



Government of Nepal
Ministry of Physical Infrastructure and Transport
DEPARTMENT OF ROADS
Singhadurbar, Kathmandu

Initial Environmental Examination
of
Narugad Bridge (Khodpe Bajhang Sadak)



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Acronyms and Abbreviations

3R	:	Reduce, Reuse and Recycle
AAPA	:	Aquatic Animal Protection Act
amsl	:	above mean sea level
CBO	:	Community Based Organization
CBS	:	Central Bureau of Statistics
CFUG	:	Community Forest User Group
DDC	:	District Development Committee
DFO	:	District Forest Office
DHM	:	Department of Hydrology and Meteorology
DHQ	:	District Headquarters
DoR	:	Department of Roads
EA	:	Environmental Assessment
EIA	:	Environmental Impact Assessment
EMAP	:	Environmental Monitoring Action Plan
EMP	:	Environment Management Plan
EPR	:	Environment Protection Rules
ERMC	:	Environment and Resource Management Consultant
ESMF	:	Environmental and Social Management Framework
FAR	:	Financial Administrative Regulations
FCB	:	Foreign Cooperation Branch
GESU	:	Geo-Environmental and Social Unit
GIS	:	Geographic Information System
GoN	:	Government of Nepal
HH	:	Household
IEE	:	Initial Environmental Examination
INGO	:	International Non-Governmental Organization
IPP	:	Indigenous Peoples Plan
IRSDT	:	Income Restoration and Skill Development Training
KII	:	Key Informant Interview
LCF	:	Local Consultative Forum
LCLA	:	Local Community Liaison Assistant
MoPE	:	Ministry of Population and Environment
MoPIT	:	Ministry of Physical Planning and Transport

MT	:	Metric ton
NDGES:		National Diesel Generator Emission Standard
NEPAP:		Nepal Environmental Policy and Action Plan
NGO	:	Non-Governmental Organization
ODF	:	Open Defecation Free
OP	:	Operational Policy
PAD	:	Project Appraisal Document
PAP	:	Project Affected Persons
PS	:	Provisional Sum
PWD	:	Public Works Directive
RSDP	:	Road Sector Development Project
SIL	:	Sector Investment Loans
SPSS	:	Statistical Package of Social Sciences
ToR	:	Terms of Reference

**नारुगढ खोला पुल
प्रारम्भिक वातावरणीय परिक्षण
कार्यकारी सारांश**

१.० प्रस्ताव

प्रस्तावित नारुगढ खोला पुल खोण्डपे - बभाङ सडक खण्ड अन्तर्गत रायल गाविस-२, बभाङ जिल्लामा पर्दछ । प्रस्तावित आयोजना क्षेत्र समुद्री सतहबाट ८७८ मी. मा पर्दछ । यस आयोजनाको प्रमुख उद्देश्य भूकम्पले क्षती गरेको हाल कायम नारुगढ पुललाई विस्थापन गरी नयाँ पक्की पुल निर्माण गर्ने रहेको छ । यस नारुगढ खोला पुल निर्माणको प्रस्तावकको नाम र ठेगाना निम्न अनुसार रहेको छ ।

भू-वातावरण तथा समाजिक शाखा,
सडक विभाग,
चाकुपाट, ललितपुर
फोन: ०१-५००५५२०

इमेल: नभकगलष्टरमयचानयखालउ
त्यसै गरी आयोजना कार्यान्वयन गर्ने निकायको नाम र ठेगाना यस प्रकार रहेको छ ।

सडक क्षेत्र विकास आयोजना,
सडक विभाग,
सानो गौचरन, काठमाडौं

२.० प्रस्तावकको विवरण

प्रस्तावित नारुगढ खोला पुलको कुल लम्बाई ३० मी.को हुनेछ भने यसको चौडाइ ७.२ मी. को हुनेछ । पक्की ढलान गरेर निर्माण गरिने उक्त पुलको दूया २८ मी. र बाँया ५० गरी कुल ८५ मी. सडक सुधार गर्नु पर्ने देखिन्छ । भौगर्भिक रुपमा २९°२७'५३.९९" उत्तर अक्षांश र ८०°५५'५८.५८" पूर्व देशान्तरमा अवस्थित उक्त आयोजना निर्माणका लागि कुल लागत रु. ५६,०५९,९०९.९९ रहेको छ ।

३.० प्रस्तावको सान्दर्भिकता

वातावरण संरक्षण नियमावलीको अनसूची-१ (नियम ३ सँग सम्बन्धित) को “ ई” सडक क्षेत्रको ४ नं. प्रावधान अनुसार कुनै पनि ठूला पुलहरु निर्माण गर्दा प्रारम्भिक वातावरणीय परिक्षण गर्नु पर्ने कानुनी प्रावधान रहेको छ । राष्ट्रिय पुल मापडण्ड २०६७ का अनुसार २५ मी. भन्दा बढी लामो स्पान भएका पुलहरु ठूला पुल भित्र पर्दछन् । प्रस्तावित नारुगढ खोला पुलको स्पान ३० मी. भएकाले उक्त पुल निर्माण गर्नु पूर्व त्यस पुलको प्रारम्भिक वातावरणीय परिक्षण तयार गरी भैतिक पूर्वाधार तथा यातायात मन्त्रालय मार्फत स्वीकृत गराउनु पर्ने कानुनी व्यावस्था रहेको छ ।

४.० प्रारम्भिक वातावरणीय परिक्षणको उद्देश्य

यस प्रारम्भिक वातावरणीय परिक्षणको मुख्य उद्देश्य प्रस्तावित आयोजनाको कार्यान्वयनबाट आयोजना क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक, साँस्कृतिक वातावरणमा पर्न सक्ने सकारात्मक तथा नकारात्मक प्रभावहरुको अध्ययन गरी सकारात्मक प्रभावहरुको बढोत्तरी तथा नकारात्मक प्रभावहरुलाई न्यूनीकरण गर्ने उपायहरु पहिल्याउनु हो ।

५.० विधि अध्ययन

यो अध्ययन प्रतिवेदन वातावरण संरक्षण नियमावली २०५४ दोस्रो संसोधनको प्रावधान अनुसार तथा यसै प्रस्तावको कार्यसूची ९.१.१.१ मा उल्लेख गरिए अनुसार तयार पारिएको हो ।

प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गर्ने क्रममा सान्दर्भिक ग्रन्थहरुको पुनरावलोकन गरी कभअयलमबचथ प्लायकबतप्यल सङ्कलन गरियो भने स्थलगत अध्ययन गरी उचबचथ प्लायकबतप्यल गर्ने कार्य गरियो । अयोजना सँग प्रत्यक्ष सरोकार राख्ने स्थानिय सरोकारवालाहरुबाट राय सुभाब पठाउन आवहान गर्दै मिति २०७३ साल कार्तिक २९ गतेको राजधानी राष्ट्रिय दैनिकमा सार्वजनिक सूचना प्रकाशित गरियो । साथै स्थलगत अध्ययनको क्रममा सो सार्वजनिक सूचनाको छाँया प्रति प्रभावित न.पा.को कार्यालय, आयोजना स्थल, आदीमा टाँस गरी प्रमाणित गरियो । स्थलगत अध्ययनकै क्रममा स्थानिय सरोकारवालाहरूसँग समूहगत छलफल गरियो । यसरी विभिन्न अध्ययनका चरणमा सङ्कलन गरिएका सूचना तथा तथ्याङ्कहरुलाई विश्लेषण गरी अयोजनाको वस्तुगत स्थिती, आयोजनाका सम्भावित असरहरु औल्याइ तथा उक्त असरहरु सकारात्मक भए वढावा दिने उपायहरु तथा नकारात्मक भए न्यूनिकरण गर्ने उपायहरु पहिचान गरियो र अन्तत वातावरणीय अनुगमन योजना समेत तयार गरी प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गरियो ।

६.० विद्यमान वातावरणीय अवस्था

प्रस्तावित नारुगढ खोला पुल सुदूरपश्चिमाञ्चल विकास क्षेत्र, सेती अञ्चल, रायल गाविस-२, बझाङ जिल्लाको खोण्डपे - बझाङ सडक भन्ने ठाँउलाई जोड्ने गरी प्रस्ताव गरिएको छ । उक्त पुल नारुगढ - सेती दोभान भन्दा ६० मी. माथी समुद्री सतहभन्दा ८७८ मी. उचाइमा रहेको छ । पुल निर्माण स्थल खेती योग्य जमिन तथा वनजंगल क्षेत्र नजिक अवस्थित रहेको छ । प्रस्तावित पुल देखि करिब १.४ किमि दायाँ तर्फ ठूलो पहिरोहरु गएको देख्न सकिन्छ । त्यस्तै सो पुल देखि करिब ४७० मि नदीको माथि एउटा ठूलो पहिरोहरु गएको देखिन्छ । नारुगढ खोलाको पुल बन्ने स्थान भन्दा माथि जलाधारको क्षेत्रफल १४.२८ वर्ग कि.मी. रहेको छ । आयोजना निर्माण गर्नका लागि पानीको १०० वर्षको उच्च बहाव १०४.२६ क्यूसेक लिइएको छ ।

प्रस्तावित आयोजना अन्तर्गत ३ रुखहरु, एउटा केरा र दुई वटा बर्काईनो पर्दछन् । साथै पुल जोड्ने बाटोमा रहेका विभिन्न प्रजातिका गुल्महरु पनि काटेर हटाउनुपर्छ ।

आयोजना क्षेत्र, बझाङ जिल्ला, रायल गा.वि.स. वडा नं. २ मा ६,३९५ जनसंख्या रहेको छ । जनसंख्याको आधारमा क्षेत्री जातीको बाहुल्यता रहेको रायल गा.वि.स. वडा नं. २ मा करिब ९०% घरधुरीहरुमा भने शैचालयको सुविधा छैन । अयोजना प्रभावित गा.वि.स.मा धाराको पानी अधिकांश घरहरुमा पुगेको पाइन्छ । उर्जाको सवालमा मुख्यतया खाना पकाउन दाउराको प्रयोग गर्ने गरिएको पाइन्छ, केवल ५ घरधुरीमा भने खाना पकाउन बायोग्यासको प्रयोग गरेको पाइन्छ । बत्ती बाल्न मुख्यतया सौर्य ऊर्जाको प्रयोग भएको पाइन्छ । अयोजना प्रभावित गा.वि.स.का ५१.४९% मानिसहरु साक्षर रहेका छन् ।

