

Environmental Assessment Document

Initial Environmental Examination

Grant Number: 0093 NEP

March 2010

Nepal: Rural Reconstruction and Rehabilitation Sector Development Program

Jorpokhari-Aahaldanda-Charibhanjyang-Oyam Road Subproject, Panchthar 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
Jorpokhari-Aahaldanda-Charibhanjyang-Oyam
Road Rehabilitation Subproject, Panchthar

Submitted to:
Ministry of Local Development
Government of Nepal

Proponent:
District Development Committee/
District Technical Office
Phidim, Panchthar

March 2010

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Road Rehabilitation Subproject, Panchthar District**

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ABBREVIATIONS

ADB	Asian Development Bank	IUCN	International Union for Conservation Nature
amsl	Above mean sea level	Km	Kilometer
AP	Affected Person	LDO	Local Development Officer
BG	Building Group	LEP	Labour based, environment friendly and participatory
Ch	Chainage	LEST	Livelihood Enhancement and Skill Training
CBO	Community Based Organization	LRMP	Land Resource Management Project
CDC	Compensation Determination Committee	M	meter
CDO	Chief District Officer	MoU	Memorandum of Understanding
CEA	Country Environmental Analysis	MoE	Ministry of Environment
CGI	Corrugated Galvanized Iron	MI	Milliliter
CF	Community Forest	MLD	Ministry of Local Development
CFUG	Community Forest Users Group	NGO	Non-Governmental Organization
CISC	Central Implementation Support Consultant	NRs	Nepali Rupees
CITES	Convention on International Trade in Endangered Species of Flora and Fauna	NTFPs	Non timber forest products
DADO	District Agriculture Development Office	OFID	OPEC Fund for International Development
DDC	District Development Committee	OP	Operational Plan
DFID	Department for International Development	OPEC	Organization of Petroleum Exporting Countries
DFO	District Forest Office/Officer	PAM	Project Administrative Memorandum
DG	Director General	PCC	Plain Cement Concrete
DIST	District Implementation Support Team	PCU	Project Coordination Unit
DIT	District Implementation Team	RBG	Road Building Group
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads	RCC	Reinforced Cement Concrete
DPO	District Project Office	RCIW	Rural Community Infrastructure Works
DPCC	District Project Coordination Committee	REA	Rapid Environmental Assessment
DRSP	District Road Support Programme	RES	Rapid Environmental Screening
DSCO	District Soil Conservation Office	RIDP	Rural Infrastructure Development Project
DTO	District Technical Office	RP	Resettlement Plan
DTMP	District Transport Master Plan	RRRSDP	Rural Reconstruction and Rehabilitation Sector Development Program
EA	Environmental Assistant/Assessment	RS	Resettlement Specialist
EARP	Environmental Assessment and Review Procedures	SF	Social Funding
ES	Environmental Specialist	SA	Social Appraisal
EIA	Environmental Impact Assessment	SDC	Swiss Agency for Development and Cooperation
EMP	Environmental Management Plan	SM	Social Mobilizer
EMS	Environmental Management Section	SDS	Social Development Specialist
EPA	Environmental Protection Act	TA	Technical Assistance
EPR	Environmental Protection Rules	ToR	Terms of Reference
ESD	Environment Screening Document	TWS	Technical Walkover Survey
FGD	Focus Group Discussion	VDC	Village Development Committee
GoN	Government of Nepal	VICCC	Village Infrastructure Construction Coordination Committee
GIS	Geographical Information System	Zol	Zone of Influence
Ha	Hectare		
HH	Household		
IEE	Initial Environmental Examination		

EXECUTIVE SUMMARY IN NEPALI

जोरपोखरी-आहलडांडा-चरीभञ्ज्याङ्ग-ओयाम सडकको प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन कार्यकारी सारांश^१

पृष्ठभूमि

नेपाल सरकारले लामो द्रन्दले गर्दा क्षति भएका ग्रामीण पूर्वाधारहरूको पुनःनिर्माण र पुनःस्थापना को कार्य एशियाली विकास बैंक, स्विस सरकार (SDC), ब्रिटिस सरकार (DFID) तथा ओपेक फण्ड (OFID)को आर्थिक सहयोगमा 'ग्रामीण पूर्वाधार पुनःनिर्माण र पुनःस्थापना आयोजना' नेपालको बिसवटा जिल्लाहरूमा संचालन गरिरहेको छ। पाँचथर जिल्लामा अवस्थित प्रस्तावित जोरपोखरी-आहलडांडा-चरीभञ्ज्याङ्ग-ओयाम ग्रामीण सडकको पुनःस्थापना सोही कार्यक्रम अन्तर्गत संचालन गर्न लागिएको एक उप-आयोजना हो। उप-आयोजना (प्रस्ताव) अन्तर्गत २४ कि.मी. लामो उक्त कच्ची सडकको ग्राभेल स्तरमा पुनःस्थापना गर्न प्रस्ताव गरिएको छ।

प्रस्तावक

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

उद्देश्य

प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन अध्ययनको मुख्य उद्देश्य प्रस्तावित उप आयोजना निर्माण तथा संचालन बाट उक्त क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक तथा सांस्कृतिक वातावरणमा पर्ने प्रभावहरू पत्ता लगाई नकारात्मक प्रभावको न्यूनिकरण र सकारात्मक प्रभाव बढाउने उपायहरू बारे सुझाव दिनु, वातावरणीय अनुगमन योजना बनाई कार्यान्वयन गराउनु, तथा प्रस्तावित सडक आयोजनाको लागि प्रारम्भिक वातावरणीय परीक्षण गरे पुग्छ भन्ने कुराको यकिन गर्नु हो।

प्रस्तावको सान्दर्भिकता तथा अध्ययन प्रकृया

प्रस्तावित सडकले पाँचथर जिल्लाको सुदुर दुर्गम भेगका वासिन्दाहरूलाई सदरमुकाम संगको पहुँच बढाउनेछ भने स्थानिय स्तरमा उत्पादन हुने तरकारी, दुध तथा चिया लाई बजार संग जोडी स्थानिय आय आर्जनमा अभिवृद्धि गर्नेछ।

जुलाई, २००९ मा फिल्ड सर्वेक्षणबाट लिइएका तथ्याङ्क तथा अन्य उपलब्ध तथ्याङ्कहरूको साथै सामाजिक तथा प्राविधिक टोलीबाट पुनर्वास कार्यको सर्भेक्षणको लागि संकलन गरेका तथ्याङ्कहरू केलाएर प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन तयार गरी निष्कर्ष तथा सुझावहरू दिइएका छन्। यो प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन नेपाल सरकारको वातावरण संरक्षण ऐन २०५३, वातावरण संरक्षण नियामावली २०५४ अनुसार तथा स्थानिय विकास मन्त्रालयबाट मिति २०६६/०२/२५ मा स्विकृत गरिएको यसै प्रस्तावकको कार्यसूचीमा उल्लेख गरीएको अध्ययन प्रकृया अनुसार तयार गरिएको छ साथै, एशियाली विकास बैंकको इन्भाईरोमेन्टल एसिसमेन्ट गाइड लाइन २००३ र सेफगार्ड पोलिसी स्टेटमेन्ट २००९को समेत अनुसरण गरीएको छ।

आयोजना को विवरण

प्रस्तावित सडकले पाँचथर जिल्लाको उत्तर पूर्वी दुर्गम भेगका वस्तीहरूलाई जिल्लाको सदरमुकाम संग जोड्दछ। यसको कूल लम्बाइ २४.०० कि.मि. छ। हाल उक्त ग्रामीण सडकको पुरै सडक खण्डमा गाडी चल्छ। यो सडक दुईवटा गाउँ विकास समितिहरू क्रमश एकतिन र ओयाम भएर जान्छ। सडकको कूल चौडाइ ४.५ मि. हुनेछ भने मोडहरूमा आवश्यकता अनुसारको चौडाइ हुनेछ। यो आयोजनाको कूल अनुमानित लागत नेरु. १२६,४६०,८९५ रहेको र प्रति कि.मी अनुमानित लागत नेरु. ५,२६९,२०३ लाग्ने देखिन्छ।

विद्यमान वातावरणीय स्थिति

यो सडक एकतिन गा.वि.स.को जोरपोखरीबाट समुद्री सतहदेखिको १,९७६ मी. को उचाईबाट शुरु भएर समुद्री सतहदेखिको १,९०७ मी. उचाईको काउले बजार भएर जान्छ। यस सडक खण्डमा विभिन्न प्रकारका चट्टानहरू जस्तै क्वार्टजाइट, सिष्ट आदि पाईन्छन्। प्रायः एलुभियल तथा रेजीड्यूल प्रकारका बालुवा र पाँगो मिसिएको माटोहरू सडक खण्डमा पाईन्छन्। सडक खण्डमा पर्ने पानीका मुख्य श्रोतहरूमा तिमुवा, सत्यांजिना, जाउबारी, चित्ते, नान्निङ्गे, सारबूङ्ग, भिर, मलाते र बाङ्गिबोटे खोल्सीहरू पर्दछन्। प्रस्तावित सडक क्षेत्रको वायु तथा पानीको स्तर सफा रहेको देखिन्छ साथै

¹ This is the Executive Summary of the IEE report in Nepali language and an English version is given in page v.

ध्वनि प्रदूषणको समस्या छैन । यो सडक प्रायः खेती गरिएको जमीन तथा वन र बस्तीहरू भएर जान्छ । पहिरो गएका ठाउँहरू काउले (दुरि ९+३४०), वारेबुङ्ग (दुरि १४+६९५) र गुरुङ्गाउँ (दुरि १५+९८०) । सडक खण्डमा पर्ने सरकारी वनहरू काउले, चरीभन्ज्याङ र ओयाम हुन् ।

यस सडक खण्डमा पाइने मुख्य रुखहरूको प्रजातिहरूमा बाँझ, कटुस, सल्ला, चिलाउने, लालीगुरास, उत्तिस आदी पर्दछन् । बाँदर, वनबिरालो, फ्याउरो, लोखर्के आदि वन्य जन्तुका साथै काग, भँगेरा, कालिज, परेवा आदि पक्षीहरू यस सडक खण्डमा पाईन्छन् । यो सडक खण्ड संरक्षित क्षेत्र वा मध्यवर्ती क्षेत्रमा पर्दैन ।

यो सडक खण्डको प्रभावित क्षेत्र भित्र ओयाम र एक्कितन गा.वि.स.का १५ वटा प्रमुख बस्तीहरू पर्दछन् । जम्मा घरधुरी संख्या १६४९ र जनसंख्या ९८२२ रहेको छ र सरदर परिवार संख्या ५.९५ छ। यहाँ बसोबास गर्ने विभिन्न जात जातिका मानिसहरूमा मुख्य गरी लिम्बु, ब्राह्मण, क्षेत्री, तामाङ, मगर तथा दलित (दमाई, कामी) पर्दछन्। दलितहरू सबै बस्तीहरूमा छरिएर बसेका छन् ।

यहाँका बासिन्दाहरूको मुख्य पेसा कृषि र पशुपालन हो । यातायातको राम्रो सुविधा नभएको तथा पहाडी क्षेत्र भएकोले कृषि उब्जनीले मात्र पर्याप्त नहुने हुदा यहाँका अधिकांश मानिसहरू श्रम रोजगारीका अन्य पेशामा काम गर्ने तथा केही मानिसहरू सरकारी तथा अन्य संस्थामा काम गर्ने, थोरै मानिसहरूले व्यापार व्यवसाय गर्ने गर्दछन् । साथै जनसंख्याको उल्लेखनीय प्रतिशत मानिसहरू जीविकोपार्जनको सिलसिलामा हिउँदमा फिदिम, भापा तथा भारत लगायतका विभिन्न ठाउँमा रोजगारीको लागि जाने गर्दछन् ।

प्रमुख वातावरणीय प्रभावहरू

सकारात्मक प्रभाव

आयोजना बाट तत्कालै हुने लाभमा स्थानीय स्तरमा रोजगारीको सिर्जना हुनेछ । आयोजना संचालनको लागी करिव ७३६९३ मानव दिन बराबरको अदक्ष र १८९५० मावन दिन बराबरको दक्ष श्रमशक्तीको आवश्यकता पर्नेछ । आयोजना संग सम्बन्धित कार्यमा (रोजगारीमा) गरीव, तथा पिछडिएका स्थानीय जनताले प्राथमिकता पाउनेछन् । यस चरणमा हुने अन्य लाभहरूमा वन्द व्यापारको बृद्धि हुने अवसर, आयोजनाले प्रदान गरेको शीपमुलक तथा जनचेतनामुलक तालिममा तथा आयोजना निर्माण कार्यमा सहभागी भई स्थानीय जनताको शीप बृद्धि हुने अवसर पर्दछन् ।

सडक सञ्चालनका चरणमा सडकले प्रभावित क्षेत्रका बासिन्दालाई वजार, सामाजिक सेवा प्रदायक स्थान तथा देशका अन्य भागहरूसम्म पुग्न छिटो, छरितो तथा सुविधाजनक पहुँचको अवसर प्रदान गर्नेछ । सडक सुविधाको कारण मल तथा किटनाशक औषधीहरूको सस्तो तथा सुलभ आपूर्तिले कृषिको उत्पादकत्वमा अभिवृद्धि हुनेछ । यसले स्थानीय जनताको आय तथा खाद्य सुरक्षामा अभिवृद्धि हुनेछ साथै स्थानीय श्रोत साधनको उपयोग गर्ने साना कृषि उद्योगहरूको प्रवर्द्धन हुनेछ । पहुँच तथा यातायातको अवसर संगै शिक्षा, स्वास्थ्य, संचार, वजार, बैकिङ तथा अन्य आर्थिक तथा सामाजिक क्षेत्रहरूको विकास हुनेछ । यसले यस क्षेत्रका मानिसहरूको समग्र जीवनस्तर उकास्न मद्दत पुऱ्याउनेछ । सडकको सञ्चालनले स्थानीय जग्गा जमिनको मुल्य बृद्धि गर्न सहयोग पुऱ्याइ स्थानीय जग्गाधनीलाई लाभ पुऱ्याउनेछ ।

आयोजना कार्यन्वयनबाट पर्न सक्ने नकारात्मक प्रभावहरू:

सडक निर्माणको क्रममा भिरहरू काट्दा, खन्दा निस्किएको माटो तथा गेगर थुपार्दा, निर्माण सामग्री भिक्नलाई खानी सञ्चालन गर्दा त्यस क्षेत्रको भिरालो ठाँउहरूमा असर पर्न गई पहिरो तथा भुक्षय हुन सक्ने सम्भावना रहन्छ । फोहर तथा खन्दा निस्किएका माटो, गेगर को उचित व्यवस्थापन हुन सकेन भने यसले भुक्षय बढाउन तथा जल प्रदूषण गराउन सक्छ ।

