गा तथा अन्य संरचना, सम्पतीको प्राप्ती तथा क्षतिपूर्ति सम्बन्धि कुराहरूलाई समेट्न छुट्टै पुर्नवास योजना बनाइएको छ ।

कामदारहरूलाई कामको प्रकृति अनुसार सुरक्षाका साधनहरू (हेल्मेट, मास्क, मफलर्स) दिइने छ र कामदारको लागि खानेपानी को आपूर्ति तथा अस्थायी खाल्टे चर्पी हरू बनाइने छन् । साथै पानीको श्रोत मा खनिएको माटो फालिने छैन । कामदारहरूको लागि औषधी तथा दुर्घटना बीमाको व्यवस्था गरिने छ ।

सडक संचालनको अवस्थामा साना साना पहिरो तथा माटोका खसेका ढिस्काहरूलाई तुरुन्तै उचित प्रविधिबाट सफा गरिने छ । सामुदायिक वन उपभोक्ता समूहहरू लाई वनको कार्ययोजना अनुसार संरक्षण र व्यवस्थापन गर्न सघाउ पुर्याइने छ । डाइभरहरूलाई सचेत गराउन वन, स्कूल र आवास क्षेत्रमा हर्न बजाउन निषेध गरिएका साइनबोर्डहरू राखिनेछन् । व्यवस्थित बस्ती विकासको लागि जनचेतना जगाउने कार्यक्रम संचालन गरिनेछन् । साथै संभावित दुर्घटना बाट जोगाउन उपयुक्त सडक सुरक्षाका उपायहरू अवलम्बन गरिनेछन् ।

वातावरणीय व्यवस्थापन योजना (Environmental Management Plan)

यस प्रतिवेदनमा वातावरण व्यवस्थापन योजना अन्तर्गत आयोजनाबाट पर्ने संभावित असरहरू, असरहरूको प्रभाव, न्यूनीकरण विधि, अनुगमन विधि तथा कार्यतालिका प्रस्तावित गरिएको छ । यसका साथै न्यूनीकरणका उपायहरूको तथा अनुगमन कार्यको कार्यान्वयन गर्ने जिम्मेवार निकायहरूको पनि पहिचान गरिएको छ । अनुगमनका लागि आवश्यक भौतिक, जैविक, सामाजिक-आर्थिक तथा साँस्कृतिक वातावरणका विभिन्न अनुगमन सुचकाङ्कहरूको पनि पहिचान गरिएको छ। करिब ११० करोड रुपैया (भ्याट र भैपरी आउने खर्च समेत गरी) लागत भएको यस स्तरोन्नती

आयोजनाको वातावरणीय प्रभाव न्यूनिकरणका लागी आयोजनाबाट करिव २ करोड २१ लाख रुपैया अनुमानित लागत रकमको व्यवस्था गरिएको छ । वातावरणीय व्यवस्थापन योजना कार्यान्वयन गर्न निम्नानुसार खर्च हुने अनुमान गरिएको छः

क्र. सं.	विवरण	रकम (ने.रु.)	कैफियत
१.	वातावरण सम्बन्धी चेतनामूलक तालिम तथा अन्य तालिम	१५०,०००/-	आयोजनाको बजेटमा समावेश गरिएको ।
२.	श्रमिकहरुको विमा	१,०२५,९४०/-	BoQ मा समावेश गरिएको ।
३.	बायो-इन्जिनियरिङ्ग	७,७७३,७१२/-	BoQ मा समावेश गरिएको।
४.	क्षतिपूर्ती तथा स्थानान्तरण	२१,१६,८००/-	पुनर्वास योजनामा समावेश गरिएको ।
५.	पुनर्निर्माण तथा अन्य (खानेपानीको पाइप, विजुलीको पोलहरु, सार्वजनिक धारा,)	९२,५०,०००/-	BoQ मा समावेश गरिएको।
६.	क्षतिपूर्ती वृक्षारोपण	३,९१,८७५/-	आयोजनाको बजेटमा समावेश गरिएको।
७.	पेशागत स्वास्थ्य सुरक्षा तथा जानकारी मूलक सूचना पाटी	७,२०,०००/-	BoQ मा समावेश गरिएको ।
८.	अनुगमन तथा मुल्यांकन	१२,३६,०००/-	आयोजनाको बजेटमा समावेश गरिएको।
	जम्मा :	२२,६६४,३२७/-	

निष्कर्ष तथा सुझावहरु

प्रस्तावित दोलखा - सिङ्गती सडक खण्डको स्तरोन्नती कार्य को प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदनले सकारात्मक प्रभावहरु नकारात्मक प्रभावको तुलनामा बढी महत्वपूर्ण रहेको र लामो समयसम्म रहने र नकारात्मक प्रभावहरु न्यूनिकरण गर्न सकिने कुरा देखाउँछ, । साथै सार्वजनिक छलफलमा उठेका सान्दर्भिक सुझावहरु लाई प्रतिवेदनमा समेटिएको छ । यो सडक आयोजनाको स्वीकृतिको लागि प्रारम्भिक वातावरणीय परीक्षण प्रयाप्त रहेको छ । यस अध्ययन अतिरिक्त वातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययन गर्न नपर्ने निष्कर्ष छ । प्रभावहरुको न्यूनिकरण र संलग्न वातावरणीय अनुगमन योजना कार्यान्वयन गरी प्रस्तावित आयोजना कार्यान्वयनको लागि सिफारिस गरिन्छ ।

सिङ्गती सडक खण्डको स्तरोन्नती कार्यको वातावरणीय परीक्षण प्रतिवेदन

Initial Environmental Examination Report of Dolakha – Singati Road Upgrading Project

Executive Summary

Proponent

This IEE Report has been prepared for the upgrading/improvement of 34.490 km long fair weather graveled feeder road connecting Dolakha Bazaar with Singati Bazaar of Dolakha district. The Proponent is the Planning and Design Branch, Geo Environment and Social Unit, Department of Roads. The Department of Roads (DoR) is the leading agency for road development under Ministry of Physical Infrastructure and Transport (MoPIT) and is responsible for translating government policies for the road sub-sector into the provision of services.

Name of the Proposal is 'Initial Environmental Examination of Dolakha - Singati Road Upgrading Works' in Dolakha District in Central Development Region of Nepal. The Proponent is the Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB).

The objective of the Proposal is to improve/upgrade the Dolakha – Singati Road (34.490 km) from existing single lane to intermediate lane bituminous paved standard under the Earthquake Emergency Assistance Project (EEAP) to restore critical public and social infrastructure and services with strengthened resiliency.

Background

The proposed loan (the Project) under Earthquake Emergency Assistance Project (EEAP) will finance improvements of three feeder roads, a total of about 124 km, in the central and western regions of Nepal. While the Project will contribute to development and expansion of the Strategic Road Network (SRN), it will include an institutional capacity assessment in the areas of road safety and road maintenance, which will form the basis for a capacity development program. Gender and social inclusion will be addressed through a livelihood program that will be targeting women involved in road construction activities in the project-affected area.

The project roads are: (i) Dolakha – Singati (34.490 km 2 lane feeder road), (ii) Dhadingbesi – Arughat – Gorkha (49.361 km 2 lane feeder road excluding 25 km overlap with Mid-Hill highway), and (iii) Panchkhal – Melamchi-Timbu Road (39.781 km 2 lane feeder road). The Department of Roads (DoR) intends to improve these roads to an all-weather bituminous double-lane Feeder Road Standard. Project roads have been selected based on environment, resettlement, social and economic impacts; and project readiness. The Project is relevant to achieving results of the Country Strategy and Program (2013-2017), enhancing global-local connectivity to facilitate regionally balanced economic growth.

The Department of Roads (DoR) intends to improve this Dolakha – Singati road to an all-weather bituminous intermediate-lane Feeder Road Standard.

Objectives of IEE

The main objective of the IEE study is to identify the impacts of physical, biological, socioeconomic and cultural environment of the Project area. The specific objectives of the proposed IEE study include to:

- identify the major issues that may arise as a result of proposed works on bio-physical, socio-economic and cultural environment of the project area,
- recommend practical and site specific environmental mitigation and enhancement measures,
- prepare and implement environmental monitoring plan for the Project, and
- make sure that IEE is sufficient or not for environmental requirement to implement the for the proposed road Project

Project Description

The Dolakha – Singati road starts from Dolakha Bazaar in Bhimeshwar Municipality and ends at Singati Bazaar in Lamidanda VDC of Dolakha district, Janakpur zone of Central Development Region of Nepal. The project road is the gateway to national pride Hydroelectric Project Upper Tamakoshi HEP. The road passes through Bhimeshwar Municipality, and four VDCs namely Suspa kshamawati, Sundrawati, Sunkhani and Lamidanda. The major settlements along the road are Dolakha Bus stop (Indramani Chowk), Chathali, Katuwachaur Gaun, Thumka gaun, Soti Bazaar, Chaughare Gaun, Mel Danda Gaun, Bhadaure Gaun, Sisa Golai, Syaule bazaar, Jhamarsi, Banchare Gaun, Chapleti gaun, and Singati bazaar.

This road has been classified as main feeder road as per DoR Standard. The proposal is for improvement/upgrading of existing fair-weather road to all weather bituminous intermediate lane feeder road. Under the EEAP, a total of 34.490 km of road section will be improved/rehabilitated and minor cross drainages structures will be replaced, landslide protection works will be carried out.

The proposed road upgrading /rehabilitation works will require more than 121,665 cubic meters of earthworks for all construction activities. The total subproject cost estimated at about NRs 1100,782,840.49 and per km cost is NRs. 31,916,000.00. This sub-project is expected to commence within 2016. A 24 month construction period is estimated followed by a 12-month Defects Liability Period (DLP) enabling the completed project road to be opened by 2019.

The concerned VDCs are referred as indirect area of impact, and direct impact area are the area occupied by the upgrading of the subproject road works (i.e. 15m on either side from centerline, which is also called corridor of impact (COI)). The road is an already existing feeder road where COI is already acquired by GoN. Most of the road passes through settlement and agriculture land.

Existing Condition

Physiographically, the proposed road project lies in midhills region. The road originates from Dolakha Bazar (Indramani Chowk) at an elevation of 1741.71 m amsl of Bhimeshwar Municipality and ends at Singati Bazaar in Lamidanda VDC at an elevation of 967.40 m amsl. This road has been upgraded previously to gravel surface by Upper Tamakoshi HEP and number of bridges and cross drainage structures across the streams along the road section are found to be in good working condition. Existing width of the road is 4.7 m on an

average and condition of road pavement, structures and drainage facilities are in fairly good condition throughout the road section.

The sub-project area lies in subtropical region. The average maximum and minimum temperature of the district is 28°C and 7°C respectively. The average annual rainfall in the district is 2043.50 mm. The road mainly passes through cultivated land, barren land, forest and settlements.

There are six (6) irrigation canal crossings along the road alignment (Chainages: 13+990, 16+670, 16+800, 28+015, 28+770 and 28+950). The road alignment follows the hilly terrain from Dolakha to Singati and some very negligible portion of the road alignment is passing through river valley of the Tamakoshi River. The sub-project area does not fall under any protected or buffer zone area. No wetlands are found within the vicinity of the road.

There are 14 major settlements along the Zol of the proposed road alignment in Bhimeshwor municipality, Suspa Kshamawati, Sundrawati, Sunkhani, and Lamidada VDCs with total population of 37,647 persons (9,856 households) and average family size of 3.82.

Diverse ethnic groups such as Brahmin, Tamang, Thami (indigenous community), Chhetri, occupational caste (Damai, Kami) live along the Zol of road alignment. In the sub-project area, language wise, 73.07% of total population speak Nepali and 12.71% people speak Thami, 6.82% people speak Tamang. Newari language is spoken by 4.97%, and Sherpa 1.06%. In the sub-project area, about 69% population aged five and above are literate and can read and write. About 11% population have passed School Leaving Certificate.

The main occupation of the people residing in the Zol of the proposed road alignment is agriculture and livestock (28.37%). People are carrying out other economic activities like employment as labor (7.60%), working in government and non-government organizations (6.88 %), trade and business (9.60 %), foreign employment (5.87%). Moreover, significant section of the economically active male population also migrates to various places including Kathmandu and India seasonally during slack farming season for employment which is the source of livelihood.

The major religion followed by the people in the sub-project area is Hinduism and Buddhism. The sub-project area does not contain any renowned archaeological and historical sites along the road corridor.

Relevancy of the Proposal and Study Methodology

The proposed road upgrading requires an Initial Environmental Examination (IEE) as per GoN, Environment Protection Act (EPA 1997) and Environment Protection Rules (EPR'97) 3, schedule 1(D) (6), the improvement of the standard, rehabilitation and reconstruction of feeder roads requires IEE. Thus, the IEE Study of the Proposal is a respect to mandatory requirement as per this provision. The approval of the IEE Report by the authorized agency, MoPIT is required before commencing the upgrading work.

This IEE report of Dolakha – Singati Road project is prepared based on the Terms of Reference (ToR) approved on 2072/9/16 BS by the Secretary level decision of the Ministry of Physical Infrastructure and Transport (MoPIT).

The findings and conclusions of the report are based on the analysis of the information collected from the field during the month of January 2016 AD by undertaking a walk-through environmental survey along the proposed route and secondary information supplemented by information collected by the social and technical teams working on the resettlement survey

and detail survey. Public consultation was made with the local people, teacher in the concerned affected areas.

Beneficial Impacts

Some of the beneficial impacts will be on human life, income generation from employment during the construction phase and increased income from improved access for market to agricultural products during operation phase. The immediate beneficial impacts from Subproject in the construction phase is generation of employment opportunities (160000 person days of unskilled and 38000 person days of skilled) for the local population. Most importantly, the upgraded road will provide smooth, easy and quick access to commercial traffic eliminating existing traffic congestion and reduction in road accidents. The upgrading of the road will reduce running costs of vehicles such as fuel economy, reduction in wear and tear of vehicle parts etc. Gaseous emission will be reduced due to better riding quality.

