Environmental Assessment Document

Initial Environmental Examination

Grant Number: 0093 NEP

April 2010

Nepal: Rural Reconstruction and Rehabilitation Sector Development Program

Chhinkhet-Syarpu Road Subproject, Rukum District

Prepared by the Government of Nepal

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Government of Nepal
Ministry of Local Development
Department of Local Infrastructure Development and Agricultural Roads
Rural Reconstruction and Rehabilitation Sector Development Program
[ADBGrant 0093NEP]

Initial Environmental Examination (IEE) Report

Of

Chhinkhet-Syarpu Road Sub-Project (Rukum District,Nepal)

Submitted to:
Ministry of Local Development
Government of Nepal

Proponent:
District Development Committee/
District Technical Office
Rukum District

April, 2010

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ABBREVIATIONS

ADB Asian Development Bank
BG Building Group
CDO Chief District Officer
Ch Chainage
CBO Community Based Organization
CEA Country Environmental Analysis
CFUG Community Forest Users Group
CISC Central Implementation Support Consultants
CF Community Forest
CITES Convention on International Trade in Endangered Species of Flora and Fauna
DIT District Implementation Team
DFO District Forest Office/Officer
DDC District Development Committee
DG Director General
DIST District Implementation Support Team
DoR Department of Road
DSCO District Soil Conservation Office
DoLIDAR: Department of Local Infrastructure Development and Agricultural Roads
DPO District Project Office
DTO District Technical Office
DSC Dry Stone Causeway
DTMP District Transport Master Plan
EA Environmental Assessment
EMS Environmental Management Section
EAS Environmental Assessment Specialist
EPA Environmental Protection Act
EIA Environmental Impact Assessment
EMP Environmental Management Plan
EPR Environmental Protection Rules
ESD Environment Screening Document
FGD Focus Group Discussion
GoN Government of Nepal
GIS Geographical Information System
Ha Hectare
Hh Household
IEE Initial Environmental Examination
LEP Labour based, environment friendly and participatory
Km Kilometer
LDO Local Development Officer
LRMP Land Resource Management Project
M meter
MoE Ministry of Environment
MoST Ministry of Science and Technology
Ml Milliliter
MLD Ministry of Local Development
NGO Non-Governmental Organization
NRs Nepali Rupees
NTFPs Non timber forest products
OP Operational Plan
PAM Project Administrative Memorandum
PCU Project Coordination Unit
RCIW Rural Community Infrastructure Work
RES Rapid Environmental Screening
RIDP Rural Infrastructure Development Project
RRRSDP Rural Reconstruction and Rehabilitation Sector Development Program
RS Resettlement Survey
SA Social Appraisal
SM Social Mobilizer
TA Technical Assistance
ToR Terms of Reference
TWS Technical Walkover Survey
VDC Village Development Committee
ZoI Zone of Influence

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छिन्खेत–र्स्यापु सडक खण्डको प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन
कार्यकारी सारांश

पृष्ठभूमि

नेपाल सरकारले लामो द्वन्दले गर्दा क्षति भएका ग्रामीण पूर्वाधारहरुको पुनःनिर्माण र पुनःर्स्थापना को कार्य एशियाली विकास बैंक, स्विस सरकार (SDC), ब्रिटिस सरकार (DFID) तथा ओपेक फण्ड (OFID)को आर्थिक सहयोगमा ग्रामीण पुनःनिर्माण तथा पुनःर्स्थापना आयोजना नेपालको बिसवटा जिल्लाहरुमा संचालन भईरहेको छ । रुकुम जिल्लामा अवस्थित प्रस्तावित छिन्खेत–र्स्यापु ग्रामीण सडकको पुनःर्स्थापना सोही कार्यक्रम अन्तर्गत संचालन गर्न लागिएको एक उप–आयोजना हो । यस उपआयोजना (प्रस्ताव) अन्तर्गत ९ कि.मी. लामो उक्त सडक ग्राभेल स्तरमा निर्माण गर्न प्रस्ताव गरिएको छ ।

प्रस्तावक

प्रस्ताव (प्रस्तावित सडक उप-आयोजना) को प्रारम्भिक वातावरणीय परीक्षणको प्रस्तावक जिल्ला विकास समिति र जिल्ला प्राविधिक कार्यालय, रुकुम हुन् । प्रस्तावकको प्रारम्भिक वातावरणीय परीक्षण स्विकृत गर्ने सम्वन्धित निकाय स्थानिय विकास मन्त्रालय हो ।

उद्देश्य

प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन अध्ययनको मुख्य उद्देश्य उप-आयोजना क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक तथा सांस्कृतिक वातावरणमा पर्ने प्रभावहरु पत्ता लागाउनु हो । अन्य उद्देश्यहरु निम्नानुसार छन् :

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

प्रस्तावको सार्न्दभिकता तथा अध्ययन प्रकृया

मे/जुन २००९ मा फिल्ड सर्वेक्षणवाट लिइएका तथ्याङ्क तथा अन्य उपलब्ध तथ्याङ्कहरुको साथै सामाजिक तथा प्राविधिक टोलीवाट पुनर्वास कार्यको सर्भेक्षणको लागि संकलन गरेका तथ्याङ्कहरु केलाएर प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन तयार गरी निष्कर्ष तथा सुझावहरु दिइएका छन् ।

विद्यमान वातावरणीय स्थिति

यो सडक छिन्खेतबाट नजिक समुद्री सतहदेखिको १,०५० मी. को उचाईबाट शुरु भएर समुद्री सतहदेखिको १,३५० मी. उचाईको र्स्यापुदहमा भएर जान्छ । यस सडक खण्डमा विभिन्न प्रकारका चट्टानहरु जस्तै क्वार्टजाइट, सिष्ट आदि पाईन्छन् । प्रायः एलुभियल तथा रेजीड्यूयल प्रकारका बालुवा र पाँगो मिसिएको माटोहरु सडक खण्डमा पाइन्छन् । सडक खण्डमा पर्ने पानीका मूख्य श्रोतमा सानि भेरी पर्दछ । प्रस्तावित सडक क्षेत्रको वायु तथा पानीको स्तर सफा नै रहेको देखिन्छ साथै ध्वनि प्रदुषणको समस्या छैन । यो सडक प्रायः खेती गरिएको जमीन तथा वन र बस्तीहरु भएर जान्छ ।

यस सडक खण्डमा पाइने मूख्य रुखहरुको प्रजातिहरुमा सल्ला, ओखर, साल, उत्तिस, चिउरी, बाँस, धुपी,आँप,आँरू तथा गैऱ्ह काष्ठ वन पैदावारमा मजिठो, सिलटिमुर, चिराइटो,हर्रो आदि पर्दछन् । यो सडक खण्ड गम्थले सामुदायिक वन भएर जान्छ । स्याल, लोखर्के, वनबिरालो, मलसाप्रो आदि वन्य जन्तुका साथै ढुकुर काग,भ्याकुर,मयुर,हुटिट्याउ आदि पंक्षीहरु यस सडक खण्ड भएर जाने वनमा पाईन्छन् । यो सडक खण्ड संरक्षित क्षेत्र वा मध्यवर्ती क्षेत्रमा पर्दैन ।

यो सडक खण्डको प्रभावित क्षेत्र भित्र बाफिकोट गा.वि.स.का ४ वटा प्रमुख वस्तीहरु पर्दछन् । जसको जम्मा घरधुरी संख्या ६९३ र जनसंख्या ४१३० रहेको छ र सरदर परिवार संख्या ५.९६ छ । यहाँ वसोवास गर्ने विभिन्न जात जातिका मानिसहरुमा मुख्य गरी ठकुरी, ब्राहमण,तथा दलित (दमाई, कामी र सार्की) पर्दछन् । दलितहरु सवै वस्तीहरुमा छरिएर बसेका छन् ।

यहाँका बासिन्दाहरुको मुख्य पेसा कृषि र पशुपालन हो । यातायातको राम्रो सुविधा नभएको तथा पहाडी क्षेत्र भएकोले कृषि उब्जनीले मात्र पर्याप्त नहुने हुँदा यहाँका अधिकाशं मानिसहरु श्रम रोजगारीका अन्य

पेशामा काम गर्ने तथा केही मानिसहरु सरकारी तथा अन्य संस्थामा काम गर्ने, थोरै मानिसहरुले व्यापार व्यवसाय गर्ने गर्दछन् । साथै जनसंख्याको उल्लेखनीय प्रतिशत मानिसहरु जीविकोपार्जनको सिलसिलामा हिँउदमा काठमाडौं तथा भारत लगायतका विभिन्न ठांउमा रोजगारीको लागि जाने गर्दछन् ।

सकारात्मक प्रभावः

यातायातको सुविधाले स्थानीय बासिन्दाहरुको जीवनमा थुप्रै सकारात्मक प्रभाव पर्दछन् । सडक निर्माण गर्दा स्थानीय वासिन्दाहरुले श्रमिकको रुपमा रोजगारीका अवसरहरु प्राप्त गर्ने र प्राविधिक शीप तथा ज्ञान समेत प्राप्त गर्ने छन् । सडक निर्माण गर्दा स्थानीय रोजगारीका ६९७२ दक्ष श्रमिक र ९०६३२ अदक्ष श्रमिक अवसरहरु स्थानीय बासिन्दाले श्रमिकको रुपमा प्राप्त गर्ने र प्राविधिक शीप तथा ज्ञान समेत प्राप्त गर्ने छन् ।

सडकको नया निर्माण भई संचालनको अवस्थामा त्यस क्षेत्रमा खाद्यानको आपूर्तिमा सुधार भई आर्थिक तथा सामाजिक स्थायीत्व बढ्न जानेछ । साथै सडक यातायातले गर्दा ग्रामीण भेगवाट बजार क्षेत्र र बजार क्षेत्रवाट ग्रामीण भेगमा सेवा तथा सामानहरुको ओसार पसार छिटो, छरितो, सुलभ तथा सस्तो हुन जानेछ । बजारमा पहुँच भएको कारण कृषि उत्पादन बढाउन कृषकहरु उत्साही हुनेछन् । यस्ले गर्दा उत्पादकत्वमा वृद्धि भई अन्ततोगत्वा ग्रामीण भेगका बासिन्दाको जीवन स्तरमा सूधार हुन जाने छ ।

सडक संचालन हुँदा व्यापार व्यवसायमा वृद्धि हुन जानेछ । छिन्खेत,बाफिकोट,नेटापोखरा,र्स्यापुदह आदि बस्तिहरुमा व्यापार क्षेत्रको विकास भई यहाँका बासिन्दाहरुको जीवन स्तरमा सुधार हुन जानेछ । यसका साथै बजार क्षेत्रको विकासले गर्दा जग्गाको मूल्यमा समेत वृद्धि हुन जानेछ ।

नकारात्मक प्रभावः

सडक निर्माण गर्दा भौतिक वातावरणमा पर्ने नकारात्मक प्रभावहरुमा भू-स्वामीत्वको प्रयोगमा वदलाव, भिरालो जग्गामा पहिरो जाने, वायू तथा पानीमा प्रदूषण, खनेको माटो फालिदा पर्ने प्रभावहरु मुख्य छन् । यसै प्रकार जैविक प्रभाव अन्तरगत गम्थले सामुदायिक वनको १.६३ हेक्टर वन नोक्सानी हुनुको साथै वन्यजन्तुको बसोवासमा अप्ठ्यारो पर्न जानेछ । जम्मा १९८ रुखहरु र बाँस हटाइनेछन् । यस आयोजनमा १.९३ हेक्टर खेतिजन्य भूमि नोक्सानीमा पर्दछ । यसले गर्दा खाद्यान्न उत्पादनमा र जीविकोपार्जनमा साथै केही घरधुरीलाई नकरात्मक प्रभाव पार्ने देखिन्छ ।

सडक संचालनको दौरान भौतिक वातावरणमा पर्ने नकारात्मक असरहरुमा भिरालोपनको स्थायित्व र यसको व्यवस्थापन, वायु तथा ध्वनी प्रदुषण तथा सडक सुरक्षाका समस्याहरु पर्दछन् । यसै प्रकार जैविक प्रभावमा वन्य श्रोत घट्नु, वन्य जन्तुहरुलाई अप्ठेरो पर्नु भने सामाजिक तथा आर्थिक प्रभावहरुमा नयाँ वस्ती र बजारको अव्यवस्थित विस्तार, सामाजिक व्यवहारमा परिवर्तन आदि पर्दछन् । प्रस्तावित सडक प्रमुख वस्तीहरु भएर जाने हुनाले निर्माणको अवधिमा यसले नेटापोखरामा ३ घरघुरी र छिन्खेतमा १ खानेपानीको इन्टेकलाई सार्नु पर्ने देखिन्छ ।

न्यूनीकरणका उपायहरु

प्रस्तावित आयोजनाले स्थानीय वातावरणमा पार्ने प्रभावलाई न्यूनीकरणगर्नका लागि उचित प्रकारको बाटोको छनौटे, उचित प्रकारको सर्भे तथा डिजाइनहरु निर्माण पूर्व चरणमा अवलम्बन गरिएको छ । प्रस्तावित सडक सर्भेक्षण तथा डिजाइन "हरित सडक बिधि" अनुरुप गरिएको छ । बाटोको छनौट तथा सर्भे गर्दा यथासम्भव घर, गोठ, सार्बजनिक पूर्बाधारहरु, खेति योग्य जमिन, वनजंगल तथा धार्मिक, सांस्कृतिक एवं ऐतिहासिक स्थलहरुलाई छलाई बाटो लाने प्रयास गरिएको छ ।

निर्माण अवधिमा पर्ने प्रभावलाई न्युनीकरण गर्न बाटो खन्दा निस्कने माटोलाई उचित तरिकाले व्यवस्थापन, जमिनको स्थिरताको लागि आवश्यक व्यवस्था जस्तै साधारण पर्खाल लगाउने, बिरुवाहरु रोपी आवश्यक टेवाहरुदिने, सडक निर्माणको क्रममा विस्थापित परिवारलाई पुनः व्यवस्थापन गर्ने उचित व्यवस्था, सडकमा ढलको उचित व्यवस्था गर्ने र आवश्यक स्थानमा बृक्षारोपण तथा वनको उचित संरक्षण गर्ने ।

सडक बनिसके पछि पनि सडक छेउमा जथाभावी अतिक्रमण रोक्न र पहिरोको खतरा, हावा , पानी प्रदुषण तथा ध्वनीको मात्रालाई घटाउँनकालागि जिबिस तथा गाउँ बिकास समिति (गाबिस) हरुलाई सडक छेउका बस्तीहरुको गाम्भीर्यतालाई अनुगमन गरि त्यसलाई नियन्त्रण गर्न सहयोग एवं तालिम दिनु पर्दछ ।

यस सडकको निर्माणवाट सकारात्मक तथा नकारात्मक दुवै प्रकारका प्रभावहरु पर्ने देखिन्छन् । सकारात्मक प्रभाव बढाउने उपायहरु तथा नकारात्मक प्रभाव न्यूनीकरण गर्ने उपायहरुको प्रभावकारी कार्यान्वयनले गर्दा सकारात्मक प्रभाव वढ्न जानुका साथै नकारात्मक प्रभाव न्यून गर्न सकिने वा हटाउन सकिने छन् । प्रभावहरुको आंकलनको आधारमा सडक निर्माण तथा संचालन दुवै चरणमा सकारात्मक प्रभाव बढ्ने उपाय र नकारात्मक प्रभाव घटाउने उपायहरु उल्लेख गरिएका छन् ।

वतावरणीय ब्यबस्थापन योजनाः

सकारात्मक असरहरुलाई बढाउने र नकारात्मक असरहरुलाई घटाउन वातावरणीय ब्यबस्थापन योजना एउटा महत्वपूर्ण उपाय हो । यसले गर्दा आवश्यकीय सूचनाहरु प्राप्त भई प्रभाव न्यूनीकरणका उपायहरुको कार्यान्वयनमा सुधार गर्न सकिन्छ । यसको लागि जिल्ला विकास समिति / जिल्ला प्राविधिक कार्यालय, रुकुमले अनुगमन प्रणालीको विकास गरी वातावरणीय सुधारमा आफ्नो प्रतिवद्धता देखाउने छ । यस कामको लागि जिल्ला विकास समिति / जिल्ला प्राविधिक कार्यालयलाई जिल्लामा रहेको आयोजना कार्यान्वयन कार्यालय र जिल्ला कार्यान्वयन सहयोग परामर्शदाताहरु र केन्द्रीय कार्यान्वयन सहयोग परार्मशदाताले सहयोग पुऱ्याउने छन्।

निष्कर्ष तथा सुझावहरुः

छिन्खेत–र्स्यापु सडक खण्डको प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदनले सकारात्मक प्रभावहरु नकारात्मक प्रभावको तुलनामा वढी महत्वपूर्ण रहेको र लामो समयसम्म रहने तथा नकारात्मक प्रभावहरु न्यूनीकरण गर्न सकिने कुरा देखाउँछ, यस कारण यो सडक उप-आयोजनाको स्वीकृतीको लागि प्रारम्भिक वातावरणीय परीक्षण प्रर्याप्त रहेको छ । प्रभावहरुको न्यूनीकरण र संलग्न वातावरणीय अनुगमन योजना कार्यान्वयन गरी प्रस्तावित उपआयोजना कार्यान्वयनको लागि सिफारिस गरिन्छ ।

सडक निर्माण गर्दा प्रभावित व्यक्तिहरुको सम्पत्तिको क्षतीपूर्ती गर्न पुनर्वास योजनको आवश्यकता पर्नेछ ।

Executive Summary

Background

Government of Nepal has received financial assistance from Asian Development Bank, SDC and OFID for implementation of the Rural Reconstruction and Rehabilitation Sector Development Program (RRRSDP). The RRRSDP aims for reconstruction and rehabilitation of rural infrastructures damaged in the twenty conflict affected districts of the country. The Proposed 9 km long Chhinkhet-syarpu Rural Road in Rukum District is one of the Subprojects selected under the RRRSDP. It is proposed for new construction in gravel standard.

Project Proponent

The 'Proponent' of the proposed Subproject (Proposal) is District Development Committee (DDC)/District Technical Office (DTO), Rukum. Ministry of Local Development (MoLD) is the 'Concerned Agency' for approving the IEE study.

Objectives

The main objective of the IEE study is to identify the impacts of physical, biological, socioeconomic and cultural environment of the sub-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 sub-project, and
- To make sure that IEE is sufficient for the proposed road sub-project.