सडक चौडाई तथा निर्माण गर्नको लागी ०.१२ हेक्टर जंगल क्षेत्र प्रयोग हुनेछ, तथा विभिन्न जातका गरी करिव ४८२ वटा रुख विरुवाहरू काटिनेछन् जस मध्ये २६६ वटा निजी रुखहरू साथै सरकारी वनको साना ठुला रुख गरी जम्मा २१६ वटा रुखहरू पर्दछन् । सडक निर्माण क्रियाकलापबाट जीवजन्तुलाई असर पर्ने तथा सडक निर्माण कार्यमा खटिएका कामदारहरूले वनका जीवजन्तुलाई जिस्क्याउने तथा तिनको शिकार गर्नसक्ने सम्भावना रहेता पनि ति न्युन हुनेछ ।

सडक निर्माण कार्यको दौरान ३.५३ हेक्टर निजी जग्गा अधिग्रहण गर्नुपर्ने हुन्छ जसले गर्दा वार्षिक मकै तथा कोदो वालीको उत्पादनमा असर पुग्नेछ । सडक निर्माण कार्यको दौरान २ वटा घर, २ वटा सामुदायिक भवन(स्कूल र उप स्वास्थ्य चौकी) लाई असर पुग्ने देखिन्छ । निर्माण कार्यको क्रममा श्रमिकहरू तथा स्थानीय जनतालाई स्वास्थ्य समस्या पर्न सक्छ तथा अप्रिय दुर्घटनाहरू घट्न सक्छन् ।

सडक सञ्चालनको चरणमा सवारी साधनको आवगमनबाट, वर्षायामको पानीबाट तथा स्थानीय भिरपहराहरूमा गाईवस्तु चराउदा वा रुख विरुवा काट्दा भिरपहराहरूमा अस्थिरता बढ्न गई पहिरो जान सक्छ । सडक किनाराका नाला बाट

वगेको अनियन्त्रित पानीले सडक मुनिका खेतवारीमा भु(क्षय हुन सक्छ। सवारी साधनको बृद्धिले धुलो तथा ध्वनी प्रदूषण बढ्नेछ। त्यसैगरी सडकको सुधार संगै वन क्षेत्रसम्म भएको पहुँचको बृद्धिले वन सम्पदा तथा अन्य जन्तुमा चाप बढ्न गई वन सम्पदाको क्षय र जीवजन्तुलाई असर पर्न सक्छ। सडकको सुधार संगै बस्ती र वजारको अव्यवस्थित विस्तार हुने सम्भावना र सडक क्षेत्र मिच्ने प्रवृत्ति देखिन सक्छ।

प्रभाव न्यूनिकरणका उपायहरू:

यस आयोजनाहरूलाई वातावरण मैत्री बनाउनका लागि सकारात्मक प्रभावलाई बढावा गर्ने तथा नकारात्मक प्रभावहरूलाई नियन्त्रण या न्यूनिकरण गर्ने थुप्रै उपायहरू यस प्रतिवेदनमा प्रस्तावित गरिएको छ। जनताले राजी खुशीले वाटोको लागी दिएको वाहेक आयोजनाले गरिवीका रेखामुनि परेका परिवारहरूको अधिग्रहण गर्ने सबै जग्गाको प्रचलित मूल्य अनुसार क्षतिपूर्ति दिनेछ। सडक मानव श्रम प्रविधिमा आधारित हुनेछ तथा LEP (श्रम मुलक वातावरण मैत्री सहभागीता मुलक) ढंगले निर्माण गरिने छ। आयोजनाले प्रभावित जनतालाई निर्माण कार्यमा रोजगारीमा तथा शिपमुलक तालिममा प्रथमिकता दिनेछ। आयोजना निर्माणको क्रममा जग्गा फँडानी गर्दा, जमिन काट्दा, खानी सञ्चालन गर्दा, खन्दा निस्किएका माटो, गेगर थुपादा तथा अन्य संवेदनशील कार्य गर्दा त्यस क्षेत्रको वातावरणलाई सुरक्षित राख्न विशेष ध्यान दिनेछ। निर्माण कार्यको क्रममा श्रमिकहरूको बिमा गरिने छ तथा सुरक्षाका सम्पूर्ण सामग्री श्रमिकहरूलाई प्रयोगमा ल्याउन दिइने छ। वन, जीवजन्तुको संरक्षण गर्न तथा सामाजिक अक्षुण्णतालाई कायम राख्न यस चरणमा जनचेतनामुलक कार्यक्रमहरू तथा तालिमहरू सञ्चालन गरिनेछ। निर्माण कार्यको क्रममा श्रमिकहरूको बिमा गरिने छ तथा सरक्षाका सम्पूर्ण सामग्री श्रमिकहरूलाई प्रयोगमा ल्याउन दिइने छ। निर्माण स्थलहरूमा प्राथमिक उपचारको सामग्रीहरूको व्यवस्था गरिने छ। काटिएका रुख विरुवाहरूको क्षति पूर्ति वापत १:२५+३०% अनुपातमा वृक्षारोपन गरिनेछ साथै निजि जग्गाको हकमा १:१ को अनुपातमा वृक्षारोपण गर्न प्रोत्सान गरिनेछ। वृक्षारोपणमा संरक्षित प्रजातिकाहरूलाई प्राथमिकता दिइनेछ। सडक सञ्चालनका क्रममा सडकमा देखिएका अस्थिरताहरूलाई नियमित रुपमा मर्मत संभार गरिनेछ। सडकमा तथा सडकको कारण नजिकैको खेतवारीमा पानी जम्मा हुन नदिन उचित निकासको व्यवस्थापन गरिनेछ। सडक दुर्घटनाबाट बचाव गर्ने उपायहरू अवलम्बन गरिनेछ।

वातावरण व्यवस्थापन योजना

यस प्रतिवेदनमा वातावरण व्यवस्थापन योजना अन्तर्गत आयोजनाबाट पर्ने संभावित असरहरू, असरहरूको प्रभाव, न्यूनिकरण विधि, अनुगमन विधि तथा कार्यतालिका प्रस्तावित गरिएको छ। यसका साथै न्यूनिकरणका उपायहरूको तथा अनुगमन कार्यको कार्यन्वयन गर्ने जिम्मेवार निकायहरूको पनि पहिचान गरिएको छ। अनुगमनका लागी आवश्यक भौतिक, जैविक, सामाजिक-आर्थिक तथा साँस्कृतिक वातावरणका विभिन्न अनुगमन सुचकाङ्कहरूको पनि पहिचान गरिएको छ। वातावरण व्यवस्थापन योजना कार्यन्वयन गर्न निम्नानुसार खर्च हुने अनुमान गरिएको छ।

क्र. सं.	विवरण	रकम (ने.र.)	कैफियत
१.	वातावरण सम्बन्धी जनचेतनामूलक तालिम तथा अन्य तालिम	३००,०००/-	आयोजनाको बजेटमा समावेश गरिने।
२.	श्रमिकहरूको बिमा	४००,०००/-	BoQ मा समावेश गरिने।
३.	बायो-इन्जिनियरिङ्ग	३,६८३,३२७/-	BoQ मा समावेश गरिने।
४.	पुनर्वास तथा जग्गा अधिग्रहण	६,४९६,८४८	पुनर्वास योजनामा समावेश गरिने।
५.	पुनर्निर्माण तथा अन्य	६००,०००/-	BoQ मा समावेश गरिने।
६.	क्षतिपूर्ति वृक्षारोपण	३९२,७२०/-	आयोजनाको बजेटमा समावेश गरिने।
७.	एच. आई. भी. रोकथाम तथा अन्य चेतनामूलक कार्यक्रमहरू जस्तै: युवा साक्षरता, स्थानीय विद्यालय सहयोग आदि	८,४२,८६९	सामाजिक योजना तथा आयोजनाको बजेटमा समावेश गरिने।
८.	पेशागत स्वास्थ्य सुरक्षा तथा जानकारीमूलक सूचनापाटी	४५०,०००/-	BoQ मा समावेश गरिने।
९.	अनुगमन तथा मूल्यांकन	२५०,०००/-	आयोजनाको बजेटमा समावेश गरिने।
	जम्मा :	१२,५१२,८९५.००/-	

निष्कर्ष

परिचान गरिएका प्रायः वातावरणीय प्रभावहरू थोरै क्षेत्रमा तथा मुख्य गरी निर्माणकार्यका वखतमा सिमित रहेको पाइएको छ। प्रस्तावित न्यूनिकरण विधिको पालना गरिएमा पहिचान गरिएका वातावरणीय प्रभावहरूको न्यूनिकरण अथवा नियन्त्रण गर्न सकिनेछ। सडक निर्माण गर्दा प्रभावित व्यक्तिहरूको सम्पत्तीको क्षतिपूर्ति गर्न पुनर्वास योजनाको आवश्यकता पर्नेछ। वातावरण व्यवस्थापन योजना अन्तर्गत उल्लेख गरिएको उपायहरूको कार्यान्वयन गरिएमा यस आयोजनाको कार्यान्वयनले आयोजना क्षेत्रको भौतिक, जैविक, सामाजिक - आर्थिक तथा साँस्कृतिक वातावरणमा उल्लेखनीय नकारात्मक प्रभाव नपर्ने देखिन्छ। यस प्रारम्भीक वातावरणीय अध्ययनको आधारमा यस प्रतिवेदनमा उल्लेख गरिएको वातावरणीय व्यवस्थापन योजनालाई पूर्ण रुपमा लागु गरी प्रस्तावित आयोजना कार्यान्वयन गर्न सिफारिश गरिन्छ। आयोजनाको वातावरणीय प्रभाव मूल्याङ्कन स्तरमा अध्ययन गर्न आवश्यक नरहेको सिफारिश समेत गरिन्छ।

EXECUTIVE SUMMARY IN ENGLISH

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 24 km long Jorpokharee-Aahaldanda-Charibhanjyang-Oyam Rural Road in Panchthar District is one of the Subprojects selected under the RRRSDP. It is an existing earthen road proposed for rehabilitation in gravel standard.

Project Proponent

The proponent and executing agencies of the proposed Road Rehabilitation Subproject for Initial Environmental Examination (IEE) is District Development Committee (DDC)/District Technical Office (DTO), Panchthar at the district level. Ministry of Local Development (MoLD) is the authorized body for approving the IEE of the proposed Subproject.

Objectives

The main objective of the IEE study is to identify the impacts from the construction and operation of the proposed Subproject on the physical, biological, socio-economic and cultural environment of the Subproject area. The objective of IEE study is to recommend site specific environmental mitigation measures for adverse impacts, benefit augmentation measures for beneficial impacts, prepare and implement environmental monitoring plan and make sure that IEE is sufficient for the proposed road sub-project.

Relevancy of the Proposal

The proposed Subproject will provide access to district headquarter, living in rural area of Panchthar district. As a result socio-economic condition of people living in that area will enhance as local products like vegetables, milk and tea will get access to market.

Study Methodology

The findings and conclusions of the report are based on the analysis of the information collected from the field during July, 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. The IEE report has been prepared according to the Environmental Protection Act, 1997 and Environmental Protection Rules, 1997 (second amendment 2007) of the Government of Nepal and Environmental Assessment Guidelines, 2003, Safeguard Policy Statement, 2009 of ADB. This report is based on the Terms of Reference (ToR) approved on 2066/02/25 by Secretary level decision of Ministry of Local Development (MoLD).

Project Description

The proposed road links with Far North-East part of the remote community of Panchthar district with the district headquarter. The total length of the road is 24.00Km. The road alignment is already opened and motorable. The road passes through two village development committees namely Ektin and Oyam. The average width of the road is 4.5 m and geometry will be improved as per design required. The total project cost is NRs. 126,460,895 and per km cost is NRs. 5,269,204.

Existing Environmental Condition

The road starts from Jorpokharee of Ektin VDC at 1976m amsl and passes through Kaule Bazaar at 1907m amsl. The road alignment is composed of various kinds of rock such as quartzite, schist etc. Generally, alluvial, residual and clay mixed sandy soil are found along the road alignment. Main water bodies found across the road alignment are Timuwa kholsi, Satyanjina kholsi, Jaubari kholsi, Chitre kholsi, Narringa kholsi, Sarbung kholsi, Bhir kholsi, Malate kholsi and Bangibote kholsi. Ambient air and water quality of the proposed project area is observed to be good and there is no noise pollution. The road mainly passes through cultivated land, forest and settlements. There are landslides at CH: 9+340(Kaule), CH: 14+695(Warebung) and CH: 15+980(Gurung gaun). Government forest along the road alignment are Kaule, Oyam and Charibhanjyang.

The dominant forest species found in the road alignment are Baj, *Alnus nepalensis* (Uttis), *Schima wallichii* (Chilaune), Laligurans, *Castanopsis indica* (Katus), *Pinus roxburghii* (Salla). *Macaca mulatta* (Monkey), *Felis chaus* (Jungle Cat), Fox and Squirrel are the wild animals reported in the forests of proposed road area. Similarly birds like *Corvus splendens* (Crow), *Passer domesticus* (Sparrow), *Lophura lencomelana* (Kalij Pheasant), *Columba livia* (Pigeon) etc. are found in the project area. The road does not fall under any protected or buffer zone area.

The alignment passes through 15 major settlements from Ektin and Oyam VDCs. The total population of project area is 9822 persons, total household number is 1649 and average family size of 5.95. Diverse ethnic groups such as Limbu, Brahmin, Chettri, Tamang, Magar and occupational caste (Damai, Kami) live along the Zol of road alignment. Occupational caste households are distributed in almost all the settlements.

The major occupations of the people are agriculture and livestock farming. 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 few are doing business. Moreover, significant percentage of the economically active male population also migrates to various places including Phidim, Jhapa and India seasonally during slack farming season for employment.

Major Environmental Impacts

Beneficial Impacts

The immediate benefit from this Road Rehabilitation Subproject is employment opportunities. The implementation of Subproject require about 73693 person days of unskilled and 18950 person days of skilled human resource. The project will give priority to the poor, ethnic minorities and disadvantaged local people for employment opportunity. Other beneficial impacts include enhancement of local business, development in skills of local people from skill developing training, awareness raising training and involvement in the construction of the project.

During operation stage of road, the people from the Zol will get easy and fast accessibility to markets, social services and other regions of the country. The fertilizers and pesticides will become cheaper with better transportation facility hence, agricultural production will increase. This will ensure better economic condition and food security of the people living in the Zol of the project area. Moreover this will promote the small agro based industries that uses local resources. Easy access and opportunity of better transportation system will develop other sectors like education, health, communication, market, banking and other socio-economic sectors. This will increase the overall living condition of the people living in Zol of project area. During operation of road, there will be increment of land price which will be beneficial for land owners.

Adverse Impacts

During the road construction, the cutting of slopes and consequently disposal of soil and earth material, operation of quarries might result in on erosion and landslide during construction. Futhermore, spoils generated during construction can create erosion and water pollution to the nearby water sources.

During road widening and construction, 0.12 Ha of forest area and total 482 nos of trees will be cleared. Among them 266 nos. of trees from private land and 216 nos of trees/shrubs from forest area will be lost during road construction. Also during construction of road there might be possible impacts on wildlife as workers might harass/ hunt the wildlife in the nearby forests, however, such effects are very minimum.

During construction stage, there will be loss of 3.53 Ha of agricultural land which results in annual reduction of agricultural production mainly, maize and millet. 2 houses, 2 community buildings (School and Sub health post) will be affected. Labours and local people are prone to health effects and accidents relating to construction activities.