The full width sealed pavement in built up areas particularly in Dolakha Bus stop, Chathali, Suspa Bazaar, Katuwachaur, Soti Bazaar, Bhadaure Gaun, Sisa Golai, Syaule bazaar, Jhamarsi, Singati bazaar will eliminate dust nuisance during dry and mud hazard during monsoon. The extension, rehabilitation and reinstatement of roadside drain will minimize inundation problem that frequently occurs in settlement areas during monsoon.

During operation phase, an improved road access will bring an improvement of food security situation and overall economic and social stability. The road will also provide cheap, safe and fast transport of goods and services from rural areas to urban centers and vice versa. The farmers will be more interested to increase agricultural production due to market accessibility. This will contribute significantly to increase the productivity in rural areas and eventually improve the overall socio-economic condition of the people.

Once the improved road is on operation, local trade and business activities will be further promoted. There is a possibility of increased economic opportunities and significant growth and extension of the local markets along the road alignment. In addition, construction of road will lead to appreciation of land values particularly near the market and settlement areas.

Adverse Impacts

Potential adverse impacts due to the proposed subproject are temporary disruption of public utilities and existing services as electrical poles/line, telephone poles/line, water supply pipelines, existing cross-drainage structures including irrigation crossings. Altogether 32 private structures (temporary sheds) and two (2) public structures (Temple) will be affected due to the implementation of the proposed subproject. There may be possibility of felling of roadside existing 50 numbers of private trees and 150 trees from nine (9) community forests.

Water pollution could result from waste disposal and spoil deposits if not properly managed. The road construction will provoke accident risks if the road safety and safe diversion is not managed for smooth flow of traffic. Air pollution due to dust particles and vehicle emissions, pollution of water, poor sanitation, road and work site accidents, social conflicts and other pressures on the local communities are the possible impacts during construction. During the operation phase, soil erosion and scouring of embanked slopes / siltation on farm land due to monsoon rain could occur. Cross-drains may cause erosion of adjacent agricultural fields if not maintained properly.

Benefit Augmentation and Mitigation Measures

Impacts from the proposed road Project can be both beneficial as well as adverse. An effective implementation of benefit maximization measures and adverse impacts mitigation measures would optimize the benefits expected from the project and avoid/minimize the adverse impact from the project. Based on the impact assessment and identification,

beneficial augmentation and adverse impact mitigation measures are presented in both constructions as well as in operation stage of the road.

Benefit Augmentation Measures

During the road construction more emphasis will be given to women workers. Agricultural support services will be improved for the increased income from the farm products and market linkages will be developed.

Adverse Impacts Mitigation Measures

Rehabilitation, extension and construction of adequate drainage and minor cross-drainage structures are provisioned in the design to avoid alteration of surface water hydrology by maintaining flow and course of stream and irrigation crossings. The mitigation measures such as bio-engineering for stabilization of embanked slopes and restoration of visual environment, road safety and occupational safety and hazards mitigation will be included in the technical detailed design. Mitigation measures for health and sanitation, pollution control and social and economic impacts are recommended and will be implemented during the Subproject implementation. Strict rules and regulation in the labor and work camp is being provisioned so that any engagement in alcoholic and other unsocial activities are restricted.

Adequate traffic signs and markings, delineators, proper passing bays at bus stops/bus bays, proper junction layout, appropriate entry and exit at access roads to minimize traffic conflict have been cautiously provisioned in the design for safety of vehicular traffic during operation phase.

Spoils should be safely disposed and managed with minimum environmental damage which includes balanced cut and fill volume, re-use of excavated materials and minimum quantity of earth works and adoption of bio-engineering techniques. Adequate slope stabilization measures will be provisioned in design for the stabilization of slopes. Unstable sites, erosion prone area, dense forest area, settlements, fertile farm land will be avoided for quarrying operation.

Most of the cost for mitigation measures is included in the in-built design and estimate. However, some of the mitigation costs not included in the project design and construction contract are estimated separately for inclusion in the Civil Works contract. Such costs include the costs for vegetation and plantation of trees, and reinstatement of public utilities/services etc. and cost for monitoring of air, water and noise during construction and operation phase etc.

Environmental Management Plan

The Environmental Management Plan (EMP) delineates key issues likely to arise from Project implementation, and proposes mitigation measures, including monitoring schedule and responsibility. The EMP also outlines environmental management roles and responsibilities, road design and construction management of different activities, site supervision, monitoring and reporting, records, and corrective measures, improvement proposals, and cost estimates for mitigation measures.

S. No.	Items	Cost (NRs.)	Remarks
1.	Capacity building (orientation) and Environmental awareness training	150,000.00	
2.	Contractor's employee and labours' insurance	1,025,940.00	Included in

			project cost
3.	Bioengineering measures	7,773,712.00	Included in project cost
4.	Resettlement and Displacement cost	2,116,800.00	Included in Resettlement plan
5.	Relocation of public utilities (Drinking water supply lines, electric poles, irrigation canal etc.)	92,50,000.00	Included in BoQ
6.	Compensatory plantation (at the ratio of 1:25 and 5 years maintenance cost)	3,91,875.00	
7.	Safety Gadgets/facilities	7,20,000.00	Included in BoQ
8.	Monitoring and Evaluation	1,236,000.00	Included in project cost
	Total Cost (NRs.)	22,664,327.00	

Most of the adverse impacts identified and predicted are of minimal scale, temporary, short term and reversible in nature associated with construction phase. The Subproject will be implemented with strict adherence to the mitigation measures as prescribed in the Environmental Mitigation Management Plan which will be a part of the Bidding Document. Total environmental management cost including monitoring cost is estimated to be NRs. 22,664,327.00.

Conclusion and Recommendation

Most of the identified environmental adverse impacts are locally confined, and limited mainly to the period of construction. With the set of proposed mitigation measures, most of the identified adverse impacts can be minimized, compensated, or even set off. Once the measures outlined in the Environmental Management Plan (EMP) are implemented, there is no risk for residual impacts that may affect the physical, biological, socio-economic and cultural environments of the Subproject area. Based on this IEE Study, this Subproject is recommended for implementation and an EIA level study is not recommended.



ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AIDS	Acquired Immune Deficiency Syndrome
amsl	Above Mean Sea Level
APs	Affected Peoples
AASHTO	The American Association of State Highway and Transportation Officials
BoQ	Bill of Quantity
BPL	Below Poverty Line
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CDC	Compensation Determination Committee
CDO	Chief District Officer
CF	Community Forest
CFC	Compensation Fixation Committee
CFUG	Community Forest User Group
Ch.	Chainage
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Col	Corridor of Impact
Cu. m.	Cubic Meter
DADO	District Agriculture Development Office
dB (A)	Decibel (A)
DBST	Double Bituminous Surface Treatment
DDC	District Development Committee
DFO	District Forest Office
DIA	Direct Impact Area
DLP	Defect Liability period
DoR	Department of Roads
DRO	Division Road Office
DWSC	Department of Watershed and Soil Conservation
EEAP	Earthquake Emergency Assistance Project
EIA	Environmental Impact Assessment
El.	Elevation
EMP	Environmental Management Plan
EPA	Environment Protection Act
EPR	Environment Protection Rules
ESA	Equivalent Standard Axle
FGD	Focus Group Discussion
FIDIC	International Federation of Consulting Engineers
FS	Feasibility Study
FY	Fiscal Year
GDP	Gross Domestic Product
GESU	Geo-Environment and Social Unit
GNP	Gross National Product
GoN	Government of Nepal
GRC	Grievance Redress Committee



HEP	Hydroelectric Project
HIV	Human Immunodeficiency Virus
I/NGO	International/Non-Governmental Organization
IEE	Initial Environmental Examination
IP	Indigeneous People
IUCN	International Union for Conservation of Nature
LEP	Labor based, Environment friendly and Participatory
LPG	Liquefied Petroleum Gas
md	Man days
MoPE	Ministry of Population and Environment
MoPIT	Ministry of Physical Infrastructure and Transport
mt	Metric Ton
NPC	National Planning Commission
NRs.	Nepalese Rupees
NTFP	Non Timber Forest Product
OHS	Occupational Health and Safety
PAF	Project Affected Family
PAP	Project Affected People
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RCC	Reinforced Cement Concrete
RN	Road Note
RoW	Right of Way
RRA	Rapid Rural Appraisal
SC	Supervision Consultant
SD	Surface Dressing
SRN	Strategic Road Network
SSEMP	Site Specific Environmental Management Plan
STDs	Sexually Transmitted Diseases
TESU	Traffic Engineering and Safety Unit
ToR	Terms of Reference
TPPF/PPC-2	Transport Project Preparatory Facility/Project Preparatory Consultant-2
TRL	Transport Research Laboratory
TSP	Total Suspended Particulates
UTKHEP	Upper Tamakoshi Hydroelectric Project
VAT	Value Added Tax
VDC	Village Development Committee
Zol	Zone of Influence



CHAPTER 1

1. NAME AND ADDRESS OF THE INSTITUTION PREPARING THE REPORT

1.1 Name of Proposal

Name of the Proposal is 'Initial Environmental Examination of Dolakha - Singati Road Upgrading Works' in Dolakha District in Janakpur zone, Central Development Region of Nepal.

1.2 Name of the Proponent and Address

The Proponent is the Planning and Design Branch, Geo Environment and Social Unit, Department of Roads. The Department of Roads (DoR) is the leading agency for road development under Ministry of Physical Infrastructure and Transport (MoPIT) and is responsible for translating government policies for the road sub-sector into the provision of services. The services it provides include planning, design, upgrading and maintenance of the Strategic Road Network, and provisions to ensure a reasonable level of safety for all road users.

The address of Proponent is:

Planning and Design Branch

Geo-Environment and Social Unit

Department of Roads

Chakupat, Lalitpur, Nepal

Telephone Number: 5260505, Fax Number: 5529106

Email: gesu.dor@gmail.com, gesunit@dor.gov.np

1.3 Consultant

The consultants of the Transport Project Preparatory Facility (TPPF), Project Preparatory Consultant (PPC – 2) are MMM Group Limited Canada in association with ITECO Nepal (P) Ltd, Total Management Services Nepal and Material Test Pvt Ltd.

The address of Consultant is:

PO Box 675, Kathmandu, Nepal

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Telephone: 4620054

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CHAPTER 2

2. SUMMARY OF THE PROPOSAL

2.1 Objective of the Proposal

Government of Nepal (GoN) has signed a loan agreement on 21 August 2015 with Asian Development Bank (ADB) under Earthquake Emergency Assistance Project (EEAP) to rehabilitate about 135 km of strategic roads and 450 km of rural roads damaged by the earthquake 2015. Majority of the houses of the poor people in the earthquake affected areas was seriously damaged and need to re-habilitate. Improving of these roads shall facilitate the rehabilitation of the devastated population as well in these areas. Recent earthquake of 2015 has also damaged the Dolakha-Singati road.

Dolakha-Singati road is the gateway to national pride Hydroelectric Project, Upper Tamakoshi Hydroelectric Project. This road has been upgraded to gravel surface by Upper Tamakoshi HEP during 2009-2011 in order to serve as the project access road. This access road to Singati bazar is unpaved road. During the monsoon season, it is difficult to drive any vehicle due to the muddy patch. It takes more than 5 hrs by bus to reach Singati bazar from the Dolakha bazar. This road also serves a number of hydro-electric projects that are under construction such as Upper Tamakoshi Hydro-electric project (456 MW), Khare Khola Hydro-electric Project (24 MW), Lower Khare Hydro-electric Project (11 MW) etc.

The objective of the proposal is to rehabilitae/upgrade the existing Dolakha - Singati Road Section following the design standards developed for feeder roads by the Department of Roads (DoR). The upgrading works will include widening of the road to a formation width of 6.5 m, geometric and grade improvements, improvements in slope stability through application of bio-engineering and upgrading the surface to Double Bituminous Surface Treatment (DBST) standard.

2.2 Relevancy of the IEE Study

The proposed road upgrading requires an Initial Environmental Examination (IEE) as per GoN, Environment Protection Act (EPA 1997) and Environment Protection Rules (EPR'97) 3, schedule 1(D)(6), the improvement of the standard, rehabilitation and reconstruction of feeder roads requires IEE. Thus, the IEE Study of the Proposal is a respect to mandatory requirement as per this provision. The approval of the IEE Report by the authorized agency, MoPIT is required before commencing the upgrading work.

2.3 Objective of the IEE

The main objective of this IEE Study is to identify the impacts of proposed project implementation on physical, biological, socio-economic and cultural environment of the sub-project area and propose mitigation measures to avoid or mitigate such impacts.

The specific objectives of the proposed IEE study include to:

- identify the major issues that may arise as a result of proposed works on bio-physical, socio-economic and cultural environment of the project area,

- recommend practical and site specific environmental mitigation and enhancement measures, prepare and implement environmental monitoring plan for the sub-project, and
- make sure that IEE is sufficient or not for the proposed road sub-project.

2.4 Anticipated Impacts by the Proposed Subproject

2.4.1 Impacts on Land Use

Being an existing feeder road with right of way already acquired by the Government, there will be no permanent impact on land use due to proposed upgrading work.

2.4.2 Adverse Impacts on the Environment, Impact on Human Life, and Population Pressure

The predicted environmental and social impacts will be both beneficial and adverse. The impacts are described as below:

a. Beneficial Impacts

During the construction phase, the project activities will create employment opportunities to the poor, vulnerable and socially excluded people of the project area (a total of 38,000 skilled and 160,000 unskilled for total project construction period of 24 months). The project provides construction work skills and technical know-how to the local workers.