Relevancy of the Proposal and Study Methodology

The findings and conclusions of the report are based on the analysis of the information collected from the field during May/June 2009 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.

Existing Environmental Condition

The road starts from Chhinkhet of Bafikot VDC at 1050m amsl and passes through Syarpudaha at 1,350m amsl.Various kinds of rock such as quartzite, schist etc.were observed along the road alignment. Generally, alluviam, residual and clay mixed sandy soil are found along the road alignment. Main waterbody found across the road alignment is Sanibhere river.Ambient air and water quality in the proposed subproject area is found to be good and there's also no noise pollution. The road mainly passes through cultivated land, forest and settlements.

The dominant forest species found in the road alignment are *Pinus roxburghii* (Salla),*Juglans rega*(Okhar),*Shoera robusta* (Saal),*Alnus nepalensis* (Uttis), *Bassia butyracea* (Cheure), *Bambusa spps* (Bamboo), *Juniperus cummunis* (Dhupe), *Mangifera indica* (Mango), *Prunus Persica* (Aaru) etc and the main NTFP species found along the road alignments are *Rubia manjith* (Majitho), (*Lindera neesiana)* Siltimur,Chiraito,Harro etc. There is 1 community forests named Gamthale Community forests along the proposed road alignment.(Shyaal) *Canis aureus*,(Lokharke) *Ratufa indica*, (Ban biralo) *Felis chaus,(*Malsanpro*) Martef*

Flabigula are the wild animals reported in the forests of proposed road area. Similarly birds are Laughing Dove (Dhukur)*Alpine chough* (Crow), *Eye-Browened Thrush* (Bhyakur), *Peacock* (Mayur), *common sandpiper* (Hutityau) etc. The road does not fall under any protected or buffer zone area.

There are 4 major settlements along the ZoI of the proposed road alignment in Bafikot VDC with total population of 4130 persons (693 households) and average family size of 5.96. Diverse ethnic groups such as Thakuri,Brahmin and occupational caste (Damai, Kami, Sarki) live along the ZoI of road alignment. Occupational caste households are distributed in almost all the settlements.

The main occupation of all people residing within the ZoI of the proposed road alignment is agriculture and livestock. Due to limited transportation facilities and high altitude, agriculture farming is not enough for subsistence level. Therefore, people are carrying out other economic activities like majority of the people work as labour and porters while some people work in government and non government organizations and a few are doing business. 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.

Beneficial Impacts

The development of transportation network will have multifold beneficial impacts. The immediate beneficial impacts from road development during the construction phase are various employment opportunities (6972 skilled and 90632 unskilled person days) for the local people and increase in construction work skills and technical know-how to the local workers.

During operation stage, 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 encourage 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 this road is on operation, 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 like in Chhinkhet, Neta Pokhara, Bafikot, Daha. In addition, construction of road will lead to appreciation of land values particularly near the market and settlement areas.

Adverse Impacts

The physical adverse impacts during construction will be due to change in land use, slope instability and air, dust and water pollution, quarry sites and spoil disposal. Similarly, biological impacts during construction will be loss of 1.63ha of Gamthale Community forest area and disturbance to wildlife and bird habitat. Total 198 numbers of trees and bamboo will be cleared. There will be loss of 1.93 ha of cultivated land. This will have impacts on food production and livelihood of some households.

The adverse physical impacts during road operation are slope instability and management, air and noise pollution, road safety. Likewise, biological impacts are depletion of forest resources and disturbance to wildlife. Socioeconomic impacts are due to new settlement and market center development, change in social behavior etc. The proposed project passes through major settlement areas so it damages 3

household at Netapokhara and 1 Water supply intake at Chhinkhet need to be relocated.

Mitigation Measures

Different mitigation measures are suggested for the conservation of environment during different stages of the project. During **pre- construction stage**, the suggested mitigation measures include appropriate route selection and appropriate detailed survey and design. Detailed survey and route selection was finalized so as to minimize impacts on houses, animal sheds, public services and infrastructures, fertile land, forest area, religious, cultural and historical sites, to the extent possible.

Similarly during the **construction stage**, suggested measures are safe disposal of spoils, management of slope stability and erosion by providing appropriate management of dry wall and use of Bio engineering. Rehabilitation of disrupted community infrastructures, management of sanitation along the road and plantation of trees with preservation of forest.

Similarly during **Operation stage.** The study recommends the site-specific protection of slopes at landslide and erosion affected sites, DDC and Village Development Committees (VDCs) should be facilitated and trained in monitoring and controlling the emergence of roadside settlements to avoid haphazard encroachment along the road alignment, and to minimize the risk of landslides and air (dust), water pollution and noise level.

Impacts from the proposed road projects 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.

Environmental Management Plan

Environmental management plan is an important tool to ensure the implementation and monitoring of mitigation measures for minimizing adverse impacts and maximizing the beneficial impacts. Similarly, environmental monitoring generates useful information and improves the quality of implementation of mitigation measures. The proponent, DDC/DTO Rukum will develop monitoring mechanism to show its additional commitment for environmental improvement and mitigate undesirable environmental changes, if any during construction and operational stage. DDC/DTO will be supported by DPO and DIST team in the district and Environmental team from the CISC for the environmental monitoring.

Conclusion and Recommendation

The IEE study of the proposed Chhinkhet-Syarpu road project reveals that the benefits from the implementation of the proposed road project are more significant and long term in nature against the adverse impacts most of which could be mitigated or avoided. Therefore, this IEE is sufficient for approval of the proposed sub-project. This sub-project is recommended for implementation with incorporation of mitigation measures and environmental monitoring plan.

A Resettlement Plan will be required to ensure that the persons affected by the losses are properly compensated.

Name and Address of the Proponent

The District Development Committee (DDC)/ District Technical Office(DTO),Rukum is the implementing agency at the district level under DoLIDAR and the Ministry of Local Development (MLD) is the concerned authority for the approval of IEE study report of Chhinkhet-Syarpu Road sub-project .

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Anita KC	Social Mobilizer
Swarswati KC	Social Mobilizer
Rama Khadka	Social Mobilizer

SALIENT FEATURES

1. Name of the Project	: Chhinkhet-Syarpu Road Sub-Project
2. Location	
2.1 Geographical Location	
2.1.1 Start Point	: Bafikot VDC, Chhinkhet
2.1.2 End Point	: Syarpu Daha , Bafikot VDC
2.2 Geographical Features	
2.2.1 Terrain	: Hilly
2.2.2 Alignment	: along the hilly terrian
2.2.3 Altitude	: 1050 m to 1350 m from MSL
2.2.4 Climate	: Sub tropical to temperate
2.2.5 Soil	: Colluvial soil, residual soil and alluvial soil
3. Classification of road	: District road & A Class Road
4. Length of road	: 9.00 km
5. Standard of Pavement	: Gravelled Road
6. Design Speed	: 20 Km/hr.
7. Traffic Forecast	: 22 vehicles per day
8. Lane	: Single
9. Major settlements	
9.1 Major settlements	: Chhinkhet,Bafikot,Pokhara,Daha.
9.2 No. of households	: 693 HH
9.3 VDCs along the road	: Bafikot.
10. Cross-section	
10.1 Right of Way	: 10 m on either side of the road
10.2 Formation Width	: 5.0m having 5% outward slope
10.3 Carriage Way	: 4.0 m
11. Structures	
11.1 Dry Stone Causeway	: 3 nos.
11.2 RCC Bridges	: 15m
11.3 Retaining Structures	
11.3.1. Dry Stone Wall	: 904 cum
11.3.2. Gabion wall	: 1850 cum
11.3.3 Bioengineering	: 3% to total cost (NRs 1652210)
12. Earthwork	
12.1 Cutting	: 87536.87 cum
12.2 Filling	: 37490.66 cum
13. Project Cost	
13.1 Net Cost (NRs.)	: 58,427680
13.2 Costs per km. (NRs.)	: 6491964
14. Employment Generation	
14.1 Total Person Day	
14.1.1 Skilled	: 6972
14.1.2 Unskilled	: 90632

1.0 INTRODUCTION

1.1 Background

The Rural Reconstruction and Rehabilitation Sector Development Program (RRRSDP) focuses on immediate post conflict development priorities for accelerated poverty reduction and inclusive development, thereby enhancing the effectiveness and efficiency of the delivery of public services, and improving access of rural people to economic opportunities and social services. The Program is financed by the Government of Nepal (GoN), Asian Development Bank (ADB), Department for International Development (DFID), Swiss Development Cooperation (SDC), Nepal and OPEC Fund for International Development (OFID). The Program covers twenty districts spread over the country. Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) under the Ministry of Local Development (MLD) is the executing agency (EA). The District Development Committees (DDCs) / District Technical Office (DTO) are the Project Implementing Agencies. The DDC/DTO are supported by District Implementation Support Team (DIST) with engineering, safeguards and social mobilization responsibilities. Rukum District is one of the project districts under RRRSDP. This Proposal is for new construction in gravel standard of the 9 km long Chhinkhet-Syarpu district road in Rukum District.

1.2 The Name and Address of Proponent

Name of Proposal	:	Rehabilitation of Chhinkhet-Syarpu District Road, Rukum District, Nepal
Name of Proponent	:	District Development Committee, District Technical Office,
Address of Proponent	:	Khalanga,Rukum District Phone No:9758501597

1.3 Relevancy of the Proposal

The Project area is located at remote and underdeveloped south-eastern part of Rukum district. This road is of New construction. The area has high potential in production of vegetable,and milk. In this regard, the proposed rehabilitation of the road will enhance access of people to social services and market centers with significantly reduced travel time and cost, and will contribute in their socio-economic development. Access shall also attract other development infrastructures and open door to further development opportunities in the area.

1.4 Need for IEE Study

An IEE of the proposed road is necessary in order to assess the environmental consequences of the proposed rural road rehabilitation and construction activities and suggest appropriate, practical and site specific mitigation and enhancement measures. It is a legal requirement by the Government of Nepal (GoN) according to article 3 of Environmental Protection Act (EPA) 1996 and rule 3 of Environmental Protection Rules (EPR) 1997 (amended in 2007). Preparation of IEE report by concerned District Development Committee (DDC)/ District Technical Office (DTO) and approval of IEE report by the Ministry of Local Development (MLD) according to Nepali legal provision is considered sufficient by the ADB according to Project Administrative Memorandum (PAM) subject to prior review of an agreed sample of sub-project IEEs by ADB. RRRSDP roads fall under category “B” project where IEE is mandatory according to Environmental Assessment Guidelines of ADB (2003).

This IEE report of Chhinkhet-Syarpu Road sub-project in Rukum district is prepared based on the Terms of Reference (ToR) approved on 2066/2/25 by the Secretary level decision of the Ministry of

Local Development (MLD). The approved ToR is given in **Annex 1**.

The findings and conclusions of the report are based on the analysis of the information collected during May/June 2009 from the field by undertaking a walk-through environmental survey along the proposed route (for which a checklist was used) and secondary information, supplemented by information collected by the social and technical teams working on the resettlement survey and detail survey.

1.5 Objectives

The main objective of the IEE study is to identify the impacts of physical, biological, socio-economic and cultural environment of the sub-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 sub-project, and
- To make sure that IEE is sufficient for the proposed road sub-project.

1.6 Methodology adopted for IEE study:

The IEE study has followed the provisions of the EPA, 1997 and EPR, 1997, the provisions of ADB and approved ToR for IEE Study by MoLD on 25/2/2066 BS. It follows methodology suggested in the approved Terms of Reference for IEE Study (please refer Annex I). For the collection of environmental features related to bio physical environment, maximum 100 meter distance observable from the centre of the road alignment was taken as an influence area and socio-economic and cultural environment was taken of ZoI (one and half hour walking distance from the centre line of the road) information of the Subproject area. The IEE study has been conducted through review of secondary information collected from relevant agencies, and primary information collected from the field survey in May/June 2009. Field survey, sample household survey, organization of Focus Group Discussions in the related VDCs was carried out and necessary information was collected. The DDCs officials, VCDs and Community Groups were also contacted to verify information to solicit their concerns. Based on the analysis of information the impacts have been predicted, mitigation measures prepared and monitoring plan has been developed.

1.7 Description of proposal:

The proposed Chhinkhet-Syarpu road lies in Rukum district of Mid Western Development region. Total length of this road is 9.00Km.Chhinkhet-Syarpu road starts from Chhinkhet and ends at Syarpu of Bafikot VDC.In between, the road passes through different settlements like Bafikot,Pokhara Bazar, Daha etc of Bafikot VDCs.This road links Bafikot,Magma,Pipal,Sayalakhadi VDC of Rukum to District headquarter This road is the shortest possible corridor to link the district with the neareast road head at Chhinkhet of Rukum district.Earthern road was constructed from Khalanga to Gilibang under GTZ in 2065 B.S. and from Gilibang to Chhinkhet is underconstruction under DDC.This Road is given Priority no. 20 in class A Road in DTMP of Rukum district (code no.54A004R).The sub-project cost is given in **Annex 3.**

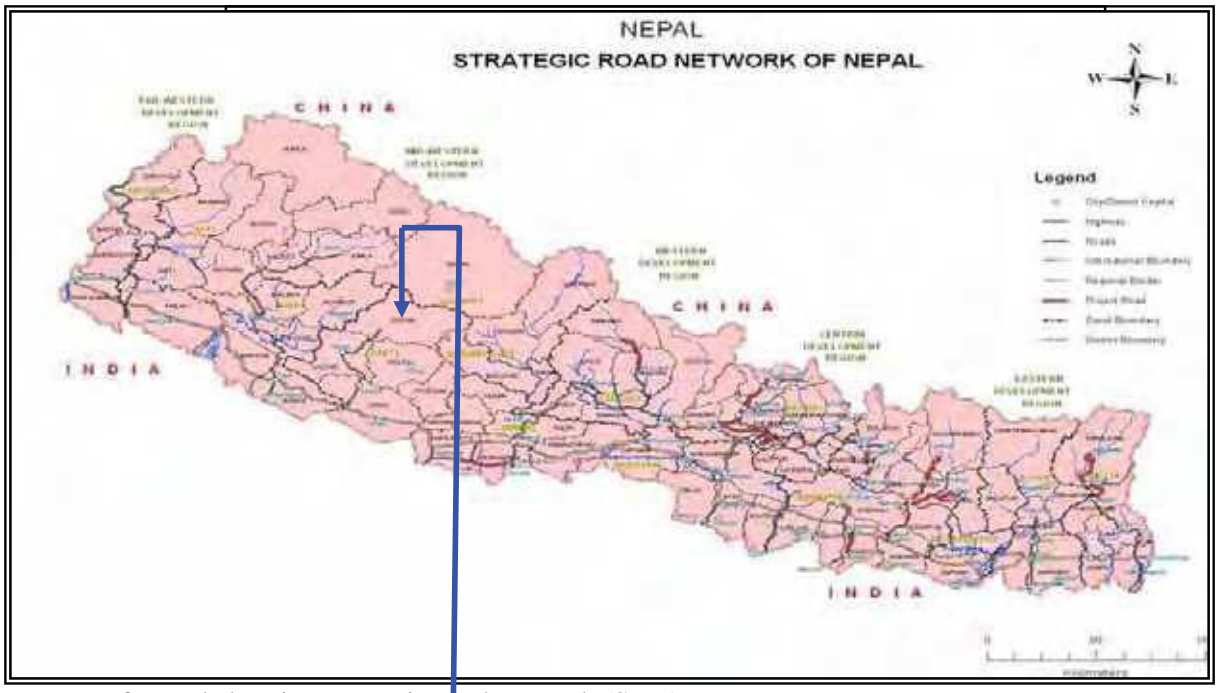
Table 1.1 Project activities of the proposed Chhinkhet-Syarpu road

SN	Road section	Chainage	Length (km)	Descriptions	Remarks
1	Chhinkhet-Syarpu	0+00 to 9+000	9.000	New Construction	New Construction in First Phase of RRRSDP Project

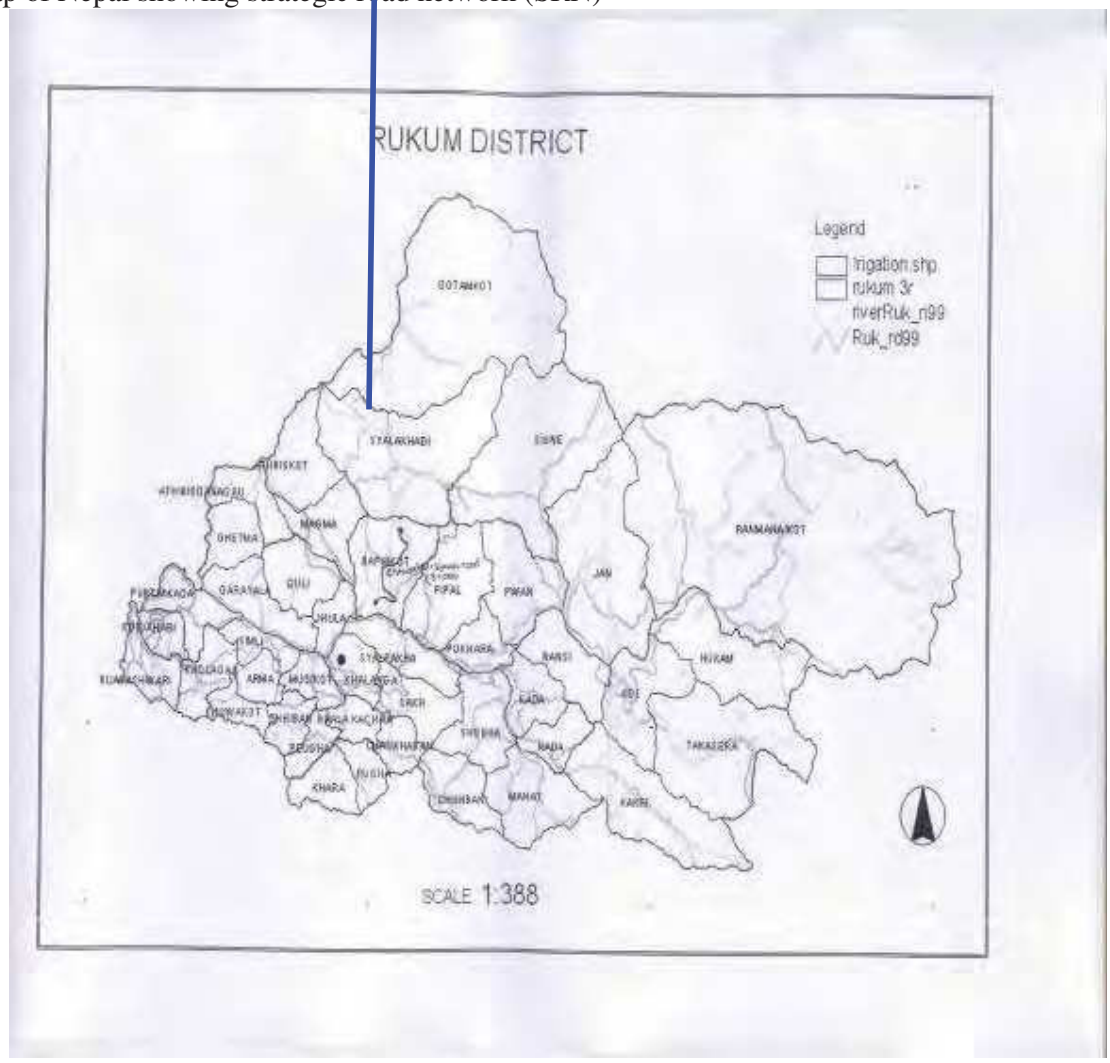
1.8 Construction Approach

This road will be constructed using the labour-based, environment-friendly and participatory (LEP) approach, the important features of which are:

- Use of local people as labour, hand tools and small equipment, rather than heavy machinery, for construction.
- Balancing cut and fill and reuse of excavated materials as construction materials, and thus not generating excess spoils, as far as possible.
- Use of bio-engineering techniques: integrated use of vegetation, simple civil engineering structures and proper water management systems for slope protection.