During operation stage, vehicular movement, monsoon rain, grazing of animals and cutting of trees on the unstable slopes might result in slope instability and hence erosion and landslides might occur. The flowing water on the side drain of the road might cause erosion of soil on adjacent agricultural land. Vehicular emissions will result in air and noise pollution. Because of easy accessibility to the

forest areas will deplete forest resources and wildlife. New settlement, bazaar area will be expanded and this may increase encroachment of the RoW.

Mitigation measures

The various benefit augmentation measures and adverse impact mitigation measures have been proposed in the report to make this project environment friendly. Other than land donated by local people for the projects, adequate compensation will be provided to affected poor and marginalized households for all the lands that need to be acquired. The construction of road will be based on Labour-based, Environment friendly and Participatory (LEP) as well as Contractor based Approach. Affected families will be given high priority for employment and skill development trainings. Necessary measures will be taken to reduce the adverse effects that might arise from site clearance, cutting of slopes, disposal of spoils and quarrying activities. Necessary trainings and awareness programs will be conducted. Necessary measures will be adopted for protection of flora and fauna. At construction site, the workers will be provided insurance, first aid facilities and safety equipments. Loss of trees will be compensated by planting of trees in the ratio of 1:25 + 30% for the numbers of trees that need to be cut down during construction and in private land, compensatory plantation will be encouraged in the ratio of 1:1. Protected species will be given emphasis for plantation. Proper maintenance and proper drain system will be provided to prevent accumulation of water on the nearby agricultural lands during operation. Adequate road safety measures will be provided to minimize road accident.

Environmental Management Plan

Environmental management plan is prepared to ensure the implementation and monitoring of mitigation measures for minimizing adverse impacts and maximizing the beneficial impacts. The necessary mitigation measures together with environmental monitoring process and responsible bodies for environmental monitoring have been identified. Similarly, for environmental monitoring various sections of physical, biological, socio-economic and cultural environment have been identified to generate useful information and improve the quality of implementation of mitigation measures.

The cost for implementing environmental management plan has been identified as follows:

SN.	Description	Amount (NRs.)	Remarks
1	Environmental awareness raising training and other training	300,000.00	To be included in project cost
2	Insurance of workers	400,000.00	To be included in BoQ
3	Bio-engineering	3,683,327.00	@ 3 % of Total Cost
4	Resettlement and Land Acquisition	6,416,848	To be included in Resettlement plan
5	Restoration or relocation of affected infrastructures, Spoil management, Reinstatement of quarry, stockpiling etc.	600,000.00	To be included in BoQ
6	Compensatory Plantation cost	312,720.00	To be included in project cost
7	Health / HIV AIDS / STD prevention awareness; other awareness program such as adult literacy; support to local school etc.	8,42,861	To be included in Social plan, project cost
8	Occupational health and safety, Information signboard	550,000.00	To be included in BoQ
9	Monitoring	250,000.00	To be included in project cost
	Total	12,512,895.00	

Conclusion and Recommendation

The identified environment impacts will be seen in limited small areas and mainly during construction period. The implementation of proposed mitigation measures for identified adverse impacts will minimize as well as mitigate the adverse impacts on environment. The Resettlement Plan and compensation to the affected households should be ensured. The implementation of measures as described in environmental management plan will mitigate the negative impacts on physical, biological, socio-economic and cultural environment. Therefore, this IEE is sufficient for approval of the proposed sub-project, and recommended for implementation with incorporation of mitigation measures and environmental monitoring plan. Therefore, the proposed Subproject does not require Environmental Impact Assessment.

1. Introduction

1.1 Background

1. The Rural Reconstruction and Rehabilitation Sector Development Program (RRRSDP) covers 20 districts spread over the country, which 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 RRRSDP 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). Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) under the Ministry of Local Development (MLD) is the executing agency (EA). The DDCs are the Project Implementing Agencies and the DTO of each respective DDC is responsible for technical and project management. The DTO will be supported by District Implementation Support Team (DIST) which includes engineering, safeguards and social mobilization. Panchthar District is one of the project districts under RRRSDP. This proposal is for rehabilitation of Jorpokharee-Aahaldanda-Charibhanjyang-Oyam district road in gravel and all weather standard in Panchthar District.

1.2 The Name and Address of Proponent

2.

Name of Proposal:	Rehabilitation of Jorpokharee-Aahaldanda-Charibhanjyang-Oyam District Road, Panchthar District, Nepal
Name of Proponent:	District Development Committee/District Technical Office
Address of Proponent:	Phidim, Panchthar
	Phone No: 024-520143
	Fax No: 024-520143
	Email: dpo_dto@yahoo.com

Name of Preparer

Mr. Parash Tuladhar (Environmental Specialist)

Data Collection and Support

Mr. Hari Deo Pandit (DIST Team Leader)
Ms. Sakuntala Chamling (Social Development Specialist)
Ms. Bhima Subedi (Social Mobilizer)
Ms. Susma Lawati (Social Mobilizer)
Mr. Dhruva Dahal (Asst. Sub-Engineer)

1.3 Relevancy of the proposal

3. Despite the project area being within Panchthar District, it belongs to remote and underdeveloped South- eastern part of the valley. The area has high potential in production of vegetable, milk and coffee. The proposed road will enhance access to market and social services to the people of the area, and will significantly contribute in their socio-economic development. Better access will also open door to new development opportunities.

IEE study of the Proposal is a legal necessity according to Environment Protection Act, 1997; and Environment Protection Rule, 1997 (Amendment 2007) of GON. Similarly, an IEE study is required according to provision of Environmental Assessment Guidelines, 2003; and Safeguard Policy Statement, 2009 of ADB.

4. The road was assumed to pass four VDCs namely Suvang, Varappa, Ektin and Oyam and was published in the notice in the daily newspaper, The Kantipur on 2nd August but during detail survey it was found that the road passes only two VDCs namely Ektin and Oyam.

1.4 Objectives of IEE study

5. The main objective of the IEE study is to identify the impacts from the implementation and operation of the Proposal on the physical, biological, socio-economic and cultural environment of the sub-project area. The IEE study recommends practical and site specific environmental mitigation and enhancement measures, prepare and implement environmental monitoring plan and make sure that IEE is sufficient for the proposed road sub-project.

1.5 Methodology adopted

6. 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 25/02/2066 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 July 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.

1.6 Description of the proposal

7. The proposed 24.00 km long earthen Jorpokharee-Aahaldanda-Charibhanjyang-Oyam Road Rehabilitation Subproject lies in the South-East part of Panchthar district in Eastern Development Region of Nepal which links the remote area of the district to its headquarter. Jorpokharee-Aahaldanda-Charibhanjyang-Oyam is the existing track and proposed for the Gravelled standard. This Subproject starts from Jorpokharee of Ektin Village Development Committee (VDC) and ends at Oyam Secondary School of Oyam VDC.

8. The road was opened in 2003 and vehicles ply during dry season. The alignment requires widening, geometrical correction in bends, and grade improvements. The location and alignment of the road is given in **Figure 1.1 and 1.2**. The total project cost is NRs. 126,460,895 and per km cost is NRs. 5,269,204 as shown in **Annex III**.

SALIENT FEATURE

1. Name of the Project Road	:	Jorpokharee-Aahaldanda-Charibhanjyang-Oyam
2. Location		
2.1 Geographical Locations		
2.1.1 Start Point	:	Jorpokaree of Ektin VDC
2.1.2 End Point	:	Oyam Secondary School of Oyam VDC
2.2 Geographical Feature		
2.2.1 Terrain	:	Hilly
2.2.2 Alignment	:	Ridge/upper valley
2.2.3 Altitude	:	1976m amsl at Jorpokharee to 1907m amsl at Kaule Bazaar
2.2.4 Climate	:	Sub-Tropical, Temperate
2.2.5 Soil	:	Alluvial soil, colluvial soil
3. Classification of Road	:	District Rural Road
4. Status of road	:	Rehabilitation proposed for all weather
5. Length of Road	:	24.00 km
6. Standard of Pavement	:	Gravel (River bed material)
7. Construction Period	:	270 Days
8. Traffic Forecast	:	80 vehicles per day
9. Design speed	:	20 km/hr
10. Major Settlements:		
10.1 Major Settlements	:	Jorpokharee, Lasune, Gairigaun, Aahaldanda, Toribari, Patlepani, Patigaun, Kaule, Chitre, Warebung, Temuna, Gurunggaun, Bhanjyang, Oyamdanda and Salbote.
10.2 No. of Household	:	1649 HHs
10.3 VDCs along the Road	:	Ektin and Oyam
11. Cross Section		
11.1 Right of way	:	5m each side (center line)
11.2 Formation width	:	4.5 m
11.3 Carriageway width	:	3.75 m
11.4 Lane	:	Single
12. Structures		
12.1 Retaining Structures		
12.1.1 Dry Stone Massonary	:	503.492 Cum.
12.1.2 Gabion Wall	:	352.500 Cum.
12.1.3 Stone Pitching	:	101.23 Cum.
3. Bio-Engineering	:	3% to total cost (NRs. 3,683,327)
14. Earth Work		
14.1 Cutting	:	44854 Cum
14.2 Filling	:	8428 Cum (No filling work in significant amount)
15. Project cost		
15.1 Total Cost (NRs)	:	NRs. 126,460,895
15.2 Costs per km (NRs.)	:	NRs. 5,269,204
16. Employment generation:		
16.1 Total employment	:	92643 (person days)
16.1.1 Skilled	:	18950(person days)
16.1.2 Unskilled	:	73693(person days)

1.7 Construction Approach

9. The construction approach will be labour-based, environment-friendly and participatory (LEP) ensuring minimum damage to local environment. The important features of the approach are (i) phased construction with balanced cut and fill; (ii) manual work and use of hand tools and small equipment rather than heavy machinery; (iii) bio-engineering for slope stabilization; (iv) avoid blasting; (v) use soft engineering structures; and (vi) use of contractors only in the works that cannot be done through manual labor.

1.8 Proposed Schedule for Implementation of Sub-project

10. Following table shows the proposed implementation schedule for Jorpokharee-Aahaldanda-Charibhanjyang-Oyam road sub-project:

Table 1.1: Sub-project implementation schedule

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

Note:

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

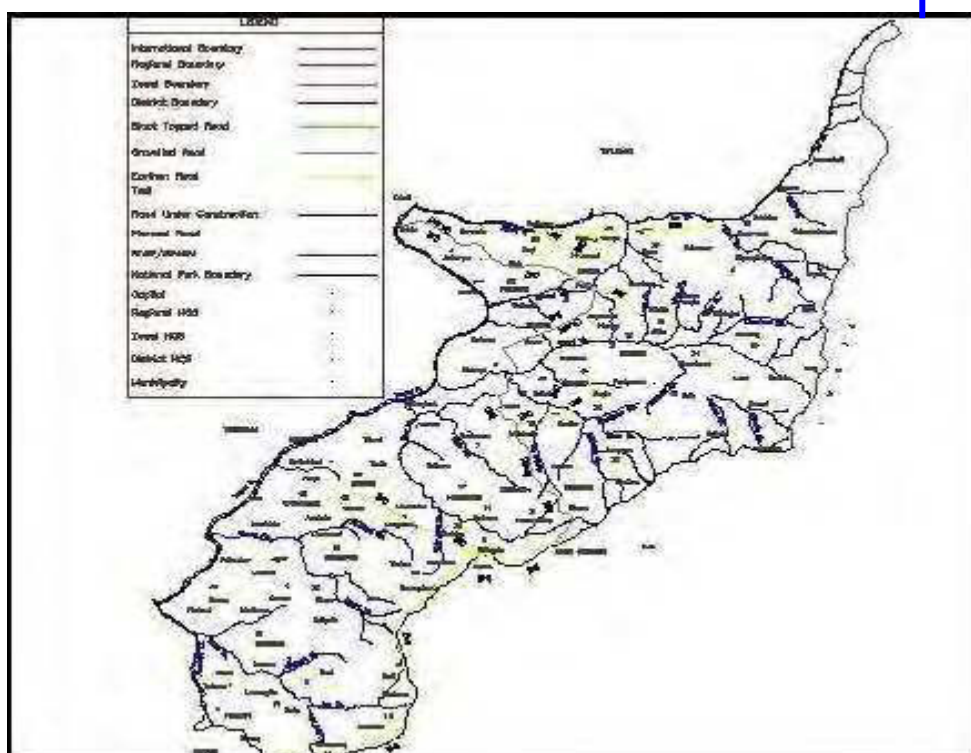
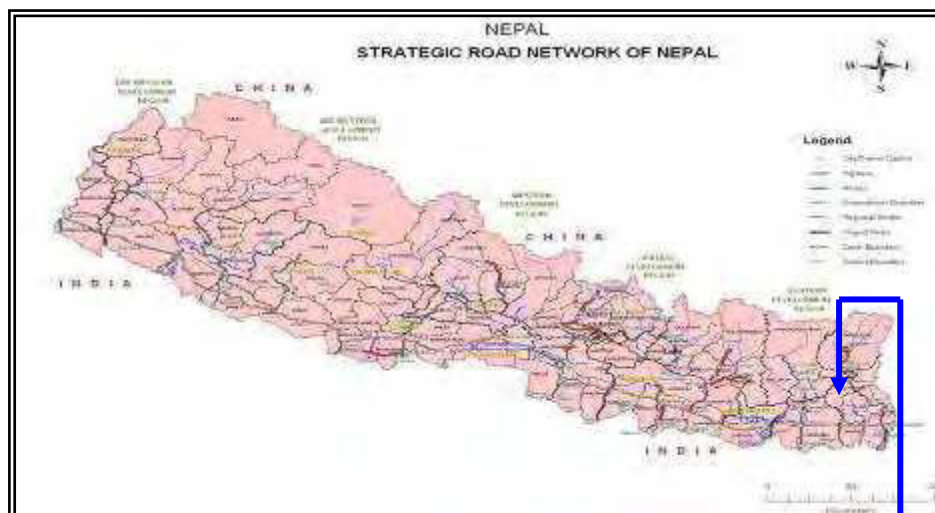


Figure 1.1 Map of Nepal showing the location of Panchthar District



Topo. Map showing the alignment of Jorpokharee-Aahaldanda-Charibhanjyang-Oyam

2. Public Consultation and Information Disclosure

2.1 Public Consultation

11. 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 August 2, 2009 in the Kantipur, a national daily newspaper (see **Annex V**) 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 (see **Annex VI** for deed of inquiry and **Annex VII** for the names of organizations).
- IEE team also carried out interaction with local communities and related stakeholders like District Forest Office, District Soil Conservation Office, District Agricultural Development Office and others during field survey to collect the public concerns and suggestions (see **Annex VIII** for the list of persons consulted). Moreover, Focus Group Discussions were conducted to collect and solicit information regarding the bio-physical and socio-economic and cultural aspects of the road. Summary of minutes of meeting with local people is given in **Annex IX** and following **Table 2.1**. The FGDs were held at different 15 major settlements along the Zol of the road and the results of FGD are mentioned in chapter 4. Existing environmental conditions and socio-economic data are tabulated in **Annex XI a, b, c and d**.
- Draft IEE report will be sent to Ektin and Oyam VDCs for Public disclosure. Recommendation letters were also obtained from above mentioned VDCs as given in **Annex X**. A copy of draft IEE will also be kept in information center of DDC, Panchthar 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: Summary of FGD Meeting

Date	Location/ VDC	No. of Participants	Issues and Suggestions of the meeting
2066/06/01	Jorpokharee/ Ektin	22	<ul style="list-style-type: none">• Soil erosion and slope failure due to road construction should be minimized with proper means• Schools and health posts should be protected• Priority should be given to local people in employment opportunities• Training for income generating activities should be provided to local women.• Plantation should be done• Local farmers should be encouraged to cultivate cash crops.
2066/06/01	Gairigaun/ Ektin	25	
2066/06/02	Aahaldanda/ Ektin	32	
2066/06/02	Kaule/ Ektin	36	
2066/06/03	Charibhanjyang / Oyam	21	
2066/06/03	Warebung/ Oyam	49	
2065/06/07	Bhanjyang/ Oyam	32	
2065/06/07	Salbote/ Oyam	24	

2.2 Information Disclosure

12. Draft IEE was kept at information center of DDC Panchthar 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 pasting at concerned VDCs, 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 websites of ADB, DoLIDAR and RRRSDP. Following offices will get the IEE report:

1. District Development Committee, Panchthar
2. District Technical Office, Panchthar
3. District Project Office, Panchthar
4. District Implementation Support Team, Panchthar
5. Ektin and Oyam VDCs
6. Ministry of Local Development, Environment Management Section
7. Department of Local Infrastructure Development and Agricultural Roads
8. Project Coordination Unit, RRRSDP
9. Asian Development Bank, Nepal Resident Mission

3. Review of Relevant Acts, Regulations, and Guidelines

13. The IEE study has followed the provisions of following acts, regulations and guidelines of Government of Nepal and ADB to ensure development and conservation of environment.

