INITIAL ENVIRONMENTAL EXAMINATION (IEE)

OF

Trishuli 3 B Hub Substation Project

Submitted to:
Ministry of Energy
Singh Durbar, Kathmandu

Through
Department of Electricity Development

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TABLE OF CONTENTS

Abbreviations and Acronym
Executive Summary – Nepali
Executive Summary - English

1 CHAPTER ONE: NAME AND ADDRESS OF THE INSTITUTION PREPARING THE REPORT

1.1 The Project Proponent I-1
1.2 Institution Responsible for the Preparation of IEE I-1
1.3 Rationality for Conducting IEE……..I-2
1.4 Objectives of the IEE Study……..I-2
1.5 Structure of the Report.....I-2

2 CHAPTER TWO: GENERAL INTRODUCTION OF THE PROJECT

2.1 Background II-1
2.2 Project Location..... .II-1
2.3 Project Accessibility..... II-1
2.4 Project Features II-3
2.5 Silent Features II-6
2.6 Project Area Delineation……II-7
2.7 Construction Planning……II-8
2.8 Land Take……II-9

3 CHAPTER THREE: STUDY METHODOLOGY

3.1 Introduction..... III-1
3.2 Desk Study and Literature Review..... III-1
3.3 Data Requirement and Study Methodology III-2
3.3.1 Physical Environment……III-2
3.3.2 Biological Environment……...III-2
3.3.3 Socio-economic and Environment……..III-2
3.4 Impact Identification, evaluation and prediction III-5
3.5 Public involvement III-5
3.6 Study Team……III-6

4 CHAPTER FOUR: REVIEW OF PLAN/ POLICIES, ACTS, RULES, REGULATIONS GUIDELINES STANDARDS AND STRATEGIES

4.1 Introduction ……IV-1
4.2 The Interim Constitution of Nepal, 2063 ……IV-1
4.3 Plan and Policy……...IV-1
4.4 Acts……...IV-2
4.5 Rules and Regulations……...IV-5
4.6 Guidelines and Conventions……IV-6
4.7 Convention of International Trade in Endangered Species of Wild Fauna and Flora.IV-8
4.8 ILO Convention of Indigenous and Tribal People (No. 169)……IV-8

5 CHAPTER FIVE: EXISTING ENVIRONMENTAL CONDITION

5.1. Physical Environment..... .....V-1
5.1.1 Topography and Land Use……...V-1
5.1.2 Geology and Soil……...V-1
5.1.3 Erosion and Land Stability……...V-1
5.1.4 Climate……...V-1
5.1.5 Watershed and Drainage……...V-1
5.1.6 Air Quality and Noise……...V-1
5.1.7 Water Quality……...V-2

5.2 Biological Environment……..…V-2
5.2.1 Vegetation and Forest……..V-2
5.2.2 Wildlife……...V-3
5.2.3 Mammals……..…V-3
5.2.4 Birds……...V-3
5.2.5 Ethno/Botany Resource Use Pattern……V-4
5.2.6 Endangered, Threatened Rare and Protected Species of Flora and Fauna…..V-4
5.3 Socio- economic and Cultural Environment……...V-4
5.3.1 General Introduction of the District……..V-4
5.3.2 Population Characteristics of the Project Area……..…V-5
5.3.3 Settlements……V-5
5.3.4 Caste and Ethnicity……..…V-5
5.3.5 Religion and Festival……V-6
5.3.6 Spoken Language……...V-6
5.3.7 Education……..V-6
5.3.8 Occupation and Employment……..…V-7
5.3.9 Agriculture and Livestock……..V-7
5.3.10 Public Health and Sanitation……V-8
5.3.11 Migration……..V-8
5.3.12 Transportation……..……...V-8
5.3.13 Communication……..…V-9
5.3.14 Electricity……V-9
5.3.15 Drinking Water Supply……...V-9
5.3.16 Religious, Historical and Archeological Sites……...V-9
5.3.17 Gender Status……...V-9
5.3.18 Law and Order……..……V-19
5.3.19 NGO/INGOs……..V-19
5.4 Profile of the project affected households……..V-10
5.4.1 Population and Households……..V-11
5.4.2 Religion……..……..V-11
5.4.3 Mother Tongue……...V-11
5.4.4 Occupation……..V-11
5.4.5 Literacy……..……...V-12
5.4.6 Land Ownership Status and Holding Size……..……V-12
5.4.7 Agriculture……..…..V-13
5.4.8 Income Pattern……V-14
5.4.9 Expenditure Pattern……V-14
5.4.10 Drinking Water……..…V-14
5.4.11 Source of Energy……..…..V-15
5.4.12 Health and Sanitation……V-16
5.4.13 Knowledge and Attitude Regarding the Project……..V-16
5.4.14 Expectation from the Project……...…V-16
5.4.15 Willingness for Compensation b Property Type……...V-16
5.4.16 Households having Residential Land/House other than the Project Area…...V-17
5.4.17 Public Consultation….....V-17

6 CHAPTER SIX: IMPACT ASSESSMENT

6.1 Physical Environment……...VI-1
6.1.1 Topography and Slope Stability……VI-1
6.1.2 Land Take and Land Use ……VI-1
6.1.3 Watershed and Drainage……...VI-2
6.1.4 Air quality and Noise Level ……VI-2
6.1.5 Water Quality ……VI-2
6.1.6 Waste and Solid disposal……VI-2
6.1.7 Crossing of Other Utilities and Interferences.....VI-2
6.2 Biological Environment……VI-3
6.2.1 Forest and Vegetation Loss……VI-3
6.2.2 Changes for Demand of Fuel wood and Timber ……VI-3
6.2.3 Exploitation of NTFPs……VI-3
6.2.4 Wildlife and Avifauna……VI-3

6.2.5 Impacts on Rare, Protected, Endangered Threatened Species……..VI-3
6.3 Socio-economic and Cultural Environment……..VI-4
6.3.1 Acquisition of Land and Structure……..VI-4
6.3.2 Loss of Agriculture Production……..VI-5
6.3.3 Health, Water Supply and Sanitation……..VI-5
6.3.4 Occupational Hazards and Safety……VI-6
6.3.5 Impacts due to restriction of future Land use Development……VI-6
6.3.6 Gender and Vulnerable group……..VI-6
6.3.7 Religious, Historical and Archaeological Site……VI-6
6.3.8 Infrastructure and Service Facility……..VI-6
6.3.9 Social and Cultural Practice……VI-7
6.4 Beneficial Impact……..VI-7
6.4.1 Local Economy……..VI-7
6.4.2 National Economy……VI-7

7 CHAPTER SEVEN: ALTERNATIVE ANALYSIS

7.1 Alternatives Considered VII-1
7.1.1 Site Alternatives.....VII-1
7.1.2 Construction Alternatives.....VII-1
7.1.3 No Forest Option.....VII-2
7.1.4 No Project Option.....VII-2

8 CHAPTER EIGHT: MITIGATION AND ENHANCEMENT MEASURES

8.1 Physical environment ……VIII-1
8.2 Biological environment……VIII-2
8.3 Socio-economic and cultural environment……..VIII-3
8.4 Environment Mitigation and Enhancement Cost.....VIII-8

9 CHAPTER NINE: ENVIRONMENTAL MONITORING PLAN

9.1 Requirements for Environmental Monitoring in Nepal.....IX-1
9.2 Environmental Monitoring Unit IX-1
9.3 Environmental Monitoring Plan IX-1
9.4 Monitoring cost……IX-4
9.5 Agencies Responsible for Environmental Monitoring IX-5
9.6 Summary of Cost Benefit Assessment.....IX-5

10 CHAPTER TEN: CONCLUSION

10.1 Physical Environment X-1
10.2 Biological Environment X-1
10.3 Socio-economic and Cultural Environment X-1

Bibliography

Annex
Annex-I: Survey License
Annex-II: Approved Terms of Reference
Annex-III: Public Notice
Annex-IV: Muchulka, Responses and Recommendation Letter
Annex-V: List of Contacted Persons
Annex-VI: Attendance of Interaction Meeting
Annex-VII: Table of loss of land, properties and agricultural production

List of Figures
Fig 2.1: Location map
Fig 2.2: Topographic map showing the proposed substation
Fig 2.3: Single diagram showing the substation components

List of Table

Table 2.1: Salient Feature of the Project……II-6
Table 3.1: Table 3.2: List of Persons Involved in IEE Study……...III-6
Table 5.1: Demographic Characteristic of the Project Affected District……..V-4
Table 5.2: Population Characteristics of the Project VDC.....V-5
Table 5.3: Caste/Ethnic Status of the VDC……V-5
Table 5.4: Religious Status of the VDC……V-6
Table 5.5: Mother Tongue of the VDC……V-6
Table 5.6: Literacy Status of the Project VDC……V-7
Table 5.7: List of Schools in the Project VDC……..V-7
Table 5.8: Non Agricultural Economic Activity by Type of Activity……..V-7
Table 5.9: Households Having Agricultural Land, Livestock and Poultry……..V-8
Table 5.10: Distribution of Surveyed Households and Population in the Project Area……..V-10
Table 5.11: Distribution of Vulnerable Population by Broad Age Groups……V-10
Table 5.12: Families Structure of the Surveyed Households……V-10
Table 5.13: Distribution of Surveyed Population by Marital Status of the Project Area……..V-11
Table 5.14: Distribution of Surveyed Households by Religion……V-11
Table 5.15: Occupational Composition of Project Affected Population (14 to 59 Years)……..V-11
Table 5.16: Literacy Status of Surveyed Population……V-12
Table 5.17: Educational Attainment among the Literate Surveyed Population……V-12
Table 5.18: Land Holding of the Surveyed Households……..V-12
Table 5.19: Distribution of Households by Landholding Size/ownership……V-13
Table 5.20: Major Crop Area Coverage, Production and Yield in the Project Area……..V-13
Table 5.21: Food Deficiency of Households……V-13
Table 5.22: Average Annual Income Sources of Surveyed Households……V-14
Table 5.23: Average Annual Expenditure of the Households……V-14
Table 5.24: Source of Drinking Water of the Households……..V-15
Table 5.25: Source of Energy for the HHs for cooking purpose……V-15
Table 5.26: Source of Fuel wood for Households……V-15
Table 5.27: Source of Lighting of the Surveyed Household……..V-16
Table 5.28: Households Willing Compensation for Property by Type.....V-16
Table 5.29: Use of the Cash Compensation by Households……..V-17
Table 5.30: Summary of Key Issues and Concerns……V-18
Table 6.1: Land requirement for the proposed project.……..VI-1
Table-6.2: List of Project affected Households by Type of Structures……VI-4
Table 6.3: Affected Household by Land loss……....VI-4
Table 6.4: Private Land Acquisition by Project Components and Facilities……..VI-5
Table 6.5: Annual Loss of Agricultural Production……VI-5
Table 8.1: Estimation of construction cost of structures……..……VIII-3
Table 8.2: Value of Total Loss of Agriculture Production due to Land Acquisition……VIII-4
Table 8.3: Cost for Agricultural Productivity Intensification……..……VIII-6
Table 8.4: Cost for Skill Development Training……VIII-7
Table 8.5: Cost Estimate for Environmental Mitigation and Enhancement Measures. ……..……VIII-8
Table 8.6: Matrix of Environmental Impact Mitigation Measures.....VIII-9

Acronyms and Abbreviations

BS	-	Bikram Sambat (Nepali official era)
CBS	-	Central Bureau of Statistics
CF	-	Community Forest
CFUG	-	Community Forest Users' Group
CITES	-	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DDC	:	District Development Committee
DoED	-	Department of Electricity Development
EIA	-	Environmental Impact Assessment
EPA	-	Environment Protection Act, 1997
EPR	-	Environment Protection Rules, 1997
ESSD	-	Environment and Social Studies Department
GoN	-	Government of Nepal
ha	-	Hectare
HEP	-	Hydroelectric Project
IEE	-	Initial Environmental Examination
ILO	-	International Labor Organization
INGO	-	International Non Governmental Organization
km	-	Kilometer
kV	-	Kilovolt
m	-	Meter
masl	-	Meter above sea level
MoE	-	Ministry of Energy
MT	-	Metric Ton
MVA	-	Mega Volt Ampere
MW	-	Megawatt
NEA	-	Nepal Electricity Authority
NGO	-	Non Governmental Organization
NTFP	-	Non Timber Forest Products
PAF	-	Project Affected Family
RoW	-	Right of Way
NRs.	-	Rupees (Nepalese currency)
ToR	-	Terms of Reference
VDC	-	Village Development Committee

कार्यकारी सारांँश

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

प्रस्तावित त्रिशुली ३ बी हब सबस्टेशन आयोजनाको प्रस्तावक नेपाल विद्युत प्राधिकरण (ने.वि.प्रा.) हो । नेपाल विद्युत प्राधिकरण वि.सं. २०४२ साल भाद्र १ मा स्थापना भएको नेपाल सरकारको पूर्ण स्वामित्वमा रहेको एक संगठित संस्था हो । यस संस्था अन्तर्गतको वातावरण तथा सामाजिक अध्ययन विभागले यस हब सबस्टेशन आयोजनाको प्रारम्भिक वातावरणीय परिक्षण (IEE) प्रतिवेदन तयारी गर्ने कार्यमा संलग्न रहेको छ । ऊर्जा मंत्रालयद्वारा ने.वि.प्रा.लाई यस हब स्टेशन आयोजनाको संभाव्यता तथा वातावरणीय अध्ययनको लागि सर्वेक्षण अनुमति पत्र मिति २०६९/८/१२ प्रदान गरिएको छ। सर्वेक्षण अनुमति पत्र म्यदा २०७१/८/११ सम्म रहेको छ।

२. आयोजना सम्वन्धी विवरण

ने.वि.प्रा. तथा अन्य निजी कम्पनीहरुले त्रिशुली जलाधार क्षेत्रमा विभिन्न जलविद्युत आयोजनाका निर्माण गरिरहेका छन । तसर्थ, उक्त जलविद्युत आयोजनाहरुबाट उत्पादित विद्युत शक्तिलाई जोडन एउटा हब सबस्टेशनको आवश्यक परेकोले यस त्रिशुली ३ बी हब सबस्टेशन प्रस्ताव गरिएको छ । यसरी त्रिशुली नदी क्षेत्रमा बन्दै गरेका र भविष्यमा बन्ने जलविद्युत आयोजनाबाट उत्पादित विद्युतलाई एकै ठाउँमा ल्याएर यहाँबाट काठमाडौको मातातिर्थ स्थित सबस्टेशनमा बिजुली पुरयाइनेछ । यस हब स्टेशन नुवाकोट जिल्लाको मनकामना गा.वि.स. वडा नम्बर ९ पहिरेबेंशी भन्ने ठाउँमा रहने छ।

३. अध्ययन विधि

वातावरण संरक्षण ऐन, २०५३ तथा राष्ट्रिय वातावरणीय प्रभाव मूल्याङ्कन (EIA) निर्देशिका २०५० को अधिनमा रही यस आयोजनाको प्रारम्भिक वातावरणीय परिक्षणको मस्यौदा प्रतिवेदन तयार गरिएको छ । नेपाल सरकारका कानूनी प्रकृया, स्थलगत अध्ययन, स्थानिय जनता तथा सरोकारवालाहरु सँगको छलफलको आधारमा यस मस्यौदा प्रतिवेदन तयार गरिएको छ।

यस प्रतिवेदनको भौतिक वातावरण अध्ययन अन्तर्गत हावापानी, भौगोलिक अवस्था, भू-उपयोग सम्वन्धी तथ्याङ्कको प्रयोग गरिएको छ। त्यसैगरी सामाजिक, आर्थिक र सांस्कृतिक अध्ययनको लागि विभिन्न घरधूरी प्रश्नावली, गा.वि.स.स्तरीय चेकलिस्ट, स्थलगत अवलोकन, स्थानियहरुसंग छलफल साथै विभिन्न प्रकाशनहरुको सहयोग लिइएको छ।

४.० वातावरण संरक्षण सम्वन्धी वातावरणीय ऐन, नियम तथा निर्देशिकाहरु

प्रस्तावित आयोजना कार्यान्वयन गर्दा वातावरण संरक्षण सम्वन्धी विद्यमान नीति, ऐन, नियम, कानून तथा निर्देशिकाहरुमा तोकिएको मापदण्डलाई पालना गर्नु प्रस्तावकको दायित्व हो । यस आयोजनाको अध्ययनको क्रममा विद्युत तथा जलश्रोतसंग सम्बन्धित नीति, ऐन, नियमावली तथा निर्देशिकाहरु जस्तै जलविद्युत विकास नीति २०५८, विद्युत ऐन २०४९ जलश्रोत नियमावली २०५०, विद्युत नियमावली २०५० आदिको पुनरावलोकन गरिएको छ। त्यसै गरी वातावरण संरक्षण ऐन २०५३, जग्गा प्राप्ती ऐन २०३४, वन नियमावली २०५१, स्थानिय स्वायत्त शासन ऐन २०५५ ,

स्थानिय स्वायत्त शासन नियमावली २०५६, वातावरणीय प्रभाव मूल्याङ्कन सम्बन्धि राष्ट्रिय निर्देशिका २०५९ आदि जस्ता अध्ययन प्रतिवेदन तयार गर्दा पुनरावलोकन गरिएको छ ।

५.० आयोजना क्षेत्रको विद्यमान वातावरणीय अवस्था

५.१ भौतिक वातावरण

प्रस्तावित हब सबस्टेशन आयोजना त्रिशुली नदी दायाँ किनारमा समथल भूमिमा रहेको छ । सो स्थान समुद्र सतह देखि करिब ६७० मिटर उचाई रहेको छ । सबस्टेशन वरिपरिको क्षेत्र साँघुरो नदी उपत्यका भित्र पर्ने डाँडाकाँडा रहेको छ ।

यस हब आयोजनाको निर्माणको लागि करिब ५ हेक्टर (१०४ रोपनी) जग्गा आवश्यक पर्ने देखिन्छ । जसमध्ये ३.६ हेक्टर खेतीयोग्य निजी जमिन पर्नेछ । सो जमिन स्थायी रुपमा अधिग्रहण गरिनेछ । त्यस भन्दा बाहेक कामदार क्याम्प, निर्माण सामग्री राख्ने ठाउँ आदिको लागि आयोजनालाई थप जमिन आवश्यक पर्ने छैन ।

५.२ जैविक वातावरण

आयोजना क्षेत्रमा पाइने प्राकृतिक वन वनस्पतिमा सल्ला र साल मिश्रित जंगल पर्छन । नुवाकोट जिल्लाा २७७ वटा सामुदायिक वन रहेका छन, जसमध्ये मनकामना गाविस भित्र ८ वटा सामुदायिक वन रहेका छन । जम्ले भिरपाखा सामुदायिक वन प्रस्तावित हब स्टेशनबाट नजिकै रहेको छ । स्थलगत अध्ययनको क्रममा आयोजना क्षेत्रमा मृग, स्याल, दुम्सी, रातो बाँदर, मलसाँप्रो, लोखर्के जस्ता स्तनधारी जनावरहरु पाइने बुझिएको छ । त्यसैगरी, सारौं, गौंथली, काग, ढुकुर, भँगेरा, कालिज, कोइली आदि जस्ता चराहरु आयोजना क्षेत्र पाइन्छ । आयोजना क्षेत्रमा रहेका सूचीकृत वनस्पतिमा साल र सिमल रहेका छन । त्यसैगरी, रातो बाँदर, कहिलेकाँही देखा पर्ने लंगुर बाँदर र चितुवा संरक्षित प्रजातिमा पर्छन । प्रस्तावित प्रसारण लाइन आयोजना राष्ट्रिय निकुञ्ज, बन्यजन्तु आरक्ष, मध्यवर्ति क्षेत्र तथा वातावरणीय रुपले संवेदनशिल क्षेत्रमा पर्दैन ।

५.३ सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

आयोजना क्षेत्रमा रहेका एक मात्र मनकामना गा.वि.स.को कुल जनसंख्या ३,३२१ रहेको छ । जसमध्ये पुरुष १,५३७ र महिला १,७८४ छन् । यस हब सबस्टेशन वरपर रहेका मुख्य बस्तीहरुमा चामपानी, पहिरे बेंशी, अर्चले, शान्तिबजार रहेका छन । राष्ट्रिय जनगणना २०५८ अनुसार ६ वर्ष भन्दा माथिका जनसंख्याको साक्षरता दर आयोजना प्रभावित गा.वि.स. तथा नगरपालिकाहरुमा ६८% रहेको छ ।

आयोजना प्रभावित हुने परिवारहरु मध्ये २८ परिवारहरुको पारिवारिक लगत संकलन गरिएको छ । सर्वेक्षण गरिएका परिवारहरुको कुल जनसंख्या १६१ मध्ये पुरुष ७७ (४७.८३%) तथा महिला ८४ (५२.१७%) रहेको देखिन्छ । आयोजना प्रभावित हुने परिवारहरुमा हिन्दु धर्मावलम्वीहरु बाहुल्यता रहेका छन् । घरधुरी सर्वेक्षण गरिएका परिवारहरु मध्ये ८५.९९% साक्षर छन् जसमा पुरुष ९२% र महिला ८०.४९% छन् । प्रभावित परिवारहरुको मुख्य पेशाको रुपमा कृषिका साथसाथै सरकारी जागिर, साना उद्योग, व्यापार तथा घरायसी कार्य पाइएको छ । नेपाल भित्र र नेपाल बाहिर काम गर्न जाने श्रमिकहरुको संख्ण पनि आयोजना प्रभावित परिवारमा उल्लेखिय देखिन्छ । धान, गहुँ, मकै, आलु र तरकारी यस क्षेत्रमा लगाइने मुख्य बालीहरु हुन् ।

घरधुरी सर्वेक्षण गरिएको परिवारको औषत वार्षिक आम्दानी रु. २,१५,२२८/- रहेको छ भने औषत बार्षिक खर्च रु. १,५५,०७१/- रहेको छ । प्रभावित परिवारको खानेपानीको प्रमूख स्रोतको रुपमा

पाइपबाट वितरित पानी तथा धारा आदीबाट आपूर्ति भएको देखिन्छ । उज्यालोको लागि अधिकांशले विद्युत प्रयोग गरेको पाइयो । खाना पकाउनको लागि अधिकांश परिवारले दाउराको प्रयोग गरेका छन भने अन्य श्रोतहरुमा एल.पि. ग्यास पनि प्रयोग भएको देखिन्छ ।