Map of Nepal showing strategic road network (SRN)



Chhinkhet-Syarpu Road (pls draw clear road alignment)
(Total Length=9.000)

Figure 1.1. Map of Rukum District showing the alignment of Chhinkhet-Syarpu Road.

Rukum District
Chhinkhet-Syarpu Road
(Total Length=9.000 km)

Figure 1.2. Topo Map showing the alignment of Chhinkhet-Syarpu road

1.9 Proposed Schedule for Implementaion of Sub-project

Following table shows the proposed implementation schedule for Chhinkhet-Syarpu road sub-project:

Table 1.2: Sub-project implementation schedule

SN	Activity	2008	2009				2010				2011	
		IV	I	II	III	IV	I	II	III	IV	I	II
1	**Detailed survey and design**											
2	**Preparation of resettlement plan**											
2.1	Life skill and income generation training											
3	**Environment Assessment and Monitoring**											
3.1	IEE report preparation and approval											
3.2	Implementation of EMP											
3.3	Environmental monitoring											
4	**Construction Work**											
4.1	Civil construction work by contractors											
4.2	Civil construction work by RBGs											

Note:

I - July, February, March
II - April, May, June
III - July, August, September
IV - October, November, December

2.0 Public consultation and information Disclosure

2.1 Public Consultation

In order to ensure the public involvement, the following procedures were followed during IEE report preparation:

- Publication of notice- A 15 days public notice was published on 1st of Shawan 2066 in the Gorkhapatra, a national daily newspaper seeking written opinion from concerned VDCs, DDC, schools, health posts and related local organizations. A copy of the public notice was also affixed in the above mentioned organizations and deed of enquiry (*muchulka*) was collected.
- Recommendation letters from Bafikot VDC were also obtained.
- IEE team also carried out interaction with local communities and related stakeholders during field survey to collect the public concerns and suggestions. The opinions and suggestions received from concerned people/institutions were included in the IEE report.
- Written responses from relevant stakeholders on the public notice were also reviewed and documented in the report.
- Published notice, deed of enquiry (*muchulka*) and recommendation letter from VDC is given in the **Annex 5, 6 and 10** respectively.
- Draft IEE report will be send to Bafikot VDC for public Disclosure.After reviewing draft IEE report and incorporating the suggestions from the concerned stakeholders, final IEE report will be prepared and sent to PCU for approval from MLD and ADB.

Table 2.1 Table showing summary of meeting minutes

Date	Name of the place for public meeting	Address	Issues and Suggestions of the meeting
2066/04/09	Chhinkhet	Bafikot VDC, Rukum	• Unskilled workers for road construction work,must be local people of affected areas • Sufficent no.of retaining wall must be constructed to protect the houses along road corridor
2066/4/5	Neta Pokhara	Bafikot VDC, Rukum	• Land slide and soil erosion should be minimized with proper means. • Physical structures and local culture and religion should be protected. • Training for income generating activities should be provided for local People.
2066/4/3	Bafikot	Bafikot VDC, Rukum	• Physical structures and local culture and religion should be protected. • Training for income generating activities should be provided for local People.

2.2 Information Disclosure

Draft IEE will be kept in information center of DDC Rukum for public Disclosure. Information was also disseminated through person to person contacts and interviews and group Discussions. However, available institutions at the local level were informed through notice distribution or posting at concerned VDC, school, health posts and public places within the road alignment corridors. The approved IEE report will be accessible to interested parties and general public through information center of DDC Rukum and websites of ADB, DoLIDAR and RRRSDP. Following offices will get the IEE report:

1. District Development Committee, Rukum
2. District Technical Office, Rukum
3. District Project Office, Rukum
4. District Implementation Support Team, Rukum
5. Bafikot VDC
6. Ministry of Local Development
7. Department of Local Infrastructure Development and Agricultural Roads
8. Project Coordination Unit, RRRSDP
9. Asian Development Bank, Nepal Resident Mission

3.0 REVIEW OF RELEVANT ACTS, REGULATIONS AND GUIDELINES

The IEE study has followed the provisions of following acts, regulations and guidelines of Government of Nepal and ADB to ensure conservation of environment during proposal implementation and operation.

Table 3.1: Review of Environmental Acts, Regulations and Guidelines

SN	Environmental Acts, Regulations and Guidelines	Description of Requirements
1	Three Years Interim Plan, 2007/08-2009/10, GoN	Requires all projects will be formulated and constructed based on methods that optimally utilize the local skill and resources and generate employment opportunities.
2	Environmental Protection Act, 1997, GoN	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.
3	Environmental Protection Rule 1997 (amendment, 2007), GoN	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.
4	Forest Act, 1993 (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.
5	Forest Rules, 1995, GoN	Elaborates legal measures for the conservation of forests and wildlife. Expenses incurred for cutting trees and transportation shall be borne by proponent.
6	*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.
7	National Park and Wildlife Conservation Act, 1973, 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.
8	Local Self Governance Act (1999) and Regulation (1999), GoN	Empowers the local bodies for the conservation of soil, forest and other natural resources and implements environmental conservation activities
9	Land Acquisition Act, 1977 and Land Acquisition Rules, 1969, GoN	Specifies procedural matters on land acquisition and compensation
10	National Environmental Impact Assessment Guidelines, 1993, GoN	Provides guidance to project proponent on integrating 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.
11	APPROACH for the Development of Agricultural and Rural Roads, 1999, GoN	Emphasizes labor based technology and environmental friendly, local resource oriented construction methods to be incorporated actively in rural infrastructure process.
12	RRRSDP Environmental Assessment & Review Procedures (EARP), 2007, GoN	For preparation of environmental assessments of future subprojects under Rural Reconstruction and Rehabilitation Sector Development Program (RRRSDP), this EARP includes: i) The process to be adopted while preparing environmental reports, ii) the potential environmental impacts that could result from undertaking the Project based on the Initial Environmental Examinations (IEEs) of sample core subprojects; iii) the proposed mitigation measures to avoid the identified impacts; iv) institutional capacity assessment and strengthening arrangements; v) legal framework for environmental assessment, domestic and the Asian Development Bank (ADB) environmental assessment and review procedures; and finally vi) the approaches to be adopted during implementation of the Project in order to ensure that environmental aspects are dealt with in a comprehensive manner.

13	Reference Manual for Environmental and Social Aspects of Integrated Road Development, 2003, GoN	Suggests stepwise process of addressing environmental and social issues alongside the technical, financial and others
14	Green Roads in Nepal, Best Practices Report: An Innovative Approach for Rural Infrastructure Development in the Himalayas and Other Mountainous Regions, 1999, GoN	Focuses on participatory, labor based and environment friendly technology with proper alignment selection, mass balancing, proper water management, bioengineering and phased construction
15	Environmental Assessment Guidelines, 2003, 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
16	Safeguard Policy Statement, 2009, 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.
17	The Interim Constitution of Nepal, 2063 (2007).	Has provision of right regarding environment - Every person shall have the right to live in clean environment.
18	The Labor Act, 1992	Regulates the working environment and deals with occupational health and safety.

4.0 EXISTING ENVIRONMENTAL CONDITION

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

4.1 Physical Environment

This section describes the physical condition of the area that comes under the ZoI of the road section along its entire length and surrounding area. The data has been collected from both secondary and primary sources.

4.1.1 Topography

The elevation of the starting point of the road at Chhinkhet is 1050m and at the end of road at Syarpu Daha is 1350m. The road alignment passes through the upper valley slopes. The grade of the road varies from 2% to 14%. Major portion of the road passes along the south-west facing slope.

4.1.2 Geology and soil type

The predominant soil types are residual soil and Colluvial deposits, which are extensively distributed along the hillslopes and along Sani Bheri River. The road stretches from Chhinkhet to Netapokhara is commonly covered by residual soil and colluvium which is mixed the patches of Gneiss, schist and quartzite exposures. From Netapokhara to Syarpu Road corridor dominantly passes through hard rock exposure of Quartzite, Gneisses, migmatites, augen-Gneiss etc.

Some part of The Chhinkhet-Syarpu road runs along the Sani Bheri River. The river originates from the high altitude region in north of the great Himalaya and cuts through the Himalayan range as an antecedent river to form steep and deep gorge. The valley slope is formed by Colluvial deposit and river terraces along the course. The terrace is filltop terrace made up of thick gravell deposit and somewhere residual soil frequent used as land use like settled area and agriculture fertile land. The deposit are more than 150m thick and the base of the terrace is situated and below the river bed. The Colluvial deposits have slope varying from 30˚ to 45˚ and form the critical angle of repose whereas vertical scarps. During the road construction, the natural slope was disturbed and the areas with the Colluvial deposits become unstable giving rise to many landslides. The rocky area consists predominantly of Gneiss, Schist alternated with quartzite. The slope in the rocky area varies from 40˚ to almost 90˚.

The geomorphic features of the area are controlled mainly by the river morphology, geological structures and lithology. It lies in the Hilly Reason of mid-western Nepal.This zone is not too favorable for cultivation and consequently some dense population is concentrated within this zone.

Table 4.1: Types of soil recorded by survey team during field study

S.N.	Chainage Range	Length (m)	Soil type	Remarks
1	0+000-3+000	3000	Alluvial soil	Area comprises the alluvial soils containing fines of greater than 85% and gravel / boulder of about 7%, extensive colluvial deposits of angular rock

				fragments, pebbles and even boulders.
2	3+000-8+000	5000	Resudial soil	Lithology consists of mainly Residual soil of fine greater than 80% with dominant colluvial deposits where rock exposed in decomposed nature. Since area has dominant colluvial deposits with angular rock fragments it is recommend to either remove the colluvial deposits or mitigate with engineering structure so that road will be safe from blocked in rainy season.
3	8+000-9+000	1,300	Resudial soil	The area lies on syarpu village which contains extensive highly porous and cohesionless residual soil containing fines of >90%. Lower part contains cultivated land and frequent settlement. Rock outcrop observed is weathered but ahead of Syarpu Village hard rock bed of quartzite alternated with schist is well exposed.

Source: Field survey, 2009

4.1.3 Climate

Chhinkhet-Syarpu road lies in the Mahabharata Range and climate in this range is Sub-Tropical. Generally, rainy season starts from May and ends in August. The meteorological record shows unevenly distributed monsoon rain in the project area with the total average annual rainfall is 2000 mm. The maximum recorded temperature in Rukum district is around 34.40° Celsius and minimum temperature is 0.40° Celsius. (*Source: Village Profile of Bafikot VDC, 2061*)

4.1.4 Hydrology and Drainage System

The main river in the project area is Shani-Bheri River. Other rivers & kholsi lies in the alignment are as follows:

Table 4.2: Rivers and Kholsi in the alignment

SN	Chainage	Water stream name	Location	Remarks
1	0+120	Kholsi	Chhinkhet	Spring-fed
2	0+200	Kholsi	Chhinkhet	Spring-fed
3	0+300	Kholsi	Chhinkhet	Spring-fed
4	8+000	Syarpu river	Syarpu daha	Outside from ROW

Source: Field survey, 2009

4.1.5 Soil Erosion and Sedimentation

The alignment of the road has been selected through safe route so that no erosion and flooding can affect the road stability. Furthermore, adequate number of cross drainage structures has been provisioned to have safe and fair weather mobility.

4.1.6 Land use

Land use pattern of the area through which the road passes have been classified into four types: cultivated land, forest,Built up area and barren land which is listed in the **Table 4.3** below.

Table 4.3: Land use pattern along the road alignment with 5m formation width

Land use	Total Length(m)	Area(sq.m)	Area (ha)
Cultivate land	3815	19255	1.93
Barren and Pasture land	954	4770	0.48
Forest(community and private and government)	3250	16250	1.63
Built up area	981	4905	0.49
Total	**9000**	**45180**	**4.53**

Source: Field Survey, 2009

4.1.7 Air, Noise and Water Quality

As there are no any large scale development project and industries in the project area, the quality of Air and Water observed good. Only water in the local streams gets polluted with flash flood, which carries sediments with it during rainy season. No any serious causes of noise pollution are observed.

4.2 Biological Environment

4.2.1 Vegetation

Rukum district lies in the Mid Western region of Nepal. The proposed road alignment crosses the sub-tropical to lower temperate vegetation types. The species found the forest mainly is Saal(*Shorea robusta*). The list of Plant species recorded during the field survey is listed in the **Table 4.4** below:

Table 4.4 List of Plant species recorded during the field survey

S.N.	Local Name	Botanical Name
1	Saal	*Shorea robusta*
2	Okhar	*Juglans regia*
3	Salla	*Pinus roxburghii*
4	Uttis	*Alnus nepalensis*
5	Banana	*Musa Nepalensis*
6	Cheure	*Bassia butyracea*
7	Mango	*Mangifera indica*
8	Aaru	*Prunus Persica*
9	Dhupe	*Juniperus cummunis*
10	Bamboo	*Bambusa spps*

Source: Field Survey, 2009

4.2.1.1 NTFPs

Non timber forest products (NTFPs) are important resources of the country and play important role in changing the socio-economic condition of the rural people. The species of non-timber forest products available within the project area are presented in **Table 4.5**

Table 4.5: Non timber forest product found in the road alignment and project area

S.N.	Local Name	Scientific Name	Plant part Use
1	Majitho	*Rubia manjith*	Whole Plant
2	Siltimur	*Lindera neesiana*	Whole Plant
3	Chiraito	*Swertia chirayta*	Whole Plant
4	Harro	*Terminalia chebula*	Fruit
5	Ritha		Whole Plant

Source: Field Survey, 2009

4.2.1.2 Community Forest

The losses of the trees which will occur in the construction of Chhinkhet-Bafikot section is 198 which include Fruits and Timbers like Mango, Saal, Date Okhar, Bamboo, Dhupi etc.

Table 4.6: Community Forests along road alignment

SN	Name of Community Forest	Chainage	Length	Main Species
1	Gamthale Community Forest	1+300-4+550	3250m	Natural and Planted forest (Salla,Okhar, Saal)
	Total		**3250m**	

Source: Field survey, 2009

4.2.2 Wildlife

Mammals

Mammal species noted during IEE field survey includes Shyaal, Lokharke, Ban biralo, Malsapro etc.

Table 4.7: Local & scientific Name of some mammals found in project area.

SN	Local Name	Sceintific Name
1	Shyaal	*Canis aureus*
2	Lokharke	*Ratufa Indica*
3	Ban Biralo	*Felis Chaus*
4	Malsanpro	*Martef Flabigula*

Source: Field Survey, 2009

Birds

The main bird species in the project area are Dhukur, Crow, Bhyakur, Peacock, Hutityau.

Table 4.8: Local & scientific Name of some birds found in project area.

SN	Local Name	English Name	Sceintific Name
1	Dhukur	Laughing Dove	*Streptopelia senegalensis*
2	Crow	Alpine Chough	*Pyrrhocorax graculus*
3	Bhyakur	Eye – browned Thrush	*Turdus obscurus*
4	Mayur	Peacock	*Hubaropsis Bengalensis*
5	Hutityau	Common Sandpiper	*Tringa hypoleucos*

Source: Field Survey, 2009

Reptiles and Amphibians

According to the local people of the project area in Reptiles snake is found. There is one of the Snake which is sometime seen in the peoject area called as Shirishe which is very poisonous snake.

Fishes

The proposed road alignment touches mainly Sani Bheri River. Sometimes migratory fishes species have been found in the project area.

4.2.3 Endangered and Protected Species

Faunal Species: Jackal (*Canis Aureus*) is listed in Appendix III of CITES. Squirrel (*Ratufa sp.*) is listed in Appendix II of CITES.

Floral Species: Okhar (*Juglans regia*) and Sal (*Shorea robusta*) are listed as protected plant species according to the Forest Act 1993 which is classified as timber trees banned for felling, transportation and export for commercial purposes.

4.3 Socio-economic and Cultural Environment

4.3.1 Population, Household and Ethnicity

The households and population of Influence area is 693 and 4130 respectively and the average house hold size is 5.96.

Agriculture Pattern

Major crops grown in the Subproject area are rice, wheat, maize, millet, potato and beans. Cash crop farming is also increasing in recent days. Major cash crops grown in the area are mustard, alainchi, amliso, vegetable. The area has appropriate climate and soil for farming of fruits such as orange,graphes,guava,banana lemon, nibuwa.

Livestock

Due to availability of good number of fodder trees, the Subproject area has good potentiality of cow and buffalo farming for dairy, and goat farming for meat. People have kept buffalo and sell milk. Despite being potential, they were not encouraged to produce milk in commercial scale due to time consumption in transportation and difficult access.

4.3.2 Main occupation

The main occupation of the people residing within the ZoI of the proposed road alignment are agriculture & livestock along with labour & porter. Due to limited transportation facilities and higher altitude, agriculture farming is not enough for subsistence level. Therefore, people are carrying out other economic activities like working in collection of herbal (most of local people) , involved in government and non government organizations , business, employment in foreign countries , labour and porters and cottage industries .