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	<i>Batabaraniya Nirdesika</i> (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. Existing Environmental Condition

14. Baseline information on the existing physical, biological as well as socio-economic and cultural environment of the proposed Subproject is described in this chapter.

4.1 Physical Environment

15. This section describes the physical condition of the area that comes under the ZOI (one and half hour walking distance from the centre line of the road) of the road section. Zone of Influence data are taken to give the total project area description. Condition and features of the site can be known from the ZOI.

4.1.1 Topography

16. The elevation of the starting point of the road at Jorpokharee is 1976m amsl and passes through Kaule Bazaar at 1907m amsl. The road alignment passes through the upper valley slope in hills and ascends up to Lasune, and then descends upto Chitre and again ascends upto Warebung and then at last descends upto Oyam Secondary School. The slope varies from 2% to 14%. Major portion of the road passes along the south and west facing hill slope.

4.1.2 Geology and Soil Type

17. The road section comprises of different types of quartzite and schists. In general, soil type along the alignment can be classified as alluvial, colluvial, residual, hard and soft rock.

4.1.3 Climate

18. The road lies in the temperate and sub-tropical climatic region. Generally, rainy season starts from June and ends in September. The meteorological record shows unevenly distributed monsoon rain in the project area with the total average annual rainfall of 1861 mm. Average minimum temperature of 5° C and average maximum temperature of 30°C is observed in the area. (Source: District Profile of Panchthar, 2058)

4.1.4 Hydrology and Drainage System

19. There are 9 numbers of natural drainage at chainages 1+450, 2+080, 2+900, 4+350, 10+365, 15+420, 15+480, 16+400 and 18+100. The summary of the cross drainage works along the road alignment is given in **Annex XIV**.

4.1.5 Soil Erosion and Sedimentation

20. The stability of slopes along the road corridor depends upon slope angle, the material constituting the slope; rock discontinuities and hydrological conditions. Proposed alignment passes through landslides or erosion prone area. There are landslides of approximately 37m*40m at CH: 9+340(Kaule), 43m*24m at CH: 14+695(Warebung) and 64m*47m at CH: 15+980(Gurung gaun). Following **Table 4.1** presents the geological features observed along the road alignment.

Table 4.1 Geological features along the road alignment

Chainage	Location	Terrain slope	State of Land dry/wet	Land Use Pattern	Geological Problem
0+000 - 9+000 Km	Ektin	Moderate	Moist	Forest	Gully erosion
9+000 - 24+000 km	Oyam	Moderate	Moist	Cultivated + forest	Gully erosion

Source: Field survey, July, 2009

4.1.6 Existing Road Condition

21. The maximum and the minimum gradient along the road alignment is 14% and 2% respectively. The whole length of the road alignment is motor-able. The width of the road alignment in average is about 4.5m. The road is operable only during dry season.

4.1.7 Existing Traffic Situation

22. Two regular passenger buses ply on the road whereas number of mini truck/pick up are 5 and number of motorcycles are around 40 in winter season. In rainy season, no. of vehicles operating in this road reduces by half. Vehicle used for transportation of milk always operates in the road except during heavy rainfall.

4.1.8 Land Use

23. Land use pattern of the area through which the road passes have been classified into three types: cultivated land, forest and barren as shown in **Table 4.2**.

Table 4.2: Summary of land use pattern along the road alignment

SN	Land use	Area (a)
1.	Agricultural Land	3.53
2.	Barren	1.56
3.	Forest	0.12
4.	Built-up area	0.05

Source: Field Survey, July, 2009

4.1.9 Air, Noise and Water Quality

24. The air, noise and water quality are not tested, but are observed to be within acceptable limit. Dust emission during vehicle operation has become common phenomena in the existing road and it is more significant during dry and winter season.

4.2 Biological Environment

25. This alignment does not pass through any protected area.

4.2.1 Vegetation

26. The dominant forest and fodder species reported in the road alignment are (*Quercus lantana*) Baj, (*Alnus nepalensis*) Uttis, (*Schima wallichii*) Chilaune, (*Rhododendron arboretum*) Lali Gurans, (*Pinus roxburghii*) Khote Salla and (*Castanopsis indica*) Katus. The forest is sparse with dominant species such as Uttis, Chilaune and Katus. NTFPs found along the road alignment are (*Ficus neriifolia*) Dudilo, Alaichi, Amsilo, Kimbhu, etc.

27. The road alignment passes through government forest in different locations. In total 0.12 ha forest areas will be lost due to the construction of this road. Total number of trees to be removed is 482. Out of these, 216 numbers of trees are to be cleared from government forest and remaining 266 nos. of trees from private land. There are three government forests along the road alignment namely Kaule, Charibhanjyang and Oyam.

4.2.2 Wildlife

28. *Vulpes vulpes* (Fox) and *calloscirus sps.* (Squirrel) are the wild animals reported in the forests of proposed road area. Similarly birds like *Corvus splendens* (Crow), *Passer domesticus* (Sparrow), *Lophura lencomelana* (Kalij Pheasant), *Columba livia* (Pigeon) etc. are found in the project area.

4.2.3 Aquatic Life

29. Fish species found in water bodies along the road alignment are Asala (*Schizothorax plagiostomus*), Katle (*Accrocheilus spp.*), Hile, Gandyaula, and Buduna. These fish species are mainly found in Bhir kholsi.

4.3 Socio-economic and Cultural Environment

4.3.1 Population, Household and Ethnicity

30. The alignment covers two VDCs namely: Ektin and Oyam. Major settlements within Zol of the project are Jorpokharee, Lasune, Gairigaun, Aahaldanda, Toribari, Patlepani, Patigaun, Kaule, Chitre, Warebung, Temuna, Gurunggaun, Bhanjyang, Oyamdanda and Salbote. Major castes in the area are Limbu, Tamang, Chhetri, Brahman and Dalit. Major occupations include agriculture, business, livestock and services. The total number of population and households is given in **Annex XI e**.

4.3.2 Main Occupation

31. The main occupation of all people residing within the Zol of the proposed road alignment is agriculture and livestock. However, agriculture farming is not enough for subsistence level due to small landholding size and lack of irrigation facilities. Therefore people are carrying out other economic activities like labour for different works.

4.3.3 Market Centres and Business Facilities

32. Major settlements along the road alignment are Jorpokharee, Lasune, Gairigaun, Aahaldanda, Toribari, Patlepani, Patigaun, Kaule, Chitre, Warebung, Temuna, Gurunggaun, Bhanjyang, Oyamdanda and Salbote. There are grocery shops and tea stalls available in the few settlements like Jorpokharee,

Kaule, Gurunggaun, Bhanjyang and Salbote. Jorpokharee, Kaule and Salbote have also some hotels and restaurants. Necessity of sewerage/drainage system has been felt in these places. Other smaller market centres with shops of daily commodities are also found along the road alignment.

4.3.4 Local Economy

33. The economy of the area is predominantly agriculture based some are harvesting forest products such as uttis for timber. Local people are gradually attracted towards cultivation of cash crops such as dudilo, kimbhu, aiselu, katus. Dairy production and selling it to the local market has been also another source of income for local farmers. Over 50 percent populations base upon agricultural activities for their livelihood. Diversity in employment pattern has been also observed in recent years. Local people have increasingly engaged in small business activities in Jorpokharee, Kaule and Salbote. Many people seasonally migrate to Phidim, Jhapa and even different parts of India to earn some money for their livelihood.

4.3.5 Agriculture Pattern

34. Major crops that are cultivated in the project area are rice, wheat, maize, millet, potato and beans. Local peoples are also found to be encouraged in cash crops in recent days. Major cash crops that are grown in the project area are mustard, alainchi, amliso, vegetables and tea. The area has appropriate climate and soil for farming of citrus type of fruits such as orange, lemon, *nibuwa*.

4.3.6 Livestock

35. Due to availability of good number of fodder trees, the project area has also immense potentiality of cow and buffalo farming for dairy and goat farming for meat. People had already started buffalo farming and selling milk. Before the opening of this track people used to carry milk on their back or hire porters to sell it to Phidim and they were not encouraged to produce milk in commercial scale due to time consumption and difficult access. Now, the road is motorable for few dry months when the weather condition is favourable. It is expected that the trend will still increasing in the coming days with the upgradation of the road.

4.3.7 Industry

36. Some local people are engaged in weaving of bamboo products, making of furniture, dairy production, tea production and tailoring. The area has the potentiality of agro-based industries such as dairy, juice production, food processing as well as furniture, bamboo products.

4.3.8 Trade and Commerce

37. Goods of daily commodities are major imports in the project area, which includes salt, sugar, packed food items, spices, clothes and other items of daily uses. Similarly, major items exported from the project area are milk, dudilo, kimbhu, vegetables, fruits, tea, timber, bamboo products.

4.3.9 Tourism Related Services

38. Some hotel, lodges are in operation in Jorpokharee Bazaar area. Since the ZoI of the project and its surrounding area has potentiality of various types of tourism promotion. People may engage themselves in various kinds of tourism related activities such as guide, cook, porter, promotion of local handicrafts and other local products if they are provided appropriate training and support.

4.3.10 Health and Sanitation

39. Major health problems observed in the area are gastric, water borne diseases, gout, respiratory diseases, skin, malnutrition, typhoid etc. Sanitation awareness among local people is increasing and many of them have toilets in their home, but there is no public sewerage system. People discharge their wastewater in the nearby natural streams.

4.3.10 Public Services and Infrastructures

Education: The proposed project area consists of a total of 3 educational institutions ranging from primary level to secondary level educational institutions. There is a Oyam secondary school in Salbote settlement. Most of the families send their children to school. Female enrollment in schools is lower than that of male students. Literacy rate in the project area has been estimated around 65 percent.

Health Facility: There are altogether 2 health posts/sub health posts in various settlements.

Communication: All of the settlements have telephone facilities mostly with CDMA connection. One post office have been serving the local people.

Transportation: Public bus service is not available. Tippers generally carry vegetables, milk and other local products from the area.

Electricity: There is electricity only in Jorpokharee and other settlements use solar energy.

Water Supply: Piped drinking water supply is available to only Jorpokharee settlement.

Irrigation: No irrigation facility has been observed in Zol of the project area.

Other Infrastructures/services: There is a Ghat, Schools, Chautara, Hotels & Lodges, Sub-health post, Community Centres and dairy farms are also available in the project area.

Industries: Cottage and other industries are not developed within the Zol. There is a rice and flour mill in Jorpokharee settlements. Many people have skills of weaving bamboo baskets; woolen cloths etc. and these skills can be commercialized to increase their income.

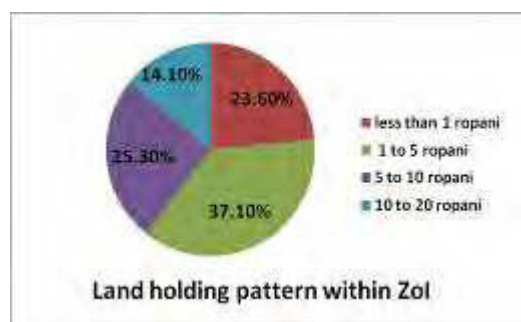
Financial Institutions: There are no saving and credit cooperatives in Zol of the project area.

Community Development Facilities/Organizations: Several community centers, community based organizations, youth clubs, women's group, NGOs and water/forest users groups are also active in Zol of the project.

4.3.11 Land Holding Pattern

40.

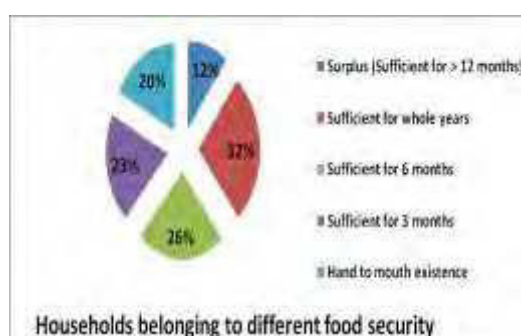
Land holding pattern within the Zol of the road project demonstrates that most of the population have 1-5 ropani (approximately 1 ha = 19.8 ropani) land and then few households fall under 5-10 ropani land holding category. No households are landless and few HHs have less than one ropani land. Details about land holding pattern are given in the **Annex XI c**.



4.3.12 Food Security

41.

About 26% of the households have enough food for only for six months. On the contrary, 32% of the households of the project area have food sufficiency for whole year, 20% households are of hand to mouth existence category and 12% households are reported as food surplus ones. Food sufficiency condition is given in **Annex XId**.



4.3.13 Migration Pattern

42. Permanent migration takes place in limited scale towards Phidim and Jhapa. Similarly, seasonal migration also takes place during slack farming season from Mangsir to Poush mainly in Phidim, Jhapa and various parts of India.

4.3.14 Settlement Pattern

43. Most of the settlements within Zol of the project are scattered type. Housing pattern of these settlements are mostly one or two storied, CGI sheet roofed buildings.

4.3.15 Potential for Development

44. Many of the places, areas and settlements within Zol of the project have the potentialities in various sectors. These sectors and their potentialities have been mentioned in **Table 4.3** below.