७.० वातावरणीय प्रभावहरु

आयोजना कार्यान्वयन हुदाँ आयोजना क्षेत्रको वातावरणमा सकारात्मक र नकारात्मक दुवै खाले प्रभाव हुने देखिन्छ । सकारात्मक प्रभावका कुरा गर्दा स्थानिय रोजगारीको सृजना, सिप प्रवाह तथा अभिवृद्धि, सहज तथा सुलभ यात्रा र बढ्दो सावरी चाप सँगै फराकिलो सडकका कारण हुने विना अवरोध यातायात सञ्चालन सकारात्मक विषयहरु हुन ।

नकारात्मक प्रभावहरूको सन्दर्भमा यस नारुगढ खोला पुल गाउँ क्षेत्रमा निर्माण गर्ने प्रस्ताव गरिएको हुनाले प्राकृतिक वातावरणमा पर्न सक्ने प्रभाव निकै न्यून रहेका छन् । आयोजना निर्माण अवधिमा भने उक्त क्षेत्रमा सावरी आवागमन व्यस्त हुने सम्भावना रहेको छ । आयोजना निर्माण गर्नाले ०.२३ हेक्टर जमिन स्थाई रूपमा आवश्यक पर्ने देखिन्छ । यसै गरी आयोजना निर्माण गर्दा एउटा बकाइनोको विरुवा र एउटा केराको बोट काट्नु पर्ने देखिन्छ । यसै गरी आयोजना निर्माण गर्नु पूर्व ६ कित्ता निजी जग्गा र ५ वटा निजी संरचनाहरू अधिग्रहण गर्नु पर्दछ, साथै विजुलीका खम्बाहरू र एउटा ट्रान्सफर्मर समेत स्थानान्तरण गर्नु पर्ने हुन्छ ।

८.० वातावरणीय प्रभाव न्युनिकरण तथा वातावरणीय व्यवस्थापन योजना

वातावरणीय प्रभाव न्युनिकरण गर्नका लागि यस प्रतिवेदनमा विभिन्न उपयहरू सुझाव गरिएको छ । जसमा प्रकृतिक प्रकोपको सम्भावना न्युनिकरण गर्न इन्जिनियरिङ तथा जैविक प्रविधिको प्रयोग गर्ने, ढुङ्गा माटोको उचित व्यवस्थापन गर्ने, आयोजना प्रभावित परिवारलाई उचित क्षतिपुर्ती प्रदान गर्ने, पेशागत सुरक्षाका उपायहरू प्रयोगमा ल्याउने, धार्मिक तथा साँस्कृतिक संरचनाहरूको जर्गेना गर्ने, लगाएतका उपाहरू यस प्रतिवेदनमा उल्लेख गरिएको छ ।

यसै गरी यस प्रतिवेदनमा वृक्ष रोपणको समेत प्रावधान राखिएको छ । जसमा ३० वटा विभिन्न जातका स्थानिय विरुवाहरू पुल निर्माण स्थल भन्दा तल र माथी गरेर खोलाको दुवै किनारामा रोप्ने । सडक निर्माणका क्रममा हुन सक्ने दुर्घटना कम गर्न संकेतहरू राख्ने, रातको समयमा बत्तीहरू बाल्ने व्यवस्था मिलाउने लगायतका उपायहरू प्रतिवेदनमा समावेश गरिएको छ ।

यसरी प्रस्तवित नारुगढ खोला पुल निर्माण गर्दा स्थानिय वातावरणमा पर्न सक्ने प्रतिकुल प्रभावहरू न्युनिकरण गर्ने, सकारात्मक प्रभावहरूलाई बढोत्तरी गर्ने र प्रतिवेदनमा उल्लेख गरिएका गतिविधिहरू निरिक्षण गर्ने प्रावधान सहित वातावरण व्यवस्थापन योजना समेत प्रतिवेदनमा उल्लेख छ । वातावरण व्यवस्थापन योजना कार्यान्वयन गर्नका लागि रु. १,६१०,१३०.०० विनियोजन गरिएको छ ।

९.० निष्कर्ष

प्रस्तावित पुल निर्माण पश्चात सवारीसाधनको आवातजावतमा सुधार हुनेछ । उक्त पुल आयोजना क्षेत्रका वासिन्दाहरूको पहुच विभिन्न सुविधाहरू जस्तै, शैक्षिक संस्था, स्वास्थ्य आदिमा सजिलो हुन्छ । उक्त पुल निर्माण गर्दा वातावरणमा कम मात्र नकारात्मक प्रभावहरू पर्ने देखिन्छ, सो प्रभावहरू न्युनिकरण गर्न उल्लेख गरिएको उपायहरू अवलम्बन गरेमा सजिलै समाधान गर्न सकिन्छ । पुल निर्माण गर्दा वातावरणमा पर्ने एक प्रमुख समस्या पहिरो रहेको र सो समस्या छिट्टै न्युनिकरण गर्नुपर्छ जसबाट भविष्यमा हुने दुर्घटनाबाट बच्न सकिन्छ । मुख्यतया पुल निर्माण गर्दा पर्ने समस्या स्थान विनिर्दिष्ट हुनाले तत्काल न्युनिकरण गर्न सकिन्छ । पुल निर्माण गर्दा केही नकारात्मक प्रभावहरू जस्तै सम्भावित दुर्घटना, वायु तथा जल प्रदुशण आदि हुन्छन् जसलाई तत्काल न्युनिकरण गर्न सकिदैन ।

Executive Summary

1.0 Proposal

Proposed Narugad Bridges lies in the Khodpe – Bajhang Road Section, at Rayal VDC-2, Bhajhang District. The project is 878 m amsl. The main objective of the proposal is to construct a concrete bridge to replace the existing earthquake damaged bridge. The name and address of the proponent of the proposed project is as follows:

Geo-Environmental and Social Unit,
Department of Roads,
Chakupat, Lalitpur
Phone: 01-5005520
Email: gesunit@dor.gov.np

Similarly, the name and address of the implementing agency is as follows:

Road Sector Development Project,
Department of Roads,
Sanogaucharan, Kathmandu

2.0 Details of the Proposal

The length of the proposed Narugad Khola Bridge is 30 m, while its width is 7.2 m. The construction of the Narugad Khola Bridge should even require the construction of additional 85 m (Right side-28 m and Left side- 50 m) approach road. The geographical location of the proposed bridge is 29°27'53.99" N latitude and 80°55'58.58" E longitudes. The estimated cost for the construction of the proposed bridge is NRs. 56,051,109.11.

3.0 Relevancy of the Proposal

As per Environment Protection Rules (EPR) 1997, construction of a major bridge requires an IEE and its subsequent approval from its concerned ministry, Schedule-1 (pertaining to rule 3) "D" Road Sector, Clause-4 of EPR). The Bridge Standard, 2010 defines the bridge with span greater than 25m as the major bridge. Since, the Narugad Khola Bridge has span greater than 25 m, an IEE report has to be prepared for it, which has to be approved by Ministry of Physical Infrastructure and Transport (MoPIT).

4.0 Objectives of IEE

The main objective of IEE is to identify beneficial and adverse impact upon the implementation of the proposed proposal and recommend the measures for the enhancement of beneficial impacts and mitigation measures for the adverse impacts.

5.0 Methods adopted for IEE study

This Initial Environmental Examination document has been prepared based on the mandate of EPR 1997 and the Terms of Reference for the IEE of this project.

The IEE study process started with the review of existing relevant literature and field based study where secondary and primary data were respectively collected. In order to collect the written comments and suggestion regarding the project implementation and its impact on the local environment a public notice was published in Rajdhani National Daily on 29th Kartik, 2073 B.S. and copies of the public notices were pasted on the notice board of project affected municipalities and around the project implementation area. Deeds of inquiry regarding the pasting of notice were also collected. Furthermore, public consultation with the local people were also organized to collect the local's view regarding the project development. Based on the collected primary and secondary information, likely environmental impacts due to project implementation were analyzed and suitable mitigation and enhancement measures were proposed. Finally, a IEE document was prepared with the incorporation of environmental monitoring plan.

6.0 Existing Environmental Condition

The proposed Narugad Khola Bridge is located in the Far-Western Development Region, Seti Zone, Bajhang District. The proposed location for the construction of the bridge connects Khodpe-Bajhang Road. The bridge location is 60 m upstream from Narugad – Seti Confluence and lies above 878 m from mean sea level. The proposed bridge location is characterized by agricultural and forested land. Several large landslides are observed on the right side at about 1.4 km. Similarly, there is a large landslide at about 470m upstream. The total catchment area of Narugad Khola, u/s from the bridge location is 14.28 km². The design discharge for the construction of the bridge is 104.26m³/s.

The project needs to clear only 3 numbers of trees namely Banana (1) and Bakaino (2). Likewise, some shrub species needs to be cleared during the construction of approach road.

The total population of Rayal VDC-2 of Bajhang District is 6,395. Chhetri is the dominant ethnic group in terms of population in the project affected VDC. About 90% of the household of Rayal VDC do not have toilet facility. Pipe line covers large fraction of households as the source of drinking water in the project affected VDC. Majority of households use firewood fuel for cooking. Only five of the households use Biogas as fuel for cooking purpose. Solar covers larger proportion of energy source for lighting. The literacy rate of Rayal VDC is 51.49%.

7.0 Environmental Impacts

There are both positive and negative impacts due to the implementation of the proposed project. Positive impacts include employment to the local people, skill enhancement, and improved mobility by the construction of wide bridge.

The construction of the proposed project will have very minimal environmental damage. The proposed 7.2 m wide bridge will facilitate the smooth movement of vehicles instead of narrow earthquake damaged bridge and will even help to minimize air pollution. However, during the construction period, the traffic flow along the road will be halted. The construction of bridge will require 0.23 ha of land permanently and clearing one Banana and two Bakaino plant. 5 private structures should be undertaken also electric poles and one transformer should be relocated.

8.0 Environmental Impact Mitigation and Environmental Management Plan

Suitable measures for the prevention of environmental impacts are recommended in the document. This includes the use of engineering and biological technique for the mitigation of landslide and associated disasters linked with slope excavation, quarry operation, and spoil management. Similarly, there is a separate provision for compensation, resettlement and rehabilitation for the project affected families, occupational health and safety instruments, improvement and conservation of religious and cultural sites, etc. in the IEE report.

Furthermore, the document also has the provision for tree plantation. Altogether 30 saplings of local trees have been proposed for the plantation. In order to avoid accidental risks around the construction site, this report recommends the installation of sign boards and lighting system.

In this way the report includes all possible measures for the enhancement of positive impacts and mitigation of adverse impacts. There is a separate chapter called Environment Management Plan which guides for the implementation of mitigation measures and monitoring provision for those mitigation measures. For the successful implementation of Environmental Management Plan NRs. 1,610,130.00 has been allocated.