Table 4.9: Settlement of the project area

SN	Name of the VDC	Name of the settlement	Major caste /ethnic group	Major occupation of the people			
				Agriculture & Livestock	Labour & Porter	Business/ Commerce	Employees
1	Bafikot	Chhinkhet	Chettri,Thakuri, Dalit	62	18	8	12
2		Bafikot	Chettri, Dalit, Thakuri	61	32	5	2
3		Pokhara	Chettri,Thakuri Dalit	54	43	1	2
4		Daha	Chettri, Dalit, Thakuri	62	33	4	1

Source: Field Survey, 2009

4.3.3 Public Services and Infrastructures

There are various social sector facilities and infrastructure in different settlements. Details about public services and infrastructures according to the settlements are as follows:

Education

The proposed project area consists of a total of 3 educational institutions ranging from primary level to college level education. Primary schools are found in majority of the settlements. The alignment access to school &campus are shown in **table 4.10.**

Table 4.10: The alignment access to school &campus

S.N.	Name of settlement	School/Campus	Distance from road
1	Bafikot	Shree Birendra higher secondary school, Primary school	10 m
2	Pokhara	Pre-Primary school	12 m
3	Daha	Primary school	15m

Source: Field Survey, 2009

Health Facility

In health sector, there is a Illaka Health Post in Bafikot for serious health problem, people go to district hospital in Khalanga & Nepalgunj also.

Communication

Regarding communication, telephone facilities are available in Chhinkhet, Pokhara, Bafikot,Daha etc.

Electricity

Electricity facilities is available in all part of Project area. For the Lighting purpose people have Solar power system in almost all households and for other electrical purpose people use electricity produced from Syarpu micro hydro power.

Business Facilities

There are grocery shops, tea stalls and lodges available in the majority of the settlements and number is more in potential market centers like Neta pokhara, Chhinkhet etc.

Water Supply

For drinking water in the district, there is no any purified water supply system. People use water of stream as water tank made as a reservoir to collect water from the stream near by the settlement. Also there is a water supply system made from the reservoir to private household and also to some

common bazaar areas like Chhinkhet,Neta Pokhara etc.1 water supply intake at 1+200 have crossed the road.

Irrigation

The project area is surrounded by small rivulets but no scientific techniques of irrigation have been implemented to use these resources. Local farmers have managed themselves for the irrigation of their land on the basis of traditional technique, that is, from the irrigation channel originated from the seasonal springs and most part of the land depends upon the monsoon rain. One Farmer Managed Irrigation System has developed from Sani-Bheri. Other irrigation line doesnot crossed the road.

Other Infrastructures

The man made infrastructure within the project area includes trails, mule tracks, irrigation systems, drinking water systems, bridges, schools, health posts, and drinking water systems . 3 household at Netapokhara (Ch 7+890) and 1 Water Supply intake (Ch 1+200) crossed the road.Brief socio-economic baseline information of the three families to be resettled is given in **Annex 14.**

Financial Institutions

There is a Nepal Bank Ltd in Khalanga,District headquarter.

Community Development Facilities

Community based organizations were not found in settlements. Play grounds, ghat (cremation site) and community centers are found in majority of the settlements.

Table 4.11: The following Community organisation and service centres influenced by alignment

SN	Type of organization/service centres	No.	Location
1	Illaka Health Post	1	Bafikot
2	Phone Service	1	Bafikot
3	Ilaka Post Office	1	Bafikot
4	Ilaka Police Station	1	Bafikot

Source: Field Survey, 2009

4.3.4 Land holding pattern

Land holding pattern within the ZoI of the road project demonstrates that no households are owning more than 50 ropanis whereas the households owning 20-50 ropanis are 9.4%,10-20 ropanis are 13.4%,5-10 ropanis are 21.9% , 1-5 ropanis are 41.4% and landless are 1.3% (approximately 1 ha = 20 ropani).See **Annex 11.c**

4.3.5 Food Security

More than 82 % of the households are involved in agriculture. Agriculture is the major occupation. But the major portions of the people do not own sufficient land to produce foods needed for consumption and sale. As a result, about 23 percent of the households can grow foods sufficient for more than 12 months. 22 percent households grow foods sufficient for 3 to 9months, 41 percent HHs for 3 months, and 14 percent grows only for less than 3 months. See **Annex 11.d**

4.3.6 Migration pattern

Permanent migration takes place in limited scale towards Terai and other places like Kathmandu. However, people migrate to foreign countries like India, Quatar,U.A.E,Malaysia,England in search of employment opportunity almost from all the settlements. Seasonal migration occurs during slack framing season from Mangsir to Poush mainly in various parts of India.

4.3.7 Potential Development area

The proposed road passes through a potential area for Rice cultivation and also potential for the production of different type of Herbal , Chhiraito, Ritha etc. All settlement are potential for rural tourism development.

4.3.8 Religious, Cultural and Historical Sites

The following historical and religious sites are within ZoI of the proposed project area:

- Syarpu, Syarpu Lake
- Shivalaya Temple

This site is visited, and used for worship, by the local residents. However, they are not popular or famous outside the locality and this temple and religious site don't fall in the proposed road alignment and there displacement is not needed.

Table 4.12: Religious and Cultural sites of the project area

S.N.	Name of the site	Location	Aesthetic/Historical Importance	Land owned
1	Syarpu	Bafikot VDC	Aesthetic/Historical Importance	Government
2	Shivalaya	Bafikot VDC	Historical	Government

Source: Field Survey, 2009

4.3.9 Labour Availability:

As the road construction method is labour based approach & need segmental construction and it could be done manually or using locally available equipments, where it depend on time factors. But in this case local labours are available for excavation and construction of small retaining structure. Also unskilled labour from neighboring district like Jajarkot,Salyan,Rolpa and Baglung will come for work. Some skilled man power can be found in influenced villages of alignment. So maximum man power which is available in the influenced village will be used first. If the local man- powers are insufficient for construction, then man – power will be hired from neighboring district.

5.0 PROJECT ALTERNATIVES:

Alternative analysis is considered as an integral part of an IEE study. The alternative analysis for a road project constitutes the development of an alternative transportation network for the enhancement of safe and faster connectivity of the rural area to market centers and thereby improves the economic conditions of the people living in the zone of influence. The alternatives, in this regard, could be other modes of transport such as trail, ropeway alternative road alignment, alternate design and others. The various possible alternatives are discussed in the following sub-sections.

5.1 Project Alternatives:

This is referred to as the other modes of transportation network to be built, which include trails, ropeways and other modes of transportation. At the same time, there is also an urgent need to conserve the environment in terms of physical, biological, social and cultural aspects. Thus, in the case of the proposed project, the alternative options in view of the need for conservation of environment as well meeting people's requirements include improvement of existing trails, construction of rope way, and construction of the Rural road.

The zone of influences has a number of trails, which are being used by the local people for transporting goods and services for many years. The zone of influence has a high potential of producing horticultural crops and these need to be transported to the market center for trading. The development of new trails or improvement of existing ones cannot provide services for vehicular movement and thus would not be able to provide desired benefits to the local people. This alternative can conserve the environment but it will fail to serve the transportation need to people living within the zone of influence.

Similarly, ropeway can be another mode of transport to enhance the transportation facilities within the zone of influence. The ropeway primarily serves to transport goods and it normally does not provide facilities for human mobility except when it is built with cable car facilities. At the present context, this alternative will not serve transportation needs and may not also conserve the environment. On the other hand, the proposed road to be built on a phase wise basis under the green road concept, as stated in the earlier sections, will have minimum adverse impacts on the environment. At the same time, when it attains full width, it can be utilized for vehicular movement. Therefore, the proposed road, which would provide improved access to market centers through safe mode of transportation goods and services produced within the area, would be the best option to serve the purposes of transportation requirement, and environmental conservation.

5.2 Alternative Route:

During the course of Feasibility survey and design the following three alternative routes were assessed in the terms of technical, environmental, financial and social aspects.The three routes are:

1. Phalamegauda-Netapokhara-Syarpu
2. Chhinkhet-Bafikot-Netapokhara -Syarpu
3. Chhinkhet-Talligaun--Netapokhara-Syarpu

Among above three **alignment 2** is most appropriate for technical as well as socio-economic & Envionmental point of view due to following reasons.

- This alternative alignment passes through mostly stable land .
- Centre line of the road can be placed carefully to balance cut and fill in comparison with two remaining alignments.
- Minimum damage of vegetation & trees during construction in comparison with other two
- Have not large scale and highly unstable fragile zone along the route in comparison with two remaining alignments.
- This alignment touches more village settlements than other two alignments.

5.3 Alternative design and construction approach:

The conventional road construction use contractors with heavy machineries and equipment, explosives, heavy concrete structures for retaining slopes, and bituminous surfacing. Green road approach is normally referred as labour based, environment friendly and participatory (LEP) method which focuses to give least disturbance to local topographical settings and conserve the delicate mountain ecology. Under this approach, construction work is done manually by the local labour without using heavy machinery and explosives. Spoil disposal is minimized through balance in cutt and fill. Soft engineering structures are used as far as possible. Vegetation cover is maintained through application of re-plantation and stabilization of slopes is achieved through bio-engineering. Using local manual labor helps to inject money in local economy through the wages earned by the people. There will also be ownership feeling among the community towards the road. The proposed road has been designed considering combination of both the LEP approach for works possible through manual labor (earth excavation, bio-engineering, gabion structures), and contractor-based approaches for works that require mechanized applications (gravelling or construction of RCC cross drainage structures).

5.4 Alternative Schedule & Process:

The project area is a food deficit area, the deficit being more acute during the months of April to June. This period is also a slack period for agricultural activities. The project intends to provide cash against the work done by the local inhabitants.

5.5 Alternative Resources:

The physical resources consumed for the construction of proposed road project will mainly include simple equipment for earthwork excavation, boulders for gabion and dry walls and gabion construction. The selected alternative appears the most suitable one considering the local environment and socio-economic conditions. The proposed construction will optimally use the local labor force and hence, the benefits will also be distributed locally.

5.6 No action alternatives:

No action alternatives avoids the implementation of the project. The alternative has both beneficial and adverse impacts on the environment including the limitation of achieving the objective of project. The objectives of this project are to provide connectivity of rural area to market center, increase productivity in rural areas, enhance the flow of goods and services from rural area to market centers and vice versa, and eventually increase the living condition of people living in the zone of influence. If the project is not implemented, the present conditions of remoteness and isolation will persist, and by denying access of the local people to the markets and vice versa, will result into the continuation of the low level of productivity and prevalence of poverty. The do nothing situation will conserve some of the environmentally adverse impacts at the cost of severe poverty.

6.0 IDENTIFICATION OF IMPACTS AND BENEFIT AUGUMENTATION /MITIGATION MEASURES

The identification and assessment of impacts has been carried out by considering the proposed proposal activities in terms of construction and operation stage. The impact of the activities will be on physical, biological. socio-economic and cultural resources within the ZoI. The impacts generated are both beneficial as well as adverse. The environmental impacts have been identified for a number of issues based on the analysis of the environmental baseline information and activities that are to be undertaken (during construction, rehabilitation and subsequent operation phase). Most of the identified impacts have been quantified to the extent possible.

The impacts have been predicted in terms of their magnitude if significance (minor, moderate and high), extent (site specific, local and regional) and duration (short, medium and long term) as illustrated in **Table 6.1**. The possible impacts from the proposal during the construction and operation stages are presented as following:

6.1 Benefit Augmentation Measures

Design Phase

The mitigation measures adopted during design or pre-construction phases are of preventive nature with two basic objectives: (i) avoiding costly mitigation and (ii) awareness among the stakeholders.

6.1.a Appropriate Route Selection

The proper selection of appropriate route for the alignment can be one of the major preventive environmental mitigation measures. The appropriate route selection will avoid or minimize the environmental degradation primarily in terms of loss of flora and fauna, slope instability and soil erosion, disruption on water bodies, loss of fertile cultivated land, and loss of valuable properties of the members of the community. This mitigation measure has been already adopted in selecting the road alignment by comparing various alternative routes in terms of socio- economy, geology, geomorphology, forest cover, and other relevant issues.

6.1.b Appropriate Detailed Survey and Design

The detailed survey and design is also a preventive measure to avoid slope instability, disruption of water systems, forest loss, road accident, etc. The survey for the project needs to take into consideration the above points, The design needs to cover the rehabilitation of disrupted water systems, proper road gradient, suitable structures on unstable zones, and other measures.

6.1.2 Construction Stage

Employment Generation and Increase in Income

One of the major direct beneficial impacts of the road during construction stage is the creation of employment opportunity to the local community. 6972 no. of skilled and 90632 no of unskilled manpower will be required for construction work. Rehabilitation of this road will generate employment for the local people which will minimize seasonal migration to other parts of the

country and India. The amount of money that is earned by the wages will directly enhance the operation of various economic activities and enterprise development.

Measures: Benefit augmentation measures will be implementing the work as much as possible through the local Road Building Groups (RBGs) the local people particularly poor; dalit (occupational caste), ethnic minority and women will be given priority for employment. They will be given training to do the job. To utilize their money earned from the project works, RRRSDP will implement life skill training for income generation activities.

Skill Enhancement

Although many people in the project area are unskilled at present, the construction of road is likely to enhance their skills in construction, and large number of people will get practical or hands on training. Furthermore, the project will also organize training on road construction and maintenance to the Road Building Groups (RBG), Social mobilizers and supervisors. This will enhance the technical skills of local people. The skill and knowledge acquired from the project during construction will enhance future employment opportunities such as trained manpower can earn livelihoods from similar project in futures.

Measures :During the road construction and rehabilitation work, members of RBGs will be given training in road construction, soft engineering structures and bioengineering works. They will also be given on-the-job training for beneficial augmentation measures. This will help them to find job as skilled worker in other future projects as an alternative occupation in addition to agriculture

Enterprise Development and Business Promotion

During construction period, different types of commercial activities will come into operation in order to meet the demand of workers. Since they will have good purchasing power, they will regularly demand for different types of food, beverage and other daily necessary items. To meet these demands, many local and outside people may operate a number of small shops and restaurants around the vicinity of the construction sites. Various farm based enterprises including wide range of agricultural and livestock products will also gain momentum as a result of increased demand by labors during construction period. This will increase local trade and business in Chhinkhet, Netapokhara and Bafikot.

Measures: Providing support to local entrepreneurs, promotion of cooperatives and linkage with bank and other financial institutions.

Community Empowerment and Ownership

During construction period, Various road construction coordination committees and road building groups will be constituted in order to proceed and implement the road construction activities.

Measures: Various coordination committees will be constituted and training will be given to them.

6.1.3 Operation Stage

Following beneficial impacts of the proposed road project are anticipated during the operational stage:

Access to Inputs and Services due to Transportation Facility

Access to inputs and services is expensive and not regular at present due to earthen road. Once the road is in operation, people would have cheaper and improved access to many inputs such as seeds, chemical fertilizer and technology leading to increased agricultural production and diversification. The transportation cost is expected to come down heavily (more than 80%) for many of the inputs that are used by farmers in the farm and other goods.

Measures :Agricultural support services will be improved for the increased income from the farm products. Regular maintenance of the road will be done by the Proponent

Development of Market centers

There is a possibility of increased economic opportunities and significant growth and extension of the minor local markets along the road like in Chhinkhet, Netapokhara, Gilibang and Bafikot area. The farmers will be more interested to increase agricultural production due to market accessibility

Measures: DDC/VDCs shall manage planned growth with required infrastructure facilities for healthy and hygienic environment in the market areas.

Appreciation of Land Value

The construction of road leads to appreciation of land values particularly near the market and settlement areas. As per discussion with local people, existing land vaue of Bafikot VDC is already 10-25 Thousand per *Ana*. The land price would increase due to the availability of reliable transportation facilities. There will be rapid increase in the commercial production of agricultural crops due to road accessibility which is also a major factor to raise the land value. This activity would likely uplift the economic condition of the local people.

Measures: Promotion of land development activities and control of encroachment within RoW. The local people will be made aware that high value lands are acceptable to the banks and microfinance institutions to provide loans for them to start their own economic/social ventures.

Increased Crop Productivity and Sale of Farm Products

Due to easy and cheaper availability of agricultural inputs and technologies, productivity will be increased along the road. Sale of farm and livestock products will be increased in the settlements along the road corridor like, Chhinkhet, Netapokhara, Gilibang and Bafikot. The major areas for the production of Rice, fruits, vegetables production are Chhinkhet and Bafikot.

Measures: Promotion of market linkages and networking for better market price.

Enhancement of Community Development Services

Local people may spend more on health and sanitary facilities, education facilities and other community services due to reduced transportation cost. The operation of road will also contribute to raise quality services in social sectors as more competent agencies and people will enter in the area to provide services. This will also encourage students to enroll in campuses for higher studies. People will get health services easily due to the regular and cheaper transportation facilities.

Measures: The access will be kept maintained so that other development and services will follow in the project area.

Promotion of Tourism Activity

Syarpu Taal is potential for rural tourism development. More tourists will visit this area due to easy accessibility. Flow of tourists due to road upgrading will contribute in the enhancement of economic activities of the area which will increase the living condition of the local people.

Women and Indigenous People Empowerment

All the people will be benefited from the road upgrading. However, women in particular may be benefited more from improved access to the market centers and various service providing agencies like health centers, banks, training institutions, women development office etc. Frequency of visit to such agencies will increase awareness level and empower the women.

Measures: During the road construction and rehabilitation, more emphasis will be given to women, dalit and vulnerable workers. At least 50% workers will be women.

6.2 Adverse Impacts

The proposed road project activities during construction and operation will create following adverse impacts on the local environment:

6.2.1 Construction Stage

The proposed road will be upgraded according to LEP approach. Therefore, there will not be severe damage to environment compared to conventional construction approach. However, dump trucks, tractors will be used for transportation of river bed material and rollers for compaction purpose which is likely to cause following impacts on physical, biological, socio-economic and cultural resources of the proposed road area.

Physical Impacts

Change in Land Use

The land acquired for the implementation of the project can undergo a long-term permanent change in the land use. Changes of land use due to the construction of road are mainly conversion of agricultural land (1.93ha),forest(1.63ha), and barren(0.48ha) land into built up area(0.49ha). The changes in land use will have impact on loss of agricultural land, which directly reduce the agricultural production.

Measures: The mitigation measures will be compensatory. Proponent will assist the farmers in coordination with district agriculture office for better agriculture extension services. Plantation of trees at the ratio of 1:25 + 10% for each cleared plant. Local timber, fruit and fodder plants shall be given emphasis.