Table 4.3: Development Potentialities in Various Sectors

SN	Sector	Development potentiality
1	Agriculture	Tea, potato, vegetable farming, timber (uttis) production, dairy production within the whole Zol
2	Tourism Promotion	There are many places along the alignment in which the tourism activities can be enhanced such as in Charibhanjyang, Warebung and Oyamdanda Settlements.
3	Small and Cottage Industry	bamboo products, furniture, dairy industry
3	Trade and business	Development of several rural market centres at various places along the road alignment and main market centres at Jorpokharee, Kaule and Charibhanjyang Bazaar.

Source: Field Survey, May, 2009

4.3. 16 Religious, Cultural and Historical Sites

45. There are no Religious, Cultural and Historical Sites along the road alignment.

5. Project Alternatives

46. Assessment on alternatives of the Subproject is discussed as in the following subsections

5.1 No Action Option

47. This alternative does not allow the implementation of the Proposal. An earthen road currently exists, which is only fair weather road. As the road connects few major settlements with high potential in dairy, vegetable and tea products, the no action option will increase the transportation time and cost for the local people to the district headquarter and markets and vice versa resulting into low level of productivity and prevalence of poverty. The no action option will conserve some of the environmental adverse impacts at the cost of poverty and hardship of the people.

5.2 Proposal Alternatives

48. Construction of ropeway, airport and road could be the options for achieving the transportation and access.

49. Ropeway can be a mode of transportation to enhance accessibility of the people within Zol. The ropeway primarily serves to transport goods and it normally does not provide facilities for human mobility except it is built with cable car facilities, is very costly. In the current power crisis situation in Nepal, cable car cannot be operated efficiently. Also, it does not connect and serve the settlements along the alignment. Hence this alternative is not feasible.

50. Air distance to project area from Biratnagar is very short and thus air connection is not feasible.

51. Considering other project alternatives, the proposed road project can be the best option to serve the purpose of efficient transportation requirement.

5.3 Alternative Alignment

52. The alignment of the Jorpokharee-Aahaldanda-Charibhanjyang-Oyam road is an existing fair weather motorable earthen road and proposed for the rehabilitation, requirement to acquire land and cutting trees will be minimum than in new alignment opening. Hence, new alternative alignment is not studied and the proposed road is selected for implementation.

Jorpokharee-Aahaldanda-Charibhanjyang-Oyam road can be constructed from another route but it is unfeasible due to limited budget and ground nature. So existing track is taken as best option.

5.4 Alternative Design and Construction Approach

53. There are two types of road design and construction methods: Conventional and green road approach. In conventional method, heavy machineries and equipment, use of explosives, heavy concrete structures with the application of bituminous surfacing, side drains, bridges and culverts etc. are extensively involved.

54. Green road approach which is normally referred as a labour based, environment friendly and participatory (LEP) method focuses to conserve the delicate mountain ecology through the protection of vegetation cover and least disturbance to the local geology as means of soil conservation. Under this approach, construction work is done manually from the local labour without using heavy machinery and explosives. Spoil disposal is minimized through balance in cutting and filling. Simple dry stone walls and stone causeways will be used. Preservation of vegetation cover is maintained through application of re-vegetation and stabilization of slopes by bio-engineering.

55. The proposed road has been designed considering the both LEP and contractor approach. The construction work will not be carried by only using the labours but equipment and machineries will also be used where manual work is not possible.

5.5 Alternative Schedule and Process

56. During the rainy season, the construction work is stopped to allow the natural compaction of the road. Rehabilitation and construction work will be carried out during the remaining months. The construction period is more appropriate from October to June as the local people are generally free from farming activities.

5.6 Alternative Resources

57. The physical resources consumed for the construction of the proposed road will mainly include boulders for gabions and stone for dry masonry wall. Stones are easily available in nearby areas of various sections of the road whereas fine aggregates like sand has to be transported from other locations. The proposed construction will optimally use the local labour force and local materials.

6. Identification of Impacts and Benefit Augmentation/Mitigation Measures

58. The identification and assessment of impacts has been carried out by considering the proposed proposal activities examined in terms of its current condition and impacts during construction and subsequent operation phases. Several such impacts have been identified based on site observation, field survey, and information obtained from the stakeholders and few were identified on value judgment. Impacts from the proposed road sub-project can be both beneficial as well as adverse. Most of the identified impacts have been quantified to the extent possible. The impacts have been predicted in terms of their magnitude, extent and duration. The possible impacts (positive and negative) in construction and operation phase are presented in the following sub-sections.

59. An effective implementation of benefit maximization measures and adverse impacts mitigation measures are also suggested hereunder. (See also **Table 7.2**).

6.1 Mitigation Measures During Pre-construction phase

6.1.1 Route Selection

60. Since, this is an existing road and proposed for rehabilitation the same alignment shall be followed with required geometrical improvements and widening of the road to the specified width of 4.5m. Local conditions (structures, set-back, lay-byes, mass balancing and safe disposal site for the excess excavated material, community utilities, slopes, sensitive spots etc.) and minimizing land acquisition from forest, cultivable lands, settlement and cultural properties will be taken into due consideration to decide on where and which side should be widened

6.1.2 Detailed Survey and Design

61. The road design will follow the rural road standards developed by DoLIDAR. The works will be executed through labor intensive construction method as far as possible and practical in this program. Bio-engineering technique will be applied for stabilization of slopes. At the detail design stage, several alternatives were explored to avoid and minimize further land requirement by using the existing track. The survey team has selected the least valuable, least agriculturally productive land for the lay-bys and other improvements and took care to avoid the acquisition of houses. These changes will be incorporated into the subproject detail design.

6.1.3 Land and Property Acquisition, Compensation and Resettlement

62. ADB Guidelines has necessary provisions for resettlement assistance including entitlements to replacement of land and other assets and/or compensation in case of involuntary resettlement, compensation cost for houses and other affected structures without deduction for depreciation or salvageable materials. However, the framework of resettlement plan also allows land donations in cases where the donation is made freely in public and without coercion, does not affect household food security and where adequate income restoration support exists for the household. The proponent commit that the voluntary contribution will be accepted if the following criteria are met:

- The donation is unforced and not the result of community pressure
- Donated land <20% agricultural holdings of the family
- Food sufficiency of the family is above 9 months
- Full income restoration measures are in place

63. Land taken previously for the existing alignment will not be compensated for but any new land will be obtained through donation under the accepted criteria and acquired by paying compensation for those who comes outside the donation criteria. The structures and crops will be compensated at replacement cost and the lost trees will be compensated at the cost of harvesting (felling and sectioning) and transportation from the site to home. Being a governmental agency, the Proponent will assist to form Compensation Determination Committee (CDC) under the Chairmanship of Chief District Officer. The Chief of Land Revenue Office, DDC representative, DTO will be members in the CDC and other representatives from DFO, DADO, Survey Office, VDC and affected person will be invited if needed. The Committee will decide the rates applicable for compensating different types of houses, land, trees and crops in accordance to established market rates. A separate Resettlement Plan has been prepared to address land and property acquisition as well as compensation issues. As per this Plan, Land donation agreement papers have been produced for the loss of land under the 20% of total holding. The compensation for trees has been calculated based on the replacement cost principle. Compensation payments for trees, land and structures will be disbursed by cheque/cash. The concerned households

whose land will be acquired for the project were informed about the land donation process and entitlements. Finally, the Memorandum of Understanding (MoU) will be prepared and households donating the land will be signed in a written agreement with DDC. If the owner of land could not be contacted an equivalent amount shall be kept separately in the DDC fund until the process is complete.

6.2 Beneficial Impacts and Benefit Augmentation Measures

6.2.1 Construction Stage

Employment Generation and Increase in Income

64. Impacts: One of the major direct beneficial impacts of the road during construction stage is the creation of employment opportunity to the local community. Total employment during construction of this road alignment is 92643 person days in which 18950 person days as skilled and 73693 person days as unskilled. Employment generation for the local people will minimize seasonal migration through for a short period. The amount of money that is earned by the wages will directly enhance various economic activities and enterprise development with multiplier effect. This is one of the direct and significant impacts of the project but it is of short-term and local in nature.

65. 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

66. Impacts: 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 (RBGs), Social mobilizers and supervisors. This will enhance the technical skills of the local people. The skill and knowledge acquired from the project during construction will enhance employment opportunities of such manpower who can earn livelihoods from similar project in future. This impact is indirect, medium, local and long-term in nature.

67. Measures: Road Building group members will be given on the job training on masonry, gabion wires, construction of dry and foundation walls, slope cutting and stabilization, bioengineering works.

Enterprise Development and Business Promotion

68. Impacts: 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 the area. Business increase rapidly in Patle pani, Gairigaun, Kaule, Charibhanjyang and salbote. This impact is also direct, low significance, local and short terms in nature.

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

Community Empowerment and Ownership

70. Impacts: 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. In this process, they will be oriented and trained to build and safeguard community infrastructures which will result in community empowerment and feeling of ownership among them. This impact is also indirect, low, local and short terms in nature.

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

6.2.2 Operation Stage

Improvement in Accessibility and Saving of Time and Transportation Cost

71. Impacts: Once the road project is completed, the people living within the road corridor will have easy access to cities and markets. This will enhance the transaction of goods and access to social services. Access to input and services will increase, which will be cheaper due to transportation facility.

72. Measures: Regular maintenance of the road will be done by the Proponent.

Increase in Trade, Commerce and Development of Market centers

73. Impact: There is a possibility of increased economic opportunities and significant growth and extension of the minor local markets along the road like in Jorpokharee, Kaule, Charibhanjyang and others. Market, Trade and Commerce centers will be increased and it will serve goods in an appropriate rate. Toribari, Temuna and Gurung Gaun take more benefit from this road in commercial purpose. The farmers will be more interested to increase agricultural production due to market accessibility. Similarly, there will be diversification in occupational pattern of local people and non-farm employment will grow to those who are till now mainly dependent on subsistence farming. This will lessen pressure on local natural resources. The impact will be indirect, low, local and long term in nature.

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

Appreciation of Land Value

75. Impacts: The construction of road leads to appreciation of land values particularly near the market and settlement areas. The land price would increase due to the availability of reliable transportation facilities. Land value of all settlement will increase with the construction of road. Mainly the land value will be increased three times in Patle pani, Gairigaun, Kaule, Charibhanjyang and Salbote. This would uplift the economic condition of the local people. The impact is indirect, medium, local and long term in nature.

76. 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

77. Impacts: 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 Jorpokharee, Kaule, Warebung, Gurung Gaun, Bhanjyang Bazaar settlements, which are potential areas for the production of vegetables, fruits and cash crops such as ginger, alainchi, tea, amliso etc. Operation of road will further commercialize the subsistence agriculture of rural area. Farm product can easily transport to other city easily so that economic status will increase totally. The economy of rural area will be further monetized and it will help the rural economy. This is the indirect, significant, local and long term impacts from the proposed road.

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

Enhancement of Community Development Services

79. Impacts: Due to increase in employment opportunities, trade, business and income, it is expected that there will be improvement in social service such as education, health, government offices, saving and credits. The improvement can also be expected with more frequent visit of extension workers, longer stay of professionals such as teacher, doctors to their rural duty areas. Similarly, enhanced income level will encourage local people to spend more on health and sanitation, development of education facilities by employing qualified and professional teachers and upgrading the existing health posts. Production of educated manpower will also help to increase the number of employees in government/non government services. This is direct, significant, local and long-term impact of the proposed project.

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

Women and Indigenous People Empowerment

81. Impacts: Women and indigenous people 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 and indigenous people. Thus, the project will have indirect, significant, local and long-term impact in Zol.

82. Measures: During the road construction and rehabilitation, more emphasis will be given to women, dalit and vulnerable workers. At least 40% workers will be women.

6.3 Adverse Impacts and Mitigation Measures

6.3.1 Construction Stage

83. The proposed road will be constructed according to LEP where manual works are possible; and contractors approach where the work cannot be done manually. The impacts on physical, biological, socio-economic and cultural resources of the proposed road area and respective mitigation measures are presented hereunder.

Physical Impacts

Change in Land Use

84. Impacts: Construction of road will convert 3.53 ha. of cultivated land, 1.56 ha. of barren land, 0.12 ha. of forest and 0.05 ha. of settlement areas into built-up area. The impact from changes in land use will be high, direct, local and long term in nature.

85. 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+30 % for the numbers of trees that need to be cut down during construction and in private land, compensatory plantation will be encouraged in the ratio of 1:1 for each cleared plant, and its maturity for five years shall be done. Local timber, fruit and fodder plants shall be given emphasis.

Spoil Disposal

86. Impacts: 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, and destruction of vegetation, crops and property at downhill through direct deposition or indirectly as result of mass flow. The impact from spoil disposal will be direct, medium, site specific and short term in nature.

87. Measures: Spoils will be safely disposed and managed with minimum environmental damage which includes balanced cut and fill volume, re-use of excavated materials and minimum quantity of earth works. The following mitigation measures will be adopted:

- Wherever possible, surplus spoil will be used to fill eroded gullies, quarries and depressed areas.
- Excess spoils will be disposed in specified tipping sites (Refer Annex IX) in a controlled manner.
- Spoils will 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 (bio-engineering, Turfing etc.)
- Necessary toe walls and retaining walls will be provided to protect the disposal of soil on downhill slopes.

Slope Instability

88. Impacts: Removal of vegetation and open cuts with exposed soil to rain may cause soil erosion as well as landslide. The road is an existing corridor, and thus the hill slopes will not be disturbed by making large and steep cuttings. Major instability areas are also not present along the road alignment except at chainages 9+340, 14+695 and 15+980. Majority of work will be done manually under LEP approach by RBGs, which is an environment friendly method. The impact of slope instability and soil erosion is direct, medium, site specific and for mid-term.

89. The following mitigation measures will be adopted during construction:

- 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
- Mass balancing in cut and fill
- Use of toe wall before disposing spoils on hill slopes
- Use of check dams, chainage management.
- Catch drains and rip-rap drains
- Breast wall with bio-engineering work is required

90. Recommended engineering structures necessary at various chainages for slope stabilization have been given in **Annex XVI**.

Water Management

91. Impacts: The concentrated water from the road outlet causes erosion and landslide eventually affecting the stability of the road itself. The impact will be indirect, medium, site specific and medium term.

92. 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.

93. Details about necessary structures required to mitigate the water induced adverse impacts are as given in **Annex XIV**.

Air Dust, Noise and Water Pollution

94. Impacts: Although the air quality of the project area is not measured, the air does not appear to be polluted. During the construction of the road, there is a strong possibility of dust emission. This may affect the local people and workers, agricultural crops, markets, schools and health posts. Contractor may use heavy equipment during surfacing works, which might be source of dust nuisance. Impact on air quality will be direct, low, local and short term in nature. The project area at present does not experience high levels of noise. However, during construction, the increased construction activities may increase the noise level to some extent. The impact of road construction on the noise level will be direct, low, local, reversible and short term in nature.

95. The water quality data within the project area is not tested. Nevertheless the quality of water in the water bodies, within the project area appears to be fairly good, as they are widely utilized households for drinking. During construction these water bodies may be polluted by spoil and construction wastes. The impact will be direct, low, local, short term and reversible in nature.