६.० वातावरणीय प्रभाव

६.१ भौतिक वातावरण

आयोजनाको निर्माणको लागि स्थायी रुपमा लिइने जग्गा नै प्रस्तावित आयोजनाको भौतिक वातावरणमा पर्ने प्रमुख प्रभावको रुपमा लिइएको छ । आयोजनाको लागि करिब ५ हेक्टर जमिन आवश्यक पर्नेछ, जुन समतल स्थानमा रहेको छ । यसले समग्र आयोजना क्षेत्रको भू उपयोगमा फरक पार्ने देखिदैंन । आयोजना निर्माणको क्रममा न्यून मात्रामा वायु तथा ध्वनि प्रदुषण हुन सक्ने छ ।

६.२ जैविक वातावरण

प्रस्तावित हब सबस्टेशन आयोजना निर्माणको लागि वन क्षेत्र प्रयोग गरिने छैन । त्यसकारण वन क्षेत्रमा प्रत्यक्ष प्रभाव पर्ने देखिदैंन । यस आयोजना निर्माण कार्यको दौरान जैविक वातावरणमा न्यून मात्रामा अप्रत्यक्ष प्रभाव पर्न सक्ने छ । आयोजना निर्माणमा थोरै सँखयामा कामदार संग्लन हुने हुनाले वरपरको वन क्षेत्रको वन्यजन्तुको बासस्थान तथा वन वनस्पतिमा नगण्य बाधा पुग्ने आंकलन गरिएको छ ।

६.३ आर्थिक, सामाजिक तथा सांस्कृतिक वातावरण

प्रस्तावित आयोजना निर्माणको क्रममा २८ घरधुरीलाई प्रत्यक्ष प्रभाव पार्ने देखिन्छ । जसमध्ये एक घरधुरीको एउटा संरचना प्रभावित हुनेछ । आयोजनाले ३.६ हेक्टर (करिब ७२ रोपनी) खेतीयोग्य जमिन अधिग्रहण गर्नेछ ।

स्थायी रुपमा लिइने जमिनवाट ५०.२ मेट्रिक टन खाद्यान्नवालीको उत्पादन क्षति हुने देखिन्छ । निर्माणको दौरान कामदारको सँखया बढनाले स्थानीयस्तरमा खानेपानी, सरसफाई लगायत स्थानीय स्रोतसाधन माथि भार थपिन सक्ने छ । साथै, आयोजना निर्माण रोजगारी सिर्जना हुने भएकोले स्थानीय बासिन्दाहरु लाभान्वित पनि हुने छन ।

७. वैकल्पिक विश्लेषण

आयोजनाको वैकल्पिक विश्लेषण स्थलगत सर्वेक्षण अध्ययनको क्रममा गरिएको छ । हब सबस्टेशन राखिने स्थान छनौट गर्दा कम वातावरणीय प्रभाव पर्ने गरी विभिन्न विकल्पहरुलाई ध्यान दिइएको थियो । जस्तैः घना बस्तीबाट टाढा, सडक पुगेको स्थान, भौगर्भिक रुपमा राम्रो स्थान, प्रसारण लाइन जोडन पायक पर्ने स्थान आदि कुराहरुलाई विचार गरिएको छ ।

८.० प्रभाव न्यूनीकरणका उपायहरु

८.१ भौतिक वातावरण

सबस्टेशन निर्माण गर्दा निस्कने माटोलाई पुरपार गरेर व्यवस्थापन गरिने छ । वर्षाको भेलको पानीलाई उचित निकास दिने गरी नाला बनाइने छ । आयोजनास्थलको अन्य भौतिक वातावरण जस्तै वायु प्रदुषणमा खासै पर्ने प्रभाव नपर्ने भएकोले न्यूनीकरण उपाय आवश्यक पर्ने छैन ।

८.२ जैविक वातावरण

आयोजना निर्माण गर्दा प्रत्यक्ष रुपमा वन क्षेत्रमा असर पर्दैन । तथापि, कामदारहरुलाई दाउराको विकल्पमा मटितेल प्रयोग गर्न लगाइने छ । आयोजना निर्माणमा संग्लन कामदारहरुलाई वरपरको वन क्षेत्रमा वन्यजन्तु समाउने शिकार गर्ने र अन्य गैरकानूनी क्रियाकलापहरु नलाग्न कडाई गरिने छ । जसका लागि सामुदायिक वन उपभोक्ता समिति तथ जिल्ला वन कार्यालय सँग समन्वय गरिने छ ।

८.३ आर्थिक, सामाजिक तथा साँस्कृतिक वातावरण

आयोजना निर्माणको क्रम र निर्माण पश्चात पनि यसले आयोजना क्षेत्रको सामाजिक, आर्थिक र साँस्कृतिक वातावरणमा असर पार्न सक्नेछ । जसका लागि न्यूनिकरण गर्नको निम्न उपायहरुको अवलम्वन गरीने छ ।

जग्गा प्राप्ति ऐन, २०३४ अनुसार स्थायी रुपमा अधिग्रहण गरिने ३.६ हेक्टर (करिब ७२ रोपनी) जमिनको लागि क्षतिपूर्तिको उचित व्यवस्था गरिएको छ । उक्त जमिन क्षतिपूर्तिको लागि करीव रु ५,९६,००,०००/– खर्च हुने देखिन्छ । अधिग्रहणमा परेका परिवारको जग्गामा रहेको कुनै अन्य संरचना अधिग्रहण गर्दा एउटा छुट्टै क्षतिपूर्ति निर्धारण गरिने छ ।

आयोजना प्रभावित क्षेत्रका स्थानीय बासिन्दाहरुको लागि आयोजनाबाट उत्पन्न हुन सक्ने संभावित प्रभाव तथा जोखिम बारे सचेतना कार्यक्रम संचालन गरिनेछ । आयोजना प्रभावित (जग्गा पर्ने) परिवारका सदस्यहरुलाई सिपमूलक तालिमको व्यवस्था गरिनेछ । साथै, यस हब सबस्टेशन आयोजनाले शिक्षा तथा खानेपानीको लागि सहयोग गर्न बजेटको व्यवस्था गर्नेछ ।

९. वातावरणीय अनुगमन

यस हब सबस्टेशन आयोजना निर्माण गर्दा वातावरणमा पर्न सक्ने प्रभावहरुको अनुगमन र वातावरणीय न्यूनिकरणका कार्यक्रमहरु संचालन गरिने छ । जसका लागि आयोजना अन्तर्गत एउटा वातावरणीय व्यवस्थापन इकाईको स्थापना गरिने छ । यस इकाईमा वातावरण तथा सामाजिक अध्ययन विभागको रेखदेखमा एक जना वातावरणविज्ञ लगायत स्थानीय कर्मचारी खटाइनेछ ।

१०. निश्कर्ष

यस प्रारम्भिक वातारणिय परीक्षण (IEE) प्रतिवेदनमा उल्लेख भए अनुसार आयोजनाको कार्यान्वयनमा भौतिक, जैविक र सामाजिक आर्थिक तथा सांस्कृतिक वातावरणमा पर्न सक्ने प्रभावहरु न्यून र व्यवस्थित गर्न सकिने किसिमका छन् । आयोजनाको लागि ३.६ हेक्टर (७२ रोपनी) खेतीयोग्य जमिनको अधिग्रहण नै सबैभन्दा मुख्य प्रभाव हो । यसले २८ घरधुरी प्रभावित हुनेछन । जैविक वातावरणमा प्रत्यक्ष असर पर्ने देखिदैंन । नकरात्मक प्रभावको न्यूनीकरण तथा सकरात्मक प्रभावको प्रवर्द्धन गर्ने कार्यक्रमको साथै वातावरणीय अनुगमनको लागि कुल रकम रु.७,१२,०८,३८६/– प्रस्ताव गरिएको छ, जुन रकम कुल आयोजनाको लागतको ३.१२ प्रतिशत हुन आउँछ ।

प्रस्तावित त्रिशुली ३ बी हब सबस्टेशन आयोजना निर्माण तथा संचालन गर्दा माथि प्रस्तुत गरिएको न्यूनिकरणका उपायहरु र वातावरणीय अनुगमन गरिएको खण्डमा यो आयोजना सामाजिक र वातावरणीय दृष्टिकोणले उपयुक्त देखिन्छ । ◆

Executive Summary

E.1 Project proponent and Organizations Responsible for the IEE Study

The project proponent is the Nepal Electricity Authority (NEA). NEA is a public undertaking of the Government of Nepal and was established in August 16, 1985 (Bhadra 1, 2042 BS) under the Nepal Electricity Authority Act, 2042. Environmental and Social Studies Department (ESSD) is responsible for conducting the IEE study of this project. The Ministry of Energy (MoE) has granted a survey license for the feasibility and environmental study of Trishuli 3B Hub substation project to NEA. The survey license was issued on BS 2069/08/12 (November 27, 2012) and is valid till BS 2071/08/11 (November 26, 2014).

E.2 Project Description

A number of power plants are being developed in Trishuli area by NEA as well as independent power products (IPPs). NEA has already started construction of various generation projects in the Trishuli basin. Some of the other projects are under different stages of development in the area. So the substation is essential for secured and guaranteed evacuation of power from this region and for other additional power plants which will be implemented in future. This Hub station will be connected with Matatirtha substation in Kathmandu by 220 kV transmission line.

The proposed hub substation lies in Pahire besi, Mankamana VDC-9 of Nuwakot district. The project area is accessible by Pasang Lhamu Highway from Kathmandu to Betrawati bazar via Bidur and then, by the access road of Trishuli 3A HEP. The project construction period is 2 years.

E.3 Study Methodology

The IEE process follows the Environment Protection Rules, 1997, and amendment made on 2009 (2065/11/26) and National EIA Guidelines, 1993. This IEE is prepared in accordance with the legal requirements of GoN, based on field studies and consultation with local people and officials. For the physical environment, data on climate, geology and land were taken. Likewise, in socio-economic and cultural environment data on population, ethnicity, religion and religious sites, infrastructure, etc are used for the study. A public notice was published in Gorkhapatra Daily on 9 Baisakh, 2071. As well, an interaction meeting was held at the project site.

E.4 Existing environmental Acts, Rules/Regulations, Policies, Guidelines, and Conventions

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

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

E.5 Existing Environmental Condition

E.5.1 Physical Environment

The proposed Hub substation is located at flat terrain along the right bank of Trishuli River. The altitude of the proposed site is approximately 670m. However, the surrounding area is narrow river valley with rugged and undulated terrain

The project will require 5.306 ha (104 ropani) land for the construction of substation. Out of total 3.687ha is cultivated land. The land will be acquired permanently.

E.5.2 Biological Environment

The natural vegetation and forest ecosystem in the project area consist of mainly Pine and Sal mixes forest and sub-tropical mixed hardwood forests. Total number of community forests in Nuwakot district is 277, out of which there are 8 different units of community forest in Manakamana VDC. The nearest community forest is Jamlebhirpakha located at ward no. 5 covering 86.93 ha forest land.

Mammals such as Barking deer (*Muntiacus munjak*), Jackal (*Canis aureus*), Porcupine (*Hystrix Indica*), Rhesus Monkey (*Macaca mulata*), Malsapro (Martes flavigula), squirrel (*Fuinambulas palmaurum*) etc. are reported in the project affected area.

Common Myna (*Acridotheres tristis*), House Swift (*Apus affinis*), House Crow (*Corvus splendens*), Spotted Dove (*Streptopelia chinensis*) and House Sparrow (*Passer domesticus*). Koilee (*Eudyanamus sp*), Red Jungle Fowl (Gallus *gallus*), etc are reported bird species in the project area. Listed plant species in the project area are Sal (*Shorea robusta*), and Simal (*Bombax ceiba*). Similarly, Rhesus monkey (*Macca mullatta*), common langur (*Maccac assamensis*) and leopard *(Panthera parades*) are the listed wild animals found in the area.

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

E.5.3 Socio–economic and Cultural Environment

According to the National Population Census 2011, the total population of the project affected VDC is 3,321 with 1,537 male and 1,784 female. The total number of households is 789 with average household size 4.2 and population density of the project VDC is 323 persons per sq. km.

The major settlements within the surrounding project area are Champani, Pairebensi, Archale, Shanti bazar. Tamang, Gurung and Brahmin are major ethnic groups in the project area. Occupational caste like Kami and Damai also reside in the project area but in outlying project area.

Agriculture is the major occupation of the people in the project area. The rest of the people are engaged in business, government service, labor, agro-based industries, livestock and poultry farming, etc. Health service in the project area is delivered through the existing sub-health post and health post in VDC

E.5.3.1 Profile of the Project Affected Families

Households survey of 28 households from project affected VDCs have been conducted. The survey reveals that the total population of the project affected household is 161 of which 77 (47.83%) are male and 84 (52.17%) are female. Similarly, the average households size and sex ratio of the project affected households are 5.75 and 0.92 respectively. All the project affected households are Hindus and they speak Nepali as mother tongue.

29.91% of the project affected persons are engaged in agriculture sector. The percentage of households occupied other than agriculture are business and small industry (7.48%), Labor (20.56%), (including labor work in outside country and in the country), service (9.35%, within the country), and student (32.71%). From the households' survey, it is revealed that 85.99% of the surveyed populations are literate with male literacy rate 92.00% and female literacy rate 80.49. Average land holding size of the surveyed households is estimated to 0.316 ha.

Households' survey shows that the total average annual income of the surveyed households is NRs. 2,15,228. The income and expenditure pattern of the surveyed households shows that the total average annual saving is NRs. 60,157.

E.6 IMPACT ASSESSMENT

Adverse Impact

E.6.1 Physical Impacts

Since the proposed substation will be located at the specific site having about 5.306 ha of land area, it will not make difference to topography of the project area. Moreover, the proposed substation site is situated at flat terrain. Therefore, the project contraction will have apparently no impact on topography and slope stability.

Land take and land use change are main physical impacts. The project will not require land for temporary use during the construction phase.

The construction activities like site clearance, excavation of the building foundation, vehicular movement will generate dust and emission at the project site. However, the construction activities are limited to small area and not in massive scale. Similarly, there may be noise due to excavator machine and vehicle as well even workforce

E.6.2 Biological Environment

Trishuli 3B Hub Substation requires certain area of cultivated land at particular site. Such site has been proposed avoiding the forest land. Hence, there will not be direct impact on the forest. Consequently, other impacts on the biological environment of the project are expected to be low.

Since there will be a small number of outsider work force (about 20 people) involved in the project construction, collection and sale of NTFPs by workers will be negligible. The possible adverse impacts on wildlife and avifauna population during the project construction phase are possibility of hunting and poaching by labor force and disturbance in the migratory movement of mammals and birds.

E.6.3 Socio-economic and Cultural Environment

The implementation of the proposed project will affect 28 households. Out of total 1 household will lose their non residential structure. The project will acquired 3.6 ha of cultivated land (private land). The total loss of crops due to the project implementation is estimated to be 50.2MT (Paddy-26.7MT, Wheat- 8.1MT,Maize- 8.1MT and 13.1MT). With the increase in population along with the construction activities, a potential decline of the access to the drinking water and sanitation condition will occur in the project area.

One of the major beneficial impacts of the project during the construction phase is the creation of employment opportunity. Altogether, 50 people will be deployed during the

construction of the project. In this regard, the employment opportunities contribute to poverty alleviation to some extent.

E.7 ALTERNATIVE ANALYSIS

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

E.8 Mitigation & Enhancement

E.8.1 Physical Environment

The muck generated during the substation will be used for backfilling and the area will be restored. Proper compaction of the excavated soil will be done. Adequate surface and sub-surface drainage will be provided at the substation area to drain away the excess water and prevent water logging.

The construction and operation of the substation will not have significant impact on the air quality of the project impact area. Vehicle utilized for construction will be complied with GoN mass emissions standards.

E.8.2 Biological Environment

There is not any need to forest clearance, project totally avoided forest The project proponent will provide kerosene to the project workers to minimize the loss of forest

The project workers will strictly be prevented from hunting and poaching and any other kind of illegal activities related to hunting and poaching. Informative and warning sign will be placed at relevant construction sites.

The project proponent will implement awareness program to aware local people and member of forest users group of the project area about the importance of forest conservation and wildlife and economic importance of forest and its role in rural society.

E.8.3 Socio-economic and Cultural Environment

Compensation for land

The total compensation for the land to acquired and utilized by the project is estimated to be NRs. 5,96,12,696. After the land acquisition Tribhuwan Secondary School will lose its main income source so NRs. 10,00,000 is allocated to school for restoration of income loss The required land will be acquired according to the Land Acquisition Act, 2034 BS and with mutual understanding between the affected families and the proponent.

Compensation of loss of crops

The total compensation for the loss of 50.2 MT is estimated to be NRs. 6,82,690 only.

Compensation for structures

Compensation for 1 structure will be compensated and the total value of such structures and land occupied is estimated to be NRs. 4,00,000. Employment opportunity will be given to local people to reduce the impact due to influx.

Health, Sanitation and Safety Program

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

Skill Development Program

The project affected people will be benefited from skill development program on house wiring, plumbing, welding and other electrical and mechanical works in their own localities.

School Support Program

Financial support will be provided to a high school in the project area. Support will be provided for purchase of computer, library establishment, drinking water facility, ladies toilet construction, and extension of school play ground.

E. 9 Environment Monitoring

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

ES-10: Conclusion

The total cultivated land requirement will be approximately 3.6 ha (72 ropani). There will be no direct impact on biological environment. In terms of the loss of land and assets, 28 households will be affected due to the implementation of the project. Various mitigation and enhancement measures have been proposed during the construction and operation phase of the project. The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 7,12,08,386; which is 3.12% of the total project cost

The IEE study concludes that construction of the proposed Trishuli 3B Hub Substation Project is environmentally and socially feasible if the proposed mitigation measures and monitoring plans are implemented.

CHAPTER-I

NAME AND ADDRESS OF THE INDIVIDUAL/INSTITUTION PREPARING THE REPORT

1.1 Project Proponent

Nepal Electricity Authority (NEA) is the proponent of Trishuli 3B Hub substation project. The primary objective of NEA is to generate, transmit and distribute adequate, reliable and affordable power by planning, constructing, operating and maintaining all generation, transmission and distribution facilities in Nepal's power system. NEA is Government of Nepal (GoN) undertaking utility organization established in BS 2042 (1985). GoN's current policies emphasize the need of environmentally sound and financially sustainable development of power project in the country.

The Ministry of Energy (MoE) has granted a survey license for the feasibility and environmental study of Trishuli 3B Hub substation project to NEA. The survey license was issued on BS 2069/08/12 (November 27, 2012) and is valid till BS 2071/08/11 (November 26, 2014). A copy of the survey license is attached in Annex-I.

Address of the Project Proponent

Nepal Electricity Authority
Durbar Marg, Kathmandu
Tel/Fax: 01-4153194
P.O.B. 10020, Kathmandu, Nepal

1.2 Institution Responsible for preparation of IEE

NEA has assigned its Environment and Social Studies Department (ESSD) to carry out the IEE study to the proposed Trishuli 3B Hub substation project. As an environmental wing of NEA, ESSD is conducting Environmental Impact Assessment (EIA), Initial Environmental Examination (IEE), monitoring and implementing mitigation measures for hydropower, and transmission line projects. ESSD is familiar with legal requirements and procedures for environmental studies and its approval as pre Environmental Protection Act (EPA), 1997 and Environmental Protection Rules (EPA) 1997 (and its subsequent amendments) of Nepal. The contact address of the organization responsible for the preparation of this IEE report is;

Environment and Social Studies Department
Nepal Electricity Authority
Kharipati, Bhaktapur, Nepal
Tel: 01- 6-611580,, Fax: 01-6611590
Email: neaessd@ wlink.com.np

1.3 Rationality for Conducting IEE

Schedule -1 of Environment Protection Rules, 1997 lists proposal requiring an IEE. As per the EPR, 1997 and the latest amendment, an IEE is required for 132 kV or above voltage level transmission line project. Since the proposed Trishuli 3B Hub substation will have components of 220 kV voltage system, it also needs an IEE before its implementation. The project area does not lie in the national park, wildlife reserve, buffer Zone, conservation Area, wetlands, historically and archaeologically important sites and or environmentally sensitive/ fragile areas.

1.4 Objectives of the IEE Study

The general objective of the study is to prepare an IEE report in order to implement the proposed Trihsuli 3B Hub Substation Project in an environmentally sound manner. The specific objectives of the study are:

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

1.5 Structure of the Report

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

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

CHAPTER-II
GENERAL INTRODUCTION OF THE PROJECT AND ITS RELAVANCY

2.1 Background

In order to alleviate the acute power shortage faced by nation, GoN declared stage of emergency sector in 2009 and approved Energy Crisis Mitigation Plan 2009. The plan included construction of 29 numbers of new 132/220/400 kV transmission line with total line length of 2255 km. A number of power plants are being developed in Trishuli basin by NEA as well as independent power products (IPPs). NEA has already started construction of Trishuli 3A (60 MW) project and Trishuli 3B (36 MW) is also being constructed by NEA. Upper Sanjen 14.6 MW, Sanjen 42.5 MW, Rasuwagadhi 111 MW, Tadi Khola 5.0 MW, Tadi Khola (Thaprek) 4.2 MW and Upper Melung-A 5 MW are some of the other projects are under different stages of development in the area.

A new 132/220/400 kV substation is required to build nearby Upper Trishuli 3B HEP which acts as a Hub for the evacuation of hydroelectric power generated in the Trishuli basin. This Hub station will be connected with Matatirtha substation in Kathmandu by 220 kV transmission line having twin Bison conductor.

The proposed site for Trishuli 3 B Hub Substation

2.2 Project Location

The proposed Trishuli 3B Hub substation project is located at Pahire Beshi, ward no. 9 of Manakamana VDC of Nuwakot district of Bagmati Zone of Central Development Region of Nepal. Physiographically the project is located in hilly region. The project location map has been presented in Fig 2.I.