During operation phase, an improved road access will bring an improvement of food security situation and overall economic and social stability. The road will also provide cheap, safe and fast transport of goods and services from rural areas to urban centers and vice versa. The farmers will be more encouraged to increase agricultural production due to market accessibility. This will contribute significantly to increase the productivity in rural areas and eventually improve the overall socio-economic condition of the people.

b. Adverse Impacts

During Construction Phase

Physical and Cultural Impacts:

As the road is already in operation and there will be not much adverse impact on physical and cultural environments. However, in some places where the road width is insufficient, 10 private temporary sheds (4 residential, 5 residential & commercial, 1 kitchen shed) needs to be acquired. Other adverse impacts due to road upgrading work are slope instability due to fresh cuts, dumping of spoil and operation of quarry sites.

Biological Impacts:

As this is upgrading project, there are limited risks for significant impacts on forests, terrestrial and aquatic fauna and flora. About 150 trees from community forests and about 50 trees from private land may be required to be felled down. There is also possibility of disturbance to wildlife due to construction activities, hunting and harassment by construction workers.

Socio-economic Impacts:

Other impacts during upgrading activities are occupational health/safety risks to labors and the public in general. Dust emission, pollution of water, poor sanitation, road and work site



accidents, sexually transmittable diseases, social conflicts and other pressures on the local communities are other impacts due to road upgrading work.

Availability of money to local labor, and influx of labor from outside the area can lead to conflict situations such as increase in alcohol consumption, gambling, prostitution and girl trafficking. Such problems persist or even increase during the operation phase and need special attention.

▪ During Operation Phase

During operation phase, slopes along the road alignment and nearby areas may be destabilized due to rain, de-vegetation of the area, soil extraction and quarry operation on unstable slopes. Roadside drains will cause erosion of downhill agriculture land. Haphazard spoil disposal will cause damage to adjacent agriculture fields and settlement.


2.4.3 Damage to be suffered by local goods or objects

Altogether 10 private structures (temporary sheds) will be affected due to the implementation of the proposed subproject.

2.5 Review of Acts/Rules, Plans/Policies, Guidelines, Standards, and Conventions

In Nepal, various legal instruments are in place to ease the integration of environmental aspects in development proposals. The study team has reviewed, but not limited to the following legislative provisions and guidelines of Nepal.

Table 2.1: Review of Environmental Acts, Regulations and Guidelines

SN	Environmental Acts, Regulations and Guidelines	Description of Requirements
1	Constitution of Nepal	The Constitution of Nepal provisions the right for every person to live in a clean environment. Article 30[1] also provisions that the State shall make necessary arrangements to maintain the natural environment. The State shall give priority to special protection of the environment, and rare wildlife, and prevent further damage due to physical development activities, by increasing awareness of the general public about environmental cleanliness.
2	The Thirteenth Plan (2013/14-2015/16) 	The Thirteenth Plan (2013/14-2015/16) has identified EIA as a priority area, and it emphasizes on environmental monitoring of the projects that are under GoN EIA process. The Plan focuses on the need for setting-up national environmental standards with the strategy of internalizing environmental management into the development programmes. The Plan has also realized to carry out Strategic Environmental Assessment (SEA) with the long term policy of promoting environmental governance. The Plan emphasized on the local participation in environment conservation, according to the Local Self Governance Act 2055, through the local bodies and making them responsible and capable to manage local natural resources.
3	Environment Protection Act, GoN, 2054 BS (1997)	Any development project, before implementation, shall pass through environmental assessment, which may be either IEE or an EIA depending upon the location, type and size of the

		projects.
4	Environment Protection Rule, GoN, 2055 BS (1997 AD) (amendment, 2064 (2007))	The EPR and its schedules clearly provide various step-wise requirements to be followed while conducting the IEE study. It also obliges the Proponent to timely consult and inform the public on the contents of the proposal and IEE study.
5	Forest Act, 2050 BS (1993 AD) (amendment, 2007), GoN	Requires decision makers to take account of all forest values, including environmental services and biodiversity, not just the production of timber and other commodities. It includes several provisions to ensure development, conservation, management, and sustainable use of forest resources based on approved work plan.
6	Forest Rules, GoN, 2051 BS (1995 AD)	Elaborates legal measures for the conservation of forests and wildlife. Expenses incurred for cutting trees and transportation shall be borne by proponent.
7	Forest Policy, 2071 BS (2014 AD)	The Forest Policy, 2071 has emphasized forest conservation, management and their sustainable use through people's participation. The long term objective of the forest policy are to meet people's basic needs for fuel-wood, timber and other forest products on sustainable yield basis; to protect land against degradation; and to conserve the ecosystems and genetic resources. The Three Years Interim Plan has taken the policy for people's participation in sustainable management and utilization of the forest resources. The plan has taken the objective of sustainable management of forest, vegetation, watershed and biodiversity to maintain balanced environment, to provide continuity in supply of forest products so as to create employment opportunities by promoting forest based industry and enterprises and to develop internal market and promote export. Activities related to forestry development, soil conservation and watershed management, and biodiversity conservation will be implemented continuously with public participation.
8	Nepal Biodiversity Strategy, 2059 BS (2002 AD)	<p>The Nepal biodiversity strategy, adopted by GoN in August 2002, specifies the implementation of EIA process in accordance with the provisions of EPA 1997 and EPR 1997 to assess the impacts of development activities on biodiversity. The strategy has given emphasis on ensuring effective implementation of the existing laws regarding EIA.</p> <p>The National Biodiversity Strategy plan describes the protection and wise use of the biologically diverse resources of the country, the protection of ecological processes and systems, and the equitable sharing of all ensuing benefits on a sustainable basis for the benefit of the people and to honour obligations under the Convention on Biological Diversity. Biological diversity in Nepal is closely linked to the livelihoods and economic development of most of her people, and relates to agricultural productivity and sustainability, human health and nutrition, indigenous knowledge, gender equality, building materials, water resources, and the aesthetic and cultural well-being of the society.</p>
9	Batabaraniya Nirdesika (Nepal; MLD), 2057, GoN	The directive is focused in the practical implementation of small rural infrastructures through the minimization of environmental impacts. This directive includes the simple methods of environmental management in the different phases of the project cycle.

10	National Park and Wildlife Conservation Act, 2029 BS (1973 AD), GoN	Addresses for conservation of ecologically valuable areas and indigenous wildlife. The Act prohibits trespassing in park areas, prohibits wildlife hunting, construction works in park area, damage to plant and animal, construction of huts and house in park area without permission of authorized person. It lists 26 species of mammals, 9 species of birds, and 3 species of reptile as protected wildlife.
11	Child Labour Prohibition and Regulation Act, 2056 BS (2000 AD)	Section 3 of the act prohibits a child from engaging in work, sub clause 1 of the clause 3 states "Nobody shall engage in work a child who has not completed fourteen years of age as a labour and sub clause 2 states "Nobody shall engage a child in a risk full occupation or work set forth in the Schedule". The section 4 states "Child not to be engaged in work against his will by temptation or fear or pressure or by any other means".
12	Labour Act, 2049 BS (1992 AD)	<p>According to the Labour Act 1992, section 4 on employment of workers and employees, and sub-section 3 on workers or employees engaged in any contract work of a permanent nature in any enterprise shall also be made permanent under subsection (2).</p> <p>Workers or employees engaged in any work as mentioned in subsection (3) shall be paid benefits provided for in this Act according to their post and scale. Notwithstanding anything contained under subsections (2) and (3), in the event that any establishment is required to increase production or service for a short period of time, it may appoint workers or employees according to need for a certain period by specifying such a period.</p> <p>Under section 5, no child shall be employed in any establishment. Except in prescribed circumstances, minors and women may ordinarily be employed for the period from 6 a.m. to 6 p.m. Women may be employed like men after making appropriate arrangements on the basis of mutual agreements between the general manager and the employees or workers in question.</p> <p>The Labour Act shall be followed in all the works carried out under the Project.</p>
13	Ancient Monument Act, 2014 BS (1957 AD)	The Ancient Monument Act, 1957, is enacted to integrate the conservation and protection of ancient monument and archaeological properties. The section 3 of this Act obliges the government to identify the importance of the historical monuments, renovate those monuments and protect such places. Any works that attracts this Act shall be dealt accordingly to this Act.
14	Local Self Governance Act, 2055 (1999) and Regulation, 2056 BS (1999 AD), GoN	Empowers the local bodies for the conservation of soil, forest and other natural resources and implements environmental conservation activities
15	Land Acquisition Act, 2034 BS (1977 AD), GoN	The Land Acquisition Act (1977, as amended 1993) guides the compulsory acquisition of land. GoN can acquire land at any place and in any quantity by giving compensation pursuant to the Act for the land acquired for any public purpose(s) or for operation of any development project initiated by GoN institutions (Section 3 and 4).
16	National Environmental	Provides guidance to project proponent on integrating

	Impact Assessment Guidelines, 2050 BS (1993 AD), GoN	environmental mitigation measures, particularly on the management of quarries, borrow pits, stockpiling of materials and spoil disposal, operation of the work camps, earthworks and slope stabilization, location of stone crushing plants etc.
17	Aquatic Animals Protection Act, 2028 BS (1961 AD)	This Act recognizes the value of wetlands and aquatic animals. Any party is punishable for introducing poisonous or explosive materials into a water source or destroying any dam, bridge or water system with the intent of catching or killing aquatic life. It also defines "private water" as a lake, pond, ditch, pool or reservoir that is on land used by a person who has been paying land tax to the government.
18	Water Resources Act, 2048 BS (1992 AD)	The Water Resources Act, 1992 empowers the government and the private sector to make necessary arrangements for the rational utilization, conservation, management and development of water resources. The Act provides an opportunity to minimize pollution, and to prevent adverse environmental impacts during the utilization of the water resources. The Act also provides for a committee as prescribed for the settlement of disputes regarding the usage of water resources.
19	Public Roads Act, 2031 BS (1974 AD)	Empowers DoR to temporarily acquire the land and other property adopting compensatory measures during the construction, rehabilitation and maintenance of the public roads according to the Act (Article 14 & 15). The Act also empowers the DoR to operate quarries, borrow pits and other facilities during the road construction (Article 17). In sum, the Act facilitates the acquisition of land and property for the extraction of construction materials and development of other facilities as well as to maintain greenery along the roadside with adoption of compensatory measures.
20	Reference Manual for Environmental and Social Aspects of Integrated Road Development, 2060 BS (2003 AD), GoN	Suggests stepwise process of addressing environmental and social issues alongside the technical, financial and others
21	The Environmental and Social Management Framework (ESMF), DoR/GESU, 2065 BS (2008 AD)	<p>The ESMF is prepared to compile in an overview and guidance manner, various safeguard and compliance aspects of environmental and social issues related with the road construction and development.</p> <p>It intends to provide technical and managerial inputs and guidance into the design of the strategic roads (both designated for rehabilitation and, to lesser extent, to new construction), through identification of key environmental and social issues related to the foreseen projects, mitigate potential impacts and concerns and, devise opportunities to enhance the benefits. The framework integrates in a step-wise approach the most important environmental and social considerations into all stages of project preparation, implementation, monitoring and operation.</p>
22	Motor Vehicle and Transportation Management Act, 2049 BS (1993 AD), GoN	This act sets standard for vehicles emission and mechanical condition for vehicle registration by the transport management office (TMO) and the TMO can deny a permit based on environmental factor. Standards are set for petrol and diesel engines under the Nepal vehicle mass emission standard 1999.

23	Soil and Watershed Conservation Act, 2039 BS (1982 AD)	The Act makes provision to control floods landslides (watershed conservation rules, 1985). The watershed conservation office is authority and district watershed conservation committee must implement watershed conservation practices and public participation for soil and land protection.
24	Forest Products Collection and Sales Distribution Guidelines, 2058 BS (2001 AD)	Clause 3 to 10 of the Guideline have specified various procedure and formats for getting approvals for vegetation clearance, delineation of lands for vegetation clearance, evaluation of the wood volume etc. and government offices and officials responsible for the approval, delineation and valuation.
25	Safeguard Policy Statement, 2009 AD, ADB.	ADB's Safeguard Policy Framework consists of three operational policies on the Environment, Indigenous people and Involuntary resettlement. It requires that (i) impacts are identified and assessed early in the project cycle, (ii) plans to avoid, minimize, mitigate or compensate for the potential adverse impacts are developed and implemented and (iii) affected people are informed and consulted during project preparation and implementation.
26	Environmental Assessment Guidelines, 2003 AD, ADB	Requires that environmental considerations be incorporated into ADB operations where environmental assessment is the primary administrative tool to integrate environmental considerations into decision-making of all types of development initiatives
27	Land Acquisition, Resettlement, and Rehabilitation Policy for Infrastructure Development Project, 2072 BS (2015 AD)	<p>This policy has provided clear guidelines to screen, assess, and plan land acquisition and resettlement aspects in development projects. The policy has the following major guiding principles:</p> <ul style="list-style-type: none"> • Involuntary resettlement should be avoided where feasible or minimized, exploring all available alternative project design. Where it is not possible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources; • Appropriate and adequate compensation for the loss of assets or income is a fundamental right of affected person; • Physically displaced people must be relocated with facilities such as school, health post, drinking water, security etc.; • Vulnerable groups such as Janajati/Adivasi, Dalits, landless, women, especially women-headed households, poverty groups and senior citizens are entitled to special benefit and assistance packages in addition to compensation and resettlement; • 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.

Other Guidelines and Manuals

The following guidelines were reviewed and applied during the preparation of the report.