96. Measures: The following mitigation measures will be adopted:

- Use of face mask by the workers working in the areas of high dust generation
- Contractor will frequently sprinkle water during surfacing of the road.
- Use of ear muffs to lessen noise pollution during rock breaking and quarrying
- Avoiding the disposal of excavated materials in the water bodies

Quarry Operation

97. Impacts: The extraction of materials from inappropriate places or 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 and vector proliferation. The impact from the operation of quarry sites will be direct, low in magnitude, local nature and short term in duration.

98. 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.

Recommended quarry sites are given in **Table 6.1**.

Table 6.1: Recommended Quarry sites

SN	Chainages	Places of recommended quarry sites
1.	5+710	Stone quarry can be obtained from Chitre kholsi
2.	10+365	Stone quarry can be extracted from Narringe kholsi
3.	15+480	Stone quarry site, 1km far from the road near Bhir kholsi
4.	18+100	Stone collection from Bangibote kholsi and nearby sides

Source: Field Survey, July, 2009

Location of Camp Sites, Storage Depots

99 Impacts: Camp will not be required if works are carried out by RBGs. However, contractor, if used, will establish camp if he bring labors from outside the area. Siting of camp may cause encroachment of forest, agriculture land, and alteration of drainage, fuel leakage, solid waste and waste water problems. Impact will be direct, medium significance, site specific and for short-term.

100. Measures: The mitigation measures will be use of local labors to avoid camp; rent local house instead of camp to keep labors; siting camp away from productive lands and forest areas; pay compensation for using private farm or lands for storage or camp; fuel and chemical storage areas will be on paved surface with surrounding catch drain to protect soil from leakage. Appropriate camp site should be at 5+610 near Patlepani, at 10+250 near Chitre, at 16+000 near Temuna and at 18+000 near Gurunggaun. At camp sites will be provided with drinking water and latrine facilities. For waste water and solid waste management, soak pit will be made and proper management will be done.

Construction Equipment Vehicles

101. Impacts: The contractor based construction will use machineries and tools. The related negative impacts are increase in air pollution due to emission of smoke and dust, and increase in vibration due to vehicular movement.

102. Measures: The following mitigation measures will be adopted:

- All equipment/vehicles deployed for construction activities shall be regularly maintained.
- Vehicles/equipment shall be regularly subjected for emission tests and shall have pollution under control certificates.
- All the vehicles deployed for material movement shall be spill proof to the extent possible.
- In any case all material movement routes shall be inspected daily twice to clear off any accidental spills.
- Materials under transportation shall be covered.

Decline in Aesthetic Value

103. Impact: Landscape degradation relates particularly to poorly designed or monitored activities resulting from quarrying operations and from indiscriminate dumping of spoil material. Road may create scars on the landscape. The impact will be direct, low in magnitude, local nature and short term in duration

104. The following mitigation measures will be adopted:

- 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 to cover the scar by greenery.

Biological Impacts

Loss or Degradation of Forests and Vegetation

105. Impacts: Total of 0.12 ha of forest will be permanently lost due to road construction work. 482 numbers of trees of various species will be removed from forest and private land during road construction (See **Annex XII**). The impacts on vegetation/forest resources have been considered to be high in magnitude, site specific in extent and long term in duration, whereas loss of other forest resources will be moderate, local and long term in magnitude, extent and duration respectively.

106. Measures: The loss of trees can not be minimized; however, it can be compensated by the plantation. 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. Proponent will manage a nursery to grow tree sapling and plant them in 1:25 ratio + 30 % for the numbers of trees that need to be cut down during construction and in private land, compensatory plantation will be encouraged in the ratio of 1:1. Emphasis will be given to plant the trees along the sides of the road in RoW.

Impact on Wildlife Due To Loss of Habitat and Hunting

107. Impacts: The proposed area is not significant habitat for wildlife and bird species. However, the construction of road may disturb wildlife and bird species present in surrounding forests along the road corridor. At kaule and Oyam habitat of animals and birds vanished. The impact will be indirect, low, local and short term in nature.

108. Measures: The following mitigation measures will be adopted:

- 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/harassing of birds or animals.
- Coordination with DFO 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)

109. Impacts: There will be no impact on flora and fauna (listed in CITES and IUCN category) as these are not reported in the proposed project area.

110. Measures: As there are no such species, mitigation measures are not warranted. However, the measures as no vegetation shall be cut unless absolutely necessary and minimum site clearance, discouraging workers for collecting fuel wood from forest or hunting/harassing faunas; shall be followed.

Socio-economic Impacts

Loss or Degradation of Farm Land and Productivity

111. Impacts: There will be permanent loss of 3.53 ha of agricultural land due to road rehabilitation. This will lead to annual loss of food grain production among the families losing lands to the project. Moreover, spoils on farm land will also affect the production of agricultural crops. agriculture is the major occupation due to the construction of road fertile land are decreased. In Oyam and Salbote Agriculture production is very good. This impact is expected to be of high in magnitude, local in extent and of long term in duration

112. 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 of Private Properties

113. Impacts: The proposed road alignment passes through nearby the settlements of Jorpokharee, Lasune, Gairigaun, Aahaldanda, Toribari, Patlepani, Patigaun, Kaule, Chitre, Warebung, Temuna, Gurunggaun, Bhanjyang, Oyamdanda and Salbote. During the construction phase, 2 houses, 2 community buildings (School and Sub health post) will be affected (**Annex XV**). The impact will be direct, site specific, short term and medium in magnitude. Details about property loss and damage will be described in Resettlement Plan Report.

114. Measures: Compensation and resettlement measures will be dealt as per decision made by Compensation Determination Committee (CDC). NRs.6,416,848 is estimated for compensation.

Impact on Community Infrastructure

115. Impacts: The road construction along this alignment has no impact on the water supply, health posts and irrigation infrastructures. But school at 19+100 and sub-health post at 19+103 lies within the RoW of the road, may affect by dust, noise pollution and accident.

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

Table 6.2: Specific Mitigation Measures of School and Sub-Health Post

Type of Public Service and Infrastructure	Chainage/ Location	Distance from the Road	Mitigation measures
Bhanjyang Lower Secondary School	19+100	Within RoW	Information signboard will be placed (Such as School area, Speed limit), Use of horns should be restricted, roadside plantation to be carried out. Fencing of school area will be done.
Bhanjyang Sub-health Post	19+103	Within RoW	Information signboard will be placed (Such as health post area, Speed limit), Use of horns should be restricted, roadside plantation to be carried out. Fencing of Sub-health Post area will be done.

Impacts on Cultural, Religious and Archeological Sites

117. Impacts: There are no any cultural, religious and archeological sites along the road alignment.

Impacts on Health and Safety Matters

118. Impacts: 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 lack of proper sanitary measures and increase in waste and water pollution can lead to an outbreak of epidemics and diseases. This impact is considered to be of the direct, high in magnitude, for short term and localized.

119. Measures: The following measures shall be adopted:

- The workers will be provided with helmets, masks 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.
- Group accidental insurance will be done for the workers.
- First aid training will be provided to field staffs.

6. 3.2 Operation Stage

Physical Environment

Road Slope Stability and Management

120. Impacts: The destabilization of slope may also be expedited due to human activities in the road neighborhood such as quarrying stones or soil, animal grazing, irrigated cultivation, opening of branch roads that will connect the road with other village settlements. This may cause damage to road section, disruption to transportation and other social impacts in the nearby areas. The inadequate maintenance of the road, blockage of drains, damages the road surface can lead to slides and slope failure. Sensitive areas for possible road slope stability problems are:

- Periphery areas of streams/kholsis/springs/ water seepage areas, which are at chainages 1+450(kholsi), 2+080(kholsi), 2+900(Kholsi), 4+350(Kholsi), 10+365(Kholsi), 15+420(Kholsi), 15+480 (kholsi), 16+400(Kholsi) and 18+100 (kholsi).
- Periphery areas of landslides, which are at chainages 9+340(Kaule), 14+695(Warebung) and 15+980(Gurunggaun).

The impact will be direct, medium local and long term nature.

121. Measures: The following mitigation measures will be adopted by DDC after completion of project:

- Rill and gully formations should be regularly monitored and immediately fixed at critical areas;
- Correction of maintenance of the slope protection measures and drainage works
- Minor landslide and mass wasting shall 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

- Catch drain, rip-rap drain, gabion wall for toe protection and Bio-engineering

Impact Due to Air, Noise and Water Pollution

122. Impacts: During operation period, vehicles will ply along the road and will emit gaseous pollutants. This will increase the pollution level of ambient air along the road corridor. Continued dust pollution may cause adverse health impact to the people living in the vicinity. As the road is of district road category and the vehicular movement is not expected to be very high, the overall impact of air pollution will, thus, be direct, low, local and long term. Noise level during the operation period will increase due to the movement of vehicles and other activities. However, due to low traffic volume, the impact due to noise pollution will be direct, low, local and long term. The disposal of spoil and other construction materials and wastes, washing of vehicles in water bodies may degrade the water quality. The impact of this kind will be direct, low, local and long term.

123. Measures: Following mitigation measures will be adopted:

- Community and road user awareness program will be organized to enhance public understanding
- Plantation will be done near the settlements
- Use of horns should be restricted near dense forest, health posts, schools and settlements
- For control of dust nuisance, sprinkling of water, speed limit of vehicle and vegetative barrier by planting trees along roadsides will be designed.

Biological Environment

Depletion of Forest Resources

124. Impacts: 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. To meet the increasing needs of the forest products, illegal felling/cutting of poles and trees may occur. Operation of road may increase in timber smuggling due to easy access and easy transportation facilities. The impact will be indirect, medium, local and long term in nature.

125. Measures: The mitigation measures recommended are:

- Encourage and support local community for controlling illegal harvesting of forest resources.
- Awareness programs shall be organized to educate local people on the conservation of forest.
- DFO will be more vigilant.

Disturbance to the Wildlife and Illegal Hunting

126. Impacts: Although the wildlife population is reported low, they may be disturbed due to the frequent movement of the vehicles. Vehicular movement, blowing of horn in the forest area will have adverse impact on the wildlife and bird species. There may occur illegal hunting during operation period by the people from outside due to easy accessibility. The impact will be indirect, low, local and long term in nature.

127. Measures: Wildlife and birds will be disturbed due to the vehicle movement. The mitigation measure for this is to erect appropriate sign boards informing drivers about:

- Prohibition of blowing horns in the dense forest areas
- Potential areas for wildlife crossing

Socio-economic and Cultural Impacts

New Settlement and Market Center Development

128. Impacts: The existing trend is to settle along the road side for the economic activities through the establishment of shops, restaurants, stalls and hotels. Expansion of settlement area and market can be observed in Jorpokharee, Kaule, Warebung, and Bhanjyang. 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. The impact will be direct, medium, local and long term in nature.

129. Measures: The following mitigation measures will be adopted:

- Awareness raising program through local organizations for planned settlements.
- Regulate settlement growth with proper planning/zoning along RoW.
- Plantation of trees along the road so that RoW is not encroached

- Give efforts by concern agencies for infrastructure facilities like drainage, sewerage etc. in the market areas.

Change in Social behavior

130. Impacts: People may leave their family in their villages to do well near the new spots for economic incentives. This may ultimately affect the traditional bonds, norms and functions of the family. This may also cause impact on social and cultural transition. However, on the other side, there will be also increased interdependence among diverse social groups and interlinkage between different geographical areas which will promote the social cohesion and culture of tolerance among people. The impact will be indirect, medium, local and short term in nature

131. Measures: The mitigation measures recommended will be facilitating awareness raising programs to the communities about negative social behavior like gambling, excess use of alcohol.

Issues on Road Safety

132. Impacts: 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. The impact will be direct, medium, local and long term in nature.

133. Measures: The mitigation measures adopted will be:

- Applying appropriate road safety measures with the help of 3-Es i.e. Engineering, Enforcement and Education.
- Required safety signs will be used along the road

7. Environmental Management Plan

134. The EMP is prepared to guide implementation of mitigation measures and monitoring requirements.

7.1 Institutions and Their Roles

Table 7.1: Institution and their roles

Institution	Role	Responsibility in the Project	Remark
Ministry of Environment	Mandated to formulate and implement environmental policies, plans and programs at national level	Facilitate when needed on environmental safeguards	No direct responsibility in the project
Ministry of Local Development (MLD)	It is concerned line ministry, executive agency and concerned agency as per EPA/EPR. Environment Management Section is responsible to look into safeguard matters for the ministry.	<ul style="list-style-type: none"> To review IEE ToR and Report, and give approval. Coordinate with project on safeguard issues Conduct environmental monitoring from central level. 	Executing Agency
Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR)	Department under MLD responsible to execute infrastructure projects under MLD. Provides back-up support to DDCs in technical matters through DTO.	RRRSDP is being executed under overall coordination and supervision of the Department for the Ministry. It is also supporting DDCs through DTOs to implement the project.	Executing Agency
RRRSDP- Project Coordination Unit	Project specific unit.	Technical Unit to support and coordinate all activities for implementation of RRRSDP. Review, comment, and forward IEE ToR and Report for review to ADB and for approval to MLD	First Class Officer / DDG of DoLIDAR has been heading the PCU.
District Development Committee / District Technical Office	DDC/DTO is Project Executing Agency.	<ul style="list-style-type: none"> Prepare IEE ToR and submit for approval to PCU/MLD Conduct IEE Study, Public Consultation, and prepare IEE Report Receive comments from PCU/ADB/MLD and modify accordingly. Get final approval from MLD. Conduct environmental safeguard monitoring Reporting 	District Technical Officer is the Project Manager
District Project Office	Project implementation office working directly under DDC/DTO.	Responsible for overall activities related to implementation of the works at field level.	Implementing Agency
Central Implementation Support Consultant (CISC)	Support consultants at central level	Technical and management support to PCU	Consultant
District Implementation Support Team (DIST)	Support consultants at district level	Technical and management support to DPO	Consultant

135. To support for smooth implementation of the project, there are various district level committees and groups including District Project Coordination Committee (a sub- committee of DDC), Village Infrastructure Construction Coordination Committee (to coordinate at VDC level). Road Building Groups are formed under participation of local people from ZoI. They carryout the construction works tat can be conducted manually. Contractor will be appointed for works requiring higher skill and mechanized support.

7.2. Reporting and Documentation

136. As part of EMP, reports will be produced at regular time intervals. Three monthly progress reports will be prepared and submitted to the DDC, and DDC will forward it to the PCU and DoLIDAR. Monitoring checklist will be developed as per the Environment Management Action Plan (EMP). The checklist will be used for regular monitoring and included in the Progress Report.