A view of the proposed substation site looking downstream

2.3 Project Accessibility

Betrawati bazaar is a main market centre on Pasang Lahmu Highway at the boarder of Nuwakot and Rasuwa districts. The proposed project site is linked by a gravel road to Pasang Lahmu Highway at Betrawati

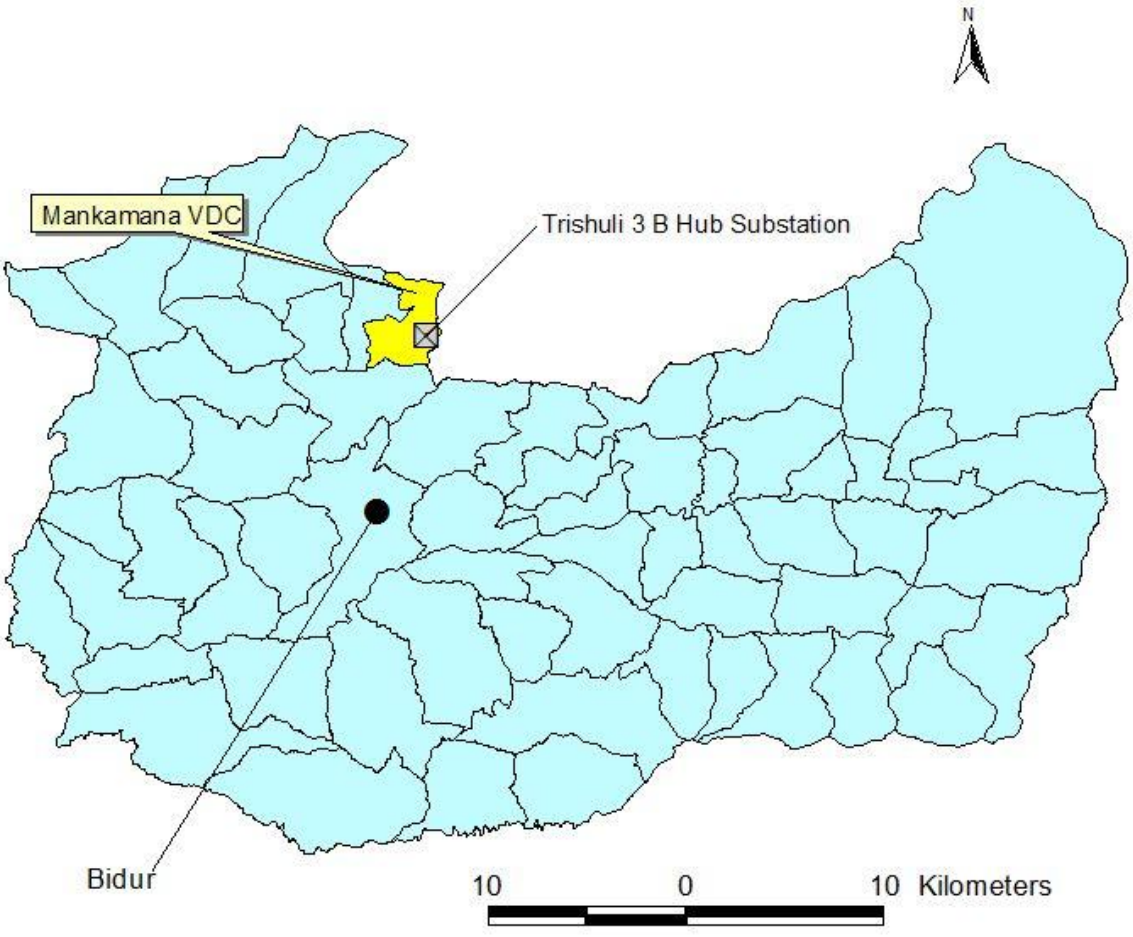

Fig 2.1: Location map of Trishuli 3 B Hub Substation Project

bazaar. Actually the gravel road is access road to Trishuli 3A Hydroelectric Project, passing by the proposed substation site. It is about 6 km from Betrawati to the proposed substation site at Pahire Bensi.

Similarly, it is 70 km away by road along Pasang Lahmu Highway from Kathmandu to Trishuli bazaar. Bidur is the district the headquarters of Nuwakot district, just 1 km ahead to Trishulibazar. Approximate road distances of different location are as following.

- Kathmandu-Trishuli (via Balaju) 70km
- Trishuli-Betrawati 8km
- Betrawati-Paire Bensi 6km

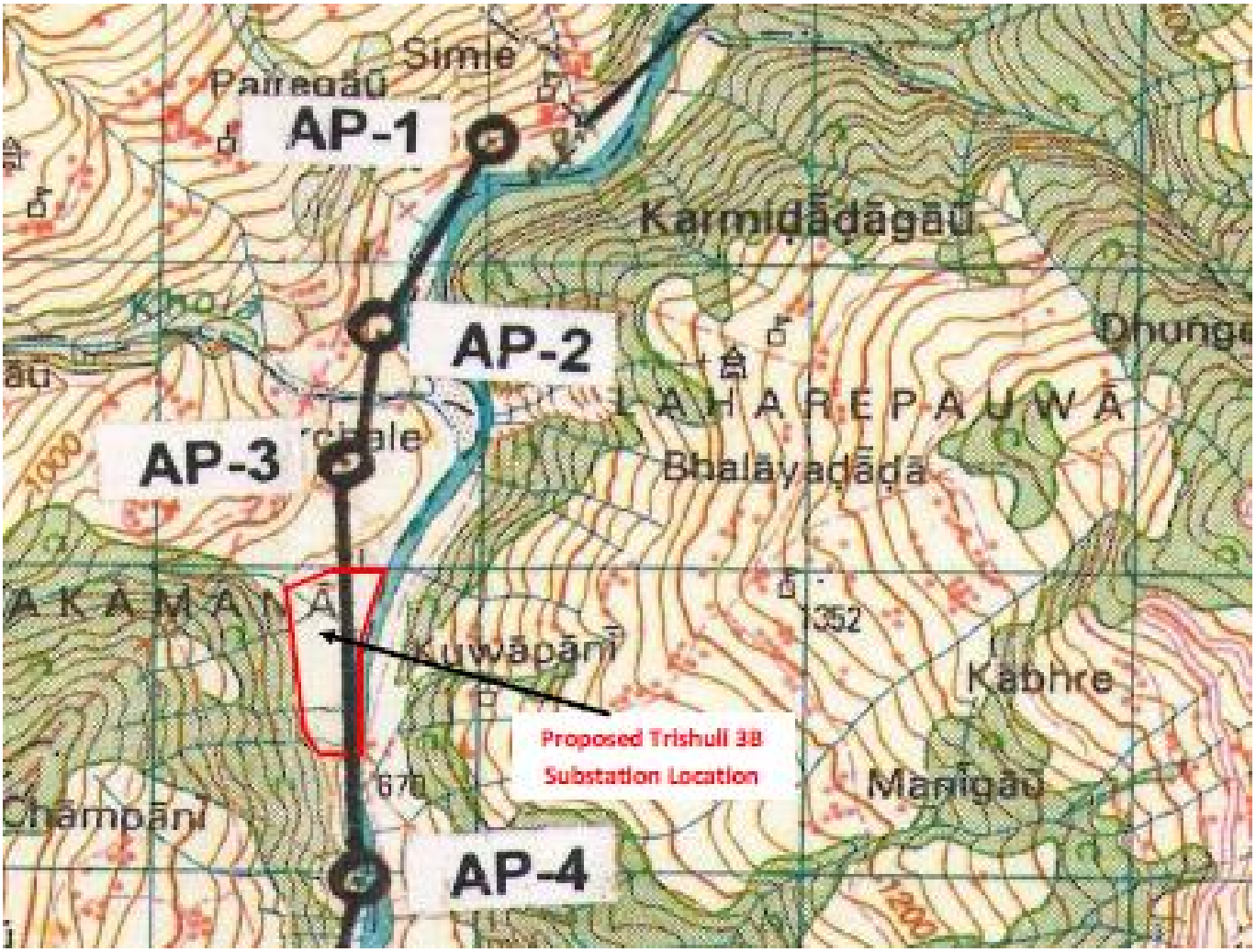

Fig 2.2: Topographic map showing the proposed Trishuli 3 B Hub Substation

2.4 Project Features

The proposed 3B hub sub-station site is in proximity to the all expected hydroelectric project (HEPs) now under construction or planned to construct in near future. As this site for the substation lies parallel to the river, in other word it is the situated on the right bank of the river need some protection work. The proposed substation site is shown overlaying in topographic map (Refer Fig 2.2). Trishuli 3A project will work together to raise the level of the land and make flood protection to make it suitable for the substation.

The main components of the Trishuli 3B Hub Project include:

(a) Construction of seven nos. 220/132/11 kV, 33.33 MVA single phase power transformer.
(b) Construction of 220 kV, 132 kV and 33 kV switchgears.
(c) Construction of 220kV, 132 kV and 33 kV bus bar, construction of staff quarter, control building and miscellaneous civil works.

Power evacaution scheme of proposed projects in the Trishuli river basin from the proposed Trishuli 3 B Hub Substation Project is shown by a single line diagram in Fig 2.3.

As per International Standard the following safety working clearances shall be maintained for the bare conductors and live parts of any apparatus in the proposed sub-station. An earthed system comprising of an earthing mat buried at a suitable depth below ground and supplemented with ground rods at suitable points is provided in the Sub Stations.

The Power Transformer shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. Total estimated cost of the proposed project is USD 24 million.

(a) System electrical parameters

Rated service voltage: 220/132/33/11 kV

Highest system voltage: 245/145/36/12 kV

Impulse voltage withstand level: 950/650/170/75kV

Number of phase: 3

Frequency: 50 Hz

(b) Climatic conditions

All plant and equipment shall be entirely suitable for the climatic conditions prevailing at site. Between June and August low-lying areas are subject to flooding. All structures designed with the seismic factor of 0.15 g. Atmospheric pollution is low and special insulator design or washing is not considered.

Max ambient shade temperature: 45^0C

Min ambient shade temperature: 0^0C

Annual average temperature: 32^0C

Max wind velocity (10 min average gust speed): 33 m/sec

Rainfall: 1,000 mm/annum

Monsoon season: June August

Relative humidity: max.100%, min. 20%

Altitude: 500 MSAL (Max.). No ice or snow expected

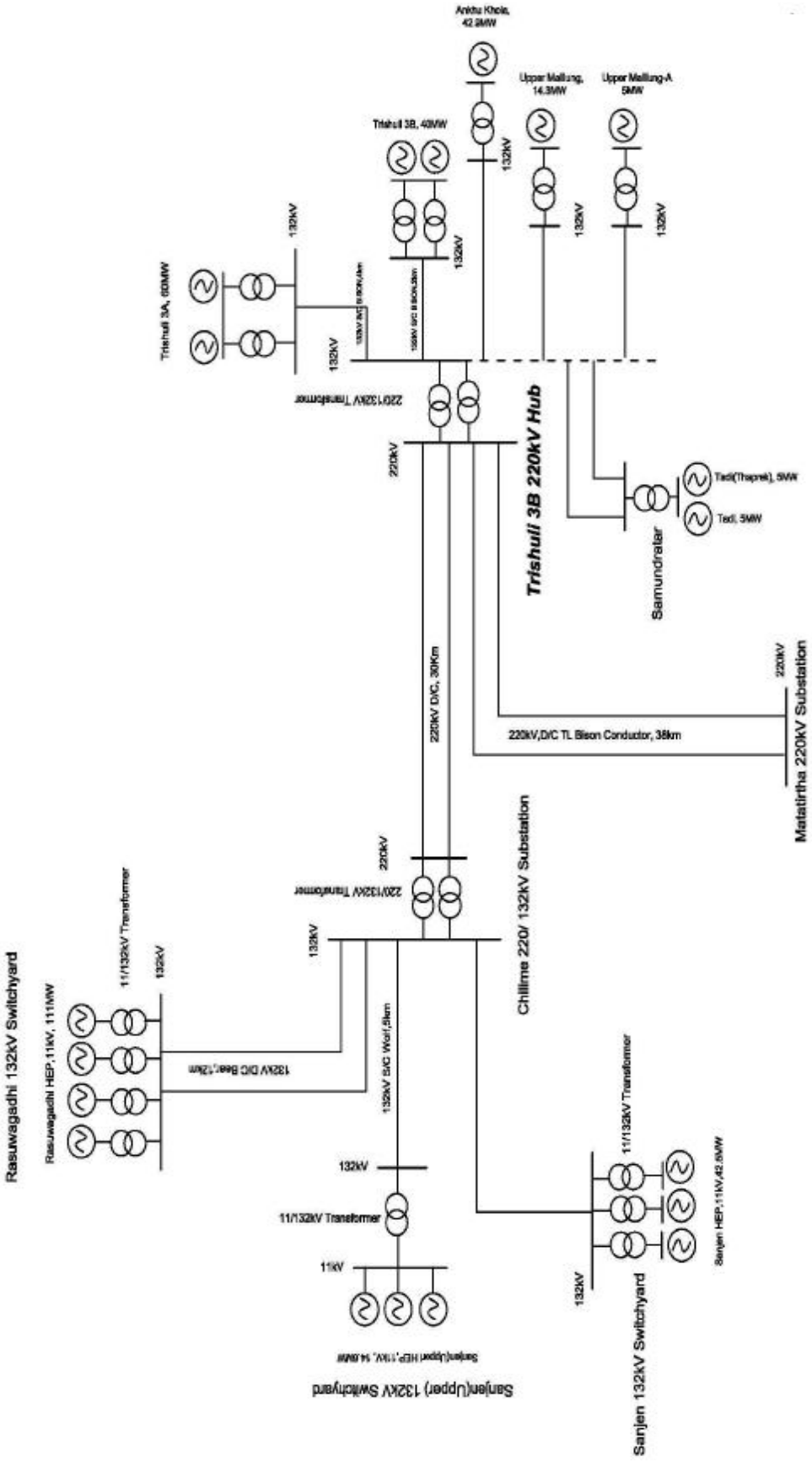

Fig 2.3: Diagram showing the power evacaution of proposed projects from Trishuli 3B Hub Subtation

(C) Technical Particulars of 220/132/11 kV Power Transformers

Rated capacity: 33.33 MVA

Quantity required: 7 nos.

Type: Outdoor, Oil-immersed

Type of cooling: ONAN/ONAF

Number of phase: 1

Number of winding: 3

Maximum voltage:

- Primary 245 kV
- Secondary 132 kV
- Tertiary 12 kV

2.5 Salient Features

The proposed Trishuli 3B Hub subsation design features are given in Table below:

Table 2.1: Salient Features of the Project

Features		**Description**
General		
Project		Trishuli 3B Hub Substation
Development region		Central Development Region
Zone		Bagmati
District		Nuwakot
VDC		Manakamana
1	Rated capacity	33.33 MVA
2	Quantity required	Seven 7) nos.
3	Type	Outdoor, Oil-immersed
4	Type of cooling	ONAN/ONAF
5	Temperature rise above 40 degree C ambient Temperature	
	a) In oil by thermometer	50 degree C
	b) In winding by resistance	55 degree C
6	Number of phase	1 (one)
7	Number of winding	3 (three)
8	Maximum voltage (line to line)	
	a) Primary	245 kV
	b) Secondary	132 kV
	c) Tertiary	12 kV
9	Rated Voltage (line to line)	
	a) Primary	220 kV
	b) Secondary	132 kV
	c) Tertiary	11 kV

10	Insulation level of winding	
	a) Basic impulse level as per IEC 76	
	- Primary	1050 kV (crest)
	- Secondary	650 kV (crest)
	- Tertiary	75 kV (crest)
	b) Power frequency induced over voltage (1 minute)	
	- Primary	460 kV
	- Secondary	275 kV
	- Tertiary	28 kV
11	Connections	
	- Primary	Star
	- Secondary	Star
	- Tertiary	Delta
12	Vector group reference	Ynynd
13	Type of tap changer	On – load
14	Number of taps	± 10 %
15	Number of taps	17
16	Method of tap changer control	
	- Mechanical local	Yes
	- Electrical local	Yes
	- Electrical remote	Yes
	"MASTER-FOLLOWER-INDEPENDENT" and "AUTO -MANUAL" selection	Yes
17	Percent impedance voltage at rated MVA and 75 °C	>12% (at normal tap)
18	System grounding	
	- Primary	Solidly grounded
	- Secondary	Solidly grounded
	- Tertiary	delta
19	Terminals & BCT	
	- Primary	Required
	- Secondary	Required
	- Tertiary	Required
20	Bushing Current Transformers	
	a) Number of core & current ratio (HV Phase & Neutral)	2 core & required as per rating
	b) Number of core & current ratio (LV Phase & Neutral)	2 core & required as per rating
	c) Accuracy class	5P20/PS class
	D) Burden of BCT (HV/LV)	15/15

2.6 Project Area Delineation

The term Project indicates the proposed Trishuli 3B Hub Substation Project. Similarly, the Project Area includes the “core project area”, "surrounding project area" and the “outlying project area” on the basis of proximity and magnitude of the impacts due to construction and operation of the proposed project. The term “project area” is also referred to as the study area for the IEE.

2.6.1 Core Project Area

The core project area implies the area required permanently as well temporarily for the proposed 3B substation construction and related activities. The core project area is considered to be high and direct impact area.

2.6.2 Surrounding Area

The surrounding project area implies the area within the immediate surroundings of the proposed substation site. The surrounding area considered as moderate and direct/indirect impact area.

2.6.3 Outlying Area

The outlying area implies the wider area. Generally, geographical boundary of the project affected VDC is considered as the outlying area. The outlying area is considered as low and indirect impact area. Thus, Manakamana VDC of Nuwakot district is broadly considered as the project area of the proposed Trishuli 3B Hub substation.

2.7 Construction Planning

The implementation of the proposed project comprises construction of a new sub-station. It comprised of construction of office cum staff quarter buildings, control builidngs, gantry, installation of transformers and equipments, their testing etc. The estimated years of project completion is two years.

2.7.1 Construction Method

Unlike the linear nature of transmission line, the proposed Trishuli 3B Hub sub-station construction work will be carried out in certain localized area. Almost construction will be manually. Since the proposed project will not have transmission line component, there will not be clearing and excavation at tower locations. The construction works will not require spoil dumping site.

No access road will be required for the project construction because there is already a gravel road (access road) to Trishuli 3A HEP project site.

The civil construction works will be as follows: Steel reinforcement, cement, coarse aggregates and fine aggregates (sand). Explosive will not be used for the project construction.

2.7.2 Construction Materials

The materials required for civil construction works of the substation will be steel reinforcement, cement, coarse aggregate and sand. Steel reinforcing bars and cement can be acquired from local manufacturers or can also be imported. Coarse aggregates will be produced at site from excavated materials or purchased from the nearby market. Likewise, fine aggregates will be collected from major quarries along riverbanks, the excavated foundation material can be used as a backfill material required for the foundation construction.

2.7.3 Requirement of Workforce

Local people those are affected by the project implementation will be encouraged for the employment. Local skilled, semi skilled and unskilled labor will be used for the construction and the transportation of the material as far as possible. Altogether about 50 people will be deployed in the construction of the project, which includes 25 unskilled, 15 semi skilled and 10 skilled human resources.

2.7.4 Project Implementation Schedule

The estimated completion period of the project is 24 months which includes 6 months pre construction phase and 18 months construction and commissioning phase. Construction of the substation can be carried out throughout the year.

2.8 Land Take

The project will require about 5.306 ha land for the placement of substation. Out of this, 3.687 ha (approximately 72 ropani) land is private cultivated land. The rest (1.619 ha) was once flood plain but now arable and being cultivated land but not registered in the Land Revenue Office or it is *Aailani.* The proposed substation site is located along the right bank of Trishuli River. The project construction will not require land for temporary use because construction yard, warehouse and camp will be inside the substation site. No forest land is required for the proposed project at all.

CHAPTER-III
DATA REQUIREMENT AND STUDY METHODOLOGY

3.1 Introduction

The IEE process follows the Environment Protection Rules 1997 (with its amendments) and National EIA Guidelines 1993.This IEE report is prepared in accordance with the legal requirements of GoN, based on the approved ToR, field study, consultation with local people/stakeholders and officials. The approved ToR is attached in Annex-II.

Soon after getting the approval of ToR from Ministry of Energy, a multi-disciplinary team comprising of environmental specialist, sociologist, statistician, and transmission line engineer undertook the baseline studies during March-April 2014.

A pre-tested questionnaire and VDC level checklist were introduced to collect household-level information from the affected households and Manakamana VDC. In order to collect primary data on the bio-physical environmental conditions, walkover survey was carried out in and around the proposed substation site.

3.2 Desk Study and Literature Review

Based on previous experiences and the review of relevant literature associated with IEE studies of various transmission line projects, demographic tables were developed. To fill these tables, a desk study was conducted in the office. All the relevant information associated with socio-economic and cultural environment was reviewed. On the basis of the reviewed information, data gaps were identified and the following techniques were used to generate the remaining data.

Relevant literatures, maps and other pertinent information of the project area were collected. The following documents which were considered to be relevant were reviewed.

- Final report of Trishuli 3B Hub Substation, Project Development Department, NEA 2008.
- Approved ToR for the IEE of Trishuli 3B Hub Station, 2014.
- EIA Report of Trishuli 3A Hydroelectric Project.
- Nepal District Profile 2012.
- District Profile of Nuwakot.
- Publication of District Development Committee (DDC) Nuwakot.
- Annual bulletin of District Forest Office (DFO), Nuwakot .
- Related books on plant taxonomy, Birds of Nepal and Biodiversity Conservation of Nepal.
- Population Census, Central Bureau of Statistics, GoN/ Nepal, 2011,

Topographical maps of the project area (Sheet no. 2785 01B of 1:25000 scale and Sheet no. 2885 13 of 1:50,000 scale) were used for the field study.

On the basis of the reviewed information with respect to the project, data gaps were identified and the methodology described in following sections of this chapter was developed to collect other relevant information required for the IEE study.

3.3 Data Requirement and Collection Methods

3.3.1 Physical Environment

The following data were collected during the IEE study:

- Meteorological data: Maximum and Minimum Temperature and rainfall of project area;
- Topographical data: Altitude and landscape
- Air, water and noise quality of the project area
- Physical setting: Physiographic location, river system, etc. of the project area
- Geological data: Rock type, soil type, slope stability, erosion, landslides, etc. of the project area
- Land use pattern of the project area.