(a) Environmental Management Guidelines, GESU/DoR, 2056 BS (1999 AD)

Environmental Management Guidelines, GESU/DOR, July 1999 have been prepared as part of the program undertaken jointly by GoN and the World Bank under the Road Maintenance

and Rehabilitation Project. These Guidelines are formally approved by Minister level decision on Kartik 22, 2053 BS (1997). The Guidelines are the part of operational practices for all road maintenance, rehabilitation and construction activities under DOR. The guideline consists of environmental mitigation measures to be incorporated into DOR Subprojects, procedures for public participation, and socio-economic considerations. The environmental mitigation measures are broken down into twelve categories including (i) quarries; (ii) borrow pits; (iii) spoil and construction waste disposal; (iv) work camp location and operation; (v) labour camp location and operation (vi) earthwork/slope stabilization (vii) use of bitumen (viii) stockpiling of materials (ix) explosive, combustible and toxic materials management (x) setting up and operation of stone crushing plants (xi) water management (xii) air and water pollution.

Implementation methods for undertaking mitigation measures for each of the activities are also given in the guideline. The Guideline suggests methods for determining how and when the public should be included in the environmental analysis. The guidelines also advise on socio-economic impacts and strategies for reducing or avoiding the potential negative impacts and for maximizing the beneficial impacts to local residents. The socio-economic impacts include important issues of land acquisition and compensation and other economic impacts with markets for agriculture production, agriculture inputs, nutrition, extraction of natural resources beyond replenishment, migration and influx of migrants, land speculation, illegal logging and mining, portering, etc. It also includes impacts on cultural heritage.

(b) Public Work Directives, 2059 BS (2002 AD)

The directives allows contractor to choose any quarry site for construction material provided that the material conforms to the specifications. Project manager should examine the operation condition, legal status, quality and potential yield of these sites. The contractor should obtain license from coordination with Department of Mines and Geology, DDC, DFO, Municipality and VDC. The directive also mentions that quarry site in environmentally sensitive area cannot be accepted.

Standards

The DoR has issued several Standards for the environmental management of road Subprojects, including the EIA Guidelines for the Road Sector (1997), which was prepared under the broad framework of the National EIA Guidelines (1993). This publication sets out environmental assessment requirements for road construction and upgrading Subprojects. Schedule 1 of these Guidelines, relating to the level of assessment required for different Subproject types, is almost identical to the 1997 Environment Protection Rules.

(a) National Ambient Air Quality Standards, 2069 BS (2012 AD)

The National Ambient Air Quality Standards, 2012 enforced by GoN has set quality standards for seven parameters: total suspended particles (TSP), particulate matter (PM₁₀), sulphur dioxide, nitrogen oxide, carbon mono-oxide, lead and benzene for the maintenance of the ambient air quality. The project during its construction and operation will have to comply with the set standards for the ambient air quality.

(b) National Standard about Noise Level 2069 BS (2012 AD)

Government of Nepal has formulated noise level standard for different area for day and night time. Environment Department has been established under the Ministry of Population and Environment for monitoring the environmental condition.

(c) Nepal Vehicle Mass Emission Standard, 2056 BS (2000 AD)

Nepal Vehicular Emission Standard, 2000 enforced for the vehicles operating on petrol, gas, and diesel. The emission standards are very specific for two, three and four wheeler vehicles. The vehicles used by the project should comply with the vehicular emission standards during the construction and operation phase.



International Conventions and Treaties

(i) Convention on Biological Diversity, 2049 BS (1992 AD)

The Convention on Biological Diversity was signed by Nepal at Rio de Janeiro on June 12, 1992. The convention, and particularly Article 14 provides a broad framework on the need for carrying out EIA to minimize adverse impacts of the projects and programs on biodiversity.

(ii) The Convention on International Trade in Endangered Species of Wild Fauna and Flora, (CITES), 2053 BS, amended 2059 BS (1973 AD, amended 1979 AD)

Nepal became party to CITES in 1975. CITES has facilitated international co-operation to regulate international trade in endangered wild flora and fauna with the aim of reducing or eliminating trade in species whose numbers or conditions suggest that further removal from their natural habitat would lead to their extinction. The National Parks and Wildlife Conservation (NPWC) Act, 1973 regulates the trade of species listed in CITES appendices. The Government has designated the Natural History Museum (Tribhuvan University) and the Department of Plant Resources as the scientific authorities for wild fauna and wild flora respectively. Similarly, the Government has designated the Department of National Parks and Wildlife Conservation and the Department of Forest as the management authorities for wild fauna and flora respectively. The Convention urges Parties not to allow trade in specimens of species included in the CITES Appendices I, II and III except in accordance with the provisions of the Convention.

(iii) United Nations Framework Convention on Climate Change (UNFCCC), 2049 BS (1992 AD)

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. This amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.

(iv) Convention (No.169) Concerning Indigenous and Tribal Peoples in Independent Countries, 2046 BS (1989 AD)

Article 7 of the convention provides the right to the indigenous and tribal people to decide their own priorities for the process of development. However, for the national development plans and programs, it mandates consultation with them in the formulation of the plans and programs. Articles 12, 13, 14 and 15 safeguard rights of the indigenous people in the land and natural resources in territories traditionally occupied by them. In the event that the state retains the right of the natural resources in their territories, it mandates formulation of special provisions under the state legislation for their participation in the decision making process and resettlement process with full compensation of the resulting loss or injury (Article 16). As Nepal is signatory to the convention, it is obliged to comply with the provisions stipulated in the conventions, if the project is to impact the safeguard rights of the indigenous people.



CHAPTER 3

3. DESCRIPTION OF THE PROPOSAL

This chapter contains a detailed description of the environmental and social setting in the subproject area, forming the basis for the impact analysis and the elaboration of mitigation measures, as well as serving as background information for monitoring and auditing the project's effects on the physical, biological and socio-economic and cultural environment after completion of works.

3.1 Type of Proposal

3.1.1 Type of Goods to be Delivered

The work includes civil works, slope protection and tree plantation, social development and environmental protection activities. The final output of the Project is a 34.490 km intermediate lane blacktopped all weather road with 3.75 metre carriageway, and 0.75m shoulder on hillside and 1.0 m on valley side, added with required longitudinal and cross drainage works. The construction will be completed in two years from commencement date.

3.1.2 Proposal's Capacity

The road is designed to confirm the feeder road standards. After upgrading, the road is anticipated to serve traffic levels from 217 vehicles per day in 2017 to 829 vehicles per day in twenty years. The cumulative ESA over 15 years for the intermediate lane road is estimated at 0.381 million.

3.2 Salient Features of the project

Table 3.1: Salient Features of the Sub-project Road

Name of the Project	Earthquake Emergency Assistance Project (EEAP)
Name of the Subproject	Dolakha-Singati Road Upgrading Work
Affected Municipalities/VDCs	Bhimeshwor Municipality, Suspa Kshyamawati, Sundravati, Sunkhani, and Lamidanda VDCs
Major Settlements	Pakhalati Bazaar, Chathali, Suspa, Katuwachaur Gaun, Thumka gaun, Soti Bazaar, Chaughare Gaun, Mel Danda Gaun, Bhadaure Gaun, Sisa Golai, Syaule bazaar, Jhamarsi gaun, Banchare Gaun, Chapleti gaun, Singati bazaar
LOCATION	
Start Point	Dolakha Bus stop
End Point	Singati bazaar
GEOGRAPHICAL FEATURES	
Terrain	Mountainous

Alignment	Hill/Ridge
Altitude	1741.00 m at Dolakha Bazaar, Bhimeshwor Municipality and 961.00 m at Singati Bazaar, Lamidanda VDC
Climate	sub-tropical
Road Type	
Classification of road	Feeder Road, Class IV
Length of Road	34.490 km
Type of Pavement	DBST
Standard of Pavement	Overseas Road Note 31 (RN 31) and/or AASHTO design method
Design Parameters	
Design Speed	30 km/hr
Right of Way	30 m (15 m either side from the centre of road)
Carriageway Width	3.75 m
Total Formation (Road Way) Width	6.5 m (Intermediate lane, with 0.75 m shoulder on hill side, 1.00 m shoulder on valley side)
Shoulder Width	0.75 m on hill side, 1.00 m on valley side
Camber of Carriage way	3%
Camber of Shoulder	3%
Minimum Length of Vertical Curve	
Maximum Grade Change	12 %
Minimum Length of Vertical Curve	120 m
Gradient	
Maximum Gradient	12 %
Exceptional Gradient	12 %
Maximum Gradient at Bridge Approach	6%
Maximum Average Gradient	6%
Maximum Length of Grade in Excess of 7% and up to Maximum Gradient at a time	300 m
Minimum Length of Recovery at Grade Specified	150 @4%
Hairpin Bends	
Design Speed	15 km/hr
Min. spacing between centers of bends	100 m

Maximum Gradient	5%
Minimum Gradient	0.5 %
Maximum super elevation	7%
Minimum Radius of Curve	12.5 m
Total Project Cost	NRs. 1,318,825,895.46 including VAT

Source: Detail Design Report, TPPF, 2016

3.3 Brief Description of the project area and works

The road starts from Dolakha Bazaar in Bhimeshwor Municipality and ends at Singati Bazaar in Lamidanda VDC of Dolakha district, Janakpur zone of Central Development Region of Nepal. The project road is the gateway to national pride Hydroelectric Project Upper Tamakoshi HEP. Initially, the road has been constructed under rural road concept by Food for Work Programme under World Food Programme. Later on this road has been upgraded to gravel surface by Upper Tamakoshi HEP in order to serve as the project access road. The start of the road (KM 0+000) is at Dolakha Bus Park, and it ends at the bridge over Singati River at Singati Bazar (KM 34 + 490). The road runs along the hilly slope above the right bank of the river Tamakoshi, with various land use pattern, mostly cultivated land, forest and settlements.

The road elevation at start point is 1741.00 m and 961.00 m amsl at the end point at Singati Bazaar. The highest elevation along road is 1815 at km 1+500. The road passes through Bhimeshwor Municipality, and four VDCs namely Suspa Kshyamawati, Sundrawati, Sunkhani and Lamidanda. The major settlements along the road are Dolakha Bus stop at start point, Katuwachaur Gaun at Km 13+650, Thumka gaun at Km 15+500, Soti Bazaar at Km 16+550, Chaughare Gaun at Km 18+100, Mel Danda Gaun at Km 18+800, Bhadaure Gaun at Km 20+800, Sisa Golai Gaun at Km 21+400, Syaule bazaar at Km 25+100, Jhamarsi gaun at Km 26+400, Banchara Gaun at Km 30+550, Chapleti gaun, at km 31+950, Singati bazaar at Km 34+300.

3.4 Key Upgrading Activities

The proposed project involves key upgrading activities including geometry improvement, pavement upgrading, drainage improvement, retaining structures; slope protection/stabilization, other off-road works, and works on traffic management and road safety. Proposed cross-section of the road is given in the Annex 5.

Geometry Improvement: This involves widening of road width to 5.5 m to meet the design standards including sections along rock falls, landslides, religious and cultural sites, markets, and built-up areas. Along selected major built-up areas and market fronts consideration has been made in the design to widen the road to full width.

Pavement upgrading: The road pavement activities involve strengthening, resurfacing and partial reconstruction on existing sections including new construction on re-aligned sections. It also covers shoulder improvement and sealing of shoulder on hill side for the road. As part of its upgrading, full pavement with Double Bituminous Surface Technique (DBST) is

designed for this road. Generally, the road sections are assumed to fall under two subgrade strength categories as per TRL: S3 (5-7%). Base and sub base are to be constructed with granular unbound material.

Drainage Improvement: This involves lining of side drains, improvement of existing natural drainage systems, culverts and causeways and construction of new culverts and causeways, and side drains along main market fronts. The road has earth ditches at places for side drainage and cross-drainage works comprising minor bridge, pipe culverts and causeways.

Table 3.2: Summary of Cross Drainage Structures

SN	Description	Quantity	
		No	Length (m)
1	New Culvert Installation	37	370
2	Extension of existing culverts	40	193
3	Replacement of smaller culvert with 900 dia	82	820
4	Replacement of 300 irrigation pipe with 600	6	60
4	Repair and improvement of Causeway	5	50

Source: Detail Design Report, Dolakha – Singati Road, 2016

Retaining Structures: This involves construction of new retaining structures including repair/rehabilitation of existing ones.