Spoil Disposal

Fresh cuts whenever is required, invites landslides and erosion during the monsoon. The common likely problems from the inappropriate disposal of spoils are: gullying and erosion of spoil tips especially when combined with unmanaged surface water runoff, damage to farm lands, destruction of vegetation, crops and property at downhill through direct deposition or indirectly as result of mass flow.

Measures :Spoils should be safely disposed and managed with minimum environmental damage using LEP approach which includes balanced cut and fill volume, re-use of excavated materials and minimum quantity of earth works. Recommended Spoil deposit sites are given in **Table 6.1**
The following mitigation measures will be adopted:

- Wherever possible, surplus spoil will be used to fill eroded gullies, quarries and borrow pits, depressed areas etc.
- Excess spoils will be disposed in specified tipping sites in a controlled manner.
- Spoils should not be disposed on fragile slopes, farmland, marshy land, forest areas, natural drainage path, canals and other infrastructures.
- After the disposal, the site will be provided with proper drainage, vegetation and adequate protection against erosion.
- Provisions of toe walls and retaining walls would protect the disposal of soil.

Table 6.1: Recommended Spoil disposal sites

SN	Chainages	Recommended Spoil disposal sites
1	0+400	Near Sani Bhere river
2	3+500	Near Phalamegauda Kholsi
3	4+750	Lower side of Kot
4	6+400	Near Netapokhara Kholsi
5	9+000	Inbetween Netapokhara and Daha

Source: Field Survey, 2009

Slope Instability

Removal of vegetation and open cuts with exposed soil to rain will cause soil erosion as well as landslide. This can become a major source of silt that the monsoon runoff carries away. The stability of slopes along the road corridor depends upon slope angle, the material constituting the slope, rock discontinuities and hydrological conditions. The degree of sliding increases during the road excavation and it may cause regular sliding during operational phase. These slides are still active and will undoubtedly cause more problems during monsoon period.

Measures :Earth excavation, particularly in unstable zones, drainage work, quarrying and spoil disposal will aggravate slope instability and soil erosion. The proposed road adopts green road approach. Adequate slope stabilization measures will be provisioned in design. Recommended Structures and its location for slope stabality are given in **Table 6.2.**

The following mitigation measures will be adopted during the construction and rehabilitation of the proposed road:

- Ensuring minimum cut slope
- Selecting cut and fill slope at correct angle depending upon the soil type
- Re-vegetation of cut and fill slope or exposed areas as soon as possible by using native plant species
- Adoption of bio-engineering techniques
- Ensuring minimum damage of vegetation during construction
- No construction work during rainy season

Table 6.2: Recommended structures along with Bio-engineering measures necessary for slope stabilization at various places

Chainage	Location	Structure/Bio-engineering
0 + 400	Chhinkhet	Gabion wall/ Tree Plantation
0 +500	Chhinkhet	Gabion wall/Bamboo Plantation
0 + 800	Chhinkhet	Gabion wall/Amliso Plantation/ Brush layering
1 + 200	Chhinkhet	Gabion wall/Bamboo Plantation/ Brush layering

Chainage	Location	Structure/Bio-engineering
3 + 020	Bafikot	Gabion wall/ Amliso Plantation/ Brush layering
5 + 170	Netapokhara	Gabion wall/ Amliso Plantation/ Brush layering
5 + 900	Netapokhara	Gabion wall/ Amliso Plantation/ Brush layering
7 +350	Netapokhara	Dry wall/Horizontal grass Plantation
7 + 850	Netapokhara	Gabion wall/Jute Netting/Grass plantation
8+ 150	Syarpudaha	Gabion wall/Jute Netting/ Grass, shrub plantation
8 + 530	Syarpudaha	Dry wall/Tree Plantation
8 + 800	Syarpudaha	Dry wall/Tree Plantation

Source: Field Survey, 2009

Water Management; spring, Streams, Rain Water (Drainage and cross drainage works etc.)

The concentrated water from the road outlet causes erosion and landslide eventually affecting the stability of the road itself.

Measures: Roads usually generate large volumes of concentrated surface runoff. The concentrated water flowing through the road and from the outlets cause erosion and landslides, eventually affecting the stability of the road itself, in order to avoid this, the following mitigation measures are suggested:

- Provide adequate and appropriate numbers of drainage structures in order to have minimum interference with and impact on natural drainage pattern of the area,
- Avoid surface water discharge into farmland or risky locations,
- Do not divert water away from natural water course unless it is absolutely necessary
- Avoid blockage or diversion of natural channels due to construction of road and disposal of spoils.
- Adopt outward road slope as per green road standard to minimize water accumulation

Dust, Noise and Water Pollution

The ambient air quality data of the project area is not available at present. The road construction and rehabilitation work is carried out manually by the local labour. For rock cutting, hand tools will be used and if the rock is hard, drilling machine will be used. The road side dwellers and workers may be affected by emission of dust during road construction. This may affect the health of the labourers and people living nearby areas. The increased construction activities like rock cutting may cause noise pollution to some extent to the workers and people living in nearby areas. Water quality data of water sources within the project area is not available. However, the water quality of water bodies within the project area appears to be good and without pollution. During the road construction, these water bodies may be affected due to excavated materials.

Measures :

- Use of face mask by the workers to minimize air pollution due to dust generation
- Plantation of local species along the roadside
- Use of ear muffles to lessen noise pollution during rock breaking and quarrying
- Avoiding the disposal of excavated materials in the water bodies

Quarrying and Borrow Pit

The construction of road requires large quantity of stones and boulders and other type of construction materials. Stones will be extracted using optimum rock cutting techniques like chiseling and hammering, heating and breaking and drilling and breaking. Blasting will not be done for quarrying purpose. The extraction of materials from inappropriate places or in excessive amount can seriously damage the local environment.

Measures: Following mitigation measures will be adopted:

- Appropriate planning for quarry and borrow operation will be made.
- Unstable sites, erosion prone area, dense forest area, settlements, fertile farm land will be avoided for quarry operation.
- After the extraction is completed, the quarry site will be rehabilitated to suit the local landscape.

Table 6.3

SN	Chainages	Places of recommended quarry sites
1.	0+000	Shani Bhere River,300m far from the road.
2.	7+300	Stone quarry site, 100 m far from the road
3.	8+500	Stone collection from Daha khola

Decline in Aesthetic Value

Landscape degradation relates particularly to poorly designed or monitored activities resulting from quarrying operations, from extraction of river bed material, from landslides that could have been avoided, and from indiscriminate dumping of spoil material. Road induced activities may lead to the generation and mismanagement of wastes in the roadsides and create scars on the landscape.

Measures: The following mitigation measures will be adopted for Decline in Aesthetic Value:

- Indiscriminate dumping of spoil material will be discouraged.
- After the extraction is completed, the quarry site will be rehabilitated to suit the local landscape.
- Plantation of local species along the roadside.

Biological Impacts

The following are possible identified impacts based on baseline information related with the upgrading of the proposed road.

Loss or degradation of Forest and Vegetation

Total of 1.63 ha of forest will be lost due to road construction. The proposed road passes through 1 CFs. From these CFs and private cultivated land, total 198 numbers of trees of various species will be removed during road construction.

Measures: During the road construction, total including all type 198 numbers of trees and bamboos will be removed as part of the site clearance.The loss of trees can not be minimized; however, it can be compensated by the plantation (1:25+10% ratio). According to the Work Procedure for Providing the Forest Land for Other Use, 2063 of Government of Nepal, project has to carry out plantation equivalent to the forest area lost from the construction of the road or pay for the plantation and protection cost for five years to the District Forest Office.The forest products from

the CFs will be utilized by the community forest users groups (CFUGs) according to community forest operational plan.

Impact on wildlife including birds due to loss or degradation of habitat, increased hunting and other form of human pressure

The proposed area is not significant habitat for wildlife and bird species. However, the construction of road may disturb wildlife and bird species present along the road corridor due to increased noise level.

Measures:

- When alignment passes through forest area, site clearance for construction shall be limited to the minimum width. No tree or vegetation shall be cut unless absolutely necessary.
- The construction activities near forest area will be appropriately managed so that there will be least disturbance to the wildlife and birds.
- Workers shall be actively discouraged from collecting fuel wood from forest or hunting of birds or animals.
- Proponent shall provide counseling services for the promotion of agro-forestry, Nontimber forest products, and horticulture in private land providing seeds, seedlings, slips, training and other incentives to the farmers residing in adjoining the road corridor in coordination with District Forest Office (DFO).
- Coordination with DFO and CFUGs to control the activities like illegal hunting and poaching by enforcing acts and regulations strictly.

Impacts on flora and fauna (as listed in CITES and IUCN Red data book)

There will be impact on flora and fauna (listed in CITES and IUCN category) as they are reported in the proposed sub project area.Sal is the protected plant species found in the road alignment.

Socio-economic and cultural Impacts

Loss or degradation of farm land and productivity

There will be loss of 1.93 ha of farm land due to road construction. This will lead to loss of food production among the families losing lands to the project. Moreover, spoils on farm land will also affect the production of agricultural crops like as Maize andMillet. Consequently, it will affect the livelihood of the households residing near the road alignment.

Measures: Productive land acquisition for the road alignment will be minimized as far as possible. Compensation for the loss of property will be provided to the affected people. A separate Resettlement Plan will be prepared to address land acquisition and compensation issues.

Loss or degradation of private properties such as houses, farm sheds, and other structures, crops and fodder/ fruit trees

The proposed road alignment passes through nearby the settlements of Chhinkhet, Bafikot, Neta Pokhara and Syarpu Daha. During the construction phase, the people of such settlements suffer by their property losses and damage by road construction works in some extent. Three household at Netapokhara (Ch 7+890) will be affected during road construction. Details about property loss and damage will be described in Resettlement Plan Report.

Measures: Compensation and resettlement measures will be dealt as per decision made by Compensation Determination Committee (CDC).

Impact on community infrastructure such as irrigation, water supply, schools, health post, trail and trail bridges

Drinking water supply intake at Chhinkhet (Ch 1+200) will be affected during road construction.

Measures: In order to avoid any impacts, the following mitigation measures will be adopted.

- Restore all disturbed infrastructures to the condition before disturbance or improve where appropriate.
- Avoid contamination of water resources systems during construction
- Schedule the construction activities during off- agriculture season.

Impacts on cultural, religious and archeological sites

There are Shivalaya Mandir and Syarpu lake within RoW of the the road alignment. Therefore, they might be affected due to the construction of the road.There will be likely no impact on local culture and tradition during construction stage.

Measures:

- Shifting of centre line of road alignment wherever possible
- Relocation of temple if it can not be avoided for dismantling
- Consultation with local people for appropriate solution

Impacts on health and safety matters

During construction, workers will be exposed to various risks and hazards. Potential impacts to health are respiration and eye diseases due to exposure to dust, risk of accident during work. The proper sanitation system should be developed to reduce the air and water pollution otherwise the surrounding environment may be polluted. It affects the health of local people.The lack of proper sanitary measures and increase in waste and water pollution can lead to an outbreak of epidemics, diseases as jaundice, typhoid etc. The most vulnerable will be women and children.

Furthermore, the road construction will encourage roadside settlement, which will increase the dumping of solid waste around the bridge may cause stomach problems due to poor quality drinking water.

Measures :The workers will be provided with helmets, masks, muffles (earplugs) depending on the nature of the construction work. Drinking water facility and temporary pit latrine will be established at construction sites to control open defecation and pollution of water bodies by the workers. Workers will be provided with first aid and health facilities. There will be provision for group accidental insurance for the workers. First aid training will be provided to field staffs like sub-engineers, social mobilizers and supervisors.

6.2.2 Operation stage

The following are possible identified impacts based on baseline information related with the operation of the road:

Physical Environment

Road Slope Stability and Management

The destabilization of slope may also be expedited due to human activities in the road neighbourhood such as quarrying stones or soil, animal grazing, irrigated cultivation. This may cause damage to road section, disruption to transportation and other social impacts in the nearby areas. The inadequate maintenance of the road due to the blockage of drains damages the road surface that can lead to slides and slope failure.

Impact due to air noise and water pollution

The operation of vehicles can disturb silent ambience of the existing area. Similarly, in long-term operation period, water and air pollution will be increased by the emission from the vehicles as well

as dust from the earthen road.

Biological Environment

Depletion of Forest Resources

The forest resources depletion may occur due to ineffective drainage works, inappropriate spoil disposal and construction practices. The development of market centers may exert pressure on forest and eventually deplete the forest resources. However, provision of forest products distribution in community forest operational plan will minimize the depletion of forest resources.

Disturbance to the wildlife and illegal hunting

Although the wildlife population is reported low, however, they may be disturbed due to the frequent movement of the vehicles. Vehicular flow, horn blowing in the forest area will have impact on the wildlife and bird species. Futhermore illegal hunting may also increase due to rapid flow of people.

Socioeconomic and Cultural Impacts

New Settlement and Market Center Development

The existing trend is to settle along the road side for the economic activities. This is primarily attributed to increased opportunities for trade and commerce through the establishment of shops, restaurants, stalls and hotels. So, there is expansion of settlement area and development of market centers in Chhinkhet, Netapokhara, Daha and Kot. This may trigger the practice of encroaching right of way (RoW). Consequently, this will reduce road capacity and increase road accidents. The increasing trend of roadside settlement is likely to increase household waste as well as wastewater on the road.

Change in Social behaviour

Flow of tourists and other visitors may influence the changes in the social behavior. This may increase economic opportunities along the road corridor. People may leave their family in their villages to dwell near the new spots for economic incentives. This will ultimately affect the traditional bonds, norms and functions of the family. This will also cause impact on social and cultural transition.

Road safety Measures

Movement of vehicles in the road will invite accidents. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents.

Impact on Livelihood and economic activities

Due to flow of vehicles some of the traditional business and indigineous skills of the local people may be influenced due to the entry of modern tools,equipements and transportation services.This will also cause impact on mule and porters.

Table 6.1. **Evaluation of Identified Environmental Impacts**

Beneficial Environmental Impacts

Phase	Impact	Magnitude	Extent	Duration
Construction Stage	Employment Generation and Increase in income	H	Lc	St
	Skill Enhancement	M	Lc	Lt
	Enterprise Development and Business Promotion	M	Lc	St
	Community Enpowerment and Ownership	L	Lc	St
Operation Stage	Access to Inputs and Services due to Transportation Facility	M	R	Lt
	Development of Market centers	M	R	Lt
	Increased Crop Productivity and Sale of Farm Products	M	Lc	Lt
	Appreciation of Land value	M	Lc	Lt
	Enhancement of Community Development Services	M	Lc	Lt
	Promotion of Tourism Activity	M	Lc	Lt
	Women and Indigenious People Empowerment	M	Lc	Mt

Adverse Environment Impacts

Phase	Aspect	Impact	Magnitude	Extent	Duration
Construction Stage	Physical	Change in Land Use	H	Lc	Lt
		Slope Instability	H	Ss	Lt
		Air Dust, Noise and Water Pollution	L	Lc	St
		Quarrying and Borrow pit	M	Ss	St
		Spoil Disposal	H	Ss	St
		Water Management Works	M	Ss	Mt
		Decline in Aesthetic Value	M	Ss	Mt
	Biological	Loss or Ddegradation of Forest and Vegetation	H	Lc	Lt
		Impact on Wildlife including birds due to loss or degradation of habitat,increased hunting and other form of human pressure.	L	Lc	St
		Impact on Flora and Fauna(as listed in CITES and IUNC Red data book)	L	Ss	St
	Socio-economic and Cultural	Loss or degradation of farm land and Productivity	M	Lc	Lt
		Impact on Health and Safety Matters	H	Lc	St
		Loss or degradation of private properties such as houses, farm sheds, and other structures, crops and fodder/ fruit trees	M	Ss	St
		Impact on community infrastructure such as irrigation, water supply, schools, health post, trail and trail bridges	M	Ss	St
		Impacts on cultural, religious and archeological sites	L	Lc	St
Operation Stage	Physical	Road slope Instability and Management	M	Ss	St
		Impact due to Air, Noise and Water Pollution	M	Lc	Lt
	Biological	Depletion of Forest Resources	M	Lc	Lt
		Disturbance to the Wildlife and Illigal hunting	M	Ss	Mt
	Socio-economic	New Settlement and Market Center Development	M	Lc	Mt
		Road Safety Measures	M	Lc	Lt
		Change in Social behaviour	M	Lc	Lt
		Impact on Livelihood and economic opportunities	M	Lc	Lt

Note:

- ***Magnitude****: This can be low-**L** (minor), medium-**M** (moderate), and high-**H** (major), depending on the scale or severity of change.*
- ***Geographical extent****: If the action is confined to the project area, it is referred as site-specific (**Ss**), if it occurs outside area but close to project area, the extent of impact is local (**Lc**), if it occurs far away from the project, it is referred as regional (**R**).*
- ***Duration****: It can be short term (**St** - i.e. less than 3 years), medium term (**Mt** - i.e. 3-20 years), and long term (**Lt** - i.e. more than 20 years).*

7.0 ENVIRONMENTAL MANAGEMENT PLAN

The EMP is prepared to guide implementation of mitigation measures and monitoring requirements. It includes institution and their roles, environmental management activities, environmental management organizational structure and budget for mitigation measures.

7.1 Institutions and Their Roles

The Ministry of Environment (MoE) is the main institution mandated to formulate and implement environmental policies, plans and programmes at the national level. It is also charged with the responsibility for preparing and issuing environmental regulations and guidelines; development and enforcement of environmental standards; pollution control, commissioning environmental research and studies; and monitoring of programmes implemented by other agencies.

The main responsibility for IEE and environmental management plan (EMP) implementation is with DDC/DTO, Rukum. During the implementation in the district, DIST team will assist DDC through DPO. The DDC/DTO will also receive necessary assistance from the CISC team for the implementation and monitoring of the EMP. The Ministry of Local Development (MLD), District Development Committees (DDCs)/District Technical Office (DTO), and the Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) are the institutions directly involved in the IEEs of RRRSDP funded sub-projects. The environmental management organizational structure is illustrated by **Figure 8.1.** The roles of these institutions are as following:

Ministry of Local Development (MLD):

As the concerned line ministry, it is responsible for review and final approval of ToRs and study reports of IEEs, and for managing environmental monitoring. MLD has established an Environmental Management Section (EMS) which is mandated with the overall environmental responsibility of the Ministry.

Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR):

It is the executing department of the RRRSDP under MLD and responsible for various project implementation activities including environmental management. It is responsible for providing back-up support to DDC/DTO in carrying out its tasks and advising MLD as necessary through Environmental Focal Point .