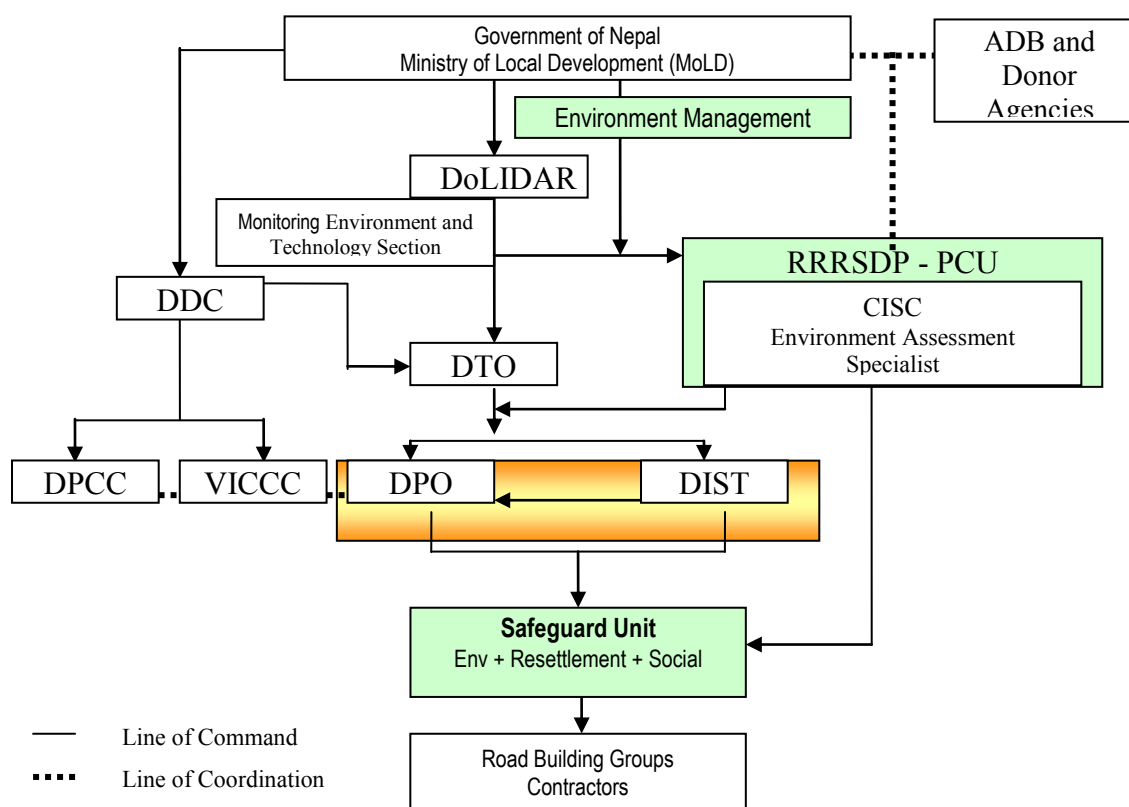
137. The Contract with contractor will clearly state that the DDC/DTO must approve the road building groups/contractor's arrangements for environmental protection, health and safety, waste management and other environment related actions identified during the detailed design phase.

138. The DIST through DPO 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 Contractor. The „Naiké’ (Leader) of RBGs will be given orientation training on ensuring environmental protection measures. Routine monitoring of such measures will be carried-out through supervision staff (environmental, social and technical staff).

139. 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.

140. The trimester environment monitoring report will be submitted for the first year of operation of the road by the Proponent to EA, who will forward the report to ADB. This is to ensure that post project monitoring is also carried out at least for one year.

Fig. 7.1: Environmental Management Organization Structure



7.3. Environmental Management Plan

141. The DDC/DTO with support of DPO/DIST at local level and PCU/CISC at central level will be responsible for conducting careful and routine monitoring of environmental safeguard and ensure the implementation of mitigation measures and according to EMAP. Overall implementation of the EMP will become proponent's responsibility. Framework for implementing environmental management plan is shown by **Table 7.2**.

Table 7.2: Identified/Predicated Beneficial Impacts and Proposed Enhancement Measures

Activity	Effect	Related Beneficial Impacts	Type of Impact *)				Benefit Augmentation Measures	Responsible Agencies		
			Nat	Ma g	Ext	Dur		Executing Agency	Supporting Agency	
Construction Stage										
Construction of road	Employment Generation and Increase in Income	Increase in income level; 3673 person will get employment.	D	H	L	ST	Involve local people to the extent possible to implement manual works through labour-based approach.	DDC/DTO/ DIST	DPCC / VICCC / CISC	
On the job training to local labour	Skill Enhancement	Increase in income generating activities, employment opportunities	IN	M	L	LT	Priority to Affected Peoples (APs) and vulnerable groups, job training on various constructions works.	DPO/DIST	DDC/DTO / CISC	
Construction of road	Enterprise Development and Business Promotion	Enhancement in local economy	D	L	L	ST	Provide support to local entrepreneurs, promotion of cooperatives and linkage with financial institutions.	DDC/DTO	DIST/ CISC	
Construction coordination committee and RBG program	Community Empowerment and Ownership	Increase in income and ownership.	IN	L	L	ST	Provide skill trainings	DPO/DIST	DDC/DTO / CISC	
Operation Stage										
Operation of Road	Improvement in Accessibility and Saving of Time and Transportation Cost	Saving in travel time and travel cost	D	H	R	LT	Proper maintenance (regular, emergency) , continuation of bioengineering	DDC/DTO	DDC / DoLIDAR	
Operation of Road	Increase in Trade, Commerce and Development of Market centers	Shifts towards improved commercial agriculture and increase in non-agricultural occupation	IN	L	L	LT	Manage planned growth with required infrastructure facilities for healthy and hygienic environment in the market areas providing drainage and sewerage systems.	DTO	DDC/VDC	
Operation of Road	Appreciation of Land Value	Improvement in local economic condition	IN	M	L	LT	Land development & management, observe that RoW is not encroached. Locals will be made aware on this fact so that they can rip its benefit.	DDC/DTO	DDC/VDC	
Operation of Road	Increased Crop Productivity and Sale of Farm Products	Enhancement in local economy	IN	H	L	LT	Promotion of market linkages and networking for better market price.	DDC/DTO	DDC/VDC	
Operation of Road	Enhancement of Community Development Services	Socioeconomic development and raise in quality service	D	H	L	LT	Encourage local people in local decision making regarding development and social services facility	Local people, DDC, VDC	DDC, VDC	
Construction of road	Women and Indigenous People Empowerment	Empower the women and indigenous people	IN	H	L	LT	Priority to women, dalit and vulnerable workers. At least 40% workers will be women.	DDC/DTO	DIST/VICCC	

Table 7.3: Identified/Predicated Adverse Impacts and Proposed Mitigation Measures

Activity	Potential Negative Effects	Related Adverse Impacts	Type of Impact *)					Mitigation Measures	Responsibility for Mitigation Measure		
			Nat	Mag	Ext	Dur	Rev		Executing Agency	Supporting Agency	
Construction Stage											
Physical Environment											
Construction of Road, site clearance	Change in land use	Loss of agricultural land, production, loss of property	D	H	L	LT	IR	Avoid fertile land, forest, settlement areas etc.	DDC/DTO/ DPO	DIST	
Construction of Road, earth excavation	Spoil Disposal and imposed weight of spoil on fragile slopes	Gully erosion, landslide, disruption of road, damage to farmland, water pollution etc.	D	M	SS	ST	Re	Proper management of spoils and waste, provision of proper drainages, toe walls Proposed spoil disposal sites are 1+430, 2+740, 4+350, 5+110, 6+250, 7+360, 8+140, 9+690, 10+940, 12+500, 13+870, 14+960, 16+240, 17+840, 18+970, 20+200, 21+540, 22+750 and 23+810.	DDC/DTO/ DPO	DIST/VICCC / VDC	
Site clearance, excavation	Slope Instability (existing land slides at cahnages 9+340, 14+695 and 15+980)	Erosion, landslide, loss of property	IN	M	SS	MT	Re	Bio-engineering application (Such as Grass plantation, Tree/Shrub plantation, Brush layering, Palisades, Bamboo plantation, Live checkdam construction etc.) shall be used to stabilize the slopes. Drainage management (Catch drain, rip-rap drain, checkdam etc.) Breast wall at chainage 9+340, Gabion wall at chainage 14+695 and Breast wall at 15+980 should be provided.	DDC/DTO/ DPO	DIST	
Construction of Road	Water Management, generation of large volume of surface runoff	Erosion, landslide, damage to farmland	IN	M	SS	MT	Re	Proper drainage structures and proper spoil disposal, Avoid blockage or diversion of natural channels due to construction of road and disposal of spoils.	DDC/DTO/ DPO	DIST	
Construction works, operation of construction vehicles, material hauling and unloading etc. Slope cutting, spoil and waste disposal.	Air pollution due to dust from exposed surface, from construction equipments and vehicles	Affect on local people and workers health and affect onagriculture.	D	L	L	ST	Re	Use of face mask while working on dust prone areas, covering of dust sources	DDC/DTO/ DPO / RBGs	DIST	
	Noise pollution	Disturbance and annoyance around school, health posts, forest areas.	D	L	L	ST	Re	Restrict horn near school, health posts etc.	DDC/DTO/ DPO / Contractor	DIST	
	Water pollution due to sediment level, spills and leakage of oils and chemicals	Risk of water borne diseases	D	L	L	ST	Re	Proper spoil management, and prevention of leakage and spills of construction chemicals, restriction in	DDC/DTO/ DPO/ Contractor/	DIST/VICCC	

Activity	Potential Negative Effects	Related Adverse Impacts	Type of Impact *)					Mitigation Measures	Responsibility for Mitigation Measure	
			Nat	Mag	Ext	Dur	Rev		Executing Agency	Supporting Agency
	to water bodies							urination and defecation in open areas	RBGs	
Cutting of slopes	Quarry operation and its potential effect on instability, landslide	Water pollution, damage to farmland, disturbance in natural drainage	D	L	L	ST	Re	Proper selection and management of quarry sites, rehabilitation of quarry sites after completion of work. Recommended quarry sites are Ch 5+710, 10+365, 15+480 and 18+100.	DDC/DTO/ Contractor/ RBGs	DPO/DIST/ VICCC
Construction of road	Location of Camp Sites, Storage Depots	Encroachment of forest, agriculture land, alteration of drainage, disposal of solid waste, and waste water	D	L	L	ST	Re	Proper selection of camp sites away from forests, proper sanitary facilities by providing Pit Latrine, sockpit. Appropriate camp site should be at 5+610 near Patlepani, at 10+250 near Chitre and at 16+000 near Temuna.	DDC/DTO/ DPO/ Contractor	DIST/VICCC
Construction of road	Construction Equipment Vehicles	Dust and Noise pollution and health risks to workers	D	L	SS	ST	Re	Cover of materials under transportation, facility of safety measures for workers, vigilance and monitoring	DDC/DTO/ DPO/Contr actor	DIST
Construction of road, quarrying operation, spoil disposal	Decline in Aesthetic Value	Scars of Landslide	D	L	L	ST	Re	Discourage indiscriminate dumping of spoil, rehabilitation of quarry, plantation of local species along the roadside	DDC/DTO/ DPO/Contr actor	DIST/CISC
Biological Environment										
Clearance of vegetation necessary for road formation	Loss or Degradation of Government Forests and Vegetation	Loss of environmental benefits from vegetation, disturbance in ecological function (dust and noise absorbance, aesthetic value etc.)	D	H	L	LT	Re	Minimize cutting of tree, vegetation and bio-engineering measures. Compensatory plantation of trees in forest at ratio 1:25 +30% will be done and in private land, compensatory plantation will be encouraged in the ratio of 1:1.	DDC/DTO/ DPO/DFO	DFO/CFUGs /DIST
Construction activity	Impact on Wildlife Due To Loss of Habitat and Hunting	Loss of biodiversity and valuable species of wildlife	IN	L	L	ST	Re	Work only in day time, do not disturb wildlife, aware workers	DDC/DTO/ DPO/DFO	DFO/CFUGs /DIST
Construction activity	Impacts on Flora and Fauna	Loss of biodiversity	IN	M	L	ST	Re	Minimum site clearance, discouraging workers for collecting fuel wood from forest or hunting/harassing faunas	DDC/DTO/ DPO/DFO	DFO/CFUGs /DIST
Socio-economic Environment										

Activity	Potential Negative Effects	Related Adverse Impacts	Type of Impact *)					Mitigation Measures	Responsibility for Mitigation Measure	
			Nat	Mag	Ext	Dur	Rev		Executing Agency	Supporting Agency
Acquisition of land for maintaining road width*	Loss or Degradation of Farm Land and Productivity (3.53 Ha)	Reduced production, hardship, food shortage	D	M	L	LT	IR	Minimize productive land acquisition through alignment selection, Compensation for affected people	DDC/DTO/DPO	CFC ² DIST/VICCC
Acquisition of land and property for maintaining road width	Loss of Private Properties	Displacement of people, hardship	D	M	SS	ST	IR	Compensation and resettlement to the owner as described in resettlement plan	DDC/DTO/DPO	CFC/DIST
Demolition of structures along road alignment	Impact on Community Infrastructure:	Loss of services provided by them	D	M	SS	ST	Re	Information signboard will be placed (Such as School and Health post area, Speed limit), Use of horns should be restricted, roadside plantation to be carried out.	DDC/DTO/DPO	PCU DIST/CISC/ VICCC/DC
Occupational health and safety aspects	Health and safety matters	Injury, fatal accidents, outbreak of epidemics and diseases, decline in capacity to work	D	H	L	ST	Re	Occupational health and safety regulations, first aid facility at sites with health treatment arrangements, contingency planning; Proper drinking water and toilet facility for construction crew	DDC/DTO/DPO/Contractors	DIST/CISC
Operation Stage										
Physical Environment										
Quarrying, operation of construction equipments	Road Slope Stability and Management	Slides and slope failure , Disturbance to traffic flow, pollution of water bodies, impacts on agriculture land, loss of vegetation.	D	M	L	LT	IR	Regular maintenance of slope protection structures, Selection of healthy upland farming techniques	DDC/DTO/DPO/VDC	DoLIDAR , DFO, District Watershed and Soil Conservation Office (DWSSC)
Operation of vehicles,	Air, Noise and Water Pollution	Disturbance to students, patients, wildlife, effect to nearby agriculture	D	L	L	LT	RE	Speed limit for vehicles, no horn signs, use vegetation	DDC/DTO	DoLIDAR/Local

* Activities that will be carried out during pre-construction period

² The Land Acquisition Guidelines, 1991 specify the establishment of an Acquisition and Rehabilitation Committee (also known as Compensation Fixation Committee, “CFC”) for fixing the rate of compensation of private properties to be acquired, consisting of the concerned Chief District Officer (Chair), Land Revenue Officer, representative of the DDC and the Project Manager and others as deemed necessary.