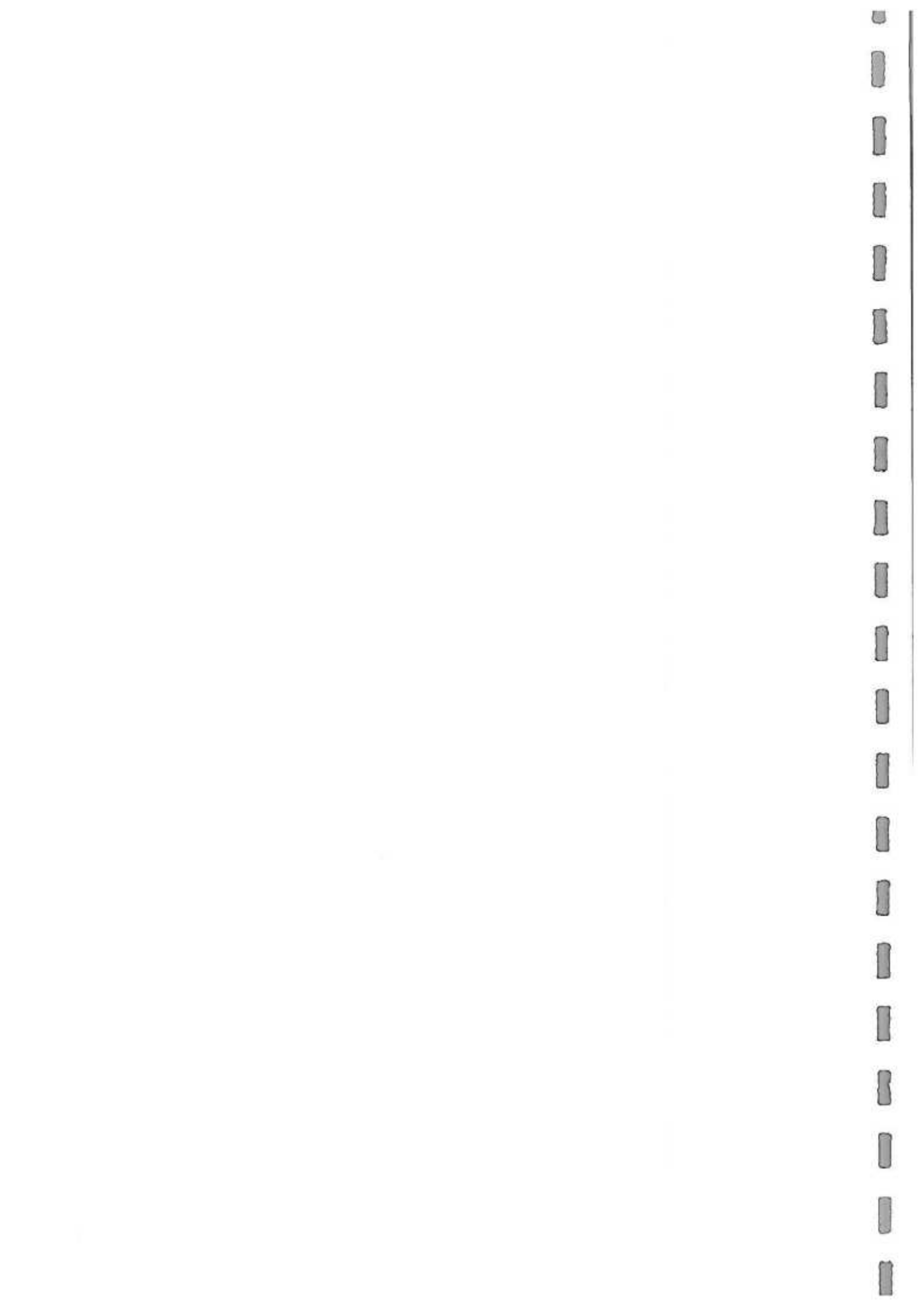
Slope protection/stabilization: This involves landslide stabilization and slope protection activities. Both civil engineering and bioengineering activities have been proposed in approximately 22,292.45 square meter area.

Road Safety Measures: This includes provision of signs, delineators, barriers and pavement markings, minor realignment at identified black spots including pedestrian foot paths in market areas. No existing posts, traffic signs and delineators exist in this road. The project has proposed for installation of 34 posts, 627 traffic signs and 1312 delineators.

Bridges: This road section has two (2) number of bridges including one Bailey bridge over Kuthali Khola of length 35m at km 6+700, 19 m single span RCC Bridge over Gumu Khola at km 29+350 and project road ends at the start of Singati Steel Truss bridge over Singati khola at Km 34+650. No new bridges are proposed under the proposed upgrading works.



Initial Environmental Examination Report on Dolekha-Singati Road



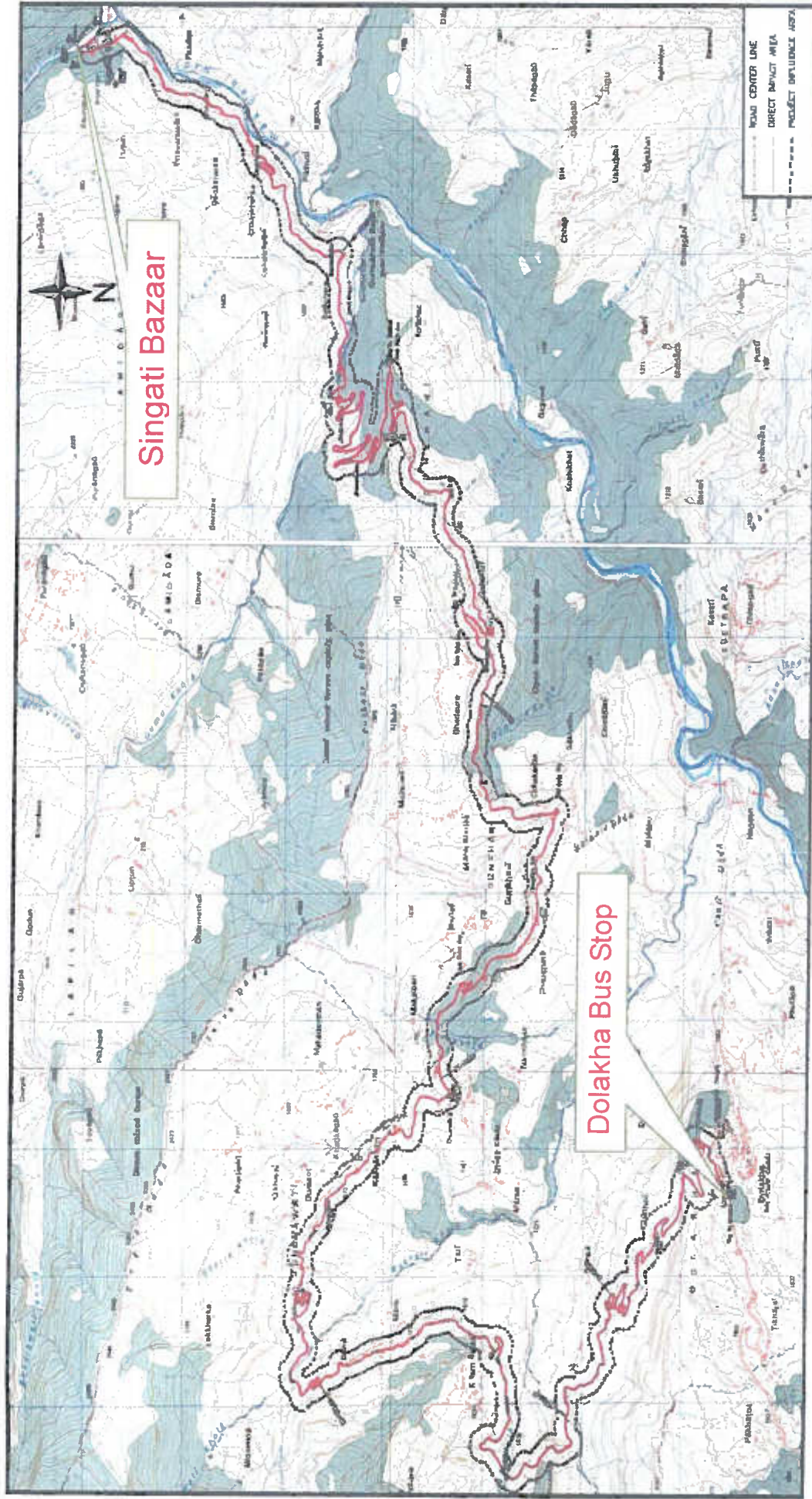
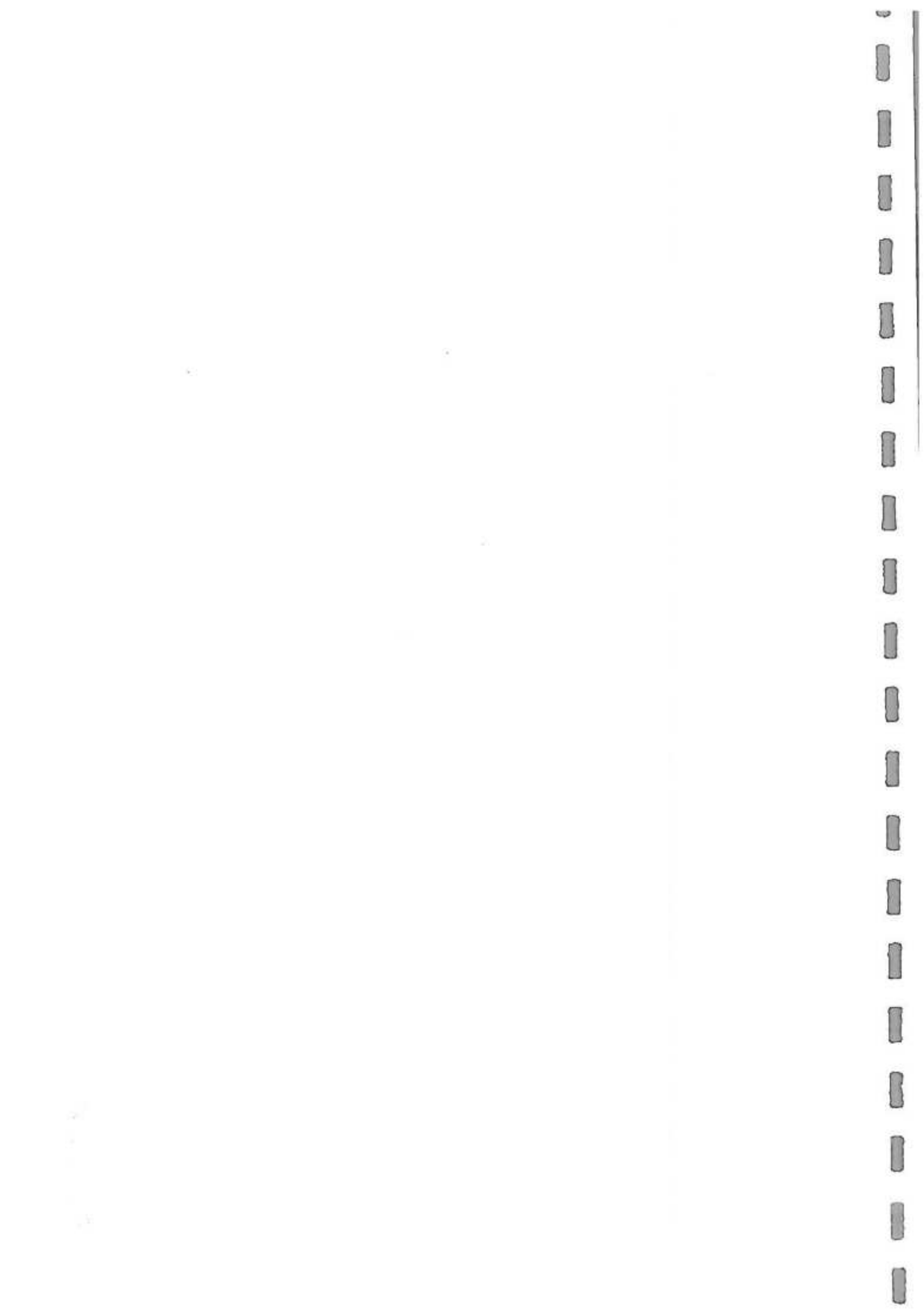