9.0 Conclusion

The construction of bridge will improve the mobility due to the year round movement of vehicles. The people will have access to facilities such as educational institutions, health facilities, etc. In case of Narugad Khola Bridge, the environmental impact of bridge construction is low and easily mitigated through the mitigation measures proposed. One of the significant environmental issues during the construction of the approach road is slope instability and landslide which will require immediate mitigation measures to prevent the future hazards associated. Largely the impacts due to the construction of proposed bridge are site-specific in nature and can be mitigated immediately during the construction period without much environmental damage and reversible impact. There are several residual impacts like future accidental risk, development of settlement around the bridge area, air and noise pollution due to the movement of vehicles, etc. for which mitigation measures could not be proposed at this stage.

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CHAPTER - 1: NAME AND ADDRESS OF THE PROPONENT**1.1 Proponent**

The name and address of the institution preparing the Initial Environmental Examination (IEE) Report of Narugad Khola Bridge (Khodpe Bajhang Sadak) is as follows:

Geo-Environmental and Social Unit (GESU)

Department of Roads (DoR)

Ministry of Physical Infrastructure and Transport (MoPIT)

Chakupat, Lalitpur

Phone: 01-5005520

Email: gesunit@dor.gov.np

The name and address of the implementing agency for the proposed project is:

Road Sector Development Project (RSDP)

Foreign Cooperation Branch

Department of Roads (DoR)

Sanogaucharan, Kathmandu

1.2 Consultant

On behalf of RSDP, Kunhwa Engineering and Consultancy Co. Ltd., Korea in association in form of sub consultancy with Environment and Resource Management Consultant (ERMC) Pvt. Ltd. has prepared the Feasibility Report and Detail Design for construction of new bridges and maintenance of existing bridges (Contract No. RSDP/Cons/Bridge/01). Likewise, the consultant has prepared the Terms of Reference (ToR) for IEE as per task A 402 and the IEE Report of this Narugad Khola Bridge. The name and address of the consultants preparing the IEE report is as follows:

Kunhwa Engineering and Consultancy Co. Ltd.

Korea

and

Environment & Resource Management Consultant (ERMC) Pvt. Ltd.

Mid-Baneshwor, Kathmandu, Nepal

P. O. Box: 12419, Kathmandu

Tel.: 977-01-4483064, 4465863, Fax: 977-01-4479361

Email: safe@ermc.wlink.com.np, Web: www.ermcnepal.com

CHAPTER - 2: GENERAL INTRODUCTION OF THE PROPOSAL

2.1 Background

Road Sector Development Project (RSDP) is being implemented by Government of Nepal (GoN) with the grant assistance from the World Bank. The implementing agency for the Project is Department of Roads (DoR) under the Ministry of Physical Infrastructure and Transport (MoPIT). The project is being implemented with the overall objective of:

- 6% increase in the number of people with all season road access
- 35% decrease in travel time for target population
- Effective road services to users
- Effective and sustainable funding for Road Maintenance by Roads Board

RSDP has been upgrading about 700 Km of existing dry season roads to the seal pavement connecting 8-districts Head Quarters namely; Darchula, Baitadi, Dailekh, Kalikot, Bajhang, Jumla, Musikot, and Jajarkot including improvement of existing intermediate lane to double lane carriageway of Narayanghat-Muglin Road.

Apart from the above mentioned projects, RSDP is going to construct a new bridge along the Khodpe Bajhang Sadak, over the Narugad Khola. The Khodpe Bajhang Sadak connects Khodpe of Baitadi district with Chainpur, the Headquarter of Bajhang district.

The proposed Narugad Bridge is located in Rayal VDC-2 of Bajhang district. The bridge lies at the chainage 69+150 in Khodpe Bajhang Sadak section. The total length of the proposed bridge is 30m (1×30m) span and 7.2 m wide. The construction of the proposed bridge will facilitate the all season transportation along the Khodpe Bajhang Sadak and will link the people of Bajhang district with Terai region.

2.2 Objectives of IEE

The objectives of IEE are as follows:

- To document the baseline on bio-physical, socio-economic and cultural environment of the project area.
- Identify the major issues that may arise as a result of proposed works and their severity on bio-physical, socio-economic and cultural environment of the project area.
- Identify easily implementable offsetting measures for the negative environmental and social issues and suggest remedial plans in case of residual impacts if any identified.
- Implementation of site specific environmental mitigation and enhancement measures, and
- Environmental Monitoring Action Plan (EMAP) for the project.
- Inform decision makers about the outcome of implementation of the proposal.

2.3 Rationality of IEE

As per Environment Protection Rules (EPR) 1997, construction of a major bridge requires an IEE and its subsequent approval from its concerned ministry (वातावरण संरक्षण नियमावलीको अनुसूची-१ (नियम ३ सँग सम्बन्धित) को “ई” सडक क्षेत्रको ४ नं. प्रावधान, Schedule-1 (pertaining to rule 3) “D” Road Sector, Clause-4 of EPR). National Bridge Standard 2010 classifies a bridge as a major bridge when its span is more than 25 m long or the total length of the bridge is more than 50 m. The span of the proposed bridge is

about 30 m and hence, the proposed construction work requires IEE. Therefore, this IEE is prepared in accordance with the Rule-5 and Schedule-5 of EPR'97.

2.4 Relevancy of the Proposal

The construction of bridge over Narugad River is very essential for the all season transportation of vehicles to Bajhang district. At present there is no any crossing structure over the Narugad River and the transportation facility remains disturbed during the rainy season. Due to this people around Bajhang district remain detached from the basic social services and facilities. The construction of 7.2m wide concrete bridge over the Narugad River will even help to facilitate the smooth movement of vehicles through the bridge and will even enhance livelihood of the local people through the improved social and economic facilities.

CHAPTER - 3: PROJECT DESCRIPTION

3.1 Project Area

The proposed Narugad Khola Bridge is located at the Rayal VDC-2 of Bajhang district, Seti Zone in the Far-western Development Region. The geographical position of the proposed bridge is $80^{\circ}55'58.58''\text{E}$ and $29^{\circ}27'53.99''\text{N}$, and its elevation from the mean sea level is 878m. The proposed location for the construction of Narugad Khola Bridge is at a distance of about 60m upstream from the Narugad-Seti confluence.

The land use around the proposed bridge location is characterized by the presence of agricultural land and forested area. Several scars of large scale landslides are also observed on the right side of the Narugad Khola at about a distance of 1.4Km along the highway. Similarly, there is a large landslide at about 470m upstream from the proposed location for the construction of Narugad Khola Bridge.

The location of the proposed Narugad Khola Bridge is presented in the following maps:

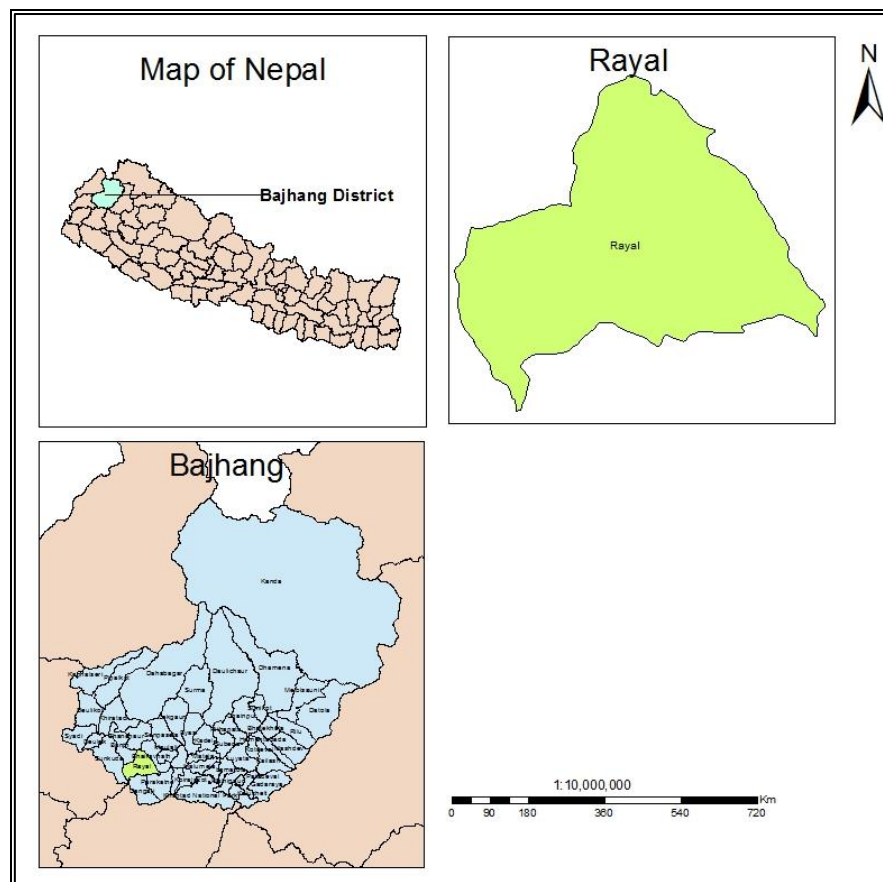


Figure 3.1: Location map of the proposed Narugad Khola Bridge

Source: GIS 10.3

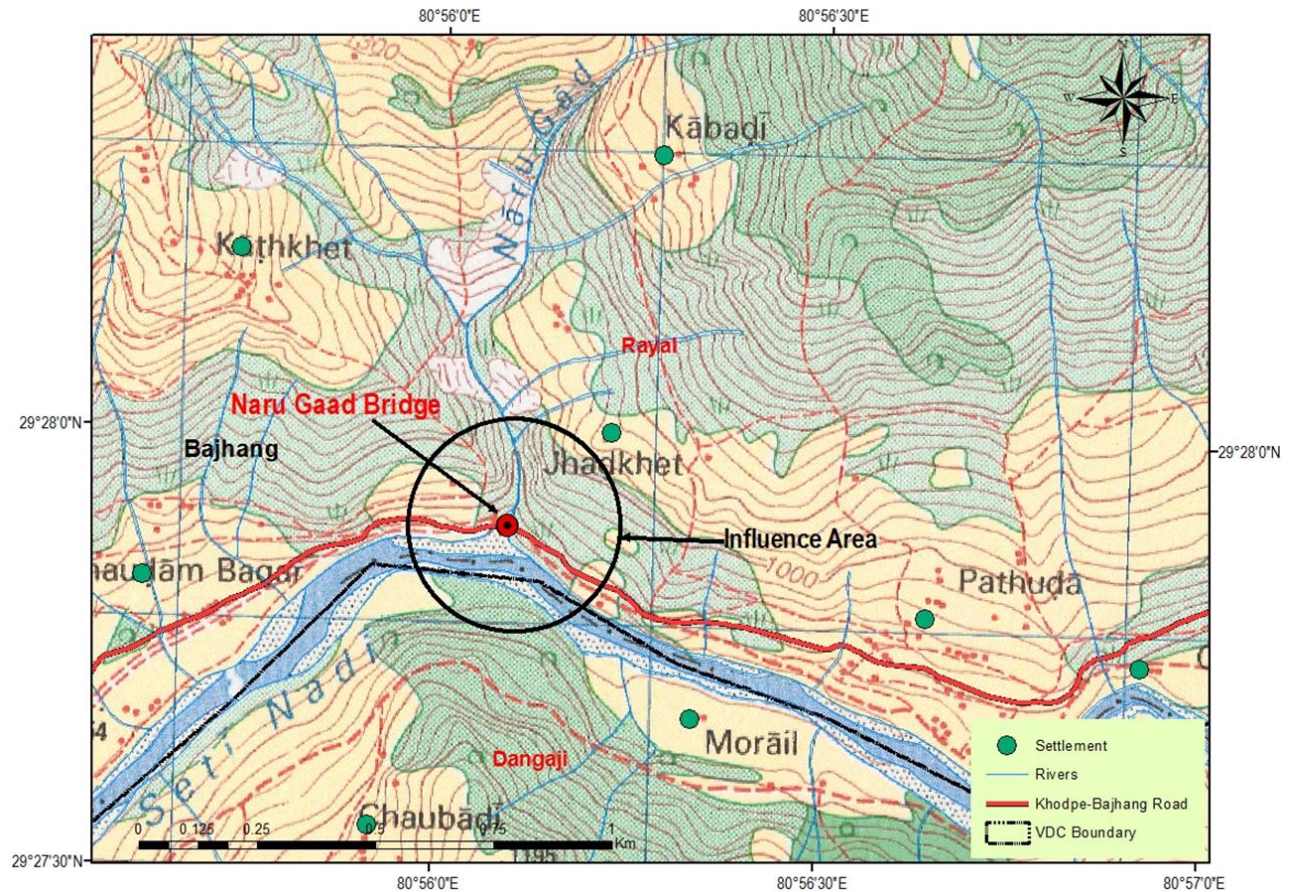


Figure 3.2: Location of Proposed Narugad Khola Bridge in topographical map

(Source :- GIS 10.3 on the Topographical maps, Department of Survey)

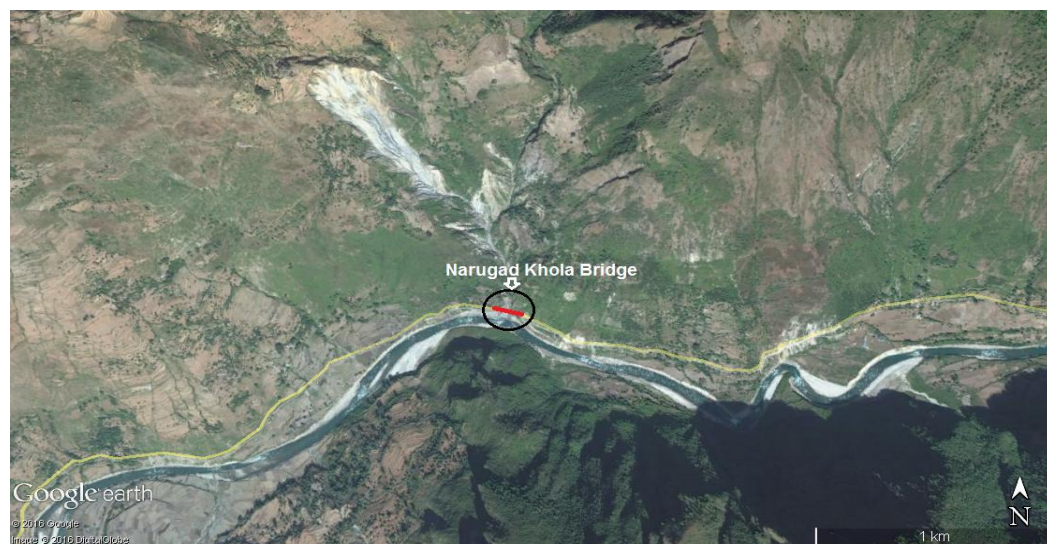


Figure 3.3: Location of proposed Narugad Khola Bridge in Google Earth Image

Source: Google Earth

3.2 Salient Features

The salient feature of the proposed bridge is presented in Table 3.1.

Table 3.1: Salient Features of Narugad Khola Bridge.

Name of the Project	Narugad Khola Bridge (Khodpe Bajhang Sadak)
Location	
Development Region	Far-western Development Region
Zone	Seti
District	Bajhang
Village/Town	Royal V.D.C-2, Bajhang
Name of the Road	Khodpe Bajhang Sadak
Chainage of the Bridge Site	69+150
Geographic Location	80°55'58.58" E 29°27'53.99" N
Classification of Road	District Road
Type of Road Surface	Earthen
Terrain/Geology	Mountainous
Structure	
Total Length of Bridge	30 m
Number of Span	1*30 m
Width of the Bridge	7.2 m
Width of Carriageway	6.0 m
Width of footpath with Railing	0.60
Type of Structure	Simply Supported
Type of Superstructure	Prestressed
Type of Bearing	Pot Bearing
Type of Abutment	RCC (Gravity Type)
Type of foundation	Open Foundation
Approach Road	85 m (Right side-28 m and Left side- 50 m)
RoW	50 m
No. of Vehicles on Bridges after construction	50-60 vehicles daily
Design Data	
Live Load	IRC Class 'A', IRC class AA tracked
Net bearing capacity of Soil	150 to 250kN/m ² as per visual inspection (IS:1904-1961)

Catchment Area	14.28 km ²
Design Discharge	104.26m ³ /s
Scour Depth	Abutment 4.61 m from HFL
Highest Flood Level	1008.59m
Lowest Bed Level	1005.20m
Concrete grade	M25-Abutment, M30 Pile, M40-Girder & slab M 20-Approach slab, railing post
Reinforcement Bars	Fe 500 (Tor Steel)
Approach Slab	RCC (3.5m)
River Training Works	Boulder/Gabion Walls/Earthen Embankment
Summary of quantities of concrete	
Grade and quantity of concrete:	
In superstructure:	M45, 185.38 m ³ M35, 65.34 m ³ M25, 28.09 m ³
In substructure:	M25, 379.02 m ³ M35, 1.56 m ³
In foundation:	M25, 473.80 m ³
Grade and quantity of reinforced steel	
In superstructure:	Fe 500, 28.70 + 1.21 mt
In substructure:	Fe 500, 39.35 mt
In foundation:	Fe 500, 27.01 mt
Summary of Cost (NRs.)	
Environmental monitoring cost	980,000.00
Physical Impact mitigating cost	615,000.00
EMP implementation cost	1,610,130.00
Total Cost of Bridge	56,051,109.11
Cost per running meter	1,868,370.30

(Source: Design Report of Narugad Khola Bridge, 2016)

3.3 Details of Project Requirements

3.3.1 Land Requirement

The construction of Narugad Khola Bridge and approach road on either side of the bridge requires about 0.23 ha of land belonging to various land use categories. The land use within the construction area mainly comprises of river bank, river channel, barren land, agricultural land etc.

Table 3.2: Project Land Requirement.

Project Component	Private		Government		Total (ha)
	Temporary	Permanent	Temporary	Permanent	
Approach Road and Bridge axis and river training	0	0.12	0	0.11	0.23
Construction Yard and Stockpiling Area	0	0	0.04	0.0	0.04
Construction Camp	0	0	0.12	0.0	0.12
Spoil Disposal			0.05	0.00	0.05
Total	0	0.12	0.21	0.11	0.44

Source: RAP, 2016

3.3.2 Source of Construction Materials

The construction materials such as gravel, sand, boulders, cobbles and pebbles can be available along the flood plain of Seti River within 2km distance from the proposed bridge location. Some materials can be extracted from the hill slope around the Narugad Khola. The other construction materials such as cement, rods will be transported from the district headquarter Chainpur.

3.3.3 Source of Energy during Construction

The project area is not connected with grid electricity supply and should completely rely on alternative sources. Electricity requirement during the construction phase shall be maintained by operating generators while the labor camp shall be lighted with solar lamp. The construction camp shall be supplied with LPG so that the possible forest destruction can be prevented.

3.3.4 Labor Camp and Material Stockpiling Site

The barren located about 200m at the upstream of Narugad Khola from the proposed bridge location will be used as the Labor camp. The labor camp and the material stockpiling site will be located adjacent to each other. The proposed land is under the government ownership. Stockpiling on particular site will not affect the smooth movement of vehicles. The labor camp will be provided with separate drinking water facility, toilet facility, etc.

3.3.5 Spoil Management Site

A total of 2500 m³ of earthen materials shall be excavated from the construction of bridge and its approach road. About 1200 m³ of materials shall be used for backfilling and gabion works, while rest of the materials shall be safely disposed in the recommended spoil disposal site. For the disposal of the spoil, it is recommended to build the 200m X 20m X 3m wall along the Seti River at the left bank of Narugad Khola about 50m from the proposed bridge location and use it as the spoil disposal site. This will safely dispose the spoil generated and also have benefit of embankment.

3.3.6 Approach Road

The project requires the construction of 85 m approach road (Right side- 28 m and Left side- 50 m). Since, there is existing road; the type of approach road construction is more upgrading (widening) type.

3.3.7 Construction activities and scheduling

- **Construction technology**

The construction of proposed bridge will be conventional mechanized methods with partially labour based.

- **Construction Activities**

Activities during construction includes civil works and river training works including excavation, use of heavy machinery and equipment, drilling, quarrying, burrowing, use of construction vehicles. The equipment like Truck, Grader, Pump, Vibrator roller, Roller, Water Bowser, Loader, Boiler, Sprayer, Air compressor, Hand sprayer, Aggregate spreader, Pneumatic Tyre, Mixer, Vibrator/Compactor, Generator, Bitumen distributor, Chip spreader, Tractor and 10-15 ton Crane will be used during construction period.

- **Construction scheduling**

The project is planned to be constructed within 18 months after the contract award. The construction works will be halted during monsoon season (June to August).