The following methodology has been used to collect the baseline data on physical environment:

- Collection of secondary data and review
- Field survey and investigation by the team of experts
- Observation
- Expert's judgment
- Public/stakeholders consultation through group meetings/key person interview
- Impact assessment

3.3.2 Biological Environment

Walkover survey, group discussion and interview were the main methodologies adopted to collect baseline information on biological environment of the project area. Since the proposed project structure does not require forest land, forest sampling was not necessary. The walkover survey in and around the project area was done to observe forest and vegetation and wild life habitat. The wildlife and birds in the area were identified from observation, indirect evidences, discussion with local people as well as by the literature review.

3.3.3 Socio-economic and Cultural Environment

The following types of data are acquired for the IEE study:

- Information on livelihood and property of project affected households;
- Demographic characteristics: Population distribution, migration pattern, age group distribution, etc;
- Ethnicity and religion;
- Education and skill level: literacy rates, skills and skilled, manpower, etc.;
- Health and sanitation: information on sub-health post/health post, hospitals, main disease, incidence of water born disease and infectious disease;
- Gender, children, the elderly, poor and ethnic minorities;

- Land holding size and ownership
- Community infrastructures and service: drinking water, supply, irrigation, foot trails, transportation, electricity, telecommunication, etc;
- Local institution and activities: government and non-government agencies, cooperatives, community based organizations;
- Other development activities;
- Cropping pattern, practices and production;
- Livestock raising;
- Estimation of loss of standing crops due to project construction, by crop type area and value.
- Local price information: land, agriculture and forest products, etc;
- Economy: occupation, employment, agriculture and livestock production, non-timber forest products, trade and commerce, etc.;
- Land ownership: list of landowners likely to be affected by land acquisition and resettlement;
- Income and expenditure of the Project Affected Families (PAFs);
- Measurement and valuation of houses, cowsheds and other structures to be acquired by the project;
- Compensation rates for land, agriculture products, forest, houses and other private infrastructures; and
- Places of cultural importance; historic, religious or cultural sites in the project affected area and the special occasions of celebrations/gathering, including the relative importance of these sites (local, regional or national);
- Aesthetic value of the affected landscape;
- Attitude of the local people to the development and to this project;
- Cultural practices of the project area; and
- Religion wise population of the project area.

Secondary data published by District Development Committee (DDC) of Nuwakot and Central Bureau of Statistics (CBS), Kathmandu was intensively used to draw the baseline information of the project affected VDC. However, the baseline information of the project site was collected from the field survey.

3.3.3.1 Identification of PAFs and SPAFs

The land/structure owners of the substation have been identified. These identified families were considered as Project Affected Families (PAFs). In addition, the families losing more than 50% of land were identified as Seriously Project Affected Families (SPAFs).

3.3.3.2 Data Collection Tools

After identification of PAFs, their baseline information was collected by using the following techniques: Households' Survey, Key Informant Survey, Public Consultation, Observation, and Photographs.

- **Households' Survey**

A Socio-economic survey of project affected households (whose land and house will be permanently acquired) was carried out. The pre-tested questionnaire was applied by a trained team of enumerators to solicit information from project affected families. Households' survey was conducted for all of those 28 project affected families losing to land and structure. The questionnaire has been designed to cover demographic characteristics, basic health conditions, income and expenditure, water and energy related issues, attitude towards resettlement and expectations from the project etc.

Interview with a local person during the field visit

- **Key Informant Survey**

Key informant survey was employed during the field visit to gather information on socio-economic and cultural activities. The VDC level checklist was designed to collect information on basic demographic and migration patterns, food sufficiency and cropping patterns, existence of user's group/committees, public facilities and infrastructure, labour force availability, existence of archaeological and religious sites etc.

- **Group Discussions**

A group discussion was organized to give special attention to issues concerning specific target groups such as women, children and farmers. Local people, leaders, teachers and key persons were also included in the discussion.

Group discussion at the project site

- **Field Observation**

The field observation of the project site was made by the team of sociologist and her staffs during 17th to 26th of Chaitra, 2070 BS to collect the baseline information of the project area and to identify the potential environmental impact and the pertinent issues. During the field visit, the team met local stakeholders and discussed with some key persons. Meetings were mainly focused on issues likely to arise due to implementation of the project, existing environment of the project area and views/concerns of stakeholders.

3.4 Impact Identification, Evaluation and Prediction

The field data from each project affected VDCs were compiled, edited and analyzed using MS Excel and MS Access. The analyzed data were then interpreted and discussed in appropriate sections of the IEE report. The main basis for the identification of the impacts is the baseline information and expert judgment will be used to identify the impact. The primary and secondary data were analyzed qualitatively and qualitatively.

Interaction program to discuss on the draft IEE report at the proposed substation site

The impacts will be predicted over a specific period and within defamed area and to collect their views. The impacts will be predicted in terms of magnitude, extent and duration. Magnitude will be further classified in term of high (H), medium (M) and low (L). Extent will be classified in term of site specific (SS), local (L) and regional (R). Duration will be classified in terms of long term (LT), medium term (MT) and short term (ST).

Project Manager interacting with local people and stakeholders in the program

3.5 Public Involvement

A public notice was published in Gorkhapatra National Daily on 9 Baisakh, 2071 BS (April 22, 2014) requesting all the stakeholders to provide their comments and feedbacks on the draft IEE report of proposed Trishuli 3B Hub Substation. A copy of the public notice is attached in Annex-III.

The notice was displayed at notice boards of District Administration Office of Nuwakot, DDC Office of Nuwakot, District Forest Office (DFO) of Nuwakot district and Office of Manakamana VDC. The draft IEE report was made available to stakeholders for feedback and suggestions regarding the procedure adopted and implemented in the project. *Muchulka* (letter of deed) of posting the notice and the recommendation from the Manakamana VDC were collected. Copies of Muchulka, suggestion and recommendation letters are given in Annex-IV. The list of contact persons during the field visit in the project area is given in Annex-V.

The IEE study team organized an interaction program with local people and stakeholders at the proposed Trishuli 3B Hub substation site located at Manakamana-9, Pairebesi on the presence of VDC secretary and Project Manager to collect the local people's concerns and settle the misunderstanding. Copies of Executive Summary (in Nepali language) of the draft IEE report were distributed to participants in the interaction meeting. Public views, comments and suggestion raised during the interaction program were noted and have been incorporated in the IEE report. Attendance of the interaction meeting is attached in Annex-VI.

3.6 The Study Team

The following personnel are involved for IEE study of the proposed transmission line:

Table 3.1: List of Persons Involved in IEE Study

S. No.	Name	Designation
1	Rabindra Prasad Chaudhari	Manager/ Coordinator
2	Thark Bahadur Thapa	Project Manager/Electrical Engineer
3	Milan Dahal	Deputy Manager/Team Leader
4	Sailaja Gyawali	Sociologist
5	Krishna Prasad Joshi	Statistician

Beside the above mentioned study team of the experts, enumerators and field helpers were hired at local level to assist the study team for collecting baseline information on each environmental domain and other necessary field support.

CHAPTER-IV
REVIEW OF PLANS/POLICIES, ACTS, RULES/REGULATIONS, GUIDELINES AND CONVENTIONS

4.1 Introduction

Nepal integrated environment aspects in all its development activities and projects only from early 1980s. Environment conservation was included in the policies since the Fifth Plan (1975-1980). The second milestone was taken during the Sixth Plan. The Sixth Plan under the environment and land use policy emphasized the integration of environmental aspects into the construction of large-scale development projects. Then finally, in the Seventh Plan it was stated that developmental programs would be implemented only after an approved EIA/ IEE report. The Eighth, Ninth and Tenth Five Year Plans have further emphasized the making of more effective EIA systems. The formulation of Sectoral Guidelines, promotion of participatory EIA/IEE system and inclusion of mitigation cost into the total project cost were some of the activities included in these three five year plans.

The prevailing Acts, Policies, Regulations and Guidelines, which are required for the construction and operation of Transmission Line Projects in Nepal, have been reviewed as per the followings while preparing the present IEE report. The proponent will abide by any other laws besides those already mentioned in the documents that are attracted due to different activities that will be undertaken during project implementation.

4.2 The Interim Constitution of Nepal, 2063 (2006)

Article 35(5) of the Interim Constitution requires the State to give priority to the protection of the environment and also the prevention to its further damage due to physical development activities by increasing the awareness of the general public environment cleanliness. The state shall also make arrangements for the special protection of the environment and rare wildlife. Provision shall be made for the protection of the forest, vegetation and biodiversity, its sustainable use and equitable distribution of the benefit derived from it. Similarly, the Article 16 of Part 3 states about the Right to Environment and Health: According to this article all citizens shall have the right to live in clean environment.

The proposed project is a component of hydropower development project and it attracts the provisions made in Interim Constitution. Hence, it is mandatory to follow the Interim Constitution of Nepal, 2063 (2006) in regards with environment conservation while implementing the project.

4.3 Plan & Policy

4.3.1 Nepal Environmental Policy and Action Plan, 2050 (1993) and 2055 (1998)

Nepal Environmental Policy and Action Plan (NEPAP) were endorsed to further institutionalize environmental protection in the development processes. The NEPAP recognize that a growing number of people are exposed to pollute from industrial enterprises. The NEPAP identifies the following factors as contributing to this process:

- Industrial plan inappropriately cited close to population centers
- Insufficient emphasis on fuel efficiency.
- Little, if any pollution abatement equipment used for reducing emission, and
- A total lack of industry pollution standards.

Hence, the NEPAP emphasizes the need for mitigating adverse environmental impacts to address urban and industrial development, air and water pollution and infrastructures development.

4.3.2 Forestry Sector Policy, 2000

The Forest Sector Policy of Nepal such as the National Forestry Plan, 1976, Master Plan for the Forestry Sector, 1988, Periodic Five Year Plan and Forestry Sector Policy, 2000 have emphasized people's participation in the forestry management. Nepal's main forest management is based on people's participation and various management models are underway. Similarly, Forestry Sector Policy, 2000 stresses on conservation of biodiversity, ecosystem and protection of land degradation by soil erosion, landslide, floods desertification and other ecological disturbances. The Public participation in forest management is sought through community forestry, collaborative forest management, leasehold forestry etc. The mitigation measures such as plantation, NTFP program and other social and community support program proposed by the project will be implemented by mobilizing the local people which is in line with the Forest Sector Policy.

The procedural guidelines for the use of forest land for other purpose stated that feasibility study will be carried out with no use of forest land to the extent possible. If it is not possible, the alternate will be considered with minimum use of forest land. This guideline also stated that the project proponent will be responsible for the plantation of 2 tree species for the loss of one tree and their management for 5 years and handing over to the concerned forest office of the district.

4.3.3 Hydropower Development Policy, 2058 (2001)

The Hydropower Development Policy was promulgated in 2001. The main objectives of the policy include producing clean energy through the development of hydroelectric projects and to help conserve the environment. It is stipulated that one of the policies is to extend the use of electricity for achieving a reduction in the utilization of fuel wood and to render necessary assistance in the conservation of forest and environment.

4.4 Acts

4.4.1 Aquatic Animals Protection Act, 2017 (1961)

This Act provided legislative protection of the habitats of aquatic species. Under this Act, it is offence to introduce poisonous, noxious or explosive material in to a water source or destroy any dam, bridge, fish ladder or water system the intent of catching or killing aquatic life. The Act was amended in 1988 to prohibit the use of unsafe pesticides.

4.4.2 Land Acquisition Act, 2034 (1977)

One of the important acts that have a bearing on the implementation mechanisms and mitigation adverse impacts of power projects is the Land Acquisition Act, 2034. This Act covers all aspects of land acquisition and compensation of land and other assets. It authorizes the government to acquire land for public purposes by providing compensation to the private landowners.

Land acquisition and compensation has not been a major issue in the rural electrification in the past because the area required for erection of a pole is so small that it has not been an

issue. However, this study recommends providing appropriate cash compensation for the land acquired by the erection of the towers. The compensation paid under this Act will be given in cash. To decide the amount of the compensation, the Land Acquisition Act (1977) has made provisions for the constitution of a Compensation Fixation Committee (CFC). That committee consists of the CDO, Chief District Land Administration and Revenue Office, Project Chief or an officer designated by the CDO and the Representative of the DDC.

The proposed project will acquire 55.3692 ha of land for transmission line and substation including forest and cultivated land. As per the land Acquisition Act, 2034 (1977), it is mandatory to acquire the land prior to the implementation of the project. The provisions made here will be applied while acquisition of land. Cultivated land requires for the project will be acquired by direct negotiation with the land owners while the forest land will be acquired by taking approval from the government.

4.4.3 Soil and Watershed Conservation Act, 2039 (1982)

In order to manage watersheds of Nepal, the Soil and Watershed Conservation Act, 1982 was enacted. The act is devoted to the protection of watersheds. Under Section 10 of SWCA, power is extended to the Watershed Conservation Officer to grant permission to construct dams, drainage ditches and canals, cut privately owned trees, excavate sand, boulders and soil, discharge solid waste and establish industry or residential areas within any protected watersheds. The Act outlines the essential parameters necessary for proper watershed management.

The Act is relevant to the proposed project as the project will utilize the soil for tower foundation in different location. There is likely to impact on soil and watershed condition of the project area. Hence, the project is obliged to follow the Soil and Watershed Conservation Act, 2039 (1982) during project implementation.

4.4.4 Water Resources Act, 2049 (1992)

The objectives of the Water Resources Act, 2049 is to make legal arrangements for determining beneficial uses of water resources, preventing environmental and other hazardous effects thereof and also for keeping water resources free from pollution. The Act strives to minimize environmental damage to water bodies, especially lakes and rivers through environmental impact assessment studies and the proponents who wish to use water resources for various purposes should prepare IEE report before a license can be granted. The Act stipulates that soil erosion, flooding, landslides or any significant impact on the environment should be avoided in all uses of a water resource. The provisions made in Water Resources Act, 2049 (1992) is mandatory in case of the implementation of the proposed project. As per the provision, the environmental impact mitigation and enhancement measures have been proposed in view of environment conservation.

4.4.5 Electricity Act, 2049 (1992)

Electricity Act, 2049 is related to survey, generation, transmission and distribution of electricity. Electricity includes electric power generated from water, mineral oil, coal, gas, solar energy, wind energy etc. Under Section 3 of the Act it is stated that survey, generation, transmission or distribution of electricity without obtaining a license is prohibited. The Electricity Act, 2049 also contain provisions to minimize soil erosion, flood, air pollution and damage on environment while producing electricity and transmission of the power (Article

24). This Act is not relevant in case of transmission and distribution of generated electricity. The present study is only for hydropower generation excluding transmission component. NEA is responsible for electricity transmission and distribution.

4.4.6 Forest Act, 2049 (1993)

The Forest Act, 2049 (Amendment 2055) recognizes the importance of forests in maintaining a healthy environment. One of the major objectives of the enhancement and enforcement of the Forest Act is the promotion of a healthy environment.

The Act requires decision-makers to take account of all forest values, including environmental services and bio-diversity. It emphasizes the development and implementation of an approved work plan for different categories of forest, i.e. Community Forests, Leasehold Forests, Private Forests and religious forests.

This Act is relevant in case of the proposed project as the project will acquire an area equivalent to 23.1046 ha forest land belonging to community, and national. It is mandatory to follow the Forest Act, 2049 (1992) while proposing the mitigation measures and also in implementation phase.

4.4.7 Labour Act, 2049 (1993)

This act is enforced by GoN in 2049/2/2. This Act classified below 15 years as child and 'anabolic' for the age group of above 14 years and below 18 years. The Act has also made provision of labour court and department of labour. The Act clearly mentions that the appointment letter should be issued for all the employees which include their working hours, working time, wages and other benefits. The Act allows for the time bond contract for the manpower required for development work. The Act specifies that working hours for the Anabolic and women must be within 6 AM to 6 PM which clearly restrict to deploy women in night works. The Act also state that equal opportunity shall be given to women as men. Similarly working period for the other employees must not exceed 8 hours a day and 48 hours in a week. If some people work beyond that period, over-time allowances must be paid which is 150% of the normal per hour wages and such over-time must not exceed 4 hours in a day. According to this act the wage rate of the employees shall not be less than the rate fixed by the concerned offices of GoN.

4.4.8 Environment Protection Act, 2053 (1997)

Nepal has enacted a comprehensive and umbrella type Act, the Environment Protection Act, 1997 (EPA, 97) which is now enforced through appropriate regulatory measures. The EPA provides a legal basis for the concerned authorities for regulation an initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA). Section 3 of the Act requires the proponent to conduct an IEE or EIA in relation to the prescribed proposals. The Act uses the word proposal instead of Projects which makes the scope of the Act much broader in relation to environmental studies. Proponent includes any government, semi government or non government agency or organization submitting an application for the approval of a proposal and possessing the responsibility to work according to such a proposal or implementing the proposal.

According to the provision in Section 6 (1) of the Act, the relevant agency is empowered to grant approval for the IEE and EIA report, only if it finds that no significant adverse effects will be caused to the environment by the implementation of the proposal. Implementation of

any proposal without the approval of the relevant agency is prohibited by the Act. As per EPA, 1997, the proposed project has obligation to carry out IEE study prior to the implementation of the proposed project.

4.4.9 Local Self-Governance Act, 2055 (1998)

The Local Self-Governance Act, 2055 contains several provisions for the conservation of soil, forest and other natural resources and implementation of environmental conservation activities. Section 28 and 19 of the Act provide that the Village and the District Development Committees are responsible for the formulation and implementation of the programs related to the protection of the environmental bio-diversity. Section 96 stipulates that it is the duty of the municipality to protect the environment through the control of air, water and sound pollution. It also obligates the Municipality to maintain environmental cleanliness through the implementation of solid waste management, flood and landslide control programs.

This Act is relevant as the proposed project will utilize natural resources and carry out development activities in the project affected VDCs. Hence, it is mandatory to the project for proposing mitigation measures.

4.4.10 Child Labor (Prohibition and Regulation) Act, 2056 (2000)

The Child Labor (Prohibition and Regulation) Act, 2056 is enacted and enforced adopting ILO Convention concerning Elimination of Worst Forms of Child Labor and Minimum Age Convention. This Act has defined the 'Child' as a person who has not achieved the age of 16 year. Article 3 bans the employing a child below the age of 14 to work as a laborer and engaging a child in the hazardous and risky works listed in the Schedule of the Act.

The proponent is mandatory to follow the Child Labour (Prohibition and Regulation) Act, 2056 (2000) during the project implementation phase. The project requires 255 manpower including skilled, semi-skilled and unskilled for the construction activities. Priority will be given for local employment. The contractor may use child labour during construction period. Hence, the contractor will be instructed to follow the Child Labor (Prohibition and Regulation) Act, 2056 (2000).

4.5 Rules and Regulations

4.5.1 Electricity Rules, 2050 (1993)

Regulations on electricity sectors have been formulated for the implementation of the provisions made in the Electricity Act, 2049. The Electricity Rules, 2050 emphasize environmental analysis, which should include environmental mitigation measures to minimize adverse impacts likely to occur while developing hydro-electricity (Rule 12 and 13). Rule 12 (f) and Rule (g) are related to the EIA/ IEE process which emphasize that the IEE report should include measures to be taken to minimize the adverse effects of the project on social, biological and physical environments and should also elaborate utilization of local labour, source of materials, benefits to the local people after the completion of the project, training to local people in relation to construction, maintenance and operation, facilities required for construction site and safety arrangements.

4.5.2 Water Resources Rules, 2050 (1993)

It is mandatory under Rule 17(e) of the regulation that any person or corporate body, who desires to obtain a license for utilization of water resources must state in his application that

appropriate measures will be taken to lessen the adverse effects due to the project on the overall environment. Rule 19 stipulates that the water resources committee shall publish a notice giving detail information about the project to the people.

4.5.3 Environment Protection Rules, 2054 (1997)

The Environment Protection Rules (EPR) was endorsed in June 1997 and was made under the provisions of the Environment Protection Act. The EPR has been amended several times and the recent was done in 2010/01/27. The recent amendment states that transmission line projects up to 400 kV voltage level requires only IEE unless it traverses through protected area, buffer zone or national parks. The EPR adopts the environmental assessment criteria mentioned in the EIA guidelines. However, the EPR establishes the administrative framework for assessing, exhibition and determination of the EIA/IEE, in terms of issues needing to be addressed and the format/layout of the EIA/IEE document.

Under section (18) of EPA, any person who contravenes any of the provisions of the Act, or the Regulations or the guidelines issued under the Act, shall be punishable with a fine up to Rs 50,000. If a proposal is implemented without the approval of the Ministry of Environment (in case of IEE, Ministry of Energy) or relevant government agency, or the person implementing the proposal is not complying with the conditions of the approval or license, the authorized official is empowered to close down that activity and may impose fine of up to Rs. 100,000 on such person or organization. This Act is relevant to the proposed project.

Under this Rules, the IEE study of the proposed project has to be carried out by the proponent and get approval from the Ministry of Energy prior to the project implementation.

4.5.4 Local Self Governance Rules, 2056 (1999)

Local Self Governance Rules, 2056 empower the local bodies to coordinate and implement development program and for rationale utilization of local natural resources. Article -7 (69) empowers the VDCs for monitoring and supervision of development work implemented in the VDC. The Article - 4 of DDC has provision of 3 members (Agriculture, Forest and Environment) committee to look after the concerned issues. Article-6 (206) specifies that the need of social, economic, environmental and public facilities should be consider while planning the project. Article-7 (210) focuses on environmental studies and stresses due consideration while implementing the project like sand quarry, stone quarry, coal mines and others.

4.6. Guidelines and Conventions

4.6.1. Biodiversity Convention, 1992

The convention contains a series of far reaching obligations related to the conservation of biological diversity and sustainable uses of its components. One of these obligations is the requirement for environmental study. The purpose of an environmental study in relation to biodiversity conservation is to identify in advance:

- The aspects of the project which is likely to have significant adverse effects on biological diversity at genetic, species and ecosystem level, and
- The steps to be taken to avoid or minimize significant adverse effects to ensure that the proposed project comply with existing environmental legislation.
- The GoN has included 17 species of plants and 39 species of wild animals in the protection list.