Rural Reconstruction and Rehabilitation Sector Development Program – Project Coordination Unit (RRRSDP- PCU):

It is the technical unit which is responsible to assist in project implementation in the districts.

Central Implementation Support Consultant (CISC):

It is responsible for supporting the implementation of RRRSDP activities in the central and districts.

District Development Committee(DDC)/District Technical Office (DTO), Rukum:

As project implementer at district level, DDC/DTO,Rukum are responsible for screening and ToR preparation, commissioning IEE studies and carrying out mitigating works along with monitoring of EMP.

District Project Office (DPO):

It is the part of project team in the district which assists DDC/DTO for the implementation of the programme.

District Implementation Support Team (DIST):

With technical, environmental, resettlement and social staff, it supports in the implementation of the project activities in the district.

District Project Coordination Committee (DPCC):

It is a sub-committee of the DDC for the implementation of the road construction and operation activities within the district.

Village Infrastructure Construction Coordination Committee (VICCC)

It coordinates infrastructures issues among beneficiaries and institutions at VDC level.

Road Building Groups/Contractors

Responsible for reconstruction.

7.2 Reporting and Documentation

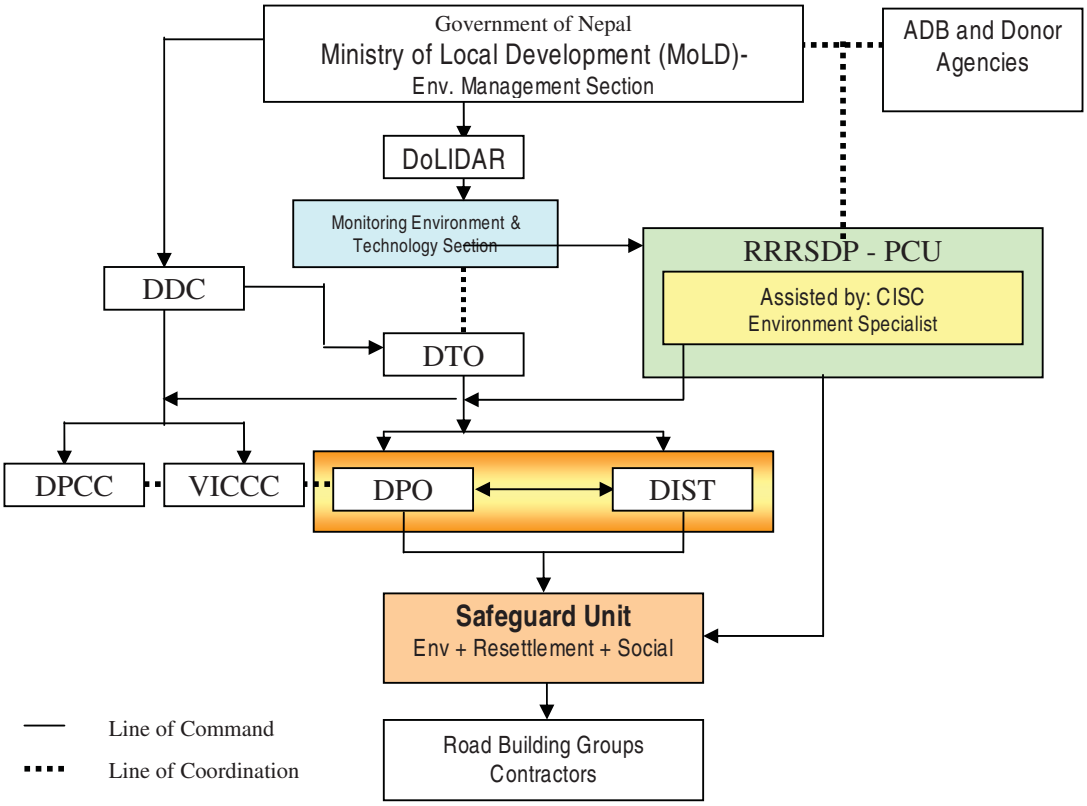
As part of EMP, reports should be produced at regular time intervals depending upon type and size of project by the EMP team or unit. Since the construction period is less than 2 years, three monthly reports will be prepared and submitted to the DDC and DDC will send to the PCU and DoLIDAR.

The Contract will need to state that the DDC/DTO must approve the road building groups/contractor's arrangements for environmental protection, health and safety, waste management and other environmentally related actions identified during the detailed design phase and these must be written into the Contract Document.

The DIST will inform the DDC/DTO in case of non-compliance and of any other environmental issue that requires immediate attention. The contract will detail the remedies for non-compliance by the RBG/Contractor.

The monthly reports will be based on recurrent site inspections and will report on the effectiveness of the mitigation measures; the contractor's compliance with the environmental specifications; measures recommended in the events of non-compliance and recommendations for any other remedial actions, etc.

Fig. 7.1: Environmental Management Organization Structure



7.3 Environmental Management Plan

The DDC/DTO with project support will be responsible for the implementation of mitigation measures and of the monitoring plan. Overall implementation of the EMP will become proponent's responsibility. Framework for implementing environmental management plan is shown by **Table 7.1.**

Table 7.1: Framework of Implementing Environmental Management Plan (EMP)

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
Beneficial Impacts and Benefit Augmentation Measures					
Construction stage					
Construction of road	Employment Generation and Increase in Income	• Members from target minorities and the disadvantaged groups will have proportional representation in RBGs. • At least 50% women participation as workers and women as RBG leaders will be ensured	DPO/DIST	Construction	Records, Discussion
	Skill Enhancement	• Training in road construction, soft engineering structures and bioengineering works for members of RBGs.	DDC/DPO/DIST	Construction	Records, Discussion
	Enterprise Development and Business Promotion	• Providing support to local entrepreneurs, promotion of cooperatives and linkage with bank and other financial institutions.	DPO/DIST	Construction	Records, Discussion
Community Empowerment and Ownership	• To strengthen capacity of communities, beneficiary participation, and social cohesion through, among others • participation, including through public hearings and social audits; • Building community capacity in maintenance of supplementary infrastructure	• Awareness raising about the Project and opportunities there under • Training of RBGs • Assisting communities in identifying supplementary infrastructure and preparing proposals Facilitating beneficiary	DDC/DPO/DIST	Construction	
Environment Management Plan					
Operation Stage					

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	Improvement in accessibility, saving of time and transportation cost	• Improve agricultural support services for the farmers • Improvement of foot trails	DDC/DADO //local farmers	Operation	Records, Discussion
	Access to Inputs and Services	• Agricultural support services will be improved for the increased income from the farm products		Operation	Records, Discussion
	Increase in Trade, Commerce and Development of Market centers	• promote cooperative and provide linkage with bank and other financial institutions for setting up business enterprises • Sewerage and other basic facilities will be supported in the market centers	DDC/DTO	Operation	Records, Discussion
	Appreciation of Land Value	• Promotion of land development activities and check encroachment within RoW	DDC/VDC	Operation	Records, Discussion
	Increased Crop Productivity and Sale of Farm Products	• Improve agricultural support services for the farmers	DDC/VDC/ local people	Operation	Records, Discussion
	Enhancement of Community Development Services	• Support promotion of community development activities and development and linkage of social infrastructure services	DDC/VDC/local people	Operation	Records, Discussion
	Promotion of Tourism Activity	• Development of lodges, restaurants and hotels for the tourists will be supported	DDC/VDC /Nepal Tourism Board	Operation	Records, Discussion
	Women and Indigenous People Empowerment	• The Project will target minorities and the disadvantaged for proportional representation in BGs, and promote female membership of at least 50% and women as BG leaders.	DDC/DPO/DIST	Operation	Discussion
Adverse Impacts and Mitigation Measures					

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
Construction stage					
Physical Environment					
Construction of road	Change in land use • Permanent conversion of cultivated land (1.93 ha) and 1.63 ha of forest will be to road built up area	• Plantation of trees in the community forests (1:25+10%) • Improving agricultural extension services • Applying additional protective measures that the remaining land will not be lost due to erosion. • Temporary lost vegetation on work site and material storage yards shall be revegetated after the completion of road construction. During re-vegetation, local species identified during the survey shall be used. The spoil sites shall be stabilized with bio-engineering technologies.	DDC/DFO/ CFUG/Local farmers	Construction	Records, observation
Construction of road (Spoil disposal)	• Gullying and erosion • Slope failure and mass wasting • Disruption of natural drainage pattern, causing scouring, erosion and landslide • Damage to irrigation systems and crops through direct deposition or indirectly as result of mass flow • Water pollution and degradation of water quality • Recommended spoil	• Wherever possible, surplus spoil will be used to fill eroded gullies, quarries and depressed areas etc. • Excess spoils will be disposed in specified tipping sites in a controlled manner and the tipping sites should be covered by vegetation by bio-engineering techniques after surplus material is tipped. • Spoils should not be disposed on fragile slopes, farmland, marshy land, forest areas, natural drainage path, canals and other infrastructures.	DDC/DIST/DSCO /RBG/Contractor	Construction	Records, observation

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	disposal sites:	• After the disposal, the site will be provided with proper drainage, vegetation and adequate protection against erosion. • Necessary toe walls and retaining walls will be provided to protect the disposal of soil. • Spoil disposal sites chainage(0+400 near sani bheri river,3+500 near Phalamegauda Kholsi ,4+750 lower side of kot,6+400 near Neta pokhara Kholsi,9+000 In between Netapokhara and Daha)			
Construction of road	• Slope instability	• Ensuring minimum cut slope • Selecting cut and fill slope at correct angle depending upon the soil type • Re-vegetation of cut and fill slope or exposed areas as soon as possible by using native plant species • Adoption of bio-engineering techniques • No construction work during rainy season • Structures provided at various Chainage (0+400,0+500,0+800,1+200,3+020,5+170,5+900,)required gabion wall and bamboo plantation, amliso plantation and tree/shrub plantation at chainage (7+350)dry	DDC/DIST/DSCO/RBG/ Contractors	Construction	Records, observation

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
		wall/horizontal grass plantation ch.7+850,8+150 required gabion wall and jute netting, grass plantation at ch 8+530,8+800 need dry wall and tree plantation.			
Water Management; Spring, Streams, Rain Water (Drainage and cross drainage works etc.)	Concentrated water from the road outlet causes erosion and landslide eventually affecting the stability of the road itself.	• Provide adequate and appropriate numbers of drainage structures in order to have minimum interference with and impact on natural drainage pattern of the area, • Avoid surface water Discharge into farmland or risky locations, • Do not divert water away from natural water course unless it is absolutely necessary • Avoid blockage or diversion of natural channels due to construction of road and disposal of spoils. • Adopt outward road slope as per green road standard to minimize water accumulation.	DDC/DPO/DIST	Construction	Records, observation
Construction of road	Air dust, noise and water pollution: (dust emission, water quality deterioration due to disposal of excavated materials and waste by workers)	• No heavy equipments will be used during construction minimizing dust emissions • By planting trees on right of way • Uses of ear muffles and face masks should be maintained. • Avoid the disposal of excavated materials in the water bodies.	DDC/DPO/DIST	Construction	Records, observation,
Quarrying	The extraction of materials from inappropriate places or	• Appropriate planning for quarrying and borrowing of	DDC/DPO/DIST	Construction	Records, observation

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	in excessive amount can damage the local environment. The potential adverse impacts of quarrying are accelerated erosion, landslides, disturbance in natural drainage patterns, water logging and water pollution.	materials will be made during construction. • Unstable sites, erosion prone area, dense forest area, settlements, fertile farm land will be avoided for quarrying operation. • After the extraction is completed, the quarry site will be rehabilitated to suit the local landscape. • Quarry sites are at ch. (0+000,7+300,8+500)			
Construction of road	Decline in asthetic value	• Indriminate dumping of spoil material will be discouraged. • After the extraction is completed, the quarry site will be rehabilitated to suit the local landscape. • Plantation of local plant species along the roadside	DDC/DPO/CFUG/ DFO	Construction	observation
Biological environment					
Construction of road	Loss or degradation of forests and vegetation: Total of 1.63 ha of forest will be permanently lost due to road construction work. The proposed road passes through four CFs. From these CFs and private cultivated land, total 198 numbers of forest trees, fodder and fruit trees of various species will be removed during road construction	• Compensatory plantation (1:25+10%) or pay for the plantation and protection cost for five years to the District Forest Office as per Work Procedure for Providing the Forest Land for Other Use, 2063 of GoN. • The forest products from the CFs will be utilized by the community forest users groups (CFUGs) according to community forest operational plan.	DDC/DPO/CFUG/ DFO	Construction	Records, observation, meeting
Construction of road	Impact on wildlife including birds due to loss or	• The construction activities near	DDC/DPO/CFUG/ DFO	Construction	Records,

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	degradation of habitat, increased hunting and other form of human pressure	forest area will be appropriately managed so that there will be least disturbance to the wildlife and birds. • Workers shall be actively discouraged from collecting fuel wood from forest or hunting of birds or animals. • Proponent shall provide counseling services for the promotion of agro-forestry, Nontimber forest products, and horticulture in private land providing seeds, seedlings, slips, training and other incentives to the farmers residing in adjoining the road corridor in coordination with District Forest Office (DFO). • Coordination with DFO and CFUGs to control the activities like illegal hunting and poaching by enforcing acts and regulations strictly.			observation, discussion
Construction of road	Impacts on flora and fauna (as listed in CITES and IUCN Red data book)	• Coordination with DFO and CFUGs to control the activities like illegal hunting and poaching by enforcing acts and regulations strictly.	DDC/DPO/CFUG/ DFO	Construction	Records, observation
Socio-economic and cultural environment					
Construction of road	Loss or degradation of farm land and productivity	• Improvement of agricultural extension services	DDC/DPO/DIST	Construction	Records, meeting, observation
	Loss or degradation of private	• A separate Resettlement Plan will	DDC/DPO/CDO	Construction	Records,

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	properties such as houses, farm sheds, and other structures, crops and fodder/ fruit trees	be prepared to address land and property acquisition as well as compensation issues.			observation, meeting
	Impact on community infrastructure such as irrigation, water supply, schools, health post, trail and trail bridges	• Restore all disturbed infrastructures to the condition before disturbance or improve where appropriate in coordination with local irrigation canal users' committee/water users' committee • At 1+200 drinking water supply intake need to relocate. • Schedule the construction activities during crop off-season not to disrupt water bodies being used for irrigation purposes by the road.	DDC/DPO/DIST	Construction	Records, observation
	Impacts on cultural, religious and archeological sites	• Shifting of centre line of road alignment wherever possible • Consultation with local people for appropriate solution	DDC/DPO/DIST/ VICCC	Construction	Records, observation, meeting
Construction of road	Health and safety matters: The potential impacts to health are respiratory and eye diseases due to the exposure on dust, risk of accident during works. The lack of proper sanitary measures and increase in waste and water pollution can lead to an outbreak of epidemics, diseases as jaundice, typhoid etc.	• The workers will be provided with helmets, masks, muffles depending on the nature of the construction work. • Drinking water facility and temporary pit latrine will be established at construction sites to control open defecation and pollution of water bodies by the workers. • Workers will be provided with first aid and health facilities.	DDC/DPO/DIST	Construction	Records, observation, meeting

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
		• Insurance for workers for accidents.			
Operation stage					
Physical environment					
Operation phase (plying of vehicles)	Slope Instability: the slope along the road alignment and nearby areas may be destabilized due to human activities in the road neighborhood such as quarrying for stones or soil, animal grazing and irrigated cultivation. This will cause the damage to road section, disruption of transportation and other social impact in nearby area	• Correction of maintenance of the slope protection measures and drainage works • Minor landslides and mass wasting will be immediately cleared and slope restored with appropriate technology (bio-engineering) • Soil conservation will be promoted in the right of way and vulnerable areas beyond the road alignment	DDC/DTO/DSCO	Operation	observation, records
	Air, Noise and Water Pollution: due to the movements of vehicles and other activities. Disposal of gases and liquid pollutants from vehicles into water bodies may cause water pollution	• Community and road user awareness program will be organized to enhance public awareness near the settlements. • Speed limit of vehicles will be maintained near the settlements • Use of horns should be restricted near health posts, schools and settlements • Plantation will be done along the Right of Way (RoW) near the settlement	DDC/DTO	Operation	observation, records
Biological environment					
Operation phase (plying of	In operational phase of the road, the rate of forest resource depletion will be	• Encourage and support local CFUG and authorities in	DDC/CFUG/DFO	Operation	observation, records

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
vehicles)	increased because of the inaccessible sites mainly in Gamthale Community forest area where forest resources are in good condition will become more accessible.	controlling illegal harvesting of forest resources. • Appropriate sign boards will be erected informing drivers about potential areas for wildlife crossing			
	Increase in poaching and illegal trafficking: Operation of road makes inaccessible sites, where wild faunas are available, will become more accessible and the rate of poaching can also increase if controls are not introduced. It may also increase smuggling of wild-fauna and their parts due to easy access and easy transportation facilities. Operation of road may increase in sudden accidents between wildlife and vehicles, ultimately results casualties and death of wild-fauna.		DDC/CFUG/DFO	Operation	observation, records
Socio-economic and cultural environment					
Operation phase (plying of vehicles)	New settlement, market centre development and population pressure: The existing trend is to settle along the road side for the economic activities.	• Regulate settlement growth with proper planning/zoning along RoW and Discourage ribbon settlement • Awareness raising programme through local organizations to plan proper settlements • Plantation of trees along the road.	DDC/DTO/VDC	Operation	observation, records
	Change in social behavior:	• facilitate awareness raising	DDC /DTO/VDC	Operation	Records,

Project Activity	Potential Environmental Impacts	Proposed Benefit Augmentation/Mitigation Measures	Institutional Responsibility	Period	Verification Method
	Flow of tourists and other visitors may influence the changes in the social behavior. This may increase economic opportunities along the road corridor. People may leave their family in their villages to dwell near the new spots for economic incentives. This will ultimately affect the traditional bonds, norms and functions of the family.	programmes to the communities about negative social behavior like gambling, excess use of alcohol			meeting, discussion
	Road Safety Measures: Movement of vehicles in the road will invite accidents. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents.	• Required safety signs will be used along the road • Applying appropriate road safety measures with the help of 3-Es i.e. Engineering, Enforcement and Education.	DDC/DTO	Operation	observation, records
	Impact on Livelihood and economic activities: Traditional business and indigineous skills of the local people may be influenced . This will ultimately affect the Livelihood and economic activities of people working as porter and operating mule cart for transport.	• conducting various training and program to the local people which help to transform traditional business and indigineous skills into modern ones. The local people working as porter and having mule will be given priorities for employment during road construction.	DDC/DTO		

7.4 Mitigation cost

The estimated cost for beneficial augmentation measures like awareness raising program, skill training, promotion of small scale industries, and income generation activities will be covered by RRRSDP. Costs for income generation and awareness programme activities for Affected Persons (APs) are included in Resettlement Plan. The design and cost estimate for most of the suggested mitigation measures such as slope stabilization, quarry site management, spoil disposal, supply of face masks, helmets, muffles, accidental insurance, bioengineering measures, plantation, land slide rehabilitation, supporting CFUGs shall be incorporated in the design and cost estimates. Therefore, most of the mitigation measures suggested would be a part of road design and construction without additional cost. All proposed mitigation measures will be integrated in the project design so that these measures may automatically form part of the construction and operational phases of the project. The indicative cost for environmental enhancement and mitigation is presented in the **Table 7.2.**

Table 7.2. Cost Estimate for Environmental Enhancement and Mitigation Measures

SN	Measures	Estimated cost (NRs.)	Remarks
1	**Benefit Augmentation Measures**		
1.1	Community Empowerment	90,000.00	Will be included in resettlement plan, Community Empowerment and Livelihood Enhancement Skills Training component of RRRSDP.
1.2	Livelihood Enhancement Skill Training	200,000.00	
2	**Adverse Impact Mitigation Measures**		
2.1	Occupational health and safety	250,000.00	Included in subproject cost
2.2	Insurance	400,000.00	Included in subproject cost
2.3	Compensatory plantation (plantation of 6435 plants in community forest area)	273,487.00	Cost estimated as per rate analysis norms of MoFSC
2.4	Drainage and cross-drainage structure	120.00000.00	Included in subproject cost
2.5	Bio-engineering works	1206572.00	Included in subproject cost
3.	Resettlement and Rehabilitation cost	380,000.00	Will be included in resettlement plan
	Total	14,800,059.00	

7.5 Implementation of Mitigation Measures

The mitigation measures should be integrated into project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and

operation phase. By including mitigation measures in the contract or in specific items in the Bill of Quantities, monitoring and supervision of mitigation implementation could be covered under the normal engineering supervision provisions of the contract.