- **Human Resource Requirements**

The construction of the proposed bridge requires an estimated, 15120 man-days of unskilled workforce, and 9180 man-days of skilled and semi-skilled workforce. The project will prioritize the local people in proposed bridge construction works.

3.3.8 Resources required during operation

The activities during project operation will be only regular monitoring of the bridge and regular and routine maintenance. While conducting regular maintenance no additional resource are required. However, in case of major maintenance resources required will be based on the activities to be conducted. During maintenance environmental safeguard measures have to be conducted.

3.3.9 Institution Involved in Project Implementation

The RSDP within Nepal's Department of Roads (DOR) under the Ministry of Physical Infrastructure and Transport (MoPIT) is the implementing agency for the proposed sub-project. DoR's Foreign Cooperation Branch (FCB) will be responsible for conducting all the implementing arrangement for the proposed sub-project. DOR's bridge branch will be responsible overseeing the technical design standards, norms, and safeguards applied to the project. The proposed sub-project will be implemented with IDA support using RSDP funding.

All safeguards related aspects of the project will be identical to the on-going RSDP project. The environmental and social aspects of bridges under the Bridge Project Unit are handled by the centralized Geo-environmental and Social Unit (GESU) of the DOR. The Bridge Project Unit coordinates with the GESU for environmental screening of the projects and outsourcing of the consultants for environmental assessment. GESU is the primary agency of the DOR for the environmental and social review of their projects including bridge projects and is the frontline agency to review EA assessments and forward the EA documents for approval to the Ministry of Physical Infrastructure and Transport (MoPIT). Responsibility for implementing the Environmental Management Plan of Narugad Khola Bridge involves a number of concerned agencies inclusively. The implementing agency for environmental safeguard of the proposed sub-project includes;

- Foreign Cooperation Branch, DoR
- Geo-environmental and Social Unit (GESU)
- Project in Charge
- World Bank
- Supervising Consultant-Environmental Safeguard Consultant
- Contractor

These stakeholders have their own roles and responsibilities for the activities associated including the design and implementation of mitigation measures during pre-construction, during construction and post construction works.

3.3.10 Maintenance approach

In the case of maintenance, persons assigned to Khodpe Bajhang Sadak will handle routine maintenance tasks such as clearing debris, and undertaking repairs that can be handled with basic hand tools. For more extensive maintenance requirements, DOR divisional offices will prepare status report of the bridges to undergo maintenance and the maintenance works will undergo through funding from the Roads Board Nepal, the national budget or funding from international donor agencies.

3.3.11 Possible emission and waste generation during construction

Different type of wastes and pollutants are assumed to be produced during the construction phase of the project. Different natures of wastes produced during the construction phase are;

Solid Wastes: Solid wastes are produced mainly during the excavation, surplus materials used during construction and camp operation. These wastes will be managed in an environment friendly manner in designated site and will be managed immediately. Steel and other metal wastes will be assembled at designated site. The solid wastes or spoils from the construction work are expected to be minimal; however, they will be managed promptly after the generation of the solid waste.

Liquid and Semi-liquid Wastes: Excavation works, slurry and, oil and grease used during the construction phase can cause water pollution. Project will conduct the activities to safely manage the liquid and semi-liquid wastes.

Air Pollution: During the excavation process, dust and soil particles can enter the atmosphere causing air pollution likewise, fuel combustion from vehicles and equipment can also degrade the air quality. Gaseous Pollutants like NO_x, SO_x, CO₂, CO and PM etc., will be produced while operation of dozers, transporting vehicles and diesel generators. Likewise dusts are assumed to be produced during transporting of cements and sands.

Noise Pollution: Operation of diesel generators, excavators, dozers and other construction activities may increase the noise level.

CHAPTER - 4: PROCEDURES ADOPTED WHILE PREPARING THE REPORT

The methodology and procedures adopted during the preparation of IEE report is discussed below:

4.1 Desk Study and Literature Review

Various information and useful data from reliable sources related with the project's IEE study were collected and reviewed. Such sources of information included existing laws, rules, guidelines and manuals, IEE reports of similar projects, Environment and Social Management framework published by DoR, GESU. Detailed Engineering Survey and Design Report of the Narugad Khola Bridge Project were reviewed to determine the nature and scope of activities of the project. Similarly, pertinent sources of secondary information were identified, collected and reviewed to build acquaintance with the environmental settings of the project area under physical, biological, socio-economic, and cultural domains of the environment. These sources included publications of DDC Bajhang, Village Development Committee, CBS, NGOs, INGOs, CBOs and other governmental and non-governmental organizations and various research papers. Data on rainfall and other meteorological conditions were also acquired from DHM.

Map Reading: Map reading is one of the vital procedures as it built the preliminary acquaintance with the general environmental setting of the project area by reading the maps of different types like topographical maps, geological maps and Google maps. Similarly, geographical boundary of the impact area was defined and delineated on the topographical map.

Checklists and Questionnaire: Based on the desk study, project specific checklists were prepared for focus group discussion, key informant survey and data collection on physical, biological, social, economic and cultural baseline data of the project area. Similarly, structured questionnaire were prepared to aid collection of socio-economic data and other relevant information.

4.2 Field Survey

Field survey was carried out by the team of multidisciplinary experts (IEE study team) to collect the baseline information on physical, biological, and socioeconomic and cultural environment. Likewise, the data related to land stability, site specific observation of air and noise quality and physiographic condition of the project area was collected through field survey. Laboratory analysis of the water collected was also carried out. Similarly, the data on biological environment was collected through the sampling technique. Household's survey using questionnaire and checklists was done to gather the information on socio-economic and cultural environment of the project impact areas. Moreover, interactions and consulting meetings with the people of project impact area was also conducted during the field visits.

4.3 Impact Area Delineation

The project impact areas were identified during the preparation of IEE. Such areas were delineated based on the field conditions and nature of project development using the similar past experiences of the experts involved in the IEE process. Based on the environmental impacts of the project, the project-affected areas are classified as the following Table 4.1.

Table 4.1: Impact Area Delineation of the Project

Direct Impact Zone	Project implementation site, the adjacent land plots, built up structures, houses and property within 500 m from the center of the proposed bridge.
Indirect Impact Zone	Beyond 500 m away within the adjoining wards of the project implementation site.
Zone of Influence	Influence area will encompass the proposed bridge location as well as off-site and/or ancillary works such as burrow pits, quarry sites, river diversion, approach road, camp site, material stockpiling yard and also includes direct and indirect impact area of the project and project implementation VDCs i.e., Royal VDC

4.4 Collection of Environmental Baseline Data/ Information

The following table presents a synopsis for the baseline information that were collected and the methods that were adopted for the collection of such baseline information of the project area.

Table 4.2: Methods to collect the baseline data

Data Collected	Methods/ Tools used
• Physical Environment	
Physiography, Topography, Land use type and land use classification,	GIS10.3 analysis on the topographical maps published from the Department of Survey, Google image.
Hydrology - drainage network and drainage density	GIS (QGIS Brighton 2.6.1) analysis on the topographical maps published from the Department of Survey, Google image.
Geology – rock types and rock classification, seismicity, stability	Field Investigation / Direct Observation, Analysis of geological map as published by Department of Mine and Geology.
Soil Type and soil condition	Field observation, soil analysis
Sound / Noise conditions	Field observation, available secondary information
Weather and Climate conditions – Temperature, precipitation, climatic and bio-climatic classifications	Secondary information from Department of Hydrology and Meteorology (DHM), other published literatures.
Type, volume and source of construction material requirement	Secondary information from design engineers, feasibility / detail design reports
Information on burrow sites / tipping sites / stockpiling sites, camp sites etc.	Field observation / Interaction with design engineers, local stakeholders.
Traffic conditions	Observation, information from the stakeholders, traffic data from feasibility report
Information on public utilities	Field observation/Interaction with local stakeholders
Chemical Environment	
Air Quality	Field Observation and available secondary information
Water Quality	Visual inspection of water around project area
Biological Environment	
Vegetation analysis	Field enumeration / survey
Faunal Environment	Key Informant Interview (KII)

Data Collected	Methods/ Tools used
Aquatic Animals	Field Sampling of Macro-invertebrates/ Macrophytes, Visual Observation/ Key informant Survey, past literatures for Fishes
<i>Socio-economic and Cultural Environment</i>	
Demographic, Economic, and social services and facilities	Secondary Information from CBS, District Development Committee (DDC), and Primary information of the projects direct impact area and indirect impact area were collected through Questionnaire survey
Cultural sites and cultural activities, historical sites, foot trails etc.	Key informant survey, Observation of cultural and historical sites.

4.5 Data Analysis

The experts of the relevant field analyzed the primary and secondary information qualitatively and quantitatively. Physical, chemical, biological, socio-economic, and cultural information were assembled and tabulated. The information were crosschecked and analyzed by the respective experts. The data were processed using computer-based spreadsheet (Excel) and SPSS and were presented in tabular and pictorial forms.

4.6 Impact Identification/ Prediction and Evaluation

The environmental impacts as a result of interaction between project activities and baseline condition were identified in terms of beneficial and adverse impacts, type (direct/indirect/cumulative), and magnitude of severity, extent, duration and reversibility/irreversibility during project construction as well as in operation stage works. The methods adopted to identify the impacts were through checklist, matrix, network or overlaying methods by using GIS software application.

The environmental impacts were evaluated as per the National EIA Guidelines (1993), based on the magnitude, extent and duration of the impact. Similarly, experts' judgment and experience from similar projects were used for the quantification of the impacts. For the impact evaluation, the matrix method with numerical ranking was used for the quantitative ranking of the predicted impacts. The numerical scale mentioned in the National EIA Guidelines (1993) was adopted for this study.

4.7 Public Involvement

The local people in project area, concerned government organizations, local NGOs, CBOs, etc. were consulted during IEE study. In accordance with the Rule (7.1) of Environment Protection Rules, 1997, a 15-day public notice was published in a national daily newspaper, Rajdhani on 29th Kartik, 2073 B.S. Furthermore, the copies of public notice were pasted at public places of project area and their evidences (Muchulka) were collected.

Local people and stakeholders were involved during various phases of study process through activities like public consultations, meetings, interactions, and discussions. These activities were employed to collect information on various environmental factors and local peoples issues and concerns regarding the project.

Public Consultation: The IEE team carried out a consultation meeting on 3rd Mangsir, 2073 B.S. at Rayal VDC-2, Bajhang. Additionally, several interactions were conducted with the local people and concerned stakeholders during field visits. The consultation and interactions were focused on the

environmental sensitivity and concerns in and around the project area, environmental features and their status, likely environmental impacts due to project implementation and possible mitigation measures.