If the project area is in the core habitat of these species and project activity will likely to affect them, mitigation measures shall be proposed and be implemented to avoid and/ or mitigate the adverse impacts. Nepal is a party to the convention of Biological diversity and in accordance to the article 14, adequate attention should be given to minimize and or avoid the impacts.

4.6.2 National Environmental Impact Assessment Guidelines, 1993

The National EIA Guidelines, 1993 developed by the National Planning Commission in conjunction with IUCN, set out the process for the environmental review and management of infrastructure projects in all sectors and the respective roles of certain GoN agencies and project proponents. The guideline was part of a comprehensive program to develop the national and sectoral guidelines for establishing a national system for Environmental Impact Assessment which was part of GoN's National Conservation Strategy. The EIA Guideline was endorsed by GoN on 27 September 1992 and gazette on 19 July 1993. The schedules attached to the Guidelines include:

Schedule 1	:	Projects requiring an IEE Report
Schedule 2	:	Projects requiring an EIA
Schedule 3	:	EIA based on project sites
Schedule 4	:	Projects requiring an IEE Report
Schedule 5	:	Format for Terms of Reference
Schedule 6	:	Environmental Impact Report Format

It is mandatory to follow the National Environmental Impact Assessment Guidelines, 2050 (1993) during the IEE study. Following the guidelines the environmental impact prediction and evaluation of the proposed project has been done on physical, biological and socio-economic and cultural environment of the project area. The guideline is used for analysis of significant issues.

4.6.3 EIA Guidelines for Forestry Sector, 1995

The GoN in keeping with the spirit of the National Environmental Impact Assessment Guidelines, 1993 framed EIA guidelines for the forestry sector in 1995. The Guideline aim to facilitate the sustainable use of forest resources for socio-economic development and meeting basic need to the community regarding the forest products, to make proposals socio culturally acceptable, economically feasible, and environmental friendly to conserve genetic resources and biodiversity and minimize environmental damage in forest areas and facilitate in identification of positive and negative impacts of programs to be implemented by other agencies in forest areas. The guideline emphasized the need of carrying out an EIA/IEE study of development projects and programs proposed for implementation in forest areas.

4.6.4 Forest, Production, Collection and Sales Distribution Guidelines, 2057 (1998)

The Clauses 3 to 10 of the Guidelines have specified various procedure and formats for getting approval for vegetation clearance, delineation of lands for vegetation clearance, evaluation of wood volume etc. and government offices and officials responsible for the approval, delineation and evaluation. These provisions have a direct relevance to the development of the project and need compliance to these provisions. These provisions have a direct relevance to the development of the project and need compliance to these provisions. The project requires to fell down an estimated of 5875 trees (size having DBH greater that 10 cm) from national and community forests and some 1760 privately owned

trees. Hence, it is obligation to the project for getting approval in view of vegetation clearance and evaluation of wood volume from district forest office prior to the construction phase.

4.6.5. Community Forest Guidelines, 2058 (2001)

This guideline has been prepared by including amendments of acts, rules by officials of GoN and related experts. Through these guidelines persons involved in the development and management of community forest like facilitators, User Groups, forester and managers etc will get help to understand about the process and stages of development of community forest. Forest Users Group, forest officials, NGOs and INGOs are getting benefit by this guideline. Till date, more than 15000 Community Forests have been handed over to the Community Forest Users Groups.

4.6.6. Community Forest Inventory Guidelines, 2005

The guideline for inventory of community forests advice to classify the forest into timber trees, pole size trees and regeneration on the basis of diameter. It has recommended using 20m x 20m size of quadrant for timber trees, 10m x10m for shrub and 5m x 5m for regeneration plots in the community forest. Plants having DBH (Diameter at breast height, i.e. 1.3m above ground) greater than 30 cm are considered as trees. Trees having DBH between 10 to 30 cm are categorized as pole and plants having less than 10 cm DBH belong to regeneration species.

4.7 Convention on International Trade in Endangered Species of Wild Fauna & Flora

Nepal became a contracting party to the convention on June 18, 1975.That aims to control the trade of certain wildlife species to prevent further endangered of their survival. CITES classified species according to the following criteria:

- Species threatened with extinction
- Species which could become endangered.
- Species that are protected

As Nepal is party to the convention related to species conservation, attention should be given to evaluate the impacts of the project activities on meeting their obligation. It is relevant to IEE study that species protection list could also be used to evaluate the significant of the identified and predicted impacts. Plant and wild animal species under legal protection provides a basis to purpose EMPs for their conservation and for least damaging them during project implementation.

Nepal is signatory to this agreement, which classified species according to criteria where access or control is important (eg. I-species threatened with extinction; II-species which could become endangered; III-species that are protected).

4.8 International Labour Organization (ILO) Convention of Indigenous and Tribal Peoples (No.169)

Nepal ratified ILO Convention No. 169 on September 14, 2007. In 2007 the UN Declaration on the Rights of Indigenous Peoples was adopted by the General Assembly. The declaration reaffirms the importance of the principle and approaches provided for under Convention No. 169 and its adoption therefore provide a fresh impetus for promoting the ratification and implementation of 169. ILO Convention No. 169 highlights the need to recognize indigenous

and tribal people's specific knowledge, skills and technologies as the basis for their traditional economies and self determined development process. Article-1 of the convention provides definition of the tribal indigenous people. Article-6 deals the consultation of the people concerned through appropriate procedure in particular through their representative institutions. Whenever, consideration is being given to legislative or administrative measures which may affect them directly.

In Article 15, the rights of the people concerned to the natural resources pertaining to their lands shall be covers the total environments of the areas which the peoples concerned occupy or other use. The peoples concerned shall wherever possible participate in the benefit of such activities and shall receive fair compensation for any damage which they may sustain as a result of such activities. Article 16 (2) clearly mention that where the relocation of these peoples is considered necessary as an exceptional measures such as relocation shall take place only with their free and inform consent.

Where their consent cannot obtained, such relocation shall take place only following appropriate procedures established by national laws and regulations, including public inquiries where appropriate , which provide the opportunity for effective representation of the peoples concerned . Article 16 (3) mention that whenever possible these peoples shall have the right to return their traditional land as soon as the grounds for relocation cease to exist. Article 16 (5) elaborated the persons thus relocated shall be fully compensated for any resulting loss or injury.

The ILO Convention on Indigenous and Tribal Peoples, 1989 (No.169) is relevant for the proposed project as there are indigenous and tribal families in the project affected area. The project will acquire and utilize most of the natural resources belonging to those families. Hence, the project has obligation to have consultation and taking consensus from them before the implementation of the project.

Article-15 states that the rights of the people concerned to the natural resources pertaining to their lands shall be specifically safeguarded. Provision includes the people to participate in the use, management and conservation of these resources. This provision creates some confusion and ultimately brings conflict between the project proponent and resources owners. Project share distribution and employment priority to these people will somehow reduce the possible conflict. The provision made in the ILO Convention on Indigenous and Tribal Peoples, 1989 (No.169) is not line fully with the prevailing acts and rules regarding environmental study of the proposed project.

CHAPTER-V
EXISTING ENVIRONMENT CONDITION

The proposed project is located in the mid-hill region of the Nuwakot district. The existing environment of the project area with regard to physical, biological and socio-economic and cultural aspects are presented in subsequent sub-chapters.

5.1 Physical Environment

5.1.1 Topography and Land use

The proposed Hub substation is located at nearly flat terrain along the right bank of Trishuli River. The altitude of the proposed site is approximately 670m. However, the surrounding area is narrow river valley with rugged and undulated terrain. The land use of the project area i.e. Manakamana VDC is agriculture, forest, settlement and barren land. The substation site is located at private cultivated land.

5.1.2 Geology and Soil

The proposed project lies in the Lesser Himalayan Zone. The geology of this area is represented by gneiss, quartzite, sandstone, limestone, slate etc. During the field visit it was observed that the proposed substation site is covered with plenty of big size boulders. The soil types encountered at the substation site are alluvium deposits, loose soil with gravel mixed and soft rocks.

5.1.3 Erosion and Land Stability

The structures have been located on stable ground of Trishuli river bank. The proposed substation site is at risk of flood. Due to excavation on hill slope for the access road passing adjoining to the substation site, it poses somewhat threat of erosion and land stability. Active and massive landslides were observed in upstream area of the proposed substation site. Trishuli River might carry debris of these landslides and it shall be serious threat to the substation proposed at the river bank in downstream area.

5.1.4 Climate

The proposed project area belongs to sub-tropical climatic zone. The average maximum and minimum temperatures of Nuwakot District are 35^0C & 8^0C. The project area is influenced by the summer monsoon rain. Monsoon rainfall in the area occurs during the month of June to September and average annual rainfall is 427mm. (District Profile of Nuwakot).

5.1.5 Watershed and Drainage

Trishuli River is snow fed at the initial stretch and then, rain-fed river. The monsoon influences the hydrology of the rivers and streams of the project area. Major tributaries of Trishuli River are Langtang Khola, Chilime and Mailung in upstream of the project area.

5.1.6 Air Quality and Noise Level

Although the project site located near the access road of Trishuli 3A HEP project, the substation site is situated in rural setting with minimum industrial activities except for some

stretches. Sources of air pollution are household fire, dust particles created by the movement of local vehicles etc. However, the overall status of air quality at the immediate project area can be considered to be moderate.

The main source of noise pollution in the project area is also due to the vehicular movement. The noise level can also be considered to be within the range of acceptable limits expecting at stretches in Trishuli 3B Hub substation area and the stretches near to the highway.

5.1.7 Water Quality

Apparently, the water qualities of rivers like Trishuli are unpolluted. The monsoon influenced the hydrology of the rivers and streamed of the area. The water quality of the streams close to the settlement areas has likely of microbiological contamination as the banks are used for open defecation and other household purposes by the local people. However, considering the sparse settlement near the banks and the quantity of water flow in the rivers the water quality of the area can be considered to be satisfactory.

5.2 Biological Environment

Nepal's rich biodiversity is a reflection of this unique geographical position as well as its altitudinal and climatic variation. The project area belongs to subtropical bioclimatic zone. The proposed substation lies in the cultivated land. However, surrounding project area as well Nuwakot district consist of good forest cover. Administratively, the forest of Nepal is divided in to six types: Government Managed National Forest, Protected Forest, Community Forest, leasehold Forest, Religious Forest and Private Forest.

Forest in surrounding of the proposed substation

5.2.1 Vegetation and Forest

The natural vegetation in the project area consist of mainly three types- Pine (*Pinus roxburghii)* forest, Sal (*Shorea robusta*) dominated hill Sal forest and sub-tropical mixed forests. During the field visit, the mixed forest was observed in the immediate surroundings of the proposed substation site in Manakamana VDC. Major tree species are Chilaune (*Schima wallichii*), Mauwa (*Engelhardia spicata*), Siris (*Alibizia spp*) etc. Regenerating hill Sal forest was observed on the west facing hill slope on the left bank of Trishuli River.

Though the proposed Trishuli 3 B substation is located at cultivated land, there are few standing trees of Siris (*Alibizia sp*) and Mauwa (*Engelhardia spicata*). Land owners have trees in their agricultural field for fodder and firewood.

Community Forests have been formed in the project areas by the local people to meet their daily fuel fodder, timber and other requirement. Total number of community forests in Nuwakot district is 277, out of which there are 8 different units of community forest in Manakamana VDC. The nearest community forest is Jamle Bhirpakha located at ward no. 5 covering 86.93 ha forest land.

5.2.2 Wildlife

The local residents informed that, the movements of wildlife in the proposed substation site are is very low, because of frequently movement of vehicles on the road. Forest has been conserved by local people's effort. Those wild animals and birds reported from the project area are of common found in midhills of Nepal. The proposed project area is not a specific habitat for any wildlife.

5.2.3 Mammals

Local people reported the presence of wild animals in the project area such as: Barking deer (*Muntiacus munjak*), Jackal (*Canis aureus*), Porcupine (*Hystrix Indica*), Rhesus Monkey (*Macaca mulata*), Malsapro (*Martes flavigula*), squirrel (*Fuinambulas palmaurum*), Jungle Cat (*Felis chaus)* etc.

5.2.4 Birds

Forest, agricultural field, wetlands, villages, rivers, streams, gorges, and cliffs provide variety of habitat for different species of birds. Common bird species found in the project area are Common Myna (*Acridotheres tristis*), House Swift (*Apus affinis*), House Crow (*Corvus splendens*), Spotted Dove (*Streptopelia chinensis*) and House Sparrow (*Passer domesticus*). Titra (*Francolinus sp*), Kalij Phesant (*Lophura leucomelana*), Koilee (*Eudyanamus sp*), Red Jungle Fowl (Gallus *gallus*), etc are reported bird species in the project area.

5.2.5 Ethno Botany/Plant Resource Use Pattern

The term 'non-timber forest product' encompasses all biological materials other than timber which are extracted from forests for human use. The NTFPs include edible plants (food, edible oils, spices, fodder, etc.) and non edible plant products such as bamboo, medicines, ornamental plants, etc.

Various uses of plants have been observed in the project area. Traditional uses of plants are common in project area and are integral part of livelihood. Some of common medicinal plants found in the project area are Amala (*Phyllanthus emblica*), Asuro (*adhatoda vasica*), Titepati (*Artemesia capillaries*), Kurilo (*Aspasgus officinalis*) etc. Plants like Sal (*Shorea robusta*), Pine (*Pinus roxburghii*) and Chilaune (*Schima wallichii*) are extensively being used for timber and fire wood.

5.2.7 Endangered, Threatened Rare and Protected Species of Flora and Fauna

Though there is no forest on the proposed substation site, surrounding areas are covered by forest and vegetation. Some of the plant and wild animals reported from the project area belong to different categories of Rare, Endangered, Threatened and Protected species of flora and fauna. Listed plant species in the project area are Sal (*Shorea robusta*), and Simal (*Bombax ceiba*). Similarly, Rhesus monkey (*Macca mullatta*), common langur (*Maccac assamensis*) and leopard *(Panthera parades*) are the listed wild animals found in the area.

5.3 Socio-economic and Cultural Environment

5.3.1 General Introduction of the Project District

According to Census 2011, total population of Nuwakot district is 277,471 with 132,787 (47.86%) males and 144,684 (52.14%) females. The total household is 59,215 with an average household size of 4.69. Similarly, the average population density is 247.52 person /sq. km. The average population growth rate from 2001 to 2011 is -0.39., which is lower than the national population growth rate 1.35 percent. The economically active population is 68%. A detail of the demographic characteristics of the affected District is given in Table 5.2.

Table 5.1: Demographic Characteristics of the Project Affected District

District	Nuwakot
Total Population	277,471
Male	132,787
Female	144,684
Total Numbers of Households	59,215
Average Households size	4.69
Population Density (persons/ Sq.km)	247.52
Sex Ratio (Males per 100 Females)	91.77
Urban Population (%)	10.00
Population below 14 years (%)	32.00
Elderly Population 15 - 59 Years (%)	57.17
Elderly Population 60+Years (%)	10.83
Economically Active Population 14 yrs+(%)	68.00
Percent of Literacy Rate (5 years & above)	59.80
Population Growth Rate (2001-2011)	-0.39
Human Development Index	36th
Total Development Index of District	0.40
Total Area of the Districts (Sq. km)	1121
Total No of VDC / Municipality	61/1
% of District Population Compared with Country's	1.05

Source: Demographic Profile of Nepal 2013

5.3.2 Population Characteristics of the Project Area (VDC)

The total population of the project affected VDC is 3321 with male 1537 and female 1784. The project area population covers 1.20% of the district population with average population density 323.37 persons/sq. km. Similarly, the household size of the project affected VDC is

4.21, which is slightly less than average district household size 4.69. A detail of the VDC information of the affected VDC is presented in the table.

Table 5.2: Population Characteristics of the Project VDC

VDC	Manakamana
Total Population	3321
Male	1537 (46.28%)
Female	1784 (53.72%)
Households	789
Family Size	4.21
Sex Ratio	116.07
Total Area of VDC in Sq.KM	10.27
Area Compared With District (%)	0.92
Population Density (persons/ Sq.km)	323.37

Source: Demographic Profile of Nepal 2013

5.3.3 Settlements

Settlement pattern are characterized by scattered small villages. In Manakamana VDC, settlements are clustered in market centers and growth centers along the roadside. The major settlements in surrounding project area are Champani, Pairebensi, Archale, Shantibazar. Other settlements are Manegaun, Ghalegaun, Puranagau, Karkigaun, Kupa, Pokhari, Thandapani, Chapdanda, Jamune etc in outlying project area.

Settlement at Pairebensi nearby the proposed substation

5.3.4 Caste and Ethnicity

The major caste/ethnic groups in Manakamana are Tamang (48.90%), followed by Brahmin Hill (21.10%). Detail is presented in Table 5.3.

Table 5.3 Caste/Ethnic Status of Manakamana VDC

Caste	**Population**	**Percentage**
Tamang	1831	48.90
Brahmin Hill	790	21.10
Gurung	575	15.36
Bhote	245	6.54
Kami	152	4.06
Chettri	64	1.71
Others	87	2.32
Total	**3744**	**100.00**

Source: CBS, 2001

The proposed substation site is located in ward no. 9 of Manakamana VDC, in which there are three settlements namely Archale, Champani and Pairebensi inhabited by Brahmans, Gurung and both respectively.

Though Tamang people are dominant in Manakamana VDC, but they live in other settlements of outlying project area. Occupational caste like Kami (blacksmiths), Damai (tailors) reside only in Karkigaun in outlying project area but not in surrounding project area.

5.3.5 Religion and Festival

Bouddha (58.55%) is the dominant religion in the project area. Hindu (40.87%) and Christianity (0.53%) are the other religions practiced in the project area (CBS 2001).

Since the project area is dominantly inhabited by Buddhist people festival like Buddha Jayanti, Lhosar (New Year festival according to Tibetan calendar) are widely celebrated. Hindu festivals like Dashain, Tihar, Maghe Sankranti are also celebrated by. Like other part of Nepal all religious groups celebrate almost festivals in project affected area.

Table 5.4: Religious Status of Manakamana VDC

Religion	Population	Percentage
Bouddha	2192	58.55
Hindu	1530	40.87
Christian	20	0.53
Others	2	0.05
Total	**3744**	**100.00**

Source: CBS, 2001

5.3.6 Spoken Language

Tamang (56.60%),is broadly spoken in the project area. The other spoken languages are Nepali, Gurung, Newari etc.

Table 5.5: Mother Tongue of the VDC

Mother Tongue	Number	Percentage
Tamang	2119	56,60
Nepali	1562	41.72
Gurung	40	1.07
Newar	17	0.45
Others	6	0.16
Total	**3744**	**100.00**

Source: CBS, 2001

5.3.7 Education

There is a secondary school at Manakamana VDC. Schools of all levels (primary, lower secondary, secondary), are found in villages of the proposed project area and higher level educational centers are available in Bidur municipality and some other market centres. Besides these formal school educations, there are also non formal educational program and school based child development center in project area. According to the Central Bureau 2001 total literacy rate of Manakamana VDC is 52.20% with male literacy rate (61.51%) and female literacy rate (43.55%).

Table 5.6: Literacy Status of the Project VDC (6 years and above)

Total			Can't Read & Write			Can Read Only			Read & Write		
Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
3253	1564	1690	1476	560	915	80	41	39	1698	962	736
%	48.08	51.95	45.37	35.81	54.14	2.46	2.62	2.31	52.20	61.51	43.55

Source: CBS 2001

Table 5.7: Lists of Schools in Affected VDC

S.N	Name of School	Address
1.	Karki Manakamana Lower Secondary School	Chanpdada-2
2.	Trivuwan Secondary School	Archale-8
3.	Jayabudha Primary School	Karkigaun-5
4.	Buddhasharan Primary School	Thandapani-1
5.	Paropakar Primary School(+8)	Bhandera-6
6.	Bhumidevi Primary School	Ghalegaun-4
8.	Bhumidevi Primary School	Puranogaun-6

Source: VDC Profile of Manakamana

5.3.8 Occupation and Employment

Agriculture is the major occupation of the people in the project area. More than 80% of the people are engaged in agricultural activities having land, livestock and poultry. The rest of the people are engaged in business, government service, labor, agro-based industries, livestock and poultry farming, etc. One of major occupations of the locals is also found in tourism sector. As alternative to these occupations, however, large numbers of young locals are in foreign employment from the project area.

Table 5.8: Non Agricultural Economic Activity by Type of Activity

No. of Households			Types of Economic Activities				
Total	Having Economic Activities	Not Having Economic Activities	Manufacturing	Trade/Business	Transport	Services	Others
720	110	610	0	23	0	31	54
%	15.28	84.72	0.00	20.91	0.00	28.18	49.09

Source: CBS 2001

5.3.9 Agriculture and Livestock

The project area consists of highly fertile cultivated lad. The agricultural products mainly include food crops, paddy, wheat, maize, millet, and cash crops, potato and vegetables. The cropping pattern in the project area is paddy-wheat, paddy-wheat-vegetable, paddy-potato and paddy-maize. People are mostly involved in agricultural activities. Livestock and poultry farming are common in the project affected VDC.

Livestock including goats, cattle, and buffalos, chickens are sold in the local market for supplementary income. The traditional irrigation facility Raj Kulo is also available in project area. Chemical fertilizer, Insecticides and improved seeds for agricultural purpose is common reside project area. The main local markets in the project area are Shanti Bazaar, Sole Bazaar and Betrawatii.

Table 5.9: Households Having Agricultural Land, Livestock and Poultry

Total	Agricultural Land Only	Livestock only	Poultry Only	Land and Live stock	Land and Poultry	Live-stock and Poultry	Land, Livestock and Poultry	None of All
720	38	2	1	181	17	2	467	12
%	5.28	0.28	0.14	25.14	2.36	0.28	64.86	1.67

Source: CBS 2001

5.3.10 Public Health and Sanitation

Health service in the project area is delivered through the existing health posts in VDC. The health services are observed to be unsatisfactory due to the non-availability of the health worker and medicines in the project affected area .Hospital service are available only in the district head-quarter of the district. People go to Kathmandu for better treatment.

Besides, traditional healing by Dhami, Jhankri is also practiced in the project area. People are generally found suffering from skin diseases, ear infections, urinary tract infections, chronic bronchitis, gastrointestinal diseases, pyrexia of unknown origin, injuries and fractures, diarrhea, diabetes, abdominal pain, toothache and others.