Sub-Project Design - The mitigation measures should be integrated in the design of the project itself. Such a step will enhance the mitigation measures in terms of specific mitigation design, cost estimation of the mitigation measure, and specific implementation criteria. The mitigation measure integration in the design phase shall also help in strengthening the benefits and sustainability of the project.

Sub-Project Contract. - The project contractor should be bound by the parameters identified in the environmental assessment pertaining to specific mitigation measures in the contract. The final acceptance of the completed works should not occur until the environmental clauses have been satisfactorily implemented.

Bill of Quantities - The tender instruction to bidders should explicitly mention the site-specific mitigation measures to be performed, the materials to be used, labor camp arrangements, and waste disposal areas, as well other site specific environmental requirements.

Supervision and Monitoring.- The purpose of supervision is to make sure that specific mitigation parameters identified in the environmental assessment and as bound by the contract is satisfactorily implemented. Likewise, monitoring is necessary such that the mitigation measures are actually put into practice.

7.6 Environmental Monitoring

Trimester Environmental Monitoring report will be submitted for the first year of operation of the road by the DDC/DTO to PCU /DoLIDAR ,who will submit the report to ADB.

7.6.1 Monitoring Responsibility

Monitoring is an integral part of the project proponent so as to know the unlikely impacts and implement corrective measures. The proponent, DDC/DTO Rukum will develop in-built monitoring mechanism to show its additional commitment for environmental improvement and mitigate undesirable environmental changes, if any during construction and operational stage. DDC/DTO will be supported by DPO and DIST team in the district and Environmental team from the DIST for environmental monitoring. There is a need to support these organizations to carry out environmental monitoring effectively. Therefore, environmental monitoring training will be conducted together with technical, social, resettlement and project performance monitoring and evaluation training.

According to EPR, 1997, the MLD/DoLIDAR is responsible for monitoring and evaluation of the impact due to implementation of the project. The MLD/DoLIDAR checks whether the DDC/DTO is carrying out monitoring activities as per the IEE, and if the prescribed mitigation measures are being implemented.Total cost estimated for central level environmental monitoring is NRs. 50,000.

DDC/DTO with RRRSDP PCU support should make arrangements for sub-project level monitoring. It should constitute a monitoring team, which must be independent from the implementation team and should consist of relevant persons in the context of a sub-project being monitored, for example persons from the forest, agriculture, social and NGO sectors. The monitoring team will be constituted separately for each monitoring event. Project's district

management team should be responsible for forming the monitoring team, financing the monitoring works, providing logistics and other necessary support. Thus, it is recommended that an external team hired by DDC/DTO takes responsibility for periodic monitoring of the environmental performance, in addition to the regular supervision and guidance provided by the DIST at the site. The sub-project specific monitoring plan as given in **Table 8.4** shall be followed.At least one monitoring in each construction season is necessary.

The sub-project level monitoring team should submit its report to RRRSDP district management, which should forward a copy to the RRRSDP Project Coordination Unit. Total cost of environmental monitoring (field visits, observation, review of reports and report preparation) is estimated NRs. 550,000 as given in **Table 7.3.**

Table 7.3 Environmental Monitoring Cost

Description	**Duration (month)**	**Rate (NRs)**	**Amount (NRs)**
District level monitoring			
1. TeamLeader/Environment Specialist	2	75,000	150,000
2. Engineer	1	70,000	70,000
3. Forester	1	70,000	70,000
4. Socio-economist	1	70,000	70,000
5. Support staff	1	40,000	40,000
6. Transportation cost		LS	50,000
7. Report preparation and sampling/lab test		LS	50,000
Central level monitoring			
Monitoring cost		LS	50,000
Total			**550,000**

7.6.2 Types of Monitoring and Monitoring Parameters

Monitoring is an on going component of the environmental assessment process and subsequent environmental management and mitigation activities. There are basically two types of environmental monitoring:

Compliance Monitoring

It verifies whether contract environmental clauses and the mitigation measures are properly implemented in the field. Compliance monitoring is necessary in order to encourage and promote the proponent to comply with the requirement as listed in the mitigation measures and condition set forth during the project approval. Hence, it is desirable to ensure the integration of mitigation measures in the document, if any, which should fully reflect environmental obligation to be complied with by the proponent.

Impact Monitoring

It confirms whether the environmental mitigation measures specified in the project design and contract are correctly formulated. Impact monitoring is necessary in order to know the actual level of impact in the field during the construction and operation of the proposed project as the environmental impacts are predicted on the basis of value judgment through some valid

assumptions. The nature and purpose of environmental monitoring are different for different stages of project process viz. the pre-construction (design and investigation), construction stage, and operation stage.

The nature and purpose of environmental monitoring will be different in the pre-construction, stage, construction stage and operation stage of the project.

7.6.2.1 Pre-construction Stage

Monitoring at this stage of project is to:

- Confirm that plan, route selection and design of the road has considered the recommendation made by IEE
- Judge the level of preparation for implementing the construction related mitigation measures, and
- Prepare up-to-date environmental status of specific site where the impacts are assessed to be significant

7.6.2.2 Construction Stage

This stage of monitoring is to check compliance with the best practices, norms and standards and on implementation of the mitigation measures prescribed by IEE. The following parameters will mainly be focused on:

- Disposal of spoil and construction wastes and its consequences
- Disruption of natural water courses, drainage work and its consequences
- Slope protection measures
- Loss, stratification or degradation of forest vegetation
- Care, sensitivity or disruption of community infrastructures
- Loss or degradation or threat to private properties
- Care, sensitivity or disruption to cultural sites
- Quarrying and river bed material extraction

7.6.2.3 Operation Stage

The monitoring in this stage is mainly related to road features, road induced activities and their impacts on receiving environment. The following parameters are mainly monitored during operation stage:

- Drainage structures, their outfall and damage to private properties, community properties and natural resources
- Effectiveness of the slope protection and soil erosion measures
- Encroachment into road side, public land, forest or marginal land
- Status of waste disposal sites, quarry sites, and river bed material extraction sites
- Road accidents
- Symptoms of emergence of road side settlements, changes in agricultural pattern
- Activities of road neighbouring communities
- Illegal felling of trees and hunting of wildlife

Table 7.4 presents Compliance and **Table 8.5** presents Impact/Effect Monitoring for the Chhinkhet -Syarpu Road Subproject respectively.

Table 7.4: Compliance Monitoring for Chhinkhet -Syarpu Road Subproject.

Parameters/Issues	Responsible Implementing Agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency
Final alignment selection as per IEE recommendation	DIST	Incorporation of IEE recommendations into alignment selection process and design document	Walkthrough along final road alignment, verifying sensitive areas	Initial stage preconstruction phase	DDC/DTO through PCU-CISC, DoLIDAR
Land and property acquisition and compensation	Proponent with assistance of DIST	Cadastral records, land and properties acquisition procedures; Procedures followed during voluntary donation of Land; Preparation of inventory of infrastructures likely to be affected	Public consultation, photos; geo-referencing; Check inventory against cadastral records and discuss with people	Initial stage pre-construction phase - well ahead of construction	CDC/PCU - CISC/ DOLIDAR
Resettlement, assistance and compensation	Proponent / DIST	Legal provisions by GoN; Compensations paid	Check compliance to legal procedures	Well ahead of construction	CDC/PCU - CISC/ DOLIDAR
Site selection and preparation of construction logistics	Proponent / VICCC	Project's arrangement for materials storage, and construction activities	Site observation, geo-referencing and photographic documentation	Beginning of construction period	DIST/DTO
Use of local labour, particularly vulnerable groups and women	DPCC/ VICCC / DIST	Specifications which obligate the contractors/RBG to observe certain quotas for employing local labour, specially vulnerable groups and women, use of child labour	Records and coordinates the process for local people's employment, interviews	During the entire period where labour work is contracted, trimester	DDC/DTO
Awareness and orientation training on road construction to technicians, and locally employed labourers	DIST/VICCC	Training programmes for skill development, occupational safety and environmental protection associated with road construction works	Specifications; training records, check training programme reports, assess feedback from participants	Beginning of construction and during construction	DDC/DTO/DIST
Compliance to Occupational health and safety matters	DIST / Contractor (if involved)	Health and safety regulations, first aid and medical arrangements, contingency plan, number and type of safety equipments such as mask, helmet, glove, safety belt	Spot checks at work sites, photos, accident records, interviews	throughout construction activities, trimester	DDC/DTO

Parameters/Issues	Responsible Implementing Agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency
Compliance to environmental protection measures, including pollution prevention, water and soil management, slope stabilisation, cut and fill, waste management, spoils, sensitive habitats and critical sites, protection of fauna and flora	Contractor/RBG /DIST	Records and observations on pollution, waste management, spoil deposit. Training programmes for labourers to prevent impacts on wildlife sensitive habitats, forests and fuel wood use.	Site inspection, discussion with Project management, consultants, and local people. Quantifying site-specific impacts, photos, laboratory tests where required. Existing patrol, control and enforcement mechanisms, enforcement records	Before and during construction period	DPO/Proponent
Vegetation clearance	Contractor / RBG / DIST	Actual number of trees felled during construction works	Record, inspection and interview with local people and CFUGs	After detail design and before construction work	CFUGs/DTO/DDC/DFO
Measures to avoid pressure on forest and wildlife	Contractor /RBG/DIST	Use of firewood or fossil fuel by construction crew, events of hunting and poaching of wildlife	Inspection, interview with local people and CFUGs	Once a month during construction	DDC/DTO/ CFUGs
Measures to protect environment from air & noise pollution	Contractor / RBG/DIST	Dust level and noise level at work sites, major settlements and sensitive spots like health centres and schools	Visual observation and discussion with residents and workers	Once in a month during construction	DDC/DTO
Measures to protect water bodies from pollution	Contractor / RBG/DIST	Visual observation, observation of open defecation and waste disposal around water sources near construction sites	Site inspection, test of site-selected samples of local streams water using standard field kit, interview	Once in a month during construction; upon demand for testing with field kit	DDC/DTO
Restoration, rehabilitation, reconstruction of all infrastructure services disrupted or damaged by the proposal activities	Contractor/RBG/DIST	Continued services by the facilities and functional public life	Site observation; VDC/DDC records; public consultation meetings; photos	Once in 15 days during construction	DDC/DTO
Adequate technical and environmental supervision	DIST	Adequate number of technicians regularly at site with ability to implement labour based road construction concept	Check number and type of technicians available at site; skill of work carried out; discussion	Twice a month during construction	DDC/DTO
Clean up and reinstatement	Contractor/RBG	Decommissioned sites indicate no	Site observation; comparing photos;	At the end of	DDC/ DTO

Parameters/Issues	Responsible Implementing Agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency
of the construction sites (camps, quarries)	/DIST	adverse/residual environmental impacts, and are rehabilitated to the satisfaction of the supervisor and land owners	consultation with land owners and community based organizations	construction period	

Table 7.5: Impact/Effect Monitoring for the Chhinkhet -Syarpu Road Subproject.

Parameters /Impacts	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementation and Monitoring Agency
Slope stability and erosion	Inclination, slope failures, causes; drainage facilities such as catch drain, side drains and functionality of cross drainage structures; fresh gullies and erosion; success/failure of bio-engineering solutions	Site observation, photos discussion with people and technicians	Near steep slopes and at landslide areas and sites	Continuously during construction and operation	DIST during construction; DDC/DTO/Soil Conservation Office during operation
Bio-engineering of disturbed slopes	Re-vegetation through bio-engineering application on disturbed slope; establishment of nursery	Site observation; inspection of nursery and its production rate, photos, measurements	Cut slope area, where vegetation is cleared; nursery siyes	During and at end of project construction	DIST/DDC/DTO
Disposal of spoils and construction wastes	Affected aesthetic value, affected forest and agriculture, initiated land erosion by local blocked drainage, hazard to downhill slope residents and agricultural lands	Site observation and interviews, photos, geo-referencing sites	At specific locations where such sites occur	During construction	DIST/DDC/DTO
Quarrying of construction materials	Initiated erosion, changes in river regime, erosion by river systems, landslide due to quarrying, degradation of vegetation, water logging,	Site observation, photos, records from local health centres	Quarry site areas	During construction	DIST/DDC/DTO

Parameters /Impacts	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementation and Monitoring Agency
	waterborne diseases				
Disruption of drainage system	Status of rehabilitation, service status of irrigation and water supply system; operation and maintenance requirement	Observation and interviews, photos, records	Irrigation schemes and water supply system	During construction	DIST/DDC/DTO
Loss or degradation of farmland, houses and properties	Status of road side land; Production / yield; Status of road side houses; Status of standing crop along alignment	Observation, data collection and analysis and interview with stakeholders	Road side land and houses	During construction	DDC/DTO/DIST/ VICCC
Water pollution	Observation of open defecation and waste disposal around water sources near construction sites	Visual observation, measurement of water sample using field kit	Local streams	During construction; upon demand for testing with field kit	DDC/DTO/DIST/ VICCC
Dust pollution	Dust level in ambient air	Visual inspection	At construction sites and at sensitive spots (schools, health spots, major settlements)	During construction	DDC/DTO/DIST
Deforestation and illegal logging	Numbers of trees, presence of ground vegetation, signs of illicit logging and extraction of NTFPs	Observations, DFO records, photos; interview with CFUGs members	In and around the construction sites, markets,	During construction and operation	DIST/ CFUGs/DFO during construction; CFUGs/DFO/DDC during operation
Killing/Poaching of wildlife	Wildlife hunting trapping and poaching by work force, trade of wildlife, road accidents inflicting wildlife	Interview with local people/ DFO/CFUGs members, photos, observations	Forest areas at roadside	Twice a year during construction and routine during operation	DIST during construction; CFUGs/DFO/DDC during operation
Change in economy	Numbers of people employed by the project during construction, numbers of women in work forces	Records kept by the project management, discussion with stakeholders	Project area	Trimester during construction phase	DDC/DTO/DIST

Parameters /Impacts	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementation and Monitoring Agency
Trade and commerce	Numbers of shops increased or decreased, rental of houses and land spaces	Records, interviews, observations, photos	Throughout project area	Once in a year	DDC/DTO/DIST/VDC
Occupational safety and hazard	Type and number of accident occurred during construction; adequacy of occupational safety measured provided; compensation provided in case of fatal accidents or invalidity	Observations, photos, spot checks, contractors' and health centre records interview with workers	Throughout project area	During construction	DIST/Proponent
Change in socio-economic structure	No and extent of new settlements/types and ethnic groups; nos and extent of new businesses; nos and extent of new services and utilities, social conflicts	Observations, interview with local people, DDC Police and VDC records	Throughout project area	During operation	DDC/DTO/VDC
Ribbon Settlement along, alignment	Congestions to road users nos. of accidents, RoW encroachment	Records, observations	Throughout project area	During operation	DDC/DTO/Local administration

8.0 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

Environmental impacts of the proposed road project are likely to have some detrimental effects associated with loss of forest and agricultural land. Most of the adverse impacts identified and predicted are insignificant and of short term in nature. The beneficial impacts with the increase of access to market centres and enhancement of productivity in rural area are more significant and are long lasting. They will have positive impact in well-being of the rural population.

The IEE has shown that none of the anticipated environmental impacts of constructing the proposed road is significant enough to need a detailed follow-up EIA or special environmental study. Therefore, this IEE is sufficient for approval of the sub-project.

8.2 Recommendation

The proposed road project is recommended for implementation with incorporation of mitigation measures and environmental monitoring plan.

A key consideration in selecting the road alignment is to minimize the acquisition of valuable agricultural and forest land. However, some agricultural and forest land will have to be acquired for the upgrading of the proposed road. A Resettlement Plan will be required to ensure that the persons affected by these losses are properly compensated.