Information Disclosure: Approved IEE reports will be sent to Rayal VDC-2, Bajhang DDC office desk for stakeholders references. The copies will be made available in Ministry of Physical Infrastructures and Transport (MoPIT), Road Sector Development Project (RSDP) office, Office of Geo-environmental and Social Unit of Department of Roads, World Bank Nepal office and electronic copy will be made available in RSDP official website for public disclosure.

Table 4-3: Summary of Public Consultation Meetings

Date	Venue	Address	Participants (Male, Female)	Issues and suggestion of local people during public consultation
3 rd Mangsir, 2073	Rayal VDC-2, Bajhang	Rayal VDC	10	• Informed and consulted with regard to the project design • Employment opportunity for local people • Compensation of Structures and land • Fair and timely compensation rate • Completion of project in time

The following organizations were consulted during the preparation of the draft IEE:

Central Level Agency: Ministry of Physical Infrastructure and Transport, Department of Roads (DoR), Road Sector Development Project (RSDP), Geo-environmental and Social unit (GESU).

Local Level Agency: Village Development Committee, Non-governmental Organizations, Community Based Organization, etc.

Recommendation Letters: The recommendation letters from project affected VDCs were collected for the environmental clearance and implementation of the project.

CHAPTER - 5: REVIEW OF RELEVANT ACTS, RULES, REGULATIONS AND GUIDELINES

Relevant legal measures including the constitution, acts and regulations, policies and plans, manuals and guidelines, standards and conventions were reviewed during the course of IEE study. Such relevant legal measures are listed in the following sub-sections.

5.1 Constitution of Nepal

Article 30 of the Constitution of Nepal, 2072 proclaims the rights regarding clean environment. Article 30 (1) states that each person shall have the right to live in a healthy and clean environment. Likewise 30(2) states that the victim of environmental pollution and degradation shall have the right to be compensated by the pollutant as provided for by law. Article 30 (3) ensures that any article of the constitution shall not be deemed to obstruct the making of required legal provisions to strike a balance between environment and development for the use of national development works. Acts and Regulations

5.2 Policies and Plans

5.2.1 Policy on Land Acquisition, Resettlement and Rehabilitation for the Infrastructure Development Projects, 2071 (2015 AD)

The government has introduced Land Acquisition, Resettlement and Rehabilitation Policy, paving the way for developers of various physical infrastructure projects to acquire land without affecting livelihood of people who have to be relocated from the area where such projects will be built. The policy, which calls for creation of a scientific standard for land valuation and extension of compensation equivalent to minimum market value of land, is expected to facilitate developers to implement projects, like hydro, roads and transmission lines, on time. This will reduce chances of significant cost overrun, which inflates project cost. Also, a provision in the policy that allows the government to take action against those who try to disrupt land acquisition process or create hurdles for project developers that have acquired land by following the due process is expected to help project developers in completing the projects on time. The policy has tried to address these complex issues of resettlement and rehabilitation so that the country can achieve its development goals without causing adverse impact on living standard of the people who are displaced or affected by the projects.

In this regard, the policy has stressed on the need to first assess economic and social impact of the development project. Based on this, projects will be categorized as high-, medium- and low-risk. High-risk projects refer to those which displace 50 or more households in the mountainous region, 75 or more households in the hilly region and 100 or more households in the Terai. Medium-risk projects, on the other hand, are those that force relocation of less than 50 households in the mountainous region, less than 75 households in the hilly region and less than 100 households in the Terai. Likewise, low-risk projects refer to those which cause productive property to shrink by up to 10 per cent.

Upon evaluation of these impacts, a strategy on land acquisition and compensation must be framed for low-risk projects. But in the case of high- and medium-risk projects, a detailed resettlement and rehabilitation plan must be designed. Also, families should be entitled to compensation if works like installation of transmission, telephone and underground drinking water pipe lines affect livelihood.

And in case the projects affect yields of registered commercial crop, fruit or flower producers, compensation equivalent to five years of revenue must be given in cash. All expenses related to land acquisition, compensation and implementation of resettlement and rehabilitation plans should be considered as project cost, according to the policy. Also, interest should be paid on compensation amount depending on the days it took to release funds to those affected by the project. The interest calculation begins from the day a formal decision was taken to operate the project, says the policy. The compensation amount for those affected by the project will be fixed by a five-member compensation committee formed under chief district officer. The committee can form a technical team to determine the compensation amount. This team should derive the compensation amount by working closely with members of families that are likely to be displaced. The policy says that “Once the compensation amount is fixed by the committee, it cannot be reviewed,” says the policy. Those not satisfied with land acquisition, resettlement and rehabilitation processes can lodge complaints at a body formed at the project office and complaint hearing offices at district and regional levels.

5.2.2 National Transport Policy 2058 BS (2001 AD)

The principal objective of the National Transport Policy is to develop a reliable, cost effective, safe facility oriented and sustainable transport system that promotes and sustains the economic, social, cultural and tourism development of Nepal as a whole. The policy states special attention shall be given to improving 'the comfort, reliability, safety, frequency, availability and affordability of public transport and to reducing harmful emissions arising from public transport operations among others. The policy also insists that the construction, improvement and management of the means of transport shall be done in harmony with the traffic safety and environmental effect.

5.2.3 Nepal Environmental Policy and Action Plan, 2049 BS (1993 AD)

Nepal Environmental Policy and Action Plan (NEPAP) have been prepared as a part of Government of Nepal's continuing effort to incorporate environmental concerns into the countries development process. The policy focuses on mitigating the environmental impacts due to urbanization, industrialization and infrastructural development. The policy further states that roads, irrigation, hydroelectric and other infrastructures project have the potential for imposing significant environmental cost if they are not designed and properly implemented. The policy also focuses that the greater involvement of the local people is a prerequisite for improving design and implementation.

5.2.4 Three Years Interim Plan 2070/71-2072/73 (2013/14-2015/16)

The plan identified the importance of road sector in promoting national unification, socio-economic development and regional balance contributing to overall development of the country. It has identified the importance of road network in promoting the access to service facilities like education, health and market, industry, tourism, hydropower development and so on. The plan focuses on upgrading and maintenance of existing roads and rendering them all weather as well as extension of the road network to places without road connection.

5.2.5 DoR Bridge Policy and Strategy, 2004

The DoR Bridge Policy emphasizes on safety, reliability and cost-effectiveness of the transport facilities. The policy has the strategies of strengthening the existing institutional capacity, establishing economic and financial norms, institutionalizing bridge maintenance and emergency works, incorporating environmental and social aspects in the management of bridges, establishing

project management cycles, technical support and standardizing bridge definitions with other organization.

5.2.6 Twenty Year Road Plan, 2059 –2079 (2002-2022)

The Government of Nepal (GoN) has formulated a 20 Year Road Plan. One of the main objectives of the Plan is the development of Strategic Road Networks (SRN). The implementing strategies of the Plan include all weather road connection to the District Headquarters (DHQ) and provision of road linkages from the DHQ to the adjacent road network of the neighboring districts and countries. The strategy adopted by the 20 Year Road Plan is aligned with the priorities set out in the Tenth Five Year Plan (2002-2007) as that plan gives priority to constructing feeder and strategic roads connecting North to South.

5.2.7 World Bank Policy on Environmental and Social Safeguard

The World Bank Operational Policy OP. 4.01: Environmental Assessment

World Bank requires environmental assessment (EA) of projects that are proposed financing from World Bank to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA evaluates a project's potential environmental risks and impacts in its area of influence, examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property), and Trans boundary and global environmental aspects.⁴ EA considers natural and social aspects in an integrated way.

The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The proposed sub-project (ie., construction of Narugad Khola Bridge) falls within Category project. As per World Bank Operational Policies a proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

For sector investment loans (SILs), during the preparation of each proposed subproject, the project coordinating entity or implementing institution carries out appropriate EA according to country requirements and the requirements of this policy. The Bank appraises and, if necessary, includes in the SIL components to strengthen, the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project implementation. If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A subprojects and, as appropriate, Category B subprojects—including any EA reports—are subject to prior review and approval by the Bank.

The World Bank Operational Policy (OP. 4.04): Natural Habitats

As per OP. 4.04, World Bank supports for the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats. Wherever feasible, Bank-financed projects are sited on lands already converted (excluding any lands that in the Bank's opinion were converted in anticipation of the project). The Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. If the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project includes mitigation measures acceptable to the Bank. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g., strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically similar protected area. The Bank accepts other forms of mitigation measures only when they are technically justified.

World Bank Operational Policy (OP 4.36): Forest

World Bank Operational Policy 4.36 aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development. Combating deforestation and promoting sustainable forest conservation and management have been high on the international agenda for two decades. However, little has been achieved so far and the world's forests and forest dependent people continue to experience unacceptably high rates of forest loss and degradation. The Bank have proposed revised approach to forestry issues, in recognition of the fact that forests play an increasingly important role in poverty alleviation, economic development, and for providing local as well as global environmental services. Success in establishing sustainable forest conservation and management practices depends not only on changing the behavior of all critical stakeholders, but also on a wide range of partnerships to accomplish what no country, government agency, donor, or interest group can do alone. Where forest restoration and plantation development are necessary, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services.

Involuntary Resettlement (OP 4.12)

The overall objectives of the bank policy on the involuntary resettlement are;

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to

enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.

- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

The policy covered the following impact;

This policy covers direct economic and social impacts that both result from Bank and or Bank assisted investment projects, and is caused by;

(a) The involuntary taking of land resulting in

- i. Relocation or loss of shelter;
- ii. Loss of assets or access to assets; or
- iii. Loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

To address these impacts the borrowers should prepare resettlement plan or resettlement policy framework that covers;

- (i) informed about their options and rights pertaining to resettlement;
- (ii) Consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and
- (iii) Provided prompt and effective compensation at full replacement cost for losses of assets affected by the project

Where necessary to achieve the objectives of the policy, the resettlement plan or resettlement policy framework also include measures to ensure that displaced persons are; (i) offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living; and (ii) provided with development assistance in addition to compensation measures (iii) such as land preparation, credit facilities, training, or job opportunities.