From the field study it is reported that most of the households use toilet facility. Use of modern toilets are also being practiced, the level of awareness towards improved health and sanitation (particularly towards the safe drinking water, use of toilets, etc.) is gradually increasing in the project area.

5.3.11 Migration

Few cases of in-migration to the project affected VDC from Rasuwa district was reported. Out migration was found higher than in-migration. Group discussion revealed that local people migrate to Kathmandu, Trishuli bazar and even nearby Betrawati bazar. Some people migrate seasonally outside particularly in cities like Kathmandu and other cities of the country seeking for employment. Young people migrating to India and abroad (mainly Gulf countries) for employment opportunity is remarkable phenomenon in the project area like in other parts of the country in recent years.

5.3.12 Transportation

Till fiscal year 2069/070 road assibilates reached every VDCs of the district total legnth104.5 km road with blacktopped and 590 km with graveled and earthen. Pasang Lahmu Highway from Kathmande to Dhunche is the main access to the project area. From Galchi to Trishuli is other main access.

Similarly, it is 70 km away by road along Pasang Lahmu Highway from Kathmandu to Trishuli. Bidur headquarter of Nuwakot district, just 2 km ahead to Trishuli bazaar. There is frequent bus service from Trishuli bazar as well from Kathmandu.

5.3.13 Communication

Communication services through mobile, CDMA and land line telephones are available in the affected VDC. Similarly, the postal and modern communication facilities like television, cable network, email/ internet and fax are also available in major market centers. Local and national newspapers are also available regularly in the main market centers.

5.3.14 Electricity

Almost area of Manakamana VDC has been electrified through NEA Grid. People mainly use firewood for cooking purpose in village area and LP gas, kerosene and electrical heater in market centers.

5.3.15 Drinking Water Supply

Piped water supply, well, traditional stone taps and stream are the main sources of drinking water in the project area. About 75% of the populations in project affected VDC are benefited by piped water supply.

5.3.16 Religious, Historical and Archeological Sites

There are no religious, historical and cultural sites of considerable importance at the proposed Hub substation site. However, Uttargaya (Betrawati, Gerkhu VDC), Kalipokhari Gupha (Tupche VDC), Nuwakot Darbar, Prithivinarayan Smirti Uddhyan,, and Bouddha Gumba (Bageswori VDC) are some of the significant historical and religious sites in Nuwakot district. Shiva temples are commonly found in most of settlements of the project area. Trisuli River is famous for rafting. Large numbers of foreign and internal tourists visit Nuwakot for it.

5.3.17 Gender Status

The decision making process in economic activity is mostly exercised by both the sexes. Land and property holding is dominated by the males. School enrolment is slightly higher among boys as compared to girls. The literacy rate of women in the project affected VDC is low in comparison to males. Women in the project area are mostly engaged as housewives. Collection of firewood/ fodder, and rearing and caring of children and old family member are common duties of the women. Some women are observed engaged in small business in the highway area. Girls trafficking were not reported during the field visit. Notable domestic violence, child marriages are also not common in the project area.

5.3.18 Law and Order

During the field survey, the general law and order situation in the project area was observed to be satisfactory. The District Police Office and Illaka Police Centers are maintaining the law and order situation in the project area.

5.3.19 NGO/INGO

Some NGOs and Clubs are working in the field of water supply, health and sanitation, sports, women awareness and income generating activities in the project area. Similarly, mothers' group, cooperatives, etc are also working in the project area.

5.4 Profile of the Project Affected Households

5.4.1 Population and Households

Proposed Trishuli 3B Hub Substation is located in Manakamana-9, Pairebeshi. Affected people are resided in ward number 8 and 9 so socio-economic data are analyzed on the basis of their habitants. Households survey for 28 households in the project affected VDC have been conducted. The survey revealed that the total population of the project affected household is 161 out of which 77 (47.83%) are male and 84 (52.17%) are female. Similarly, the average households size and sex ratio of the project affected households are 5.75 and 0.92 respectively.

Table 5.10: Distribution of Surveyed Households and Population

	Population				Households	
Ward	**Male**	**Female**	**Total**	**Sex Ratio**	**Total**	**Average HH Size**
Ward 8	29	29	58	1	10	5.8
Ward 9	48	55	103	0.87	18	5.7
Total/Avg.	**77**	**84**	**161**	**0.92**	**28**	**5.75**

Source: Household Survey, 2014

As per the broad age group classification, the majority of population falls in the age group of 15-59 year, which comprised of 66.46% population. Similarly, the total dependent population (population of the age group 0-14 years and senior citizen-age group of 60 year and above) is 33.54%.

Table 5.11: Distribution of Vulnerable Population by Age Groups

Ward	**Broad Age Group**			**Population**
	0-14 years	**15-59 years**	**60 and above**	
Ward 8	16	37	5	58
Ward 9	21	70	12	103
Total	37	107	17	161
Percentage	**22.98**	**66.46**	**10.56**	**100.00**

Source: Household survey, 2014

Type of family

The nuclear type of family is dominant in the project affected households. Of the total 28 households, 12 (42.86 %) households are categorized as joint type and the rest 4916(57.14%) are nuclear type.

Table 5.12: Families Structure of the Surveyed Households

Ward	**Family Type**		
	Nuclear	**Joint**	**Total HHs**
Ward 8	6	4	10
Ward 9	10	8	18
Total	16	12	28
Percentage	**57.14**	**42.86**	**100.00**

Source: Household survey, 2014

Marital status

Of the total population (161), 76 (47.20%) are married and 80 (49.69%) and unmarried. Similarly, the population of widow/widower is 5 (3.31%).

Table 5.13: Distribution of Surveyed Population by Marital Status

Ward	Marital Status			Population
	Unmarried	Married	Widow/Widower	
Ward 8	32	23	3	58
Ward 9	48	53	2	103
Total	80	76	5	161
Percentage	**49.69**	**47.20**	**3.31**	

Source: Household survey, 2014

5.4.2 Religion

All the surveyed households practiced Hinduism though in affected vdc majority of the households practiced Buddhism.

Table 5.14: Distribution of Surveyed Households by Religion

Ward	Religion						HHs
	Hinduism		Buddhism		Christian		
	Hhs	%	Hhs	%	Hhs	%	
Ward 8	10	100.00		0.00		0.00	10
Ward 9	18	100.00		0.00		0.00	18
Total	28	100.00		0.00		**0.00**	**40**

Source: Household survey, 2014

5.4.3 Mother Tongue

Nepali is the spoken language of all the surveyed households.

5.4.4 Occupation

Agriculture is the main occupation of the surveyed households. About 29.91% of the surveyed households have adopted agriculture as a main occupation. The percentage of households occupied other than agriculture are business and small industry (7.48%), Labour (20.56), (including labor work in outside country and in the country), service (9.35%, within the country), and student (32.71%).

Table 5.15: Occupational Composition of Project Affected Population (14 to 59 yr)

Major Occupations	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
Agriculture	11	22.00	21	36.84	32	29.91
Business and Small Industry	4	8.00	4	7.02	8	7.48
Labor wage(In country)	12	24.00	7	12.28	19	17.76
Labor wage(Outside country)	3	6.00		0.00	3	2.80
Service(Inside country)	7	14.00	3	5.26	10	9.35
Student	13	26.00	22	38.60	35	32.71
Total	50	100.00	57	100.00	107	100.00

Source: Household survey, 2014

5.4.5 Literacy

From the household's survey, it is revealed that 85.99% of the surveyed populations are literate with male literacy rate 92.00% and female literacy rate 80.49%. The literacy rate of the project affected population is very high then VDC (68%) and district (59.80%).

Table 5.16: Literacy (Population of 5 yr & Above) of Surveyed Population

Literacy Status	Male		Female		Total	
	No.	%	No.	%	No.	%
Illiterate	6	8.00	16	19.51	22	14.01
Literate	69	92.00	66	80.49	135	85.99
Total	75	100.00	82	100.00	157	100.00
Percentage	**47.78**		**52.22**		**100.00**	

Source: Household survey, 2014

Out of the literate population, the percentage with Just literate, Primary Level, Lower Secondary Level, Secondary Level, SLC, Intermediate Level and Bachelors Level education are 20.00, 17.78, 20.00, 17.78, 9.63, 5.19 and 9.63 respectively. Population having literate only is 14.01%. The table describes the educational attainment among the literate population of the sample households.

Table 5.17: Educational Attainment among the Literate Surveyed Population

Educational Attainment	Male		Female		Total	
	No.	%	No.	%	No.	%
Literate only	13	18.84	14	21.21	27	20.00
Primary Level	10	14.49	14	21.21	24	17.78
Lower Secondary	13	18.84	14	21.21	27	20.00
Secondary	14	20.29	10	15.15	24	17.78
SLC	8	11.59	5	7.58	13	9.63
Intermediate	3	4.35	4	6.06	7	5.19
Bachelors and above	8	11.59	5	7.58	13	9.63
Total (Literate)	69	100.00	66	100.00	135	100.00

Source: Household survey, 2014

5.4.6 Land Ownership Status and Holding Size

The household's survey shows all of the sampled households have their own land for cultivation. Average land holding size of the surveyed households is estimated to 0.356 ha. Table 5.15 represents the average holdings size of the households

Table 5.18: Land Holding of the Surveyed Households

Ward	HHs	Irrigated Khet (ha)	Bari(ha)	Pakho-Bari(ha)	Ghaderi	Total(ha)	Ha/hh
Ward 8	10	1.962	0.612	0.153	0.240	2.967	0.297
Ward 9	18	4.188	2.265	0.153	0.391	6.997	0.389
Total	28	6.150	2.878	0.306	0.631	9.964	0.356
Average		0.220	0.103	0.011	0.023	0.356	

Source: Households, Survey 2014

Land holding size

The surveyed households have been classified on the basis of different landholding categories such as marginal, small, medium, and large. Majority of the households i.e. 89.29% are categorized as marginal type families whereas 10.71% are small type. The distribution of the land holding size on the basis of holding category is shown in Table 5.16.

Table 5.19: Distribution of Households by Landholding

Landholding Categories		Households		Total Area	
Category	**Size of holding(ha)**	**No.**	**%**	**Area(ha)**	**%**
Marginal	Up to 0.5	25	89.29	6.676	67.00
Small	0.5 - 1.0	1	3.57	0.740	7.43
	1.0 - 1.5	2	7.14	2.548	25.57
	1.5 - 2.0		0.00		0.00
Medium	2.0- 4.0		0.00		0.00
Total	-	28	100.00	9.964	100.00

Source: Household survey, 2014

5.4.7 Agriculture

The main cereal crops cultivated by the surveyed households are paddy, potato and maize. Similarly, cash crop like potato is also cultivated by the surveyed households. The detail of the major crops, production and yield are presented in Table 5.17.

Table 5.20: Major Crop Area Coverage, Production and Yield

Description	Major Crops			
	Paddy	**Wheat**	**Maize**	**Potato**
Total Cropped Area	7.6	1.34	4.13	1.84
Total Production (MT)	26.3	2.7	8.1	13.1
Yield(MT/ha)	**3.46**	**2.01**	**1.96**	**7.12**

Source: Household survey, 2014

Food deficiency

The households' survey shows that out of total households (28), 17 households (60.71%) have food deficiency. On the basis of classification of food deficiency period of the sampled households, 4 (23.53%) households have food deficiency for 6 to 9 months of the year. Similarly, 9 (52.94%) households have food deficiency for 3 to 5 months, 3 households have less than 3 months and 1 household have greater than 9 months.

Table 5.21: Food Deficiency of Households

Ward	Food Deficit Month				Total No. of HHs
	< 3	**3-5**	**6-9**	**>9**	
Ward 8	1	4	2		7
Ward 9	2	5	2	1	10
Total	3	9	4	1	17
Percentage	**17.65**	**52.94**	**23.53**	**5.88**	

Source: Household survey, 2014

5.4.8 Income pattern

Household's survey shows that the total average annual income of the surveyed households is NRs. 215,228. Of the total income share of daily wages/porter is highest i.e. 57,964 (26.93%) followed by service (22.63%), business (11.95%), daily wage/porter (6.52%), business and cottage industry (11.95%), remittance (17.16%), and Bridha Bahatta (0.60%). Income from agriculture and animal husbandry sector contributes only 20.73%. The Table depicts the detail of the income sources of the surveyed households from different sectors.

Table 5.22: Average Annual Income Sources of Surveyed Households

Income source	Average Income	%
Agriculture and animal husbandry Income	44621	20.73
Service	48714	22.63
Business	25714	11.95
Daily Wages/Porter	57964	26.93
Old age allowance (Briddha Bhatta)	1286	0.60
Remittance	36929	17.16
Total Average Income	215228	100.00

Source: Household survey, 2014

5.4.9 Expenditure pattern

The average expenditure of the surveyed households is NRs.155071. The share of expenditure on non-food item is higher i.e. 51.36% as compared to food item (48.64%). Among the non-food items the share of clothing is highest i.e. 12.67% followed by education (11.02%), medicine (7.28%), festival (9.62%), fuel (4.16%), transportation (3.15%) and water/electricity (2.68%). The income and expenditure pattern of the surveyed households shows that the total average annual saving is NRs. 60,157.

Table 5.23: Average Annual Expenditure of the Households

Ward	Expenditure Heading								
	Food Items	**Clo.**	**Edu.**	**Med.**	**Fes.**	**Fuel.**	**Wat/Ele.**	**Tran.**	**Expenditure(NRs)**
Ward 8	46.84	13.66	10.13	8.65	9.89	3.88	2.93	4.02	141700
Ward 9	50.93	12.18	11.54	6.54	9.45	4.33	2.54	2.49	162500
Average/Percentage	**48.64**	**12.67**	**11.02**	**7.28**	**9.62**	**4.16**	**2.68**	**3.15**	**155071**

Source: Household survey, 2014

5.4.10 Drinking water

Pipe water supply and public tap are the main sources of drinking water of the surveyed households. About 85.71% of the surveyed households depend on pipe water supply while 14.29% use public tap. Households survey shows that hundred percent of the surveyed households of VDC use pipe water supply in their homes. The household's survey shows the available supply of drinking water is sufficient throughout the year.

Table 5.24: Source of Drinking Water of the Households

Ward	Source							
	Piped Water		Well/Tube well		Public Tap		River	
	Hhs	%	Hhs	%	Hhs	%	Hhs	%
Ward 8	9	90.00		0.00	1	10.00		0.00
Ward 9	15	83.33		0.00	3	16.67		0.00
Total/Percentage	**24**	85.71		0.00	**4**	14.29		0.00

Source: Household survey, 2014

5.4.11 Source of Energy

Cooking Fuel

Fuel wood is the main sources of energy for cooking purpose of the surveyed households. About 82.14% of the surveyed households use fuel wood for cooking purpose while rests 17.86% use LP gas.

Table 5.25: Source of Energy for the HHs for cooking purpose

Ward	Source					
	Fuel wood		Biogas		LPG	
	No.	%	No.	%	Hhs	%
Ward 8	10	100.00		0.00		0.00
Ward 9	13	72.22		0.00	5	27.78
Total	**23**	**82.14**		**0.00**	**5**	**17.86**

Source: Household survey, 2014

Firewood is collected mostly from community forest, private land and by purchasing. 57.14% of the households collect firewood from community forest while 14.29% collect from own (private) forest. Similarly, about 10.71% of the households purchase firewood.

Table 5.26: Source of Fuel wood for Households

Ward	Source					
	Community Forest		Private Forest		Purchase	
	Hhs	%	Hhs	%	Hhs	%
Ward 8	7	70.00	2	20.00	1	10.00
Ward 9	9	50.00	2	11.11	2	11.11
Total	**16**	57.14	**4**	14.29	3	10.71

Source: Household survey, 2014

Lighting Fuel

Household survey shows all of the surveyed hhs (100%) use electricity for lighting purpose.

Table 5.27: Source of Lighting of the Surveyed Household

Ward	Source			
	Electricity		Kerosene Lamp	
	Hhs	%	Hhs	%
Ward 8	10	100.00		0.00
Ward 9	18	100.00		0.00
Total	**28**	**100.00**		**0.00**

Source: Household survey, 2014

5.4.12 Health and sanitation

On the average all of the surveyed households have their own toilet. There is no open defection observed in field visit. Management of solid waste disposal is satisfactory in the surveyed households. Three methods such as dump at safe place, burn and buried have been adopted by the surveyed households for the management of solid waste disposal. Dump at safe place is mostly practiced in the households.

5.4.13 Knowledge and Attitude Regarding the Project

Knowledge

All households have knowledge about the proposed project and its activities. According the surveyed households, the main sources of information about the project activity are through the NEA employers, neighbors and others. All of the households got information from NEA employers.

Attitude

Almost households have shown their positive attitude towards the proposed project while some of the households are against the project activities.

5.4.14 Expectation from the Project

The expectations of the project affected families are mainly for good compensation for the land and property, employment, electricity facility and local development. Majority of the households have shown their interest for good compensation. Similarly, some of the households have shown their expectation for employment and local development.

5.4.15 Willingness for Compensation by Property Type

Among two options either cash or land for land, mostly households preferred for cash compensation (78.57%) followed by land for land 21.43.

Table 5.28: Households Willing Compensation for Property by Type

Ward	Type	
	Cash	Land for Land
Ward 8	8	2
Ward 9	14	4
Total	22	6
Percentage	**78.57**	**21.43**

Source: Household survey, 2014

Use of cash compensation

The surveyed households have expressed their interest for using cash compensation on purchase of land, construction of new house and to run business. About 85.71% households wanted to use cash compensation for the purchase of land in the project area or its vicinity. Similarly, 7014% of the households are willingness to start new business and 7.14% for pay loan, education and cash for foreign employment process.

Table 5.29: Use of the Cash Compensation by Households

Ward	Type				
	Purchase Land	House Cont.	Start Business	Pay Loan	Other
Ward 8	9	0	1		
Ward 9	15	0	1		2
Total	24	0	2		2
Percentage	**85.71**	**0.00**	**7.14**	**0.00**	**7.14**

Source: Household survey, 2014

5.4.16 Households having Residential Land/House in Area other than the Project Area

- **Land**

All the surveyed households have their own land other than in the project area

- **House**

By wall type

Hundred percent of the surveyed households have their own house for residence. The walls of houses are usually constructed by mud and stone/brick, wood, bamboo and galvanized zinc sheet.

By floor type

Majority of floor of houses are made up of by mud and a few are made by cement/tiles/marbles.

By roof type

Thatched, galvanized zinc and RCC type roof are prevalent in the surveyed households. Majority of the households have their house with galvanized zinc sheet followed by thatched roofed. Few house having RCC roof.

By no. of storey

Two storey houses are common among the surveyed households. More than 80% of the households have their house with 2 storey, one story house and three storey households also observed during field survey.

5.4.17 Public Consultation

Public have the right to know and to be involved in information exchange and decision-making that affects their lives, resources and properties from the beginning of a project. Community participation and consultation from the beginning is crucial to reduce misunder-

standings and successful implementation of a project. When the public is well informed and motivated, project implementation could be relatively trouble-free. Considering this, an interaction program was held at Manakamana-9, Pairebeshi on April 26, 2014 in the presence of VDC Secretary, Project Manager, SPAF members to collect the concerns /issues regarding the proposed Trishuli 3B Hub substation.

The participants were requested to express their opinions as well as they were informed regarding the project and its activities. Information such as project purpose, project type, impact area, likely impacts and potential opportunities due to project implementation were provided to the people during the consultation.

The local people have positive attitude regarding implementation of the project realizing the need of substation for regular supply of electricity. During the interaction several issues and concerns were raised by the people. The key issues and concerns raised by the local people are related to compensation, employment, implementation of mitigation and enhancement measures and community participation in the project activities. The key issues/concern raised by the local people during community consultations are summarized in Table 5.30.

Table 5.30: Summery of Key Issues and Concerns

Key Areas of Concerns	Details of Issues/Concerns
Compensation	• Appropriate compensation for land and private property, • Compensation of land/property as per the prevailing market rate. • Distribution of compensation on timely • Appropriate compensation for Tribhuwan Secondary School since it loses income source
Livelihood	• Employment to local people during the construction period , • Devaluation of land due to various transmission line corridor,
Community Support Programs	• Support for health, education/school, irrigation, road/bridge and drinking water in the project affected area, • Community support programs like skill development, women empowerment program, income generation program should be launched by the project.
Infrastructure	• Public and private infrastructures should be protected during the construction of the project,
Other	• Information about adverse impact of high voltage should be provided for the local people prior to the project construction. • Further assistance is required for all the affected people.

CHAPTER-VI
IMPACT ASSESSMENT

This chapter addresses the likely adverse impacts in the construction and operation of the Trishuli 3B Hub Substation Project. The construction and operation of the project will result in changes to the existing baseline condition. The study team have also figured out beneficial impacts of the project. The general discussions are organized in three categories, namely the physical, biological and socio-economic and cultural environment, and split into the construction and operation phases.

6.1 Physical Impacts

The main physical impacts on the environment are those associated with land take for the proposed substation. The major impacts anticipated during the construction phase are discussed in the sections below.

6.1.1 Topography and Slope Stability

Construction Phase

Since the proposed substation will be located at the specific site having 5.3 ha of land area, it will not make difference to topography of the project area. Moreover, the proposed substation site is situated at nearly flat terrain. Therefore, the project construction will have apparently no impact on topography and slope stability.

Operation Phase

No impact on topography is expected during the operation phase except for the impact on natural scenery.

6.1.2 Land Take and Land Use

Construction Phase

The project will require 5.306 ha of land permanently, out of which 3.687 ha is private agricultural land and the rest (1.619 ha) is river flood plain, now being cultivated by local people. The project will not require land for temporary use during the construction phase. The impacts due to the land take and land use shall be moderate in magnitude, site specific and long term in duration.

Table 6.1: Land requirement for the proposed project

SN	Project Component	Type of land take	Ownership	Land-use			Total Area (Ha)	Remarks
				Cultivated Area (ha)	Forest Area (ha)	Others (ha)		
1	Substation	Permanent	Private	3.687			3.687	
			Govt/Not registered as private (*Aailani*)	. .		1.619	1.619	under cultivatiion
2	RoW							Not required
3	Tower Pad							Not required
			Total				5.306	

Operation Phase

The project will take land for the substation forever as well land use will be changed for the particular 5.3 ha of land in Mankamana VDC of Nuwakot district. The impact is considered as moderate in magnitude, site specific and long term in duration.