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ANNEX

Annex 1
Terms of Reference

Terms of Reference (ToR)

for

Initial Environmental Examination (IEE)

of

Chhinkhet-Syarpu
Road Sub-Project

Submitted to:

Ministry of Local Development,
Government of Nepal

Proponent:

District Development Committee (DDC)/
District Technical Office (DTO)
Rukum
Telephone No. – 088-680063/019-657004
Fax No. – 088-649091/019-657005

May 2009

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Project Coordinator

ABBREVIATIONS

ADB	Asian Development Bank
Ch	Chainage
CF	Community Forest
CISC	Central Implementation Support Consultants
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
DDC	District Development Committee
DG	Director General
DIST	District Implementation Support Team
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DPO	District Project Office
DPCC	District Project Coordination Committee
DTO	District Technical Office
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management Section
EPA	Environmental Protection Act
EPR	Environmental Protection Rules
FGD	Focus Group Discussion
GoN	Government of Nepal
IEE	Initial Environmental Examination
IUCN	The World Conservation Union
Km	Kilometer
LEP	Labour based, environment friendly and participatory
MLD	Ministry of Local Development
NGO	Non-Governmental Organization
PAM	Project Administrative Memorandum
PCU	Project Coordination Unit
REA	Rapid Environmental Checklist
RRRSDP	Rural Reconstruction and Rehabilitation Sector Development Project
SF	Social Funding
SDC	Swiss Agency for Development and Cooperation
SDS	Social Development Specialist
SM	Social Mobilizer
TA	Technical Assistance
ToR	Terms of Reference
VDC	Village Development Committee
ZoI	Zone of Influence

Project Committee

1.0 NAME AND ADDRESS OF THE PROPONENT

The District Development Committee (DDC)/District Technical Office(DTO), Rukum is the implementing agency at the district level and the proponent of the Initial Environmental Examination (IEE) study for the construction of ChhinKhet-Syarpu road sub-project. The Ministry of Local Development (MLD) is the concerned authority for the approval of IEE study report.

Address of the Proponent

District Development Committee
District Technical Office, Rukum, Musikot
Telephone No. - 019-657004,088-680063
Fax No. - 019-657003,088-649091

2.0 INTRODUCTION

2.1 General Introduction

Government of Nepal has received a grant from ADB, DFID(Depertment for International Development) and loan assistance from OPEC, Fund for International Development to finance the Rural Reconstruction and Rehabilitation Sector Development Project (RRRSDP). The project goal is to reduce rural poverty in 20 very poor remote Terai,Hill and Mountain districts affected by the conflict. RRRSDP focus on immediate post conflict development projects for accelerate poverty reduction and inclusive development, thereby enhancing the effectiveness and efficiency of the delivery of public service and improving assess of rural people to economic opportunities and social services. The purpose is to achieve sustainable increased access to economic and social services, and enhanced social and financial capital for people in the project area, particularly poor and disadvantaged groups. Labour-based, environmentally friendly, and participatory approaches (LEP) will ensure that the investment in construction and rehabilitation of infrastructure results in sustainable, improved access to economic and social services, and enhanced social and financial capital.

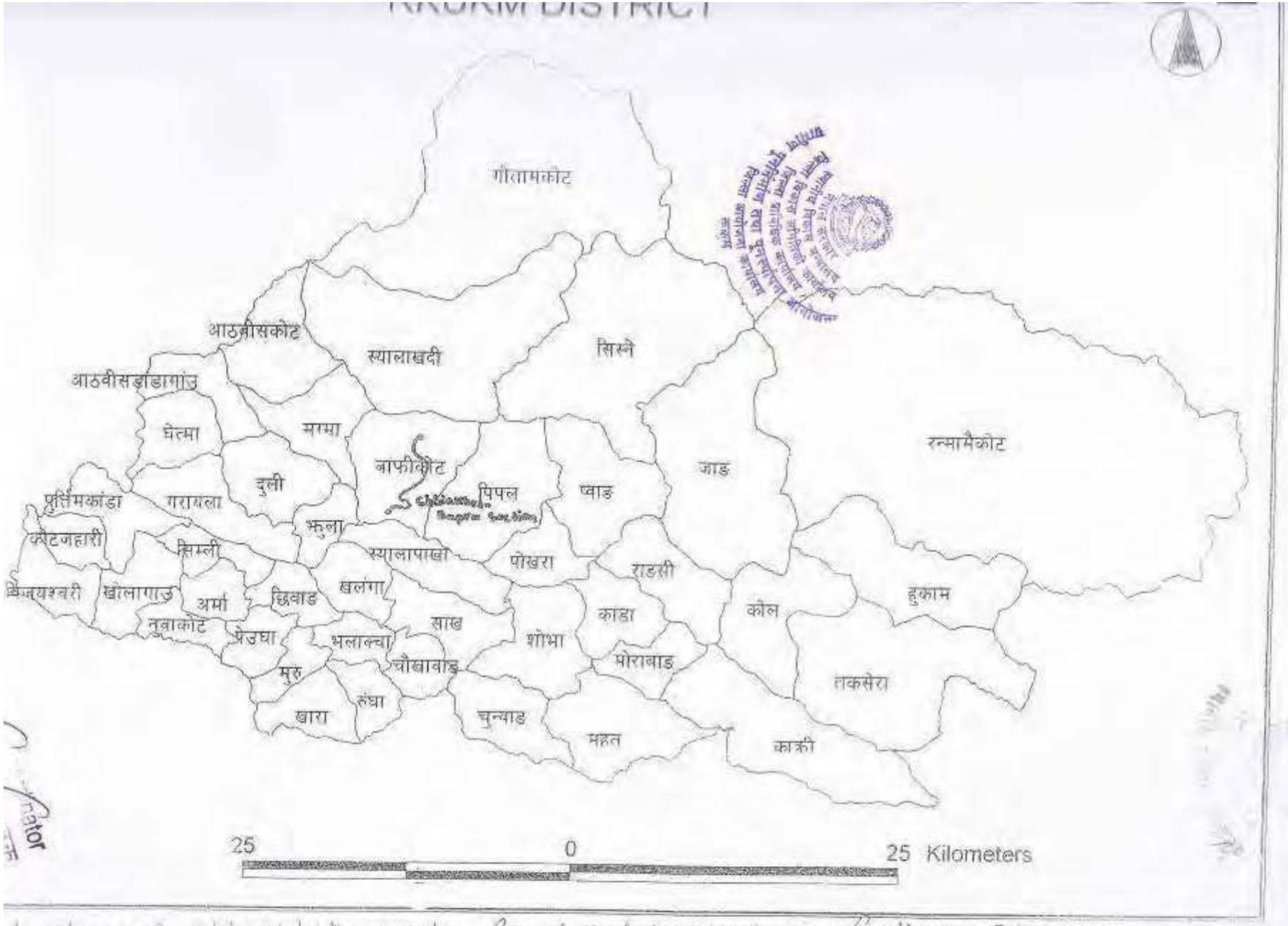
Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) is the executing agency. The implementing arrangements are as following: DoLIDAR has established a project coordination unit (PCU) in Kathmandu, headed by a project coordinator to coordinate all project activities. The PCU will be responsible for guiding and monitoring district development committees (DDCs) as they implement project components. At the district level, project implementation will be the responsibility of the district project office (DTO) within the district technical office of each DDC. A local engineering consultant (DIST) to cover technical issues and social mobilization and support for rural infrastructure building groups, will support the DTO.

This Terms of Reference (ToR) is prepared to conduct an IEE of ChhinKhet-Syarpu road sub-project in Rukum District. This road has been selected after the walkover survey of ChhinKhet-Syarpu roads from the sub-list on the basis of prioritization criteria. This is a high priority road in DTMP of Rukum district and is proposed for construction under RRRSDP.

2.2 BACKGROUND OF THE SUB-PROJECT

The proposed road is the shortest possible corridor to link the district with the nearest road head at ChhinKhet of Rukum District. Earthen Road was constructed from Khalanga to Gilabang under GTZ in 2065 B.S and from Gilabang to ChhinKhet is underconstruction under DDC is not connected by motorable road but there is a mule road from Gilabang, is under progress extending along so that ChhinKhet will be near to Road link in future. The sector is about 09+000 km. in length. This road corridor passes from different settlements like Banfikot Bazar,Daha etc. of Baphikot VDCs. Syarpu daha is the major tourist place of the Rukum district.

The location and alignment of the road is given in **Figure 1 and 2.**



Location of Chhinkhet - Syalpa Road sub project in Rukum District

Khachare
Bargāli
Khoiqāda
Sāntāru
Kāpre
Kāddoāg
Pipa
Sāniçaha
Māsan
Pānāca
Dāme
Sukē
Nepāne
Talm-Chilāqa

2.2 OBJECTIVES

The objectives of the proposed IEE study includes 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,
- make sure that IEE is sufficient for the proposed road sub-project, and
- provide information on the general environmental setting of the sub-project area as baseline data.

2.4 RELEVANCY OF THE SUB-PROJECT

Chhuchhu-Syarpu road links Banfikot,Magma,Pipal,Syalakhadi Village Development committees of Rukum District to district headquarter. This road is considered as an important road for the people of Rukum district. This road is given Priority No. 20 in Class A Road in DTMP of Rukum District (code no 54A004R). This road futher can be extended to other VDCs of the distict. This road is one of the tourist road.

An IEE of the proposed road is necessary in order to assess the environmental consequences of the proposed rural road construction activities and suggest appropriate, practical and site specific mitigation and enhancement measures. An IEE of a district road is a legal requirement according to Environmental Protection Act, 1996 (EPR, 1996) and Environmental Protection Rules, 1997 (EPR, 1997). Preparation of IEE report by concerned District Development Committee (DDC) and approval of IEE report by the Ministry of Local Development (MLD) according to Nepali legal provision is considered sufficient by the ADB.

3.0 REVIEW OF RELEVANT LAWS, RULES AND GUIDELINES

Government of Nepal has adopted various acts, regulations and guidelines to ensure the integration of development and conservation of environment. The IEE study will be guided by the requirements and provisions of the following acts, rules and guidelines as applicable:

- Environment Protection Act, 1997 and Environment Protection Rules, 1997 (amended 1999)
- Forest Act, 1993 and Forest Rules, 1995
- *Bataharunya Nirdesika* (Nepal; MLD), 2057
- National Park and Wildlife Conservation Act, 1973
- Local Self Governance Act, 1999 and Local Self Governance Rules, 2000
- Land Acquisition Act, 1977 and Land Acquisition Rules, 1969
- National Environmental Impact Assessment Guidelines, 1993
- APPROACH for the Development of Agricultural and Rural Roads, 1999 (DoLIDAR)

information collection will be made covering physical, biological, socio-economic and cultural aspects of the environment.

5.0 ALTERNATIVES FOR THE IMPLEMENTATION OF THE PROPOSAL

Alternative analysis has been considered as an integral part of IEE study, which involves an alternative ways of achieving the objectives of a proposed sub-project. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the unwanted impacts.

The study team will conduct alternative analysis considering the following issues:

- No action option
- Project alternatives
- Alternative alignment
- Alternative design and construction approach
- Alternative schedule and process
- Alternative resources

6.0 REQUIREMENT OF THE IEE STUDY

This includes time schedule, estimated budget and appropriate manpower (experts) for conducting IEE study.

6.1 TIME SCHEDULE

IEE report will be completed within eight weeks after the approval of ToR. An indicative time frame for conducting IEE is given in the **Table 1** below:

Table 1. Proposed work schedule for conducting IEE study

SN	Activities	Week							
		1	2	3	4	5	6	7	8
1	Orientation training to the team								
2	Desk study and review								
3	Public notice publication								
4	Field visit for survey and consultation with community								
5	Collection of suggestions and recommendations from stakeholders								
6	Analysis and interpretation								
7	Draft report preparation								
8	Comments on draft report								
9	Final Report preparation and submission								
10	Approval of the final report.								

6.2 ESTIMATED BUDGET AND STUDY TEAM

Most commonly an IEE of an infrastructure sub-project in the district need expert inputs from the following sectors:

- Landslides, slope stability, bio-engineering and erosion

Project Coordinator

- Forestry and wildlife
- Geology
- Road engineering
- Social, economic and culture.

The IEE will be carried out and prepared by DIST Environmental Specialist, with support from DIST team _Rukum, Environmental Specialist from CISC and District Project Office (DPO). CISC Environmental Specialist will provide necessary training to DIST for the environmental assessment procedures. The activity of IEE preparation will be supervised by DPO office. Since, the IEE report will be prepared by the DIST team with the support of the CISC, no separate budget and manpower is required. However, specific subject matter experts will be hired for short term basis if needed.

7.8 ENVIRONMENTAL BASELINE

This will describe environmental setting of the project location and surrounding areas and will contain information on rèlevant bio-physical, socio-economic and cultural factors and features. The updated, processed and analyzed information and data on each of the relevant bio-physical, socio-economic and cultural aspects will be presented in the IEE report. As far as possible, other environmental features such as, sensitive area, population and settlements, forests, geological features will be shown in the map.

7.9 ANALYSIS AND INTERPRETATION

Both secondary and primary information and data collected will be analyzed and interpreted. The bio-physical information will be tabulated to the extent possible. The socio-economic, cultural and religious information will be cross checked and analyzed.

7.10 IDENTIFICATION, PREDICTION AND EVALUATION OF IMPACT

The identification and prediction of impacts shall be carried out by considering the proposed project actions/activities in terms of rehabilitation and construction of the road project. The impacts of the activities shall be on bio-physical, socio-economic and cultural resources in a defined zone of influence (i.e.1.5 hours walking distance from the road alignment or 5 km distance).

The impacts shall be 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 reversible, irreversible, severe, moderate and significant. The likely impacts shall be assessed covering both adverse and beneficial ones. The methodology adopted for impact identification and prediction will be checklists and matrix method. The likely impacts of the proposed road construction as well as operation are described in the following sections.

7.11 BENEFICIAL IMPACTS

Beneficial impacts due to the construction of the road shall be assessed by the study team in terms of impacts on physical, biological, socioeconomic and cultural systems of the project area. The impacts shall also be assessed in the category of extent, duration and magnitude. Based on the identification and prediction of the impacts, the suitable enhance measures to maximize the project benefits shall be explored and designed. The largest

[illegible] impacts will be on the physical and socio-economic environment as given [illegible]

[illegible] Construction Stage
- Employment Generation and Increase in Income
- Skill Enhancement
- Enterprise Development and Business Promotion
- Community Empowerment and Ownership

[illegible] Operation Stage
- Access to Inputs and Services
- Development of Market centers
- Appreciation of Land Value
- Increased Crop Productivity and Sale of Farm Products
- Enhancement of Community Development Services
- Promotion of Tourism Activity
- Women and Indigenous People Empowerment

[illegible] ADVERSE IMPACTS

The study adverse impacts during construction and subsequent operation and maintenance in terms of physical, biological, socioeconomic, cultural and religious [illegible] due to project actions shall be identified, predicted and evaluated. Based on the [illegible] impacts, appropriate mitigation measures shall be recommended.

[illegible] Construction Stage - Though the sub-projects will apply LEP approach to the [illegible] possible during the implementation, it may not be possible to avoid all likely [illegible] the study shall take into account the following issues:

Physical environment

The issues and concerns generally related to physical environment typically include, but [illegible] limited to:
- Change in Land Use
- Spoil Disposal
- Slope Instability
- Water Management works i.e. springs, streams, rain water (Drainage and Cross Drainage Works
- Air Dust, Noise and Water Pollution
- Quarrying and Borrow Pit
- Decline in Aesthetic Value

Biological environment

The issues and concerns generally related to biological environment typically include, but [illegible] limited to:
- Loss or degradation of forests and vegetation.
- Impact on wildlife including birds due to loss or degradation of habitat, increased hunting and other form of human pressure.

- impact on flora and fauna (as listed in CITES and IUCN Red data book)

Socio-economic and cultural environment

The issues and concerns generally related to socio-economic and cultural environment usually include, but not necessarily limited to:

- Loss or degradation of farm land and productivity
- Loss or degradation of private properties such as houses, farm sheds, and other structures, crops and fodder/ fruit trees
- Impact on community infrastructure such as irrigation, water supply, schools, health post, trail and trail bridges
- Impacts on cultural, religious and archeological sites
- Impacts on health and safety matters.

9.2.2 Operation stage - The following issues will be taken into account during operation and maintenance stage:

Physical environment

- Road slope stability and management
- Impact due to air, noise and water pollution

Biological environment

- Depletion of forest resources
- Disturbance to wild life and illegal hunting

Socio-economic and cultural environment

- New settlement along the road alignment
- Change in social behaviour
- Impact on livelihood and economic opportunities
- Road safety measures

9.6 BENEFIT AUGUMENTATION/MITIGATION MEASURES

The IEE study will propose site-specific benefit augumentatin and mitigation measures to enhance the benefits expected from the sub-project and minimize/mitigate avoid or control of proposal's adverse impacts. The benefit augumentation and mitigation measures will be selected based upon appropriateness and cost analysis and these will be suggested for pre-construction, construction and post construction phase of the project. Mitigation measures will be proposed for the impacts on physical, biological, socio-economic and cultural environment.

9.7 ENVIRONMENTAL MANAGEMENT PLAN

The study will ensure the implementation and monitoring of mitigation measures for minimizing adverse impacts and maximizing the beneficial impacts. This plan will also identify the key environmental monitoring indicators with respect to activities, methods and responsibilities in order to monitor the environmental condition and adoption of suitable mitigation measures.

IEE report format

The format will be in line with provision made in the Schedule 5 of EPR, 1997 and should be adapted to project specific situation. The IEE report will contain the following sections:

i. Cover page with name of the proposal and proponent and address
ii. Table of content
iii. List of Abbreviation (acronyms)
iv. Executive Summary that includes:
   - Background
   - Project Proponent
   - Objective
   - Relevancy of the Proposal
   - Project Description
   - Existing Condition
   - Identification of Impacts and Benefit Augumentation/Mitigation Measures
   - Environmental Management Plan
   - Conclusions and recommendations
v. **Salient Features of the Project**
vi. **Introduction:** This section should describe the project in simple terms and concisely, without missing relevant points but avoiding unnecessary details. The project description should provide following information:
   1. Background
   2. Relevancy of the proposal
      - Objectives
      - Methodology adopted
   3. Name and Address of the Proponent
   4. Description of the Sub-project
   5. Construction Approach
   6. Proposed Schedule for Implementation of Sub-project

vii. **Public Consultation and Information Disclosure**

viii. **Review of Relevant Acts, Regulations and Guidelines:** During the study relevant policies, legislations and guidelines should be reviewed and their salient features should be mentioned in this section. Similarly related institutions should be consulted.

ix. **Existing Environmental condition:** Baseline information on the existing physical, biological as well as socio-economic and cultural resources of the proposed sub-projects is described here. Environmental features such as sensitive areas, population and settlements, forests should be shown in a map

x. **Project Alternatives:** This section summarizes the alternatives by environmental comparison. This may include the following sub-headings.
1. Project alternative
2. Alternative routes