Activity	Potential Negative Effects	Related Adverse Impacts	Type of Impact *)					Mitigation Measures	Responsibility for Mitigation Measure	
			Nat	Mag	Ext	Dur	Rev		Executing Agency	Supporting Agency
Inadequate drainage		land and crops						barrier.		administration
Biological Environment										
Road operation	Depletion of Forest Resources	Loss of timber, forest resources and benefits	IN	M	L	LT	IR	Enforcement of law, vigilance and monitoring, participation of community	DFO/CFUGs/VD Cs	DDC/CDO
Road operation	Disturbance to the Wildlife and Illegal Hunting	Collision of wildlife with vehicles, disturbance in their normal activities, Loss of biodiversity	IN	L	L	LT	IR	Warning traffic signal, Awareness training to driver to limit speed and horn use ,Enforcement of law, vigilance and monitoring	DTO/CFUGs	DDC/CDO / DFO
Socio-economic Environment										
Easy Access by road operation	New Settlement and Market Center Development	Encroachment of Row, increased accidents, delay in traffic movement, depletion of local resources, water pollution	D	M	L	LT	IR	Awareness program, enforcement of law, planning of land development, plantation of trees.	DDC/DTO	CDO / VICCC
Operation of Road	Change in Social behavior	Social and cultural conflicts	ID	M	L	ST	Re	Awareness, Enforcement of law and order, Provision of training for skill	DDC/DTO	DDC/DoLID AR
Operation of Road	Issues on Road Safety	Increase in accidents	D	M	L	LT	IR	Appropriate road safety measures, Safety signs along the road.	DDC/DTO	DDC/DoLID AR

* Legend Value in parenthesis is level of significance:

Nature- IN= Indirect ; D= Direct

Magnitude- L= Low ; M= Medium ; H= High ;

Extent- SS= Site Specific; L= Local ; R= Regional; N= National ; CB=Cross-boundary

Duration- ST= Short Term ; MT= Medium Term ; LT= Long term , Re=Reversible; IR= Irreversible

7.4. Mitigation cost

142. 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 the Community Empowerment Component and Livelihood Enhancement Skills Training (LEST) program of the RRRSDP. Costs for income generation and awareness program activities for Affected Persons (APs) are included in Social Action 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 shall be incorporated in the design and cost estimates. Therefore, most of the mitigation measures suggested would be a part of main project 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 7.3**.

Table 7.4: Cost Estimate for Environmental Enhancement and Mitigation Measures

SN.	Environmental Protection Measures	Estimated Budget (NRs.)	Remarks
1. Benefits Augmentation Measures			
1.1	Training to DC/DTO/DPO/DIST to conduct environmental monitoring and reporting	50,000.00	To be included in project cost
1.2	Training to Naika of RBGs	50,000.00	To be included in project cost
1.3	Enhancement in Technical Skills (Bio-engineering)	200,000.00	To be included in project cost
	Sub-Total (1)	300,000.00	
2. Adverse Impacts Mitigation Measures			
2.1	Bio-engineering work	3,683,327.00	To be included in BoQ
2.2	RBG Insurance	400,000.00	To be included in BoQ
2.3	Information Signboard	50,000.00	To be included in BoQ
2.4	Compensation for properties		To be included in Resettlement plan
2.5	Restoration or relocation of affected infrastructures, spoils disposal site management and rehabilitation, reinstate of quarry etc.	600,000.00	To be included in BoQ
2.7	Compensatory plantation Re-plantation / Re-forestation	312,720.00	To be included in project cost
2.8	Health / HIV AIDS / STD prevention awareness; other awareness program such as adult literacy support to local school etc.	842,861.00	To be included in Social plan, project cost
2.9	Occupational health and safety; First aid boxes, campsite sanitation (Pit latrine); solid waste management, Safety measures for workers (Helmets, gloves, masks, boots, etc.)	500,000.00	To be included in BoQ
2.10	Resettlement and Land Acquisition	6,416,848.00	
	Sub-Total (2)	12,805,756.00	
	Total	13,105,756.00	

7.5. Implementation of Mitigation Measures

143. The mitigation measures will 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. The project contractor will 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.

144. The tender instruction to bidders will explicitly mention the site-specific mitigation measures to be performed, the materials to be used, labor camp arrangements, and waste disposal areas, as well as other site specific environmental requirements. Action to be taken against failure to comply with EMAP requirements will also be clearly agreed in the contract agreement document.

7.6. Environmental Monitoring

145. The IEE prescribes the mitigation measures in order to minimize adverse impacts and to enhance beneficial impacts. Environmental monitoring plan is an important tool to ensure the implementation of mitigation measures.

7.6.1 Monitoring Responsibility

146. Monitoring is an integral part of the project proponent. The Proponent, DDC/DTO Panchthar will develop in-built monitoring mechanism to safeguard environment construction and operational stages. DDC/DTO will be supported by District Implementation Team (DPO and DIST) team in the district and Environmental Management Specialist from the CISC will ensure meaningful monitoring and undertaking corrective actions.

147. According to EPR, 1997, the MLD/DoLIDAR is responsible for monitoring and evaluation of the impact of the 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.

148. DDC/DTO with support from PCU/CISC will make arrangements for sub-project level monitoring. It will constitute a monitoring team. 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 take 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 7.4 and 7.5** shall be followed. At least one monitoring in each construction season is necessary.

149. The sub-project level monitoring team should submit its report to RRRSDP district management, which should forward a copy to the RRRSDP-PCU. Total cost of environmental monitoring (field visits, observation, review of reports and report preparation) is estimated NRs.250,000.00 as given in **Table 7.4**.

Table 7.5: Environmental Monitoring Cost

S. No.	Detail	Unit	Quantity	Rate	Total (NRs.)
1	Environmental Management Specialist	Man-month			Included in the Cost of DIST
2	Sociologist / Public Relation Expert	Man-month			Included in the Cost of DIST
3	Stationary and Computer		LS		100,000.00
4	Printing and Photocopies		LS		50,000.00
5	Transportation		LS		50,000.00
6	Cost for Monitoring by MoLD/DoLIDAR		LS		50,000.00
	TOTAL				250,000.00

Thus, total environmental monitoring and management cost is **NRs. 13,355,756.00**

7.6.2 Types of Monitoring and Monitoring Parameters

150. 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. The frame work for compliance monitoring is given in the **Table 7.6**.
- Impact Monitoring** - It confirms whether the environmental mitigation measures specified in the project design and contract are correctly formulated. The frame work for impact monitoring is given in the **Table 7.7**.

Table 7.6: Monitoring Indicators Selected for IEE

Monitored Sector	Parameters Selected for Monitoring
Soil, Landslide, Erosion Waste management sites	<ul style="list-style-type: none"> Number, location and extent of slope failures Cause analysis for slope failure, natural/man-made Area (ha.) of land, forest and properties affected Nos. and extent of gully erosions and pavement failures Nos. and extent of road subsiding effects Suitability of corrective/bio-engineering measures Nos. of days and nature of traffic delays due to slides Sites and suitability for safe disposal of wastes and garbage
Bio-engineering	<ul style="list-style-type: none"> Nos. and plant species selected for bio-engineering, disaggregated by protective function
Seismicity	<ul style="list-style-type: none"> Nos. and magnitude of local seismic activities and respective damage to structures, including road
Water Pollution, Water Resources and their uses: Surface/ ground water Irrigation water Drinking water Public taps	<ul style="list-style-type: none"> Nos. and extent of water-logging at operative and/or decommissioned construction sites Blockage of waterways - extent and secondary impacts Water pollution incidents due to unsafe disposal of waste and spoil, analyzing effects on local fisheries Damage to farm lands due to water shortage or pollution Use of field kit for drinking water quality, determining pH, particulates, turbidity etc.
Air and Noise Level in relation to traffic volume	<ul style="list-style-type: none"> Assessment of noise level in site by direct observation and interview with stakeholders Visual assessment of dust development at selected sites/sensitive spots and interview with local stakeholders Traffic volume measurements
Road Safety	<ul style="list-style-type: none"> Speed measurements at selected spots Nos. and type of road accidents recorded in the Traffic Police and in local health service centers Suitability of local road signs Records on public and driver road safety awareness campaigns
Wildlife/ Habitat Disturbance Impacts on Forest resources	<ul style="list-style-type: none"> Nos. and extent of road accidents inflicting wildlife DFO records of illegal timber extraction and wildlife trade Observations and handling of invasive species
Socio-economic Development near Road alignment	<ul style="list-style-type: none"> Demographic, economic and education data Nos. and extent of new settlements /types and ethnic groups Nos. and extent of new businesses Nos. and extent of new services and utilities
Resettled Households and livelihood restoration	<ul style="list-style-type: none"> Nos. of HHs resettled HH questionnaire to identify livelihood conditions of resettlers Income situation and opportunities for the resettlers Verification of compensation and assistance to resettlers
Community awareness programs relating to environment protection and avoidance of social conflicts	<ul style="list-style-type: none"> Nos./schedule of campaigns and nos. of beneficiaries Revision of training agenda & propagated information material Questionnaire evaluation, interviewing selected participants on the impacts of the training provided by associated NGOs and Contractors Nos. of beneficiaries having received awareness training against the spread of HIV/AIDS and girl/boy trafficking Records from locals and local police concerning social conflicts

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

Pre-construction Stage

152. 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, and
- Prepare up-to-date environmental status of specific site where the impacts are assessed to be significant

Construction Stage

153. 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 borrow pits

Operation Stage

154. 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 borrow pits
- Road accidents
- Symptoms of emergence of road side settlements, changes in agricultural pattern
- Activities of road neighboring communities
- Illegal felling of trees and hunting of wildlife

Table 7.7: Compliance Monitoring for Jorpokahree-Aahaldanda-Charibhanjyang-Oyam Road Construction Works

Parameters/Issues	Responsible Implementing Agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency
Final alignment selection as per IEE /EMP recommendation	DIST	Incorporation of IEE / EMP recommendations into alignment selection process and design document	Walkthrough along final road alignment, verifying sensitive areas	Initial stage preconstruction phase	Proponent through 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	CFC / PCU (CISC) / DOLIDAR / MLD
Resettlement, assistance and compensation	Proponent / DIST	Legal provisions by GoN; Compensations paid	Check compliance to legal procedures	Well ahead of construction	CFC / PCU (CISC) / DOLIDAR / MLD
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/ DPO
Use of local labour, particularly vulnerable groups and women	DPCC / VICCC / DIST	Specifications which obligate the contractors/BG to observe certain quotas for employing local labour, specially vulnerable groups and women, prohibition of child labour	Records and coordinates the process for local people's employment, interviews	During the entire period where labour work is contracted, trimester	Proponent / DPO
Awareness and orientation training on road construction to technicians, and locally employed labourers	Proponent in assistance of DIST	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	DIST / Proponent (DTO)
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, First Aid, Emergency Rescue	Spot checks at work sites, photos, accident records, interviews	throughout construction activities, trimester	Proponent / DPO
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	Arrangement specified in the Code of Practice and in Manuals relating to environmental protection; EMP detail in IEE Document; 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

Parameters/Issues	Responsible Implementing Agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency
Vegetation clearance	Contractor / RBG / DIST	Actual number of trees felled during construction works; Location (in Formation Width or RoW	Record, inspection and interview with local people and CFUGs	After detail design and before construction work	DPO CFUGs / Proponent
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	DPO / CFUGs / Proponent
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, Observation of good construction practices and Discussion with residents and workers	Once in a month during construction	Proponent / DPO
Measures to protect water bodies from pollution	Contractor / RBG / DIST	Visual observation, observation of open defecation/waste/spoil disposal around water sources near construction sites ; Parameters like pH, hardness, DO, Turbidity etc.	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	Proponent / DPO
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 records; Public Consultation Meetings; Photos	Once in 15 days during construction	Proponent / DPO
Adequate technical and environmental supervision	DIST	Adequate number of technicians regularly at site 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	DPO , Proponent
Clean up and reinstatement of the construction sites (camps, quarries, borrow pits)	Contractor / RBG / DIST	Decommissioned sites indicate no adverse/residual environmental impacts, and are rehabilitated to the satisfaction of the supervisor and land owners	Site observation; Comparing photos; Consultation with land owners and CBOs	At end of construction period	Proponent / DPO

Table 7.8: Impact / Effect Monitoring for Jorpokharee-Aahaldanda-Charibhanjyang-Oyam Construction Works

Parameters /Issues	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 where bio-engineering failed	Continuously during construction and operation	DIST during construction; Proponent / DPO / 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	During and at end of Project construction	DIST/ Proponent
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/ Proponent
Quarrying of construction materials	Initiated erosion, changes in river regime, erosion by river systems, landslide due to quarrying, degradation of vegetation, water logging, waterborne diseases	Site observation, photos, records from local health centres	Quarry site areas	During construction	DIST/ Proponent
Disruption of drainage system	Status of rehabilitation Service status of irrigation and water supply system; Operation and maintenance requirement	Observation and interviews, photos, fisheries data, wildlife records	Disrupted aquatic system, irrigation schemes	During construction	DIST / Proponent
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	Proponent / DIST/ VICCC
Water quality	observation of open defecation and waste disposal around water sources near construction sites ; Parameters like pH, hardness, DO etc.	Visual observation, measurement of water sample using standard field kit	local streams	During construction; Upon demand for testing with field kit	DIST / Proponent
Air quality	Dust level in ambient air	Visual inspection and comparison with baseline condition	At construction sites and at sensitive spots (schools, health spots, major settlements)	During construction and operation	DIST / Proponent
Forest and vegetation	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 during operation
Wildlife	Wildlife hunting trapping and poaching by work force, trade of wildlife, biological survey on selected biota, 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 during operation
Change in economy	Numbers of people employed by the Project during construction	Records kept by the Project	Project Area	Trimester during	DIST /Proponent

Parameters /Issues	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementation and Monitoring Agency
	Numbers of women in work forces	management, Discussion with stakeholders		construction phase	
Trade and commerce	Numbers of shops increased or decreased, rental of houses and land spaces	Records, interviews, observations, photos	Project Area	Throughout Project, once in a year	Proponent / VDC
Cottage industries	Establishment of industries in the vicinity of Project Area	Records and interviews, photos	Project Area/ zone of influence	Throughout Project	Proponent / 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 labourers	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	Project Area	During operation	Proponent / VDC
Ribbon settlement	Congestions to road users Nos. of accidents, RoW encroachment	Records, observations	Project Area	During operation	DDC/CDO

8. Conclusion and Recommendations

8.1 Conclusion

155. The IEE study of the proposed Jorpokharee-Aahaldanda-Charibhanjyang-Oyam road sub-project does not pass through any environmentally sensitive area and have minimal detrimental effects associated with loss of forest and agricultural land. Most of the adverse impacts predicted are of low significance and short term as well as of reversible nature. The beneficial impacts with the facility of access to market centers and location of social services will enhance productivity in rural area and improve the quality of life of the people. In addition, local people will get direct employment as workers which will contribute significantly in improving their livelihood. These 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.

156. 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

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

158. 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 and possibly some built areas will have to be acquired for construction of the proposed road. A Resettlement Plan will be required to ensure that the persons affected by these losses are properly compensated.

9. Miscellaneous

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ANNEXES

Annex I: Terms of Reference

Terms of Reference (ToR)

for
Initial Environmental Examination (IEE)
of

Jorpokharee-Aahaldanda-Charibhangjyng-Ovam
Road Sub-Project

Submitted to:

**Ministry of Local Development,
Government of Nepal**

Proponent:

**District Development Committee (DDC)/
District Technical Office (DTO)**

Panchthar

Telephone No. – 024-520143/520144

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March 2009

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Figure 1: Map of Nepal Showing Location Jorpokharee- Aahaldanda-Oyam Road Sub-Project in Panchthar District.

Figure 2: Map of Panchthar district Showing Jorpokharee-Aahaldanda-Oyam Road Sub-Project.

Pangas

[Signature]

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
RFA	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
Zol	Zone of Influence