6.1.3 Watershed and Drainage

Construction Phase

Since the proposed substation will occupy a small area of land (5.3 ha), it will not affect the watershed and drainage of the project area.

Operation Phase

No impact is expected during the operation and maintenance period.

6.1.4 Air Quality and Noise Level

Construction Phase

The construction activities like site clearance, ground levelling, excavation of the building foundation, vehicular movement will generate dust and emission at the project site. However, the construction activities are limited to small area and not in massive scale. Similarly, there may be noise due to construction machines and vehicles as well even workforce noise. The impact on air quality and noise level will be low in magnitude, site specific in terms of extent and of short duration.

Operation Phase

No impact on air quality and noise is envisaged during the operation phase.

6.1.5 Water Quality

Construction Phase

During the construction period, water will be used from nearby the Trishuli River. The improper disposal of solid wastes and chemicals such as cement slurry, construction materials, and human wastes into the river deteriorate the river water quality. The impact is expected to be moderate in magnitude, site specific and for a short duration.

Operation Phase

Possible leakage of transformer oils into nearby the Trishuli River is one of serious issue by environmental view point. Now, Poly Chlorinated Biphenyls (PCBs) are legally prohibited in Nepal. However, there are chances of its use or contamination of the transformer oils by PCBs. In such cases, there is potential of health hazard problems to the operational workers and communities located close to the substation site. Likely impact on the water quality of Trishuli River is high in magnitude, local and long term in duration.

6.1.6 Waste and Spoil Disposal

Construction Phase

The improper disposal of solid waste like cement bags, iron bar and other leftover construction materials, kitchen waste and waste generated by the labour camp might cause adverse impact to the environment. The spoil generated due to the excavation of dead end tower and building foundation is also detrimental to land and water quality of the area. However, excavated muck can be used for back filling and compaction. The magnitude of impact is considered to be low, extent is site specific and duration is short term.

Operation Phase

No impact on waste and spoil disposal is expected during the operation phase.

6.1.7 Crossing of Other Utilities and interferences

Operation Phase

The proposed substation will not cause impact due to crossing of other utilities and interferences.

6.2 Biological Environment

Unlike other transmission line project, the proposed Trishuli 3 B Hub Substation Project will not require several kilometer long linear strip of land for the right of way. In fact, it requires certain area of land at particular site. Such site has been proposed avoiding the forest land. Hence, there will not be direct impact on the forest. Other impacts indirectly on the biological environment of the project are expected to be low. Those impacts are described below:

6.2.1 Forest/ Vegetation

Construction Phase

Since the proposed substation site is located at the cultivated land, there will be no loss of forest land. However, while site clearance for the substation site, few standing trees of Siris (*Alibizia sp*) and Mauwa (*Engelhardia spicata*) will be uprooted. The respective owners will take away the wood logs from their agricultural field. The impact is insignificant.

Operation Phase

No impact.

6.2.2 Demand for Firewood and Timber

Construction Phase

Surrounding community forests supply firewood and timber to households in the project area. There will be a few people as workforce from outside the project area for a short period of time. Due to this, increase in demand of firewood and timber during the construction period is expected to be low. This impact will be low in magnitude, site specific and short-termed.

6.2.3 Exploitation of NTFPs

Construction Phase

Since there will be a small number of workforce (around 20 people) involved in the project construction, collection and sale of non timber forest products (NTFPs) in surrounding community forests by workers will be negligible.

6.2.4 Wildlife and Avifauna

Construction Phase

The construction disturbances resulting from construction machines and vehicular movement would interrupt normal movements, feeding and other activities of mammals available in the surrounding project area. Construction activities may affect migratory movement of birds disturbing to their normal route.

The possibilities of hunting and poaching by work force during the construction period will have some adverse impact on local wild fauna. However, such pressure on wildlife will be low in magnitude, local in extent and duration is of short term.

Operation Phase

No impact is expected wildlife. However, the substation structures like line bays, gantry etc combined with incoming and outgoing transmission lines may pose obstruction to bird flying along the course of Trishuli River.

6.2.5 Impacts on Rare, Protected, Endangered & Threatened Species of Flora & Fauna

Construction Phase

Indirect pressure on existing forest and ecosystem of the project area might cause adverse impact on those rare, endangered and threatened plant and animal species if any. However, impact is expected insignificant.

6.3 Socio-economic and Cultural Environment

The likely impacts due to project implementation are associated with land take, social and cultural problems, health and sanitation etc. The anticipated impacts regarding the socio-economic and cultural environment of the project area are discussed below:

6.3.1 Acquisition of land and structure

Construction Phase

Households loosing land and structure

The construction of the proposed Trishuli 3B Hub Substation will affect 28 households. Out of them 27 households will lose their land only; one household will lose land and structure.

Households Losing structure

There will be acquisition of one built up structure for the proposed substation site.

Table 6.2: List of Project affected Households by Type of Structures

S.N	Project component	VDC	Name of HHs head	Loss of structure	Affected house			
					No.	Plinth area (ft^2)	Type	No. of floor
1	Substation	Manakamana		House	1	250	Kachchi	2
				Total	**1**	**250**		

Source: Field survey, 2014

Households losing land

Out of the total 28 affected households due to the land acquisition, 14.28 % households will lose less than 10% of their land. Similarly, 17.86% of households will lose land in the range of 10% to 25%, 21.43% of households will lose 25% to 50% and 46.43% of the households more than 50% of land. The detail loss of land of project affected families due to construction of substation is given in Annex-VII.

Table 6.3: Affected Household by Land loss

Percentage of loss of land	Households	
	No of Households	Percentage
< 10	4	14.28
10 - 25	5	17.86
25 -50	6	21.43
>50	13	46.43
Total	**28**	**100.00**

Land requirement

The project will acquire 5.306 ha (104 ropani) land permanently which is cultivated. Out of total acquisition land, 3.687 ha (72 ropani) is private land. Remaining 1.619 ha (32 ropani) is government land (*Ailani),* which was flood plain in the past, now being cultivated by local people. The meeting of local community's decided to allocate the production from government land to Tribhuwan Secondary School and it is main source of income to run the school. After the land acquisition, the school will lose its income source.

Table 6.4: Private Land Acquisition by Project Components and Facilities

S. No.	Land Requirement for Project			
	Project Component and Facilities	**Quantity**	**Area (ha)**	**Remarks**
1.	Angle towers			
2.	Suspension towers			
3.	ROW			
4.	Substation	1	3.687	
5.	Temporary camp			
	Total land		**3.687**	

Operation Phase

Land acquisition will not be required during operation phase.

6.3.2 Loss of Agriculture Production

Construction Phase

As a result of the land acquisition of fertile cultivated land, annual agricultural production is estimated to be 50.2 metric ton (MT). Similarly, loss of cereal crops like paddy, wheat, maize and potato are 26.3 MT, 2.7 MT, 8.1 MT and 13.1 MT respectively. The magnitude of this impact is considered to be moderate, extent is site specific and duration is long termed.

Table 6.5: Annual Loss of Agricultural Production

S.N.	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Total Production (MT)	Amount
1	Paddy	3.393	11.74	3.46	26.3	352200
2	Wheat	0.517	1.04	2.01	2.7	29120
3	Maize	2.444	4.79	1.96	8.1	134120
4	Potato	0.94	6.69	7.12	13.1	167250
				Total	50.2	6,82,690

Source: Household Survey, 2014

Operation Phase

The overall magnitude of impact is considered to be low, extent is site specific and duration is long term.

6.3.3 Health, Water supply and Sanitation

Construction Phase

The likely influx of construction forces may add further stress on the local health and sanitation situation. Discharge of wastes of various types including metals, paper, kitchen wastes etc. is potential to degrade the sanitary hygienic conditions around the construction sites.

Similarly, with the increase in population along with the construction activities, a potential decline of the access to the drinking water and existing sanitation condition might occur in the project area. The overall impact on water supply and sanitary situation will be: shortage of drinking water, increase pressure on the existing water supply system, increase in disease vectors, and reduced water quality due to increased sanitation problems etc. However,

outsider workforce will be about 20 people; therefore the impact on water supply and sanitation will be low, short term and site specific.

Operation Phase
No impact is anticipated during the operation phase.

6.3.4 Occupational Hazards and Safety
Construction Phase
Work related injuries and vehicle accidents are likely impacts expected during the construction of the project. The magnitude of impact is low, the extent is site specific and the duration is short termed.

Operation Phase
Lack of operation and maintenance skill and unavailability of the essential safety equipments may add risk with safety regards. The overall magnitude of impacts is considered to be low, extent is local and duration is long termed.

6.3.5 Impact due to restriction of future land use development
Operation phase
Since the proposed Trishuli 3B Substation has been planned to connect different high voltage transmission line to evacuate power from upcoming hydropower projects in Trishuli basin and Trishuli-Matatirtha (Kathmandu) 220 kV transmission line will take off from this substation, it will affect future land use development in the immediate surroundings of the proposed substation site. This is the issue raised by local people most seriously. Hence, impact is high, local and long termed.

6.3.6 Gender and Vulnerable Group
Construction Phase
During the project construction people will be employed on daily wages for construction works. The contractor, especially the sub-contractors, may discriminate the women and vulnerable group while hiring the worker. Child labor may be possible in the construction works because of poor economic condition in the project area. Considering the nature of construction work and manpower employed, the magnitude of impact is considered to be low, the extent is local and the duration is short termed.

Operation Phase
No impact is expected.

6.3.7 Religious, Historical and Archeological Site
Construction Phase
Since there are no temples, religious and cultural sites in vicinity of the proposed substation site, no impact is expected on it.

6.3.8 Infrastructure and Service Facility
Construction Phase
The construction work and related influx of population in the project area will make the existing institutions regarding health, water supply, telecommunication, electricity etc. Besides, existing market and hotels will come under pressure. The impact is expected to be low in magnitude, local in extent and short duration.

Operation Phase
No impact is anticipated during the operation phase.

6.3.9 Social and Cultural Practices

Construction Phase

During the project construction, the influence of the outside workforce on the local way of life and traditional cultural practice may result into cultural erosion, undesired social practices, disputes, conflicts and possible dilution of social bonds among the local people. However, outsider workers will be in small number (about 20 people), so impacts shall be low in magnitude, local and short termed in duration.

Operation Phase

After completion of the construction work, the impact on culture by the construction work force will subside and it shall be no matter of issue.

6.4 Beneficial Impacts

Construction Phase

6.4.1 Local Employment

One of the major beneficial impacts of the project during the construction phase is the creation of employment opportunity. Altogether, 50 people will be deployed during the construction of the project, which includes 25 unskilled, 15 semi-skilled and 10 skilled manpower. In this regard, the employment opportunities contribute to poverty alleviation to some extent. The magnitude of impact is considered to be moderate, extent is local and duration is short termed.

6.4.2 Local Economy

The employment opportunity, income from shops, house rental, increase demand for fresh vegetables, meat and rental/lease of land etc are the areas of income during construction period. Furthermore, local contractor and local people will also be engaged for some construction work, which is considered as beneficial impacts for the local economy. As a result of increased trade and business, significant amount of cash will be introduced into local economy. This short term economic boom will contribute to the development of local economy. The increase in business will enhance the economic status of local people. The magnitude of impact is considered to be moderate, extent is local and duration is medium term.

6.4.3 National/Regional Economy

The proposed project will evacuate the energy from hydropower projects to be developed in Trishuli river basin of Nuwakot and Rasuwa districts. The reliability in power distribution will enhance the production of the industries and boost the economic activity in the districts as well Kathmandu valley because it is the nearest load center.

CHAPTER-VII

ALTERNATIVE ANALYSIS

A key aspect of good environmental practice is the evaluation of potential alternatives. In order to achieve this goal the environmental and social considerations need to be brought into the planning. In case of this project, a range of site alternatives was investigated and the lowest and highest impacts on engineering, environmental and land use of these sites was determined to select the best substation site.

The alternative location of the proposed project was selected taking into consideration the following criteria:

- which have minimal environmental impact
- Improvement of reliability of the power system
- Avoid build up swampy and unstable areas
- Provide easy access for construction and maintenance works
- Avoid settlements as far as possible
- Proximity of road etc.

7.1 Alternatives considered

Some of the major alternatives considered during the feasibility and IEE studies were:

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

7.1.1 Site Alternatives

Comparative studies for the feasibility of the different routes were done on the basis of the following guidelines:

1. Proximity to the all expected hydroelectric plants to be constructed and shortest distance from the highway as far as possible.
2. Rectangular or square in shape for ease of proper orientation of bus-bars and feeders.
3. Far away from obstructions, to permit easy and safe approach/termination of high voltage overhead transmission lines.
4. Free from master plans/layouts or future development activities to have freline corridors for the present and the future.
5. Easily accessible to the public road to facilitate transport of material.
6. Leveled ground to reduce leveling expenditure.
7. Above highest flood level (HFL) to avoid water logging.
8. Minimum or no forest and vegetation.
9. Avoid the negative impact to the environment.
10. Located on geologically stable ground
11. Avoid settlements areas or densely populated area
12. Minimum no of affected households
13. Avoid close vicinity of radio stations, radar canters and airport
14. Avoid forest, protected area and wildlife sanctuaries

7.1.2 Construction alternatives

Manual excavation has been adopted. Different design alternatives for substation and its protection, ruling span and voltage level have been also carried out during the feasibility and

the IEE study. In order to simplify the erection procedures and make the project cost-effective Lattice type construction has been selected.

The alternative study included the comparative studies for the voltage level of 220 kV and 400 kV. The voltage level of 220 kV has been opted for to avoid the excess area of land restriction and land disturbances.

Since it provides more opportunity for the local employment will have less impact on topography, low disturbance to surrounding areas and does not require wider access road. Mechanical excavation requires motorable access roads and cause more impact to environment including air and noise pollution. However, concreting will be done using mixer and vibrator in order to maintain the quality.

Internationally accepted standard technology will be applied for the installation and procurement of the goods and equipment.

The construction activity shall be planned in dry period to minimize the unnecessary damage and disturbances. This will reduce the project impact on physical, biological and socioeconomic resources of the area. Construction in rainy season will cause soil erosion problem, blockage of drain and difficulty to crossing of River and excavation of tower foundation and hence delay the project progress due to other disturbances. The indoor works of substation may be carried out in rainy season. However, the indoor works of substation may be carried out in rainy season.

7.1.3 No Forest Option

Since the proposed substation requires certain land area at particular site, the project site for the substation has been selected avoiding forest land at all.

7.1.4 No Project Option

The unprecedented growth in power consumption has led to severe imbalance in demand and supply of electricity power in the country which has resulted in load shedding in Nepal since last few years and will be continued in the country in the years to come. This load shedding has resulted in financial loss to the country.

If the proposed project is not implemented then there will be no project induced loss/effects on vegetation, cultivated area and other project induced environmental and socio-economic impacts. No action alternative would result in heavy deficit of power and energy in central part of the country where major industries are located.

The construction of the proposed project will reduce system loss and provide reliable power to the load centres of Nepal. Increase in electricity supply to local people will help to switch energy consumption trend. Socio-economic conditions of the local people are likely to be increased through employment opportunities and income generation activities. There will also be possibilities of establishment of small scale industries. The construction of this hub substation will play a major role not only solving the power crisis in the country but also in exporting surplus power generated in the from the hydroelectric projects like Trishuli 3A and 3B.

Therefore, the construction of Trishuli 3B Hub substation is essential for the overall development of the country.

CHAPTER-VIII

MITIGATION AND ENHANMCENT MEASURES

The mitigation and enhancement measures outlined in this chapter have been proposed to curtail potential adverse impacts and enhance beneficial impacts identified during the study. Those adverse and beneficial impacts not identified or predetermined during the study if later discovered during the construction phases will be explicitly mitigated or enhanced by the project.

The general discussion is organized into three categories of physical, biological, and socio-economic and cultural aspects, and has been split into construction and operation phases in an equivalent manner as for Chapter VI– Impact Assessment. The mitigation measures to be carried out have been listed below.

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

8.1 Physical Environment

8.1.1 Topography and Slope Stability

Construction Phase

Since there will be no impact on topography and slope stability, no mitigation measures is required. However, river protection works will be required because the proposed substation site is located at the bank of Trishuli River. As well, proper landscaping and re-vegetation is recommended inside the substation premises.

Operation Phase

No mitigation measure is needed.

8.1.2 Land Use and Land Take

Construction Phase

The permanent land use changes due to construction of substation cannot be mitigated. The camp sites are proposed within the substation site.

Operation Phase

No mitigation.

8.1.3 Watershed and Drainage

Construction Phase

Since the project construction will not affect and watershed condition and natural drainage of the project area, no mitigation measure is proposed at all.

Operation Phase

No mitigation measures on the watershed and natural drainage is needed during the operation and maintenance period.

8.1.4 Air and Noise Quality

Construction Phase

The construction of the substation will not have significant impact on the air quality of the project impact area. Vehicle utilized for construction will be complied with GoN mass

emissions standards. Proper maintenance of all vehicles and construction machinery will be done regularly. Helmets, Ear mufflers and air mask will be provided to labor force working in areas susceptible to dust pollution.

Operation Phase
The impacts due to corona effect cannot be mitigated.

8.1.5 Water Quality
Construction Phase
The waste generated from the mixing concrete will be disposed in pits and filled with soil. Proper care will be taken not mix the waste materials into Trishuli river. Toilets will be provided to the workforce. Garbage and solid wastes generated by the workforce will be dumped safely away from water bodies. Good construction practices and site management will be adopted to avoid impacting soil and ground water, and pollution of water bodies.

Operation Phase
To prevent mixing of oil leakage from transformers into the river and ground water, pits are proposed to trap the oil leakage in detail design of the substation. During procurement process quality of the transformers will be ensured.

8.1.6 Waste and Spoil Disposal
Construction Phase
The biodegradable domestic waste will be managed by burying in pits at reasonable distance from water bodies and subsequently covering with soil. Waste generated from construction activities like cement bags and containers, rejected material, plastic, wooden planks will be kept separated instead of throwing haphazardly elsewhere. The contractor will be responsible for the establishment of the waste management system at the construction and camp areas.

Operation Phase

No mitigation.

8.2 Biological Environment

8.2.1 Vegetation/Forest Resources

Construction Phase
There is no need to forest clearance. Therefore, no mitigation is required.

Operation Phase
No mitigation.

8.2.2 Supply of Alternative Fuel
Construction Phase
Though expected increase demand of firewood is low, contractors will be complied to provide kerosene or cooking gas to the project workers.

8.2.3 Exploitation to NTFP and Disturbance to Wildlife and Avifauna
Construction Phase
The project proponent will be responsible to avoid unnecessary machinery disturbances and lighting so that the construction activities will not disturb wildlife in the surrounding areas.

The project workers will strictly be prevented from hunting and poaching and collecting NTFPs in the forests of project area. Informative and warning sign will be placed at relevant construction sites.

Operation Phase
Markers such as colour balls will be attached to Dead End tower/s inside the substation to improve line visibility for bird.

8.3. Socio-economic and Cultural Environment

8.3.1 Acquisition of land and structure

Construction Phase

- **Compensation for permanently acquired land**

The project will acquired about 3.687 ha (72 ropani) of cultivated land belonging to 28 families. Hence, mitigation cost for 3.687 ha of land is estimated to be NRs. 5,96,12,696 (The average price of land of the project area is NRs. 1,61,70,000 per ha).

After the land acquisition Tribhuwan Secondary School will lose its main income source so NRs. 10,00,000 is allocated to school for restoration of income loss.

- **Compensation for structure**

Compensation will be provided for 1 structure (non residential house). In practice, compensation cost for structure has been calculated classifying into two categories i.e. cost for plinth area of the structure and construction cost of the structure.

Compensation cost for land occupied by structure (Plinth area)
Since structure is located in the Hub Substation and area occupied by structure has been included in Trishuli 3B Hub Substation so additional amount for plinth area will not be required.

Compensation of structure based on construction cost
The total compensation of 1 structure based on the construction cost is estimated to be NRs. 4,00,000.

Table 8.1: Estimation of Construction Cost of Structure

S.No.	Description	Type of structure	No.	Area (sq. ft)	Rate (NRs./sq.ft.)	Amount (NRs.)
1	House*	Kachchi	1	500	800	40000
		Total	**1**	**500**		**4,00,000**

Source: Households Survey, 2014

*Non residential

8.3.2 Compensation for loss of standing crops

The total compensation of the project affected households for production loss of 50.2 MT is estimated to be NRs. 6,82,690. The value of total loss of crops is estimated based on their yield, production, and local market rate. The crop wise value with area is shown in Table 8.3.

Table 8.2: Value of Total Loss of Agriculture Production due to Land Acquisition

S.N.	Crop types	Actual production area loss (ha)	Production Loss (MT)	Productivity (MT/ha)	Total Production (MT)	Amount (NRs)
1	Paddy	3.393	11.74	3.46	26.3	352200
2	Wheat	0.517	1.04	2.01	2.7	29120
3	Maize	2.444	4.79	1.96	8.1	134120
4	Potato	0.94	6.69	7.12	13.1	167250
				Total	**50.2**	**6,82,690**

Source: Household Survey, 2014

8.3.3 Health, Water and Sanitation

Construction Phase

The project proponent will keep the project area clean and hygienic to ensure the project activities will not cause the spread of communicable diseases. The labor camp will be provided with simple dry pit toilet constructed on hard ground and far from water sources. Toilets will be made in temporary camps at the rate of approximately a single toilet for 6 people.

The domestic solid waste generated in the project area will be either buried in designed landfill areas or converted in to compost. Alternately, the existing health post/sub-health posts will be strengthened to provide health facilities to local people and the workers. Additional water supply facilities will be provided along the project area whenever the pressure on the existing system.

Operation Phase

No mitigation measures are required during this phase.

8.3.4 Occupational Hazards and Safety

Construction Phase

The necessary precaution and warning signs will be placed at major construction site and dangerous areas to make the local aware about the construction activities and the associated risks. This area will be restricted for the entry of unauthorized people. The project proponent will provide safety helmet, eye glass, safety boot, safety belt, fire fighting accessories, to the work force at the work site.