Indigenous People (OP 4.10)

This policy contributes to the World Bank goal of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the project by the affected Indigenous Peoples. Such Bank-financed projects include measures to (a) avoid potentially adverse effects on the Indigenous Peoples' communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and intergenerationally inclusive. The Bank recognizes that the identities and cultures of Indigenous Peoples are inextricably linked to the lands on which they live and the natural resources on which they depend. These distinct circumstances expose Indigenous Peoples to different types of risks and levels of impacts from development projects, including loss of identity, culture, and customary

livelihoods, as well as exposure to disease. Gender and intergenerational issues among Indigenous Peoples also are complex. As social groups with identities that are often distinct from dominant groups in their national societies, Indigenous Peoples are frequently among the most marginalized and vulnerable segments of the population. As a result, their economic, social, and legal status often limits their capacity to defend their interests in and rights to lands, territories, and other productive resources, and/or restricts their ability to participate in and benefit from development. At the same time, the Bank recognizes that Indigenous Peoples play a vital role in sustainable development and that their rights are increasingly being addressed under both domestic and international law.

On the basis of the social assessment and in consultation with the affected Indigenous Peoples' communities, the borrower prepares an Indigenous Peoples Plan (IPP) that sets out the measures through which the borrower will ensure that (a) Indigenous Peoples affected by the project receive culturally appropriate social and economic benefits; and (b) when potential adverse effects on Indigenous Peoples are identified, those adverse effects are avoided, minimized, mitigated, or compensated for. The IPP is prepared in a flexible and pragmatic manner, and its level of detail varies depending on the specific project and the nature of effects to be addressed. The borrower integrates the IPP into the project design. When Indigenous Peoples are the sole or the overwhelming majority of direct project beneficiaries, the elements of an IPP should be included in the overall project design, and a separate IPP is not required. In such cases, the Project Appraisal Document (PAD) includes a brief summary of how the project complies with the policy, in particular the IPP requirements.

5.3 Acts

5.3.1 Environment Protection Act, 2053 BS (1997 AD)

Nepal has enacted Environment Protection Act (EPA), 1997 which is enforced through appropriate regulatory measures. Its preamble mentioned "whereas, it is expedient to make legal provisions in order to maintain clean and healthy environment by minimizing as far as possible, adverse impacts likely to be caused from environmental degradation on human beings, wildlife, plants, nature and physical objects; and to protect environment with proper use and management of natural resources, taking into consideration that sustainable development could be achieved from the inseparable interrelationship between the economic development and environment protection". Major highlights of the act are;

Section 3: It requires the proponent to carryout IEE and EIA as prescribed.

Section 4: No one is supposed to implement the proposal without approval from the concerned agency.

Section 5: In order to implement any proposal, the proponent should submit the proposal along with its report on IEE or EIA to the concerned agency for approval.

Section 6(1): The relevant agency is empowered to grant approval for the IEE report, only if it finds that no significant adverse effects will be caused to environment by the implementation of the proposal. The government agency is required to forward the EIA report submitted along with proposal to it, with its opinion on the report to the Ministry of Science, Technology and Environment (MoSTE).

Section 6(2): While preparing the IEE report of the proposal, if it is found necessary to carry out EIA of such a proposal, the concerned agency can issue an order to carry out EIA.

5.3.2 Solid Waste Management Act, 2068 BS (2011 AD)

This Act provisioned the duties, roles and responsibilities of local government to take action to control haphazard waste generation, disposal or collection and has provisions for various punitive measures against those engaged in activities detrimental to the intentions of the Act. The act considers offenses and is liable to punishment inter alia to discharge solid waste in ways other than the time and place prescribed by the local Body, to keep, throw, stack or discharge any kind of hazardous waste on the road or in any public place causing adverse effects to public health except in places prescribed by the Local Body. Section 4(2) mentioned that the responsibility for processing and management of hazardous waste, medical waste, chemical waste or industrial waste under the prescribed standards shall rest with the person or institution that has generated the solid waste. Section 5(2) mentioned that, it is the duty of every person, institution or entity to reduce the quantum of the solid waste by making arrangements to dispose the disposable (biodegradable/Organic) solid waste within their own area or making arrangement for the reuse thereof and discharging the remaining solid waste thereafter. Chapter 9 section 38 assumes offences inter alia, if any person discharge solid waste in ways other than the time and place prescribed by the Local Body, to park any kind of transportation vehicle in the road or any public place during the time prescribed by the Local Body for carrying out cleaning or collection of solid waste or during the cleaning time, or to refuse to remove the vehicle from such place; to keep, throw, stack or discharge any kind of hazardous waste on the road or in any public place causing adverse effects to public health except in places prescribed by the Local Body.

5.3.3 Public Road Act, 2031 (1974)

Section 19 of the Act states that, permission of DoR is required to carry out activities within the limits of the road boundaries. Local governmental offices have to give notice to the DoR prior to the start of activities in the limits of the public roads (Section 29). The Act empowers DoR to acquire any land on a temporary basis (for storage facilities, construction camps, etc.) during road construction and upgrading. The temporary acquisition of land containing any buildings (e.g. houses, sheds, temples and schools) is avoided wherever possible. The Act also empowers DoR to “lift earth, stone or sand from any adjoining land” during construction and upgrading works. The Act does not provide for leasing of land. However, DoR is required to pay compensation for any damages caused to buildings, crops and trees, where the farming activity of the landowner is interrupted, and where the landowner has to incur expenses to restore the land after its return. Compensation is determined between DoR and the titleholder, or through mediation, involving officials from the relevant VDC and District. The GoN may prohibit, through notification in the *Nepal Rajapatra* (Government Gazette), the construction of any permanent structure (other than walls) within 6m of the road formation edge.

5.3.4 Labor Act 2048 BS (1992 AD)

The Act mandates the employer to give priority to the Nepalese citizen while employing personnel and workers in company. After a year of service, the company or employer has to employ the workers permanently with broadly defined position, roles and responsibilities and the pay scale. But employee under contract for short duration of time will not be entitled for permanent employment. The employer could terminate the employee with prior approval of the Department of Labour and prior notice to the employee as defined by the law. The labour act prohibits the employment of the child or under-aged person. The employer could not force the workers to work for long hours other than that defined by the law. The employer has the responsibility to ensure healthy environmental conditions of the workplace as defined by the law.

5.3.5 Local Self-Governance Act 2055 BS (1998 AD)

The Act empowers the VDCs, DDCs and Municipalities to conserve, manage and use their natural resources and collect tax, revenue from the sale and use of such resources and use it for local development. Section 25(e) of the Act requires the ward to help for protection of environment through plantation over the bare land, cliff and mountains. Section 28 has mentioned the functions, rights, and duties of VDC. The VDCs are required to protect the environment, nature and natural resources. Section 55 empowers VDC to levy taxes on utilization of natural resources. Section 68 lists the property of the VDC, which includes natural resources. Apparently, natural resources include mineral resources and thus, VDCs have an absolute authority over the natural resources.

5.3.6 Forest Act, 2049 (1993)

The forest Act, 1993 recognizes the importance of forests in maintaining a healthy environment. The act requires decision makers to take into account of all forest values, including environmental services and biodiversity, not just the production of timber and other forest commodities. The basis of the act's approach to forest and forest products is 'resource oriented' rather than 'use oriented'. Section 23 empowers the government to delineate any part of the national forest that has a special environmental, scientific or cultural importance as a protected forest. Section 49 of the act prohibits reclaiming lands, setting fires, grazing, removing or damaging forest products, felling trees or plants, wildlife hunting and extracting boulders, sand and soil from the National forest without the prior approval. The act opens avenues to carry out IEE of the development proposal if they are to implemented in the forest areas and/or pass through the forest areas. Section 68(1) of the Act empowers the government to permit the use of any part of Government managed forest, community forest, leasehold forest, if there is no alternative except to use the forest area for the implementation of a project of national priority without significantly affecting the environment.

5.3.7 Aquatic Animal Protection Act, 2018 BS (1961) (Amended 2056 BS)

The Aquatic Animals Protection Act (1961) and amendment indicates an early recognition of the value of wetlands and aquatic animals. Section 3 renders punishable to any party introducing poisonous, noxious and explosive materials into a water resource, or destroying any dam, bridge and water system with the intent of catching or killing aquatic life. There is no reported case of prosecution for a breach of AAPA. This demonstrates the government's ineffectiveness in developing a surveillance system for conserving aquatic life. Under section 4, the government is empowered to prohibit catching, killing and harming of certain kinds of aquatic animals by notification in the Nepal Gazette. However, notice under this section has never been published by the Government. The act has been amended to include the provision that obliges the proponent to construct fish ladder at the dam site to ensure the movement of aquatic animal. If it is not possible, the proponent should establish fish hatchery or a nursery, close to the dam site of the water resource projects, for artificial reproduction and conservation (Section 5b).

5.3.8 National Foundation for the Development of Indigenous Nationalities Act, 2002

The act has provisioned the establishment and operation of "*National Foundation for Development of Indigenous Nationalities*" for social, economic and cultural development and upliftment of various Indigenous Nationalities of Nepal and for their equal participation in the mainstream of national development. The main objectives of the foundation are;

- To preserve and promote the language, scripts, cultures, arts and histories of the indigenous nationalities;
- To preserve and promote the languages, scripts, cultures, arts, and histories of the indigenous nationalities;
- To preserve and promote the traditional knowledge, skills, technologies and special knowledge of the indigenous nationalities and to provide assistance in its vocational use.
- To cause the indigenous nationalities to be participate in the mainstream of overall national development of the country by maintaining a good relation, goodwill and harmony between different indigenous groups, castes, tribes and religious communities of Nepal; and
- To provide assistance in building an equitable society by making social, economic, religious and cultural development and upliftment of indigenous nationalities.

5.3.9 Land Acquisition Act 2034 (1977) and Amendment, 2049

The act was promulgated for the purpose of acquiring land for public uses or for government institution. The Land Acquisition Act, 1977 clearly empowers the Government to acquire necessary land at any place in any quantity by giving the compensation pursuant to the Act for the land required for any public purpose or for operation of any development project initiated by government institution (Section 3 and 4). The Government shall provide compensation to the concerned person and organization as decided by the Compensation Fixation Committee. The committee consists of Chief District Officer, Chief District Land Administration and Revenue Officer, Project Chief and the Representative of the DDC. The compensation paid under this Act will be in cash. However, under the Section 14 of the Act it is stated that, the Government may allot land to those people whose land has been acquired, from the land it possess such as Ailani, or Government-owned any other land, and if they prefer land for land.