Figure 3.2: Road Alignment Map of Dolakha-Singati Road



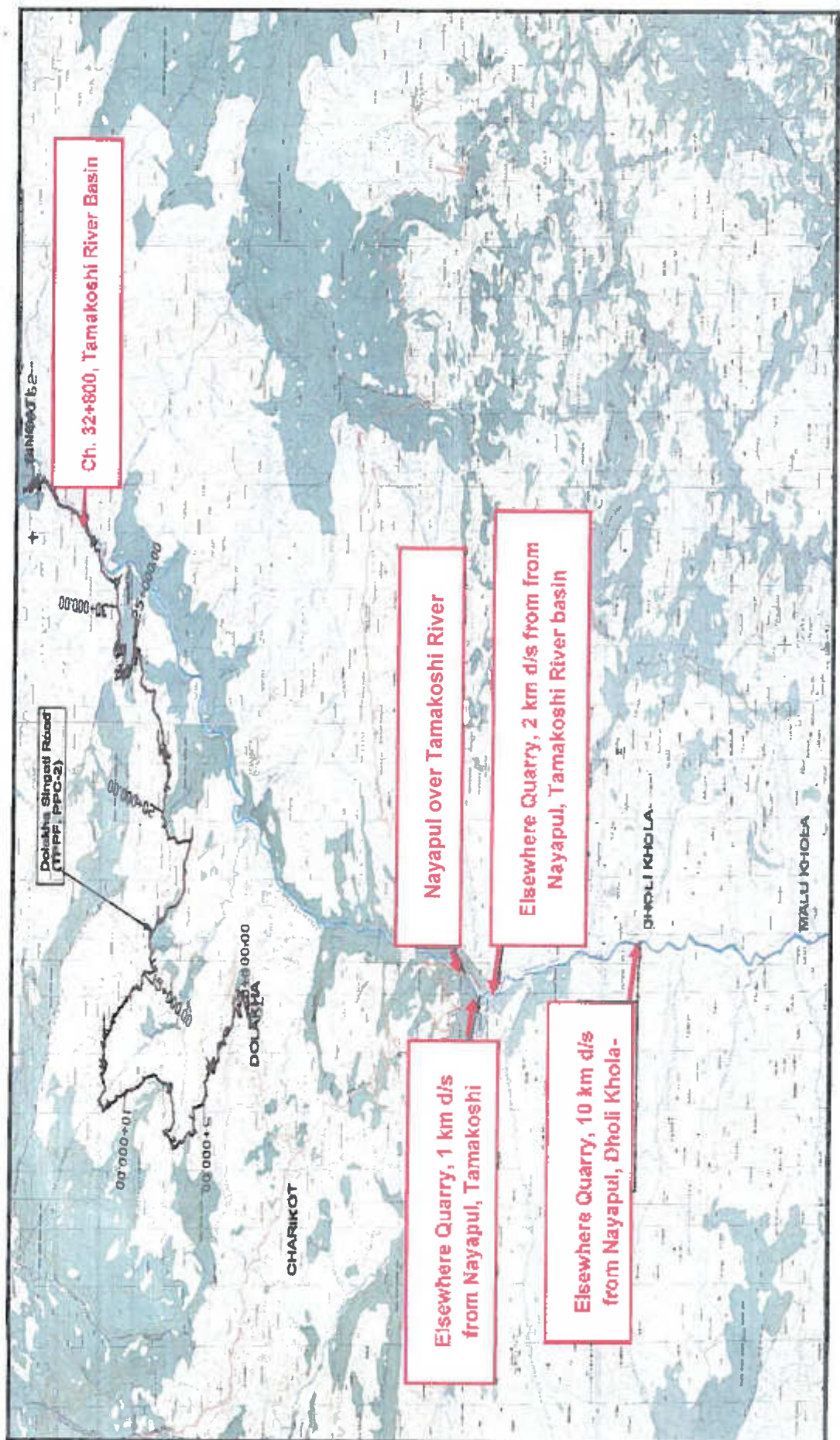
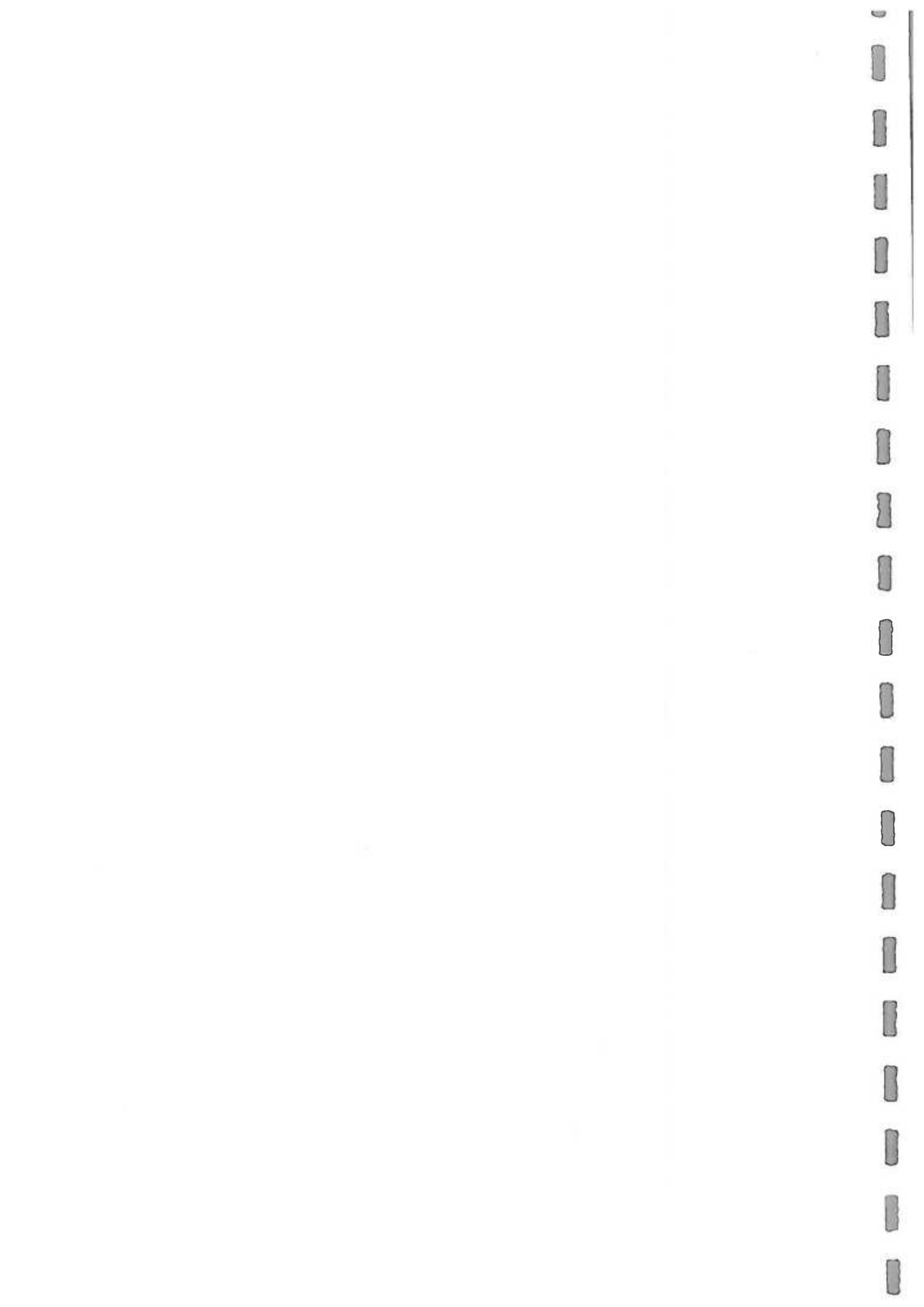


Figure 3.3: Location Map of Probable Quarry Sites



3.5 Materials to be used

The materials to be used in the Subproject works are presented in Table 3.3.

Table 3.3: Summary of Estimated Quantities of Materials

Item Description	Unit	Quantity
Earthwork Excavation	cu.m.	121,665.00
Boulders for soling, random rubble masonry, dry rubble masonry and gabion boxes.	cu.m.	23802.00
Concrete class M10/40	cu.m.	2153.00
Concrete class M20/20	cu. m.	2925.00
Concrete class M25/20	cu. m.	50.00
Concrete class M15/20	cu.m.	2196.00
Gravel as filter material	cu.m.	800.00
Common back fill material	cu.m.	500.00
Reinforced concrete pipe (NP3, 90Ø; NP2, 60Ø, 45Ø)	RM	1638.00
Reinforcement steel	MT	131.67
Formwork materials	sq.m.	23,823.00
Gravel materials for sub base	cu.m.	41,696.00
Base materials	cu.m.	33,017.00
Bitumen for DBST	lit	518,960.00

Source: Detail Design Report of Dolakha-Singati Road, 2016

3.6 Emissions Resulting from Implementation of the Proposal

Solids: There will be estimated 109,257 cu. m. of materials to be excavated and dumped as spoil.

Noise: The expected noise level along the road is low (maximum 50 dBA) as the traffic is low during the dry season. During upgrading, the movement and operation of construction plant and equipment will increase noise level to some extent. However, by applying mitigation measures, the noise level is expected to be within acceptable level.

Dust: The dust level in the air is observed generally to be low, except during passing of occasional vehicles along the road. The upgraded road will have sealed bituminous layer, and hence the dust emission will be controlled.

3.7 Energy to be used

Mainly diesel and petrol are used for the construction work; LPG and kerosene for labor camp. All such energy demands will be fulfilled by the contractor from outside the project area so as not to create pressure on local fuel demand. The project strictly prohibits illegal extraction of fuel wood.

3.8 Details on the technology

The technology used for the construction work will be both machine and labor based. Machine based method is mainly used for specialized works like use of vibrator for surface laying and compacting, use of distributor for laying and use of compactor for finishing.

bituminous seal etc. whereas labor is mainly employed for the manual work like earthwork, construction of side drain, bioengineering etc.

3.9 Manpower Requirements

For total project construction period (24 months) work force required for the project works is estimated at approximately 38,000 skilled and 160,000 md unskilled laborers.

3.10 Resources required for the implementation of the proposal

The total estimated cost for road upgrading project is estimated to be NRs 1,318,825,895.46 including contingency and VAT.

3.11 Construction planning, Construction schedule

The detailed design and preparation of bid documents for EEAP roads has been carried out under TPPF/PPC-2. The construction work is expected to begin at the third quarter of 2016. A 24 month construction period is estimated followed by a 12-month defects liability period enabling the completed project road to be opened by 2019.

3.12 Sub-project Area Delineation

Direct Impact Area (DIA):

This project impact area includes all the areas where activities related to the road construction will take place. This area shall be studied in greater detail regarding the impacts on physical, biological as well as socio-economic and cultural environment. The areas within the RoW (30 m) of proposed road (15 m on either side from the center line of the road) are referred as Corridor of impact (Col) in this Report. The area, within which upgrading work is carried out, is referred as formation width (6.5 m). It includes Bhimeshwor Municipality (wards 2, 3), Suspa Kshyamawati (ward 5), Sundrawati (wards 2, 3, 7 & 9), Sunkhani (wards 1, 2, 4, 5, 7 & 9), and Lamidanda (wards 6 & 7) VDCs.

Indirect Impact Area (IIA):

In this area, physical and biological environment will probably experience minimal impacts. However, influx of labor from these areas may affect the socio-economic and cultural environment of the project area. The concerned municipality, VDCs and areas within 200 m from the center line of road on either side are referred as Indirect Impact area (IIA) in this study.

Zone of Influence (Zoi):

The zone of influence of project road consists of one municipality and four affected VDCs falling within its alignment viz. Bhimeshwor Municipality, Suspa Kshyamawati, Sundrawati, Sunkhani, and Lamidanda VDCs.

Cumulative Impact Area (CIA):

This road is the gateway to the national pride hydroelectric project, Upper Tamakoshi HEP. Besides the important UTKHEP, there are numbers of other hydropower projects being identified and some under construction in the Tamakoshi valley and its tributaries Khare

Khola and Singati Khola. These projects, some under construction and others in the pipeline will bring induced impacts in the project area. A district road (Sunkhani-Kyanpa road) located at Ch. 21+430 on left hand side of the project road and there is an access road (Km. 32+790) to Tamakoshi crusher plant on right hand side.

3.13 Other necessary matters

Data requirement and study methodology

In order to meet the objectives of IEE, primary and secondary information were generated through field studies, and literature review. The primary data were collected employing the following techniques: focus group discussions, field observation, and walkover along the road alignment. Secondary information were collected from various documents, reports, maps, designs and cost estimates. The likely Impacts (both beneficial and adverse) were identified and/predicted by adopting the simple checklists and matrix methods outlined in the environmental guidelines. Based on the likely impacts in terms of its magnitude, duration and extent, the suitable mitigation measures have been designed. Similarly, Environmental Monitoring Plans have been prepared taking into consideration the types of impacts and suggested mitigation measures. Following approach and methodology were adopted during the IEE report preparation.

Methodology Adopted for IEE Study

Terms of Reference (ToR), submitted to the Geo-environment and Social Unit (GESU) of Department of Roads (DoR) for the IEE Study of Road upgrading, was approved by the Ministry of Physical Infrastructure and Transport (MoPIT) on 2072/09/16 BS. Based on approved ToR, IEE Study of the subproject Road has been conducted. The current Study has followed the procedures outlined in approved ToR. The major activities undertaken during the preparation of this report are as follows.

a. Desk Study

The study of the reports and documents relevant to the subproject were carried out to generate secondary data on physical, biological and socio-economic and cultural environment of the subproject area.

b. Field Survey

A walkover survey along the proposed road alignment was carried out during January, 2016 to collect information on the physical, biological and socio-economic and cultural environment of subproject area. Data on physical environment have been derived from available topographical map, site observation, and photographs, consultation with local communities and enquiring about the history of natural disasters like landslides and flooding in the area.

Information on the flora and fauna, Protected, Rare and Endangered species, sensitive habitats in the subproject area was noted through the responses by locals and observation during the site visit.

Socio-economic and cultural environment of subproject area was studied through various methods of secondary and primary data collection. These included literature review and other formal and informal information collection methods.

c. Data Processing

Primary and secondary data collected were processed through commonly used methods. Available maps were interpreted. The impacts of the proposed activities on bio-physical, social, economic, and cultural resources in the defined influence area were analyzed. The impacts were classified in terms of extent (site specific, local, and regional), magnitude (low, medium, and high) and duration (short term, medium term and long term) as well as nature (direct, indirect), reversibility (reversible, irreversible) and level (low, moderate, and significant). The likely impacts were assessed covering both adverse and beneficial ones.

d. Public Consultation

According to Rule 7 (1) of EPR, a 15 days Public Notice, seeking the written opinions from the concerned stakeholders and institutions on possible impacts from implementation of the Proposal, was published in **Annapurna Post**, a national daily newspaper on 26th of Pausa 2072 (see Annex 2.1).

Copies of the Public Notice were pasted at the offices of Municipality, VDCs, CFUGs etc., and a public deed of enquiry (*Muchulka*) was collected confirming the pasting of such notice. Some comments or suggestions from the concerned stakeholders and affected peoples were also collected.

e. Preparation of IEE Report

Based on the analysis of impacts and their nature, appropriate beneficial impacts augmentation measures and adverse impacts mitigation measures were prepared. Such measures were based on site-specific issues, past experience on similar projects, and expert judgments. Monitoring plan for the implementation of mitigation measures was prepared. This Report has been prepared in the format prescribed in EPR, Schedule 5 pertaining to Rule 7 of the EPR.

f. Time, Cost and Specialists Involved

Total time stipulated for the IEE study was twenty (20) weeks and the study has been carried out under Earthquake Emergency Assistance Project (EEAP). The budget for the IEE study is a part of consulting services for Project Preparatory Consultant under Transport Project Preparatory Facility (TPPF), PPC-2.

Study Team:

S. No.	Name	Position
1.	Shiv Shanker Karki	Environmental Specialist/Team Leader
2.	Prof. Dr. Vishnu Dongol	Geologist
3.	Shiv Prasad Dhakal	Sociologist
4.	Tito Khatriwada	Biologist
5.	Chintamani Sharma	Resettlement Expert
6.	Utsav Subedi	Highway Engineer

3.14 Description of existing environment (Baseline Information)

Baseline information on the existing physical, biological as well as socio-economic and cultural environment of the proposed sub-project are described in this section.