The contractor will provide safety training to the project workers prior to the construction work. Community safety awareness program about the high voltage electricity will also be implemented. The project workers involved in construction work will also be trained and informed about health and occupational measures.

Operation Phase

Safety equipment required for the operation of the substation will be provided. The substation area will be restricted for entry of unauthorized person.

8.3.5 House, Settlements and Social Infrastructures

Operation phase

Protection measures will be applied in around the substation after the consultation with local people/stakeholders. Fencing, sign and other appropriate tools of public awareness will be adopted to reduce the likely impact on people, their property and public infrastructures.

8.3.8 Gender and Vulnerable Group

Construction Phase

The project will ensure not to discriminate the local people based on their gender, caste, colour and place of origin. Similarly, priority for jobs will be given to the vulnerable group as per their ability and skills and willingness to work in the project area. Child labor will be prohibited in the project area.

Operation Phase

No mitigation measures required during operation phase.

8.3.12 Economic Activities

Construction Phase

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

- To minimize the impacts of loss of agricultural products due to the land acquisition, and any effect on the occupation will be compensated through appropriate agricultural extension program, livelihood skill training programs, etc.;
- Maximum job opportunities will be provided to the local people in prudential order and assistance to local communities into the planning through coordination with district level and local government office of the respective district.

Operation Phase

No mitigation measures required during operation phase.

8.3.13 Infrastructure and Service Facility

Construction Phase

To minimize the impacts on the existing institutions and service facilities following measures will be implemented:

- Provision of water supply through tube wells,
- Provision of health and support program;

Operation Phase

No mitigation measures are required during this phase.

8.3.14 Social and Cultural Practice

Construction Phase

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

- Special instruction to all the construction workers to act in a responsible manner during and after working hours;
- Respecting the rights, properties and practices of local people;
- Prohibiting all the outside labors to live outside construction camps.

Operation Phase

Employment in the substation will be given to the local people to reduce tension and potential conflicts with local residents.

8.3.15 Withdrawal of Economic Activities

Operation Phase

Upon the completion of project, most of the skilled labours find some inconveniences and difficulties in losing their jobs due to financial reason. In order to minimize the adverse impacts on the local economy in this critical condition and enhance the living standard of the

affected communities, following measures will be adopted by the project: The project will impart some adverse impacts on life style and economic status of local people.

8.3.16 Enhancement Measures

8.3.16.1 Agricultural Intensification Program and Vegetable Farming

The proposed project will itself provide the local communities and the region with numerous opportunities for socio-economic development. Project located in the cultivated land, the environment team after the extensive field investigation has concluded that the project area will benefit from the training program on improved agricultural and vegetable farming system.

To increase the agricultural production in the area, improved techniques and methods need to be introduced. A training program on improved agricultural farming will be conducted for the local farmers, which will provide opportunities for increasing agricultural production in their farmlands.

This training program will consist of lectures from experts, demonstration of new techniques and dissemination of information. The total cost allocated for training programs regarding agriculture is NRs 4,91,000 (including cost for trainee's allowance, expert hiring, training materials, logistic support, etc).

Table 8.3: Cost for Agricultural Productivity Intensification

S. N.	Particulars	No. of persons	No. of days	Unit cost (daily allowance)	Total Cost (NRs)
1	Local Farmers /participants	28	7	700	1,37,000
2	Agriculturist /trainer	4	7	3000	84,000
3	Distribution of seed/improved materials			LS	70000
4	Training Materials and Logistics			LS	2,00,000
				Total Cost	**4,91,000**

8.3.16.2 Health, Sanitation and Safety Program

An awareness program will be conducted in the project area to alert local people to the potential dangers related to health, sanitation and safety. This program will be targeted to the people residing in and around the vicinity of the substation. Awareness program on construction related safety issues and electrocution will also be given to the local residents. To tackle the problem, a joint program on health and sanitation can be launched in association with local NGOs during the construction phase. The project will allocate NRs 3,00,000 for sanitation and safety programs.

8.3.16.3 Skill Development Program

The project affected people (especially focus for SPAF) will be benefited from skill development program on sewing/knitting, driving, electrical/house wiring, computer in their own localities. The total estimated cost for such training programs is NRs. 13,80,000 (including cost for trainee's allowance, expert, training materials, logistic support, etc). This training will enable the PAF members in getting suitable jobs during and after the construction. The estimated cost for these trainings is given in Table 8.4.

Table 8.4: Cost for Skill Development Training

Particulars	Total Number	Allowance @ Day	Total Days	Total (NRs.)
Electrical Wiring				
Trainees	8	500	30	1,20,000
Training Expert	2	2500	30	150,000
Training Material & Logistics			Lump Sum	1,50,000
Total				**4,20,000**
Computer				
Trainees	8	500	30	1,20,000
Training Expert	2	1500	30	150,000
Training Material & Logistics			Lump Sum	1,50,000
Total				**4,20,000**
Sewing/Knitting				
Trainees	8	500	30	1,20,000
Training Expert	2	2,500	30	150,000
Training Material & Logistics			Lump Sum	1,500,000
Total				**4,20,000**
Driving				
Trainees	8	500	30	1,20,000
Cost for service provider	8	500	30	1,20,000
Licensing	8	5000		80,000
Training Material				20,000
Total				**3,40,000**
			Grand-Total :	**16,00,000**

8.3.17 Resettlement and Rehabilitation

Households' survey shows that all the surveyed households will be affected due acquisition of land and non residential structure. No one affected households need to be resettled.

- **Relocation of House**

Out of total project affected households (28 HHs), one family will lose their house.

- **Applicable policy and legislation**

Land Acquisition Act, 2034 (1977) will be the main legislative system for land and other physical asset acquisition. The procedure defined in the Act will be followed for the acquisition. Compensation Fixation Committee (CFC) to be chaired by Chief District Officer of the concern district will determine the compensation rates of land.

- **Transportation Allowance**

In addition to the compensation for asset losses, a household who is losing structure will be entitled for the transportation allowance. Household whose structure to be relocated, will receive transportation allowance equal to NRs. 40,000.

8.3.18 Corporate Social Responsibility (CSR)

As a corporate responsibility the proponent has allocated some money for the betterment of local people. The total CSR cost is estimated to be NRs. 20,00,000. Following are the sectors covering as CSR:

School Support Program

Financial support will be provided to Tribhuwan Secondary School for construction of physical infrastructure. The total amount for this provision is NRs. 15,00,000

Health and Sanitation Program

Existing health post in the affected VDC should be strengthened in association with the District Public Health Office. The total amount for this provision is NRs. 5,00,000

8.4 Environmental Mitigation and Enhancement Cost

The mitigation and enhancement cost including CSR cost for implementing various mitigation and enhancement measures mentioned above is estimated to be NRs. 644,64,486. The cost breakdown is given below in Table 8.5.

Table 8.5: Cost estimate for Environmental Mitigation and Enhancement Measures

Description	Amount (NRs)
A. Mitigation Measures	
1.Land acquisition	5,96,12,696
2.Land acquisition (School)	10,00,000
4. Compensation for Structure	4,00,000
5. Loss of standing crops	6,82,696
6.Transportation allowance	40,000
7. Awareness training and hoarding boards	50,000
Sub-total A	**622,35,386**
B. Enhancement Measures	
1. Skill oriented training program	16,00,000
2. Agricultural intensification program	3,91,000
3. Health, Sanitation and Safety Program	3,00,000
Sub-total B	**22,91,000**
C. Corporate Social Responsibility (CSR) Cost	
1. School Support Program	15,00,000
2. Health and Sanitation	500,000
Sub-total C	**20,00,000**
Total	**6,44,64,486**

Table 8.6: Matrix of Environmental Impact Mitigation Measures

	Potential Impacts	Magnitude	Duration	Extent	Mitigation Measures	
					Action	Agency to be Consulted
Construction Phase	**Physical Environment**					
	Topography & Slope Stability					
	No change in existing topography and disturbance to slope				River training at the bank of Trishuli River. Proper landscaping and and re-vegetation.	VDC
	Land take and land use					
	Acquisition of 5.306 ha land	M	LT	SS		
	Air quality and Noise Level					
	Air and Noise pollution due to construction activities	L	ST	SS	Emission standard compliance. Maintainance of vehicle. Ear mufflers and mask to workforce.	
	Water Quality					
	Detioration of water quality due to construction waste as well human waste from camps into Trishuli river	M	ST	SS	Proper care of waste not to mix into water bodies. Good construction practices.	Local CBO/Club
	Waste and Spoil Disposal					
	Construction solid waste and garbage is an issue.	L	ST	SS	Proper waste management system by contractor.	

	Potential Impacts	Magnitude	Duration	Extent	Mitigation Measures	
					Action	Agency to be Consulted
Construction Phase	**Biological Environment**					
	Demand for Firewood and Timber					
	Demand for Firewood and Timber increases.	L	ST	SS	Supply of keresene to labor camp.	
	Wildlife and avifauna					
	Disturbance to wildlife and wildlife habitat	L	ST	L	Special instruction to workforce. Awareness	CFUG, CBO
	Socio-economic and Cultural Environment					
	Acquistion of land and structure					
	28 families affected due to landtake	H	LT	L	Adequate Compensation and according to the agreed procedures/rates	VDC, DAO
	One built up structre to be removed	L	LT	L	Adequate Compensation and according to the agreed procedures/rates	VDC, DAO
	Loss of agricultural production					
	Loss of yield due to permanent landtake (50.2 MT)	M	LT	SS	Compensation, agriculture intensification program and training etc.	VDC, DADO
	Health, water supply and sanitation					
	Stress on local health, water supply and sanitation due to influx of workforce	L	ST	L	Proper waste management. Additional water supply.	VDC, CBO
	Occupational Hazards and Safety					
	Accident risks while construction work	L	ST	SS	Sign Boards, safety training for workers, safety awareness programs• Provision of safety measures like helmets, gloves, dress, boots and safety belt, etc to the workers during working hours.	
	Restriction of Future Landuse Development					
	Trishuli 3B Hub substation is connected to different high voltage lines, so it restrict future land use development in the project area.	H	LT	L		
	Gender and Vulnerable Group					
	Work burden on women, child labour	L	ST	L	Ensure no children employed by projects, ensure suitable works for the women	VDC, CBO

	Potential Impacts	Magnitude	Duration	Extent	Mitigation Measures	
					Action	Agency to be Consulted
	Infrastructure and Service Facility					
	Pressure on the existing infrastructures due to influx of workers	L	ST	L	Health support program	CBO
	Impact on the Social and Cultural practices					
	Influence of outsider workforce on local way of life and traditional practices	L	ST	L	Awareness programmes, close camp for outsider workforce.	CBO
	Beneficial Impacts					
	Local employment. Contribution to local economy and national/reginal economy.	M	ST/MT	L/R	Priority to local people and local products/agency	
Operation Phase	**Physical Environment**					
	Topography					
	No impact					
	Landuse and landtake					
	No impact					
	Watershed and Drainage					
	No impact					
	Air and Noise quality					
	Corona effect				No mitigation	
	Water Quality					
	Leakage of oils from the transformers into water bodies	H	LT	L	Ensure special design structure like oil pit in detail design of substation and procurement of quality transformers.	

Potential Impacts	Magnitude	Duration	Extent	Mitigation Measures	
				Action	Agency to be Consulted
Biological Environment					
Bird					
Obstruction to the flying of birds	L	ST	L	Markers (colour balls) can be attached to Dead End Tower to improve the visibility for birds	
Socio-economic and Cultural Environment					
Loss of agricultural production					
Loss of yield due to permanent landtake	L	LT	SS	No mitigation required because compensation would be paid already during construction phase	
Occupational Hazards and Safety					
Safety risk	L	ST	L	Safety equipment. No entry for unauthorized person into the substation.	
House, settlement and social infrastructures					
Restriction of Future Landuse Development	M	ST	SS	Fencing, sign and other appropiate tools of public awareness will be adopted.	

Magnitude: H - High M - Medium L - Low

Duration ST- Short Term LT- Long Term

Extent L- Local SS- Site Specific

CHAPTER- IX
ENVIRONMENTAL MONITORING PLAN

This section discusses and outlines the environmental monitoring programs of the proposed Trishuli 3B Hub Substation Project. It also assists to ensure compliance with environmental laws and in ameliorating and eliminating adverse impacts. This chapter on monitoring is formulated in accordance with Environmental Protection Rules, 1997 and its amendments.

9.1 Requirements for Environmental Monitoring in Nepal

An Environmental Monitoring Plan will be required to define the responsibilities for the monitoring, the parameters that will be monitored, where the monitoring will take place and its frequency. Monitoring of socio-economic impact indicators should wherever possible be participatory, involving local groups assessing their own situations as part of the process. This will assist local communities raise their awareness about their situations and the chain of causality bringing about their situations of relative gain or loss.

The Project proponent will primarily be responsible for the implementation of monitoring program. The environmental monitoring will be carried out at all the project impact areas in a regular or intermittent schedule. Compliance monitoring will be carried out regularly whereas the impact monitoring will be done at the middle and at the end of construction phase or as prescribed in the monitoring plan and schedule. In general, observation, inspection, review of official records, interview, counting and/or measurements will be used for monitoring. Furthermore, scientific methods will be used for the monitoring requirements, where and whenever necessary.

9.2 Environmental Monitoring Unit

An Environmental Monitoring Unit (EMU) will be formed which will consist of experts from ESSD and other qualified personnel from the local market. EMU will be responsible for day-to-day Environment monitoring works. This Unit will consist of experts like

- Environmentalist
- Field staffs

This unit will have two principal functions. The first is to conduct community related mitigation measures on behalf of the project; while the second is the implementation of mitigation measures. The Unit will work in close co-ordination with the Project Manager and NEA-ESSD. The Unit, in addition of foreseeing mitigation and monitoring will also take care of the community problems arising during project construction. Furthermore, the Unit will use EMP as the guideline for implementing the mitigation specified in IEE and clauses in Tender Documents regarding environmental compliance. The co-ordination of the compliance monitoring and mitigation program allocated under the contractor will be the responsibility of the project proponent.

9.3 Environmental Monitoring Plan

A monitoring program required for the project to evaluate the application and effectiveness of mitigation measures is formulated in three phases.

i) Baseline Monitoring

The baseline monitoring will collect the field data regarding baseline conditions of the project area. Focus will be on the gathering of scientific and sociological information needed to verify and update the data provided by this IEE process.

ii) Compliance Monitoring

In this monitoring, the project proponent will oversees and ensures the implementation of the required mitigation measures according to GoN guidelines and approved mitigation plan. The Unit will be delegated the day-to-day responsibilities in this respect.

iii) Impact Monitoring

Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The monitoring of the proposed Hub substation will include:

a) Physical Environment

- Land use and stability
- Air, Water and Noise pollution

b) Biological Environment

- Indirect impact on surrounding forests
- Disturbances to wildlife and ecological settings

c) Socio-economic and Cultural Environment

- Employment and opportunity to locals
- Economic status of the affected people and relocated people
- Adaptation of resettlement households to their new homes and communities
- Public safety and security
- Health and sanitation
- Compensation

9.3.1 Grievance Redress Mechanism (GRM)

The GRM for any infrastructure project provides an effective approach for complaints and resolution of issues made by the affected community in a reliable way. Considering this, a Grievance Redress Cell (GRC) will be established at the project site. The cell will have representation from the project, local administration, civil society and the Project Affected Families. The GRC will look into complaints and concerns of local people, outsider labors and stakeholders.

Table 9.1: Monitoring Plan and Schedule

SN	Parameter	Indicators	Method	Location	Schedule
A	**Baseline Monitoring**				
	Physical Environment				
1	Land use and stability	Changes in land use pattern and stability/flood risk	Site observation	Substation site	Once during the construction phase and operation phase each
2	Air, water and noise pollution	Air and water quality, Noise level	Site observation, Sampling	,, ,,	Before and after rainy season prior to construction
	Biological Environment				
3	Demand of firewood and timber	Observation of Vegetation and maintenance of RoW	Discussions with Users Group, observation, local people and District Forest Office	Surround community forest	Once each during preconstruction and construction
4	Wildlife and avifauna	Wildlife habitat and	Observation,	Surrounding	Once each

		clearance	discussion with local people	area	during preconstruction and construction phase
	Socio-economic and Cultural Environment				
5	Settlement/infrastructure	Increae in settlements/infrastructure, migration	Discussion with local people, VDCs, observation	Manakamana VDC	Once each prior to construction and operation
6	Socio-economic/cultural baseline	Update socio-economic/cultural baseline	Discussion with local people, observation, review	Project affected areas	Once prior to construction
B	**Impact Monitoring**				
	Physical Environment				
1	Land use	Stability/ landuse changes from the baseline	Observation	Substation	Continuous observation during construction, annually during operation
2	Waste disposal	Unpleasant odour and visual impact	Observation	substation	Monthly during construction
3	Air Quality/water quality		observation	Project area	Monthly during construction
	Biological Environment				
4	Pressure on Forest	Forest Cover	Observation and survey of the forest area before and after construction, discussion with local people and FUGs.	Surrounding Community forests	Regular basis during construction and annually during operation
5	Wildlife	No, of wildlife seen	Observation, keeping records on wildlife, birds and reptiles killed	Surrounding areas	Regular basis during construction and annually during operation
Socio-economic and Cultural Environment					
6	Compensation	Socio-economic parameters like economic status, living conditions etc of the affected people.	Housing assets, living conditions, income etc.	Affected local people	Regularly for at least three years following land acquisition
7	Health issues	Types of Diseases and record of outbreak of diseases	Record of diseases, inspection of camps of camps	Project area and particularly camps	Continuous during construction period
8	Safety	No. of casualties	Records of accidents	Project area	Continuous during construction period/operation phase
9	Employment	No. of local people employed by project	Records kept by management	Project area	Continuous during construction period and annually during operation

10	Impact on Women/Children	Status of women children	Record of women employment; children education; Inspection on Child Labor	Project area	Continuous during construction period
11	Indirect economic benefits	Economic activities in the area	Trade and business revenues	Project affected VDC	Once a year during construction and once during operation
C	**Compliance Monitoring**				
1	Incorporation of IEE recommendations into project documents	Yes/No	Review/cross checking of tender and design documents	Kathmandu Office	During and after the project design stage completion of tender documents
2	Incorporation of Environmental considerations mentioned in the tender documents in the contractors proposed work plans	Yes/No	Review of proposed work plan submitted by the contractor	Kathmandu Office/site office	During contract negotiations
3	Integration of mitigation measures in the detail design and contract documents	Yes/No	Review process	Kathmandu office	During project approval
4	Allocation of adequate budget for the implementation of the environmental mitigation measures and monitoring works		Review, inquiry and consultation	Kathmandu office	During detail design and contract agreement
5	Land/property acquisition procedures	Compliance with national legal requirements	Discussions with local people	Affected VDC/site office	At the time of acquisition
6	Trainings and trainees	Number of trainings and trainees	Survey/observation	Project affected area/VDC	Periodic during construction and operation

9.4 Monitoring Cost

The monitoring costs have been estimated in Table 9.2. The total cost for the monitoring activities has been estimated as NRs.

Table 9.2: Environmental Monitoring Cost

S.N.	Particulars	Man month/Quantity	Rate in NRs	Total in NRs
1	**Manpower**			
	Environmentalist	18	143000	2574,000
	Field staffs	36	30,000	108,000
2	Logistics and transportation	Lumsum		2000,000
	Total			46,82,000

9.5 Agencies Responsible for Environmental Monitoring

The project proponent NEA will have the prime responsibility to carry out the monitoring activities. ESSD will be the organization responsible for pre-construction monitoring of the proposed project. The Trishuli 3B Hub Environmental Management Unit comprising the staff from ESSD. This Unit will work on behalf of the project. The Unit will be responsible for compliance and impact monitoring.

9.6 Summary of Cost Benefit Assessment

The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 7,12,08,386; which is 3.12% of the total project cost. The summary of environmental cost benefit analysis is shown in Table 9.3. The proponent has obligation to carry out the mitigation, enhancement and monitoring activities of the project.

Table 9.3: Environmental cost benefit analysis

SN	Description of cost	Amount (NRs.)
1	Cost for environmental mitigation measures	26,22,690
2	Cost for enhancement measures	22,91,000
3	Cost for other social support program and CSR cost	20,00,000
4	Cost for environmental monitoring	46,82,000
5	Land Compensation cost	5,96,12,696
	Total environmental cost including monitoring cost	**7,12,08,386**
	Total Project cost	US $ 23,991,190 (Rs.2,27,91,63,050)
	Percentage of total environmental cost to the total project cost	3.12%

CHAPTER-X
CONCLUSION

The environmental issues/impacts identified during the IEE study can be mitigated and manageable. The finding of IEE shows that the adverse impacts on physical, biological, socio economic and cultural environment due to the implementation of the proposed Trishuli 3B Hub Substation are mostly low, local and short term.

The total land requirement will be approximately 5.306 ha (104 ropani). The project requires 3.687 ha (72 ropani) of private land and 1.619 ha of government land. There will be no direct impact on biological environment of the project site since forest land and tree felling is not required for the project construction. In terms of the loss of land and assets, 28 households will be affected due to the implementation of the project.

Wherever possible, efforts have been made by the project planning team to limit adverse impacts on the environment by selecting environmentally benign design options and otherwise suggesting appropriate mitigation measures. Mitigation measures has been proposed for all identified/predicted adverse impacts and enhancement measures are developed for maximize the project benefits. However, those impacts/issues now not predicted/document in this IEE report but might appear later; will be also undertaken by Environmental Management Unit during the construction phase.

The proponent NEA will have obligation to carry out the mitigation, enhancement and monitoring activities of the project. The environmental impact mitigation measures will be incorporated in detail design of the substation and so on, contract documents.

The total environmental cost (mitigation, enhancement, CSR, and monitoring costs) of the proposed project is estimated to be NRs. 7,12,08,386; which is 3.12% of the total project cost. This cost also includes compensation (NRs. 5,96,12,696) to the private land acquired for the proposed substation. Based on experience of similar kind of other project and prevailing market rates, the cost has been estimated and supposed to be sufficient.

In overall, this IEE study concludes that the proposed Trishuli 3B Hub Substation shall not have significant impacts on physical, biological and socio-economic & cultural environment of the project area; hence the proposed project is environmentally and socially feasible. The IEE study is adequate and no further study is supposed to be required regarding environmental assessment of the proposed project.