3.14.1 Physical/Chemical Environment

a. Road Environment

Physiographic ally, the proposed road subproject lies in mid-hills region. The road starts from Dolakha Bazar at an elevation of 1,741.71 m amsl of Bhimeshwar municipality and ends at Singati Bridge in Lamidanda VDC at an elevation of 967.40 m amsl. This sub-project lies in subtropical region. The average maximum and minimum temperature of the district is 28°C and 7°C respectively. The average annual rainfall in the district is 2043.50 mm.

b. Topography and Soils

The sub-project area lies in the central mid-hills of Nepal. The topography of sub-project area is characterized by valley, ridges and hill slopes. The road alignment follow on the hilly terrain from Adlakha to Singati and some very negligible portion of the road alignment is passing on river valley of the Tamakoshi Khola. The road alignment passes through cultivated land, forest and bushes and villages such as Kuthali, Rampa, Chathali, Suspa, Kshemawati, Sundrawati, Mel Danda, Sunkhani, etc.

c. Geology

The road alignment passes on the rocks of the Ulleri and Seti formations of the Midland Group, Eastern Nepal (Figure 3.4). In the road alignment, the rocks of the Ulleri Formation are represented by augen gneiss and feldspathic schist, whereas the rocks of the Seti formation are mainly composed of grey to greenish-grey phyllites and quartzite. At the surface, colluvial deposits and rocks are predominantly found along the road. The road alignment passes through weathered rocks of phyllite to gneiss and colluvium to alluvium deposits. Thickness of colluvial range 2 to 5 m and alluvial deposits more than 5 m. Approximately, 31% of road alignment passes through cultivated land, about 42% passes through alluvial to colluvial deposits (boulder mix soil), about 13% over soft phyllitic to gneiss weathered rock mass and remaining 14% over fresh to slightly weathered and slightly fractured hard rock of phyllite to gneiss with quartzite.



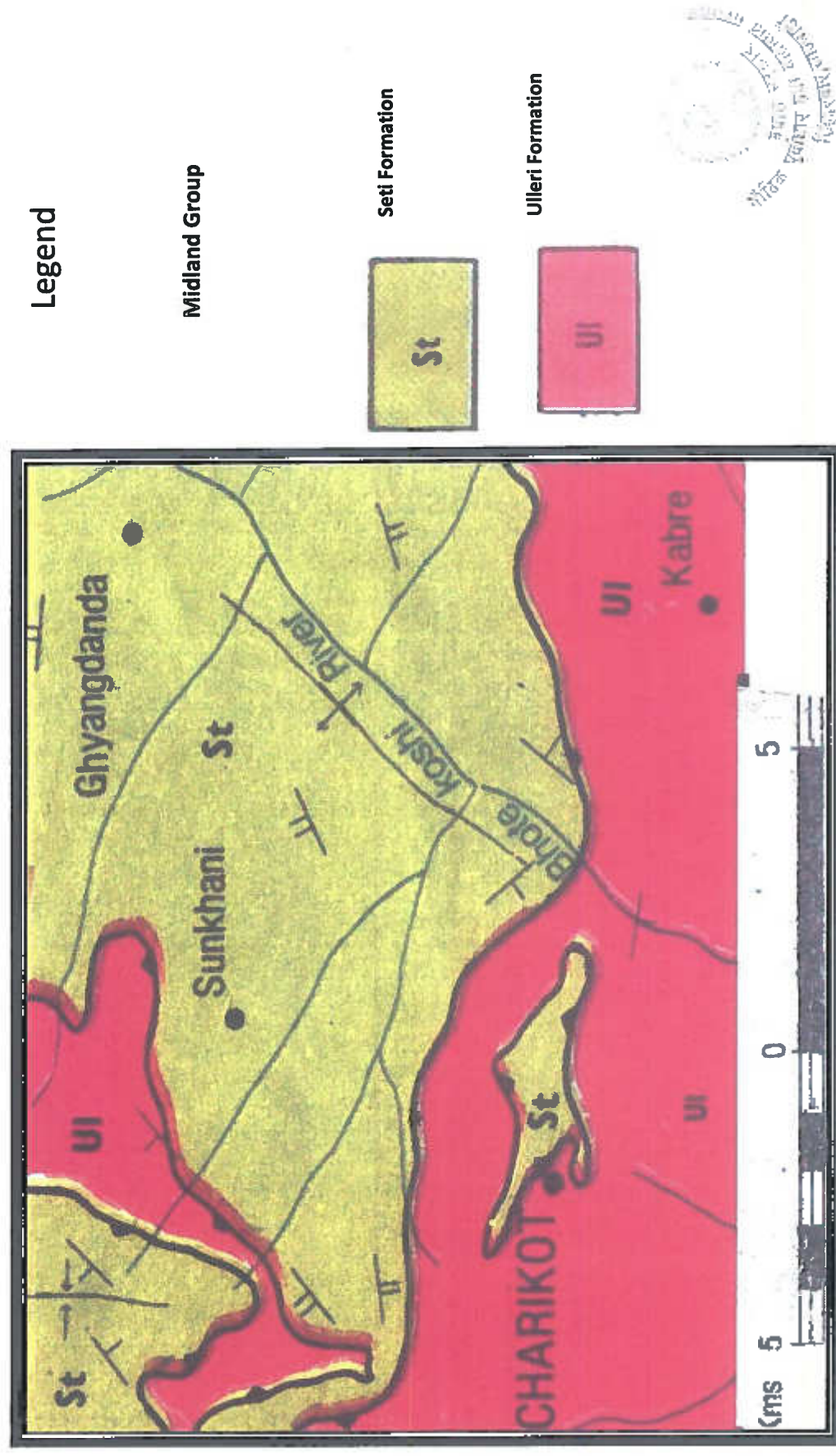


Figure 3.4: Geological map of the Charikot-Ghyangdanda area (Source: DMG, 1984)

d. Land Use Pattern

Land use pattern of the direct corridor of impact (COI) of 100 meter either side from the center line of the road was observed and noted during walkover survey. It was found that the land use pattern are dictated by topography (elevation and slopes), climate, soils and availability of irrigation facility. Accordingly, lands in the sub-project corridor are used for forests, agriculture, settlements, grazing and other (streams, rock outcrops, etc.) purposes. Agriculture is another important land use practice along the road corridor. The major crops grown are maize, millet, pulses, oilseeds and vegetables. Besides cultivation of crops, farm grown trees such as fodder, fruit species are grown around home stead areas. There are few patches of grazing lands where livestock open grazing is practiced. The detailed existing land use patterns along the road corridor are depicted in Table 3.4.

Table 3.4: Land Use Pattern along the Road Alignment

Chainage		Land Use Type	Remarks
From	To		
0+000	0+420	Market area and settlements	Pakhalati
0+420	0+950	Cultivated Lands and Forest Area	
0+950	1+200	Settlement Area and Cultivated Land	
1+200	1+950	Forest Area	
1+950	2+810	Settlement Area, Cultivated Land and Forest Area	
2+810	4+580	Forest Area	
4+580	4+690	Settlement Area, Cultivated Land and Forest Area	Chathali
4+690	4+910	Forest Area	
4+910	7+440	Settlement Area, Cultivated Land and Forest Area	
7+440	8+750	Cultivated Lands and Forest Area	
8+750	10+200	Settlement Area	Kshyamawati Bazar
10+200	11+400	Cultivated Lands and Forest Area	
11+400	15+450	Settlement Area, Cultivated Land and Forest Area	
15+450	16+300	Settlement Area, Cultivated Land and Forest Area	
16+300	17+450	Market Area and Forest Area	Soti Bazaar
17+450	22+150	Settlement Area, Cultivated Land and Forest Area	Mel Daanda, Shisha Golai & Bhadaure
22+150	23+100	Cultivated Land and Forest Area	
23+100	23+910	Settlement Area, Cultivated Land and Forest Area	Sitka Bazaar
23+910	25+960	Settlement Area and Forest Area	
25+960	29+425	Settlement Area, Cultivated Land and Forest Area	Jhamarshi
29+425	30+200	Forest Area	
30+200	31+000	Settlement Area, Cultivated Land and Forest Area	
31+000	32+000	Forest Area	
32+000	32+500	Settlement Area, Cultivated Land and Forest Area	
32+500	33+000	Forest Area	Way to crusher Plant at km. 32+800
33+000	33+900	Settlement Area, Cultivated Land	

		and Forest Area	
33+900	34+150	Forest Area	
34+150	34+490	Settlement Area, Market Area and Forest Area	Singati Bazaar

Source: Field Survey, 2015 Legend: FA- Forest Area, MA- Market Area, SA- Settlement Area, CL- Cultivated Land

e. Meteorology and Climate

The climate of the subproject area is sub-tropical. The maximum annual average rainfall is found to be 2,043.50 mm. The subproject area experiences the maximum and minimum temperatures at the nearest site (referred from the index station 1103 at Jiri) of 28°C and 7°C respectively. The maximum and minimum monthly relative humidity at the project area is 92% and 51% respectively.

The annual precipitation data of Dolakha district (1995-2012) are presented in Table 3.5.

Table 3.5: Annual Precipitation of Dolakha District (Jiri Station)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Annual Precipitation (mm)	2526	2235	NA	NA	NA	2625	NA	NA	2839
Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Annual Precipitation (mm)	2613	2015	1980	NA	2863	2010	2556	2682	2325

Source: Environmental Statistics of Nepal, 2013

f. Hydrology and Drainage

There are 9 small and large streams (including dry streams) across the road alignment as water resources. There are six (6) irrigation canal crossings along the road alignment (Chainages: 13+990, 16+670, 16+800, 28+015, 28+770 and 28+950). No wetlands are found within the vicinity of the road. Table 3.6 shows the list of rivers crossed by the Dolakha-Singati Road.

Table 3.6: Rivers/Streams crossed by the Road Section

S. No.	River/Stream	Chainage (m)
1	Gumfung khola	5+780
2	Kuthali Khola	6+552
3	Taksing khola.	7+000
4	Thangne khola	10+905
5	Sundrawati Khola	11+100
6	Saune khola	11+180
7	Shera khola	14+157
8	Gumu Khola	29+425
9	Singati Khola	34+895

Source: TPPF/PPC-2 Field Study 2015

g. Slope Stability

A few cut slope failures are found along the road alignment. These are occurred in colluvial deposits and represents shallow in depth, except two susceptible deep seated failures. The main causes of failures are rock weathering, precipitation, groundwater, under cutting of slope for road formation and poor surface water management. At present most of the cut slope failures are in stable condition and is treatable with minor engineering interventions. At

around Chainage 10+100 to 10+400 and around the slope at right approach of Gumu khola are problematic due to deep seated and active nature of slide.

There are some major landslides and erosion prone areas along the road alignment as presented in Table 3.7 below.

Table 3.7: Description of Instabilities along the Road Section

S. No.	Location (Chainage)	Landslide Type	Causes/Effect
1.	1+335 - 1+355	Wedge & Plane Failure	Rainfall
2.	3+240 - 3+265	Old landslide	Groundwater/Breast wall Tilted
3.	6+340 - 6+350	Reactivated debris slide	Steep slope and rainfall/Breast wall damaged
4.	6+665 - 6+670	Debris Flow	Retaining wall damaged, pipes are choked
5.	10+230 - 10+300	Deep seated colluvial landslide	Piping, toe cutting by gully, pore water pressure Sinking of the road, collapse of some parts and destruction of side drain and retaining walls
6.	11+100 - 11+110 (Sundravati Kh); but vulnerable up to Wodare Khola (11+200)	Debris Flow	Earthquake 2015 induced and other landslides on the upper reach of the Khola and monsoon rain Large boulders destroyed breast walls, cause way and retaining walls are partially damaged
7.	12+890 - 12+950 & 12+960 - 13+005	Debris slide and flow	Slides at upper reaches, loose overburden, earthquake, rainfall Large debris deposit
8.	25+590 - 25+600	Cut slope failure	Weathering, rainfall
9.	25+680 - 25+690	Cut slope failure	Weathering, rainfall
10.	29+252 - 29+300	Debris slide	Earthquake of 2015 and monsoon rain, groundwater, poor management of water from paddy field above the slide zone

Source: Geotechnical Investigation Report, 2016

h. Cross Drainage Structures

This road section has two (2) number of bridges including one Bailey bridge over Kuthali Khola (km 6+700) of length 35m, and 19m single span RCC Bridge over Gumu Khola (km 29+350) and project road ends at the start of Singati Steel Truss bridge over Singati khola at Km 34+650. No new bridges are proposed under the proposed upgrading works.

i. **Quarry Sites**

Major sources for the construction materials is Tamakoshi River basin. The different location of Tamakoshi River Basin sources are located at 35 km from Charikot, Headquarter of Dolakha District towards the road alignment and other two sources are located 19 km and 30 km away from the project road start Point. Study and investigation for possibility of construction materials had been done from four major sources, which are shown in Figure 3.3 above. The study for availability of construction materials (boulders, cobble, gravel and sand) quarries, existing crushing plants were identified along the Tamakoshi river corridor around Ch. 32+800.

Crushed stones and aggregates are one of the main construction materials for the road construction. The construction materials like stones, sands and boulders are sufficiently

available nearby the project site. All together four (4) quarry sites at various locations have been proposed in Table 3.8.

Table 3.8: Probable Location of Quarry Sites

S.N.	Location/ Chainage and Details	Natural Deposit Details	Remarks
1	Ch.32+800, Gravel and Sand (Tamakoshi River Bank) Approx. Qty.= 25000m ³	River deposits comprising of cobbles, pebbles of quartzite, Sand stone, gneiss and Phyllite	River deposited Gravel. Possible source of Sand, Base, Sub-base, Stone and if selected boulders and Gravel need to be properly crushed and screened for base-course and SD aggregate.
2	Ch.39+000, (Vorie Hill Side Area) as Sub-base Approx. Qty.= 15000 m ³	Hill side deposits comprising of cobbles, pebbles of quartzite, Sand stone, gneiss and Phyllite	Hill side slide deposited as Sub-base.
3	I. Elsewhere Quarry, 1Km D/S from Nayapul Tamakoshi River Basin. Approx. Qty.= 34000 m ³	River deposits comprising of boulders and cobbles. The dominant rock types of source are Quartzite, Sandy with some phyllite boulders and Silt.	Natural river Boulder for Stone masonry works. If selected boulders need to be properly crushed for Base material and S.D. aggregates.
4	II. Elsewhere Quarry, 10Km D/S from Nayapul Dholi Khola - Tamakoshi River Basin). Approx. Qty.= 35000 m ³	River deposits comprising of boulders, Colluvial deposits, and cobbles. The dominant rock types of source are Quartzite, Sandy with some phyllite boulders and Silt.	Natural river Boulder for Stone masonry works. If selected boulders need to be properly crushed for Base material and S.D. aggregates.

Source: TPPF Consultant Report, 2015

j. Air, Noise and Water Quality

The air quality observed was good and expected to be within national ambient air quality standards of Nepal. Likewise, water quality in the proposed road section is observed to be good since it is free from any kind of pollution. There is no defecation problem observed around the drinking water sources. However, during the monsoon season the quality of water may be deteriorated due the accumulation of silt, landslide, gully erosion etc. The proposed area does not have any sources of noise nuisance.

3.14.2 Biological Environment

a. Vegetation

Major forest types that are found in the subproject area are Subtropical Broad-leaved forest with the dominance of *Schima wallichii* and *Castanopsis indica*; Subtropical Pine forest with the dominance of *Pinus roxburghii* and Lower Temperate Mixed Broad-leaved forest. All the forests are in growing stage with scattered plantation of *Alnus nepalensis* and *Pinus roxburghii* along the alignment of the road.

The dominant forest and fodder species reported in the road alignment are Angeri (*Lyonia ovalifolia*), Banjh (*Quercus lanata*), Chilaune (*Schima wallichii*), Chulethro (*Brassaiopsis hainla*), Dhudilo (*Ficus nerifolia*), Dursul (*Ribes* sps.), Phalat (*Quercus lamellase*), Guras (*Rhododendron arboreum*), Jamun (*Syzygium cumini*), Kafal (*Myrica esculenta*), Katush

(*Castanopsis indica*), Khanyo (*Ficus semicordata*), Khote salla (*Pinus roxburghii*), Koiralo (*Bahunia variegata*), Lakuri (*Fraxinus floribunda*), Okhar (*Juglans regia*), Paiyun (*Prunus cerasoides*), Uttis (*Alnus nepalensis*), Gogan (*Saurauia nepauensis*), Kagbhalayo (*Semicarpus anacardium*), Kaulo (*Persea odoratissima*), Jigano (*Eurya acuminata*), Khirro (*Sapium insigne*), Kutmiro (*Litsea monopetala*), Mauwa (*Bassia latifolia*), Nemaro (*Ficus auriculata*), Pahenli (*Listea salicifolia*), Lapsi (*Choerospondias axillaris*), Maledo (*Macaranga indica*), Lampate (*Duabanga grandifolia*).

Beside this, some horticultural plants such as Naspatti (*Pyrus communis*), Suntala (*Citrus rostriculata*) Nibuwa (*Citrus limonum*), Aaru (*Prunus persica*), Kera (*Musa paradisiaca*), Kagati (*Citrus aurantifolia*), Arubhakhada (*Prunus domestica*) are also reported.

b. Non Timber Forest Products (NTFP)

Non timber forest products (NTFPs) are defined as any kind of products derived from forest species other than timber and fuel wood. The major NTFP species found in the subproject area are Amala (*Emblica officinalis*), Chutro (*Berberis aristata*), Swertia Chirayita (Chiraito), Koiralo (*Bahunia variegata*), Timur (*Zanthoxylum armatum*) Ghodtapre (*Centella asiatica*) and Bojho (*Acorus calamus*) and Majitho (*Rubia manjith*).

c. Protected Vegetation

The protected vegetation found in the subproject area contains one tree species and one herb species. However, none of the species is affected by the upgrading activities of the road.

Table 3.9: Protected Vegetation in the Subproject Area

SN	Local Name	Scientific Name	Remarks		
			IUCN Category	CITES Code	Forest Act and Rules
1.	Okhar	<i>Juglans regia</i>	-	Appendix II ¹	Banned for collection, use, sale and transport
2.	Chiraito	<i>Swertia chirayita</i>	V		

Source: E= Endangered V= Vulnerable T= Threatened

d. Community Forests

There are nine (9) CFs along the proposed road alignment as given in the Table 3.10.

Table 3.10: Community Forests (CF) Along Road Alignment

S. No.	Name of Community Forest	Major Species
1.	Tilicho, Bhimeshwar Municipality-3, Chathali	Chilaune (<i>Schima wallichii</i>), Sallo (<i>Pinus roxburghii</i>), Uttis(<i>Alnus nepalensis</i>)
2.	Chathali Baghkhori, Bhimeshwar Municipality-3, Chathali	Chilaune (<i>Schima wallichii</i>), Sallo(<i>Pinus roxburghii</i>), Uttis (<i>Alnus nepalensis</i>), Gurans (<i>Rhododendron arboreum</i>)
3.	Seti Devi, Bhimeshwar Municipality-3, Chathali	Chilaune(<i>Schima wallichii</i>), Sallo (<i>Pinus roxburghii</i>), Uttis(<i>Alnus nepalensis</i>)
4.	Rampa, Suspa Kshyamawati VDC	Chilaune(<i>Schima wallichii</i>), Sallo (<i>Pinus roxburghii</i>), Uttis(<i>Alnus nepalensis</i>)
5.	Ramite Masandanda, Suspa Kshyamawati VDC	Chilaune(<i>Schima wallichii</i>), Sallo (<i>Pinus roxburghii</i>), Uttis(<i>Alnus nepalensis</i>)

¹ Species not yet threatened, but which could become endangered if trade is not controlled

6.	Damar Thami, Suspa Kshyamawati VDC – 2, Ahale	Chilaune (<i>Schima wallichii</i>), Sallo(<i>Pinus roxburghii</i>), Uttis (<i>Ainus nepalensis</i>)
7.	Soti Kalipokhari, Sunkhani – 6,7, Bhatteli	Chilaune (<i>Schima wallichii</i>), Sallo(<i>Pinus roxburghii</i>), Uttis (<i>Ainus nepalensis</i>), Gurans (<i>Rhodendron arboreum</i>)
8.	Soti ra Vanarasi, Sunkhani – 1,	Chilaune (<i>Schima wallichii</i>), Sallo(<i>Pinus roxburghii</i>), Uttis (<i>Ainus nepalensis</i>), Gurans (<i>Rhodendron arboreum</i>)
9.	Sirish Ghari, Lamidanda – 5,6,8	Chilaune (<i>Schima wallichii</i>), Sallo(<i>Pinus roxburghii</i>), Uttis (<i>Ainus nepalensis</i>), Gurans (<i>Rhodendron arboreum</i>)

Source: Field survey, 2015

e. Private forest

Local people have planted trees in some patches of their private land. The main tree species is Uttis, Chilaune and other fodder species. These are not registered as a private forest in DFO. People do not use the private trees for commercial propose.

f. Religious, Leasehold and Government Forest

No religious, leasehold and government forest are found along the road alignment.

g. Trees on Farm land

Trees have been planted on farm land. The species are mainly fodder species and common species are Uttis, Chilaune and Salla etc. Other species include Lapsi, Alaichi, Amriso, Orange etc.

h. Terrestrial Wildlife

The terrestrial wildlife found in the forests of subproject area includes a number of common as well as rare species. The road does not fall under any protected or buffer zone area.

Table 3.11: Terrestrial Wildlife in the Subproject Area

S.N.	Local Name	Scientific Name	Remarks	
			IUCN Category	CITES Code
1	Chituwa	<i>Panthera pardus</i>		Appendix I ²
2	Mirga	<i>Corvus duvauceli</i>	E	Appendix I
3	Badar	<i>Macaca mulatta</i>		Appendix II
4	Bhalu	<i>Molurus ursinus</i>		Appendix I
5	Syal	<i>Canis aureus</i>		Appendix III ³
6	Dumsi	<i>Phaptr indicia</i>		Appendix II

Note: E= Endangered V= Vulnerable T= Threatened

Source: Field survey, 2015

i. Birds

The types of birds found in the Subproject area are Mayur (*Pavo cristatus*), Kalij (*Lophura leucomelanos*), Danphe (*Lophophorus impejanus*), Munal (*Tragopan satyra*), Bhyakur (*Turdoides* sp.), Chil (*Milvus migrans*), Titra (*Francolinus francolinus*), Gidha (*Gyps* sps), Gauthali (*Hirundapus caudacutus*), Dhukur (*Streptopelia* sp.), Ban Kukhura (*Gallus gallus*), Kag (*Corvus splendens*) and Chibe (*Dicrurus* sp.). Among them *Pavo cristatus* and *Lophophorus impejanus* are listed in CITES Appendix I. Similarly, *Tragopan satyra* is listed in CITES III.

² Species threatened with extinction.

³ Species that are protected by individual countries within their borders, and for which co-operation of other convention signatories is sought.

j. Fish, Amphibians and reptiles

The major river in the road corridor is the Tamakoshi River and Gumu stream. The River is rich in fish diversity. The major species found are Sahar (*Tor spp.*), Eel (*Anguilla bengalensis*), Jalkapoor (*Ompac bimaculatus*), Kalle (*Acrossocheilus hexagonolepis*) and Asla (*Schizothorax spp.* & *Schizothoraichthus spp.*). Khasre bhyaguta (*Bufo sp.*), Pani Bhyaguta (*Rana tigrina* included in CITES Appendix II), Paha (*Bufo spp.*) and Chheparo, Gohoro (*Varanus spp.*) are recorded amphibians and reptiles respectively in the project area.

The road does not fall under any protected or buffer zone area.

k. Protected area

The project area does not contain any national park, wildlife reserve, conservation area, hunting area, including buffer zone area, world heritage site and other protected areas.

3.14.3 Socio-Economic and Cultural Environment**a. Population**

According to the Census 2011 (CBS), total population of Dolakha is 186,557 with an annual population growth - 0.91% (decreasing) and having 53.36% female population. The average family size is decreasing, and it was 4.1 families per household in 2011. The population density per square kilometer is decreasing since 2001. It was 93 sq. km in 2001 and 85.2 sq. km in 2011.

Population, according to 2011 census, by male, female and total of 1 municipality and 4 VDCs touched and traversed by the proposed upgrading road section is 37647, which accounts for 20.18% of the district population. Gender-wise population distribution is estimated at 46.70% male and 53.30% female.

Table 3.12: Population Distribution in Project affected Municipality/VDCs

Municipality/VDCs	Total HHs	Population			Average HH Size
		Total	Male	Female	
Dolakha District	45,688	186,557	87,003	99,554	4.08
Project Affected Municipality/VDCs					
Bhimeshwor Municipality	6,076	22,537	10,489	12,048	3.71
Suspa Kshyamawati	864	3,437	1,575	1,862	3.98
Sundrawati	677	2,766	1,322	1,444	4.09
Sunkhani	1,194	4,675	2,131	2,544	3.92
Lamidanda	1,045	4,232	2,063	2,169	4.05
Total	9,856	37,647	17,580	20,067	3.95

Source: CBS Nepal, 2011

Table 3.13: Population Distribution in DIA of the Road

Municipality/VDCs Wards	HHs	TP	M	F	Avg. HH Size
Bhimeshwor Municipality					
2	476	1,615	727	888	
3	242	978	480	498	
Total	718	2593	1207	1386	3.61

Municipality/VDCs Wards	HHs	TP	M	F	Avg. HH Size
Suspa Kshyamawati					
5	142	565	255	310	3.98
Sundrawati					
2	77	296	141	155	
3	49	178	93	85	
7	70	289	141	148	
9	120	524	259	265	
Total	316	1287	634	653	4.07
Sunkhani					
1	78	278	121	157	
2	174	628	285	363	
4	213	830	398	432	
5	124	513	248	265	
7	100	402	177	225	
9	188	706	329	377	
Total	877	3357	1538	1819	3.83
Lamidada VDC					
6	186	858	323	335	
7	106	407	201	206	
Total	292	1065	524	541	3.65
Grand Total	2345	8867	4158	4709	3.78

Source: CBS Nepal, 2011

b. Caste/Ethnic Composition, Language and Religion

The project area is of multi-ethnic composition with Kshetri, Tamang, Newar, Brahmin, and Thami as dominant groups. Distribution of this ethnic composition in the ranking order is Chhetri 34.17 % followed by Brahmin (16.54 %), Thami (15.47%), Newar (12.41%), Tamang (8.17%), Kami (3.32%), Sarki (2.22%) and remaining 7.70 percent in other groups. Other groups include Sherpa, Sanyasi/Dushnami, Dharmi/Dholi, Magar, Gharti/Bhujel, and Sunuwar who also have remarkable presence within the district. The ethnic composition (%) by VDCs within Dolakha – Singati Road is presented in Table 3.14.

Table 3.14: Ethnic Composition of Affected Municipality/VDCs

Municipality/ VDC	Total	Caste/Ethnicity wise population														
		Chhetri	Newar	Brahman-Hill	Tamang	Thami	Magar	Kami	Sarki	Sherpa	Gharti/Bhujel	Sanyasi/ Dashnami	Damai/Dholi	Majhi	Thakuri	Others
Bhimeshwor Municipality	22,537	7608	4300	3000	2807	1357	154	804	573	383	424	107	330	-	101	589