5.3.10 Ancient Monument Protection Act 2013 (1956)

This depiction of the act has been done to maintain peace and order by preserving the ancient monument and by controlling the trade in archaeological objects as well as the excavation of the place of ancient monuments and by acquiring and preserving ancient monument and archaeological, historical or artistic objects. Section 12 of the act mentioned the following act as punishable,

- One who destroys, demolishes, removes, alters, defaces or steals having realized an amount equal to the claimed amount of such Ancient monument shall be punished with a fine of twenty- five thousand rupees to one hundred thousand rupees or with an imprisonment of five years to fifteen years or both.
- One who uses the ancient monument in an unauthorized way or harms it by any other means having realized an amount equal to the claimed amount of such ancient monument shall be punished with a fine up to twenty- five thousand rupees or with an imprisonment up to five years or both.
- One who destroys, demolishes, defaces, steals or removes or alters unauthorizedly or causes harm to the archaeological object by any other means, having realized on amount equal to the

claimed amount of such archaeological objects shall be punished with a fine a five- thousand rupees to one hundred thousand rupees or with an imprisonment up to five years or both.

5.3.11 Child Labour (Prohibition and Regulation) Act 2057 BS (2000 AD)

The Child Labour (Prohibition and Regulation) Act 2000 preclude that “whereas it is expedient to prohibit engagement of child in factory, mining and similar other riskful work and to make necessary provision for health, child's safety and services and facilities while engaging them in other work. Under the Section 3 of the Act, children below 14 years of age are strictly prohibited to works as a labourer. Section 4 of the act states that “Nobody shall engage in work a child as a labourer by pleasing, gratifying or misrepresenting him or under greediness or fear or thereat or coercion or any other way against his will”. Under Section 6, in case any Enterprise has to engage a child in works, an approval has to be obtained from the concerned labour office or any authority or official prescribed by that office and form the father, mother or guardian of the child.

5.4 Regulations

5.4.1 Environment Protection Regulations, 2054 BS (1997 AD)

The EPR adopts the environmental assessment criteria mentioned in the National EIA Guidelines. Major highlights of the Rule are;

Rule 3: The proponent is required to carry out IEE as per Schedule 1.

Rule 5: While preparing the IEE report, the proponent should prepare and submit the TOR and get approval from concerned body.

Rule 6: In case, the approving agency of IEE report finds appropriate to carry out EIA, the proponent should fulfill all the formalities of the EIA process.

Rule 7(1): The proponent should prepare IEE report in the format as indicated in schedule 5 of the EPR, 1997.

Rule 7(2): In case of IEE report, the proponent should publish a public notice on the concerned VDC, municipality, DDC, schools, Health posts, and hospital through a National level daily newspaper seeking their opinions and suggestions in writing within 15 days and prepare a deed of public inquiry. The opinions and suggestions received should be included in the report.

Rule 10: The proponent should submit 15 copies of the IEE/EIA report along with the recommendation of the concerned VDC or municipality to the concerned agency for approval.

Rule 11: The concerned agency, after investigation should approve the IEE report within 21 days from the date of its receipt

Rule 45-47: Anyone wishing to receive compensation may file the application to the Chief District Officer (CDO) and should forward the file to the concerned agency in case the evaluation of effects/loss. Once the loss is evaluated, the CDO should determine the amount of compensation within 60 days of receipt of application. The proponent should pay the compensation amount within 30 days of decision. In case the proponent (individual, institution or proponent) fails to pay within time limit, the victim may submit an application, and the CDO shall auction the property of the proponent and pay the amount of compensation as determined.

5.4.2 Solid Waste Management Rules 2070 (2013 AD)

Rule 5 is relevant for the implementation of the proposed project which provisioned that no one shall discharge solid waste by mixing harmful, chemical, organic or inorganic waste with other waste. The arrangement for final discharge should only be made after processing of harmful, chemical, organic or inorganic waste into a general waste. Rule 7 provisioned that the collection, storage and transportation of harmful, chemical, organic or inorganic waste shall only be done by applying a safe mode.

5.4.3 Forest Rules 2051 (1995)

Rule 65 (1) of the Forest Regulation stipulates that in case the execution of any project having national priority in any forest area causes any harm to any local, individual or community, the proponent of the project itself bear the amount of compensation to be paid. Similarly, the entire expenses required for the harvesting, logging and transporting of the forest products in a forest area should be borne by the proponents of the project. In addition to this, Section 65(2) states that, "the proponent has to pay all the expenditures required during harvesting, logging and transporting operation of forest products cleared from the forest area". The Forest Regulation, 1995 (amended in 2001) has listed 3 species banned for collection, use, sale, distribution, transportation and export, 9 species banned for export and 7 tree species banned for felling, transportation and export.

5.5 Manuals/Guidelines/ Directives

5.5.1 Environmental and Social Management Framework (ESMF), 2064 BS (2007) with Addendum 2013(Revised)

The objective of ESMF is to frame guidelines and procedures to deal with environmental and social impacts associated with the implementation of this project. The framework presents the detailed account of environmental and social framework to deal with impacts and preparation of mitigation plans. The framework also describes the implementation arrangements including monitoring and evaluation mechanisms for implementing the mitigation measures.

5.5.1 National Environmental Impact Assessment Guidelines 2050 BS (1993 AD)

The objectives of the guideline are to assist in assessment of the impacts likely to be caused on the environment by implementation of the project; facilitate to optimize the benefit of development without degrading the environmental quality, natural resource base and cultural heritage of the society, help to discover the protective and preventive measures to remove the adverse impacts likely to be caused on the environment by the implementation of the project; facilitate to integrate the environmental consideration in the project planning cycle; provide information to decision makers to determine whether or not the proposed project is to be implemented from an environmental perspective and what mode should be adopted while implementing the project.

5.5.2 Environmental Management Guidelines, GESU/DOR, 1999

Environmental Management Guidelines, GESU/DoR, July, 1999 was prepared - as part of the program undertaken by GON and the World Bank under the Road Maintenance and Rehabilitation Project. The guideline was prepared to help in operational practices for all road maintenance, rehabilitation and construction activities under DOR. The Guideline outlines environmental mitigation measures to be incorporated into DOR projects, procedure for public participation, and socio-economic considerations. The guideline proposed environmental safeguard measures into

twelve issues including (i) Quarries; (ii) Borrow Pits; (iii) Spoil and Construction Waste Disposal; (iv) Work Camp Location and Operation; (v) Labour Camp Location and Operation; (vi) Earthwork/Slope Stabilization; (vii) Use of Bitumen; (viii) Stockpiling of Materials; (ix) Explosive, Combustible and Toxic Materials Management; (x) Setting Up and Operation of Stone Crushing Plants; (xi) Water Management; (xii) Air & Noise Pollution. This guideline also outlines implementation methods for undertaking mitigation measures for activities related to these issues.

5.5.3 Reference manual for Environmental and Social aspect of integrated Road Development

This manual provides guidance to integrate social and environmental considerations, including public involvement strategies, with technical road construction practices. It suggests process of addressing environmental and social issues alongside technical, financial and others. The manual recommend various environmental and social approaches, actions and strategies.

5.5.4 Public Work Directives, 2002

Public Works Directive (PWD) 2002 is designed to apply uniform procedures for public construction works including environmental procedural guidelines which are consistent with the World Bank's best practices. The PWD combine financial administration regulations (FAR) and other rules and regulations on technical, social, and environmental matters to provide a single source of procedures and reference documents for implementing public construction works. Their guidance applies to the procurement of works under large, medium and small contracts. As concerns decent work, several sections within the PWD mention application of labour laws. The PWD specifically mentions that in all cases, existing laws prevail over the directives and, as noted in more detail in this paper, some of these documents contain obligations for contractors.

5.5.5 Batawaran Nirdesika 2057 (2001)

The directive is focused in the practical implementation of the small rural infrastructure through the minimization of environmental impacts. This directive includes the simple methods of environmental management in different phases of project cycle.

5.6 Standards

5.6.1 National Standard on Noise Level 2069 BS

The threshold limit of noise for Leq in decibel as prescribed by The National Standard for Noise, 2069 B.S. has for different sectors in day and night are as follows;

Threshold limit of noise in different sectors

Sectors	Threshold limit of Noise Leq (dB)	
	Day	Night
Industry	75	70
Business	65	55
Rural residential area	45	40
Urban residential area	55	50
Mixed residential area	63	55
Peaceful area	50	40

Maximum threshold limit of noise for several machineries

SN.	Instrument	Maximum threshold limit (dB)
1	Water pump	65
2	Diesel generator	90
3	Loudspeaker, other entertainment instrument	70

5.6.2 National Ambient Air Quality Standard 2012 AD

The construction emissions fugitive and combustion shall not pollute the ambient air quality to exceed the following limits.

National ambient air quality standards for several pollutants

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum
TSP (Total Suspended Particulates)	$\mu\text{g}/\text{m}^3$	Annual	-
		24-hours*	230
PM ₁₀	$\mu\text{g}/\text{m}^3$	Annual	-
		24-hours*	120
Sulphur Dioxide	$\mu\text{g}/\text{m}^3$	Annual**	50
		24-hours*	70
Nitrogen Dioxide	$\mu\text{g}/\text{m}^3$	Annual	40
		24-hours*	80
Carbon Monoxide	$\mu\text{g}/\text{m}^3$	8 hours*	10,000
Lead	$\mu\text{g}/\text{m}^3$	Annual**	0.5
Benzene	$\mu\text{g}/\text{m}^3$	Annual**	5
PM _{2.5}	$\mu\text{g}/\text{m}^3$	8-hours*	40
Ozone	$\mu\text{g}/\text{m}^3$	8-hours*	157

5.6.3 Nepal Road Standard 2070 BS

Nepal Road Standards- 2070 (Second Revision 2070), applies to all *Strategic Roads* in rural areas being constructed within Nepal. Based on this standard, standard designs for roads and bridges including typical drawings were prepared, which are used till now.

5.6.4 Nepal Bridge Standard 2067 BS

Department of Roads (DoR) has formulated these standards with a view to establish a common procedure for design and construction of road bridges in Nepal.

5.6.5 National Diesel Generator Emission Standard, 2012

The MoSTE introduced in October 2012 the National Diesel Generator Emission Standard (NDGES) for new and in-use generators with a capacity of 8 KW-560kW (under the 1997 Environmental Protection Act). The emissions limits are set for four major pollutants: CO, HC, NO_x and PM. The emission limit for PM for new DG set less than 19kW is 0.80 g/kWh; for 19 to <37kW, the emission limit is 0.60 g/kWh; for 37 to <75, it is 0.40 g/kWh; for 75 to 130 kW, it is 0.30 g/kWh; and for 130 to <560 kW, it is 0.20 g/kWh.

5.6.6 Nepal Vehicle Mass Emission Standard 2056 BS

Nepal Vehicle Mass Emission Standard 2056 BS provides the insight to the emission standards for different categories vehicles on several criteria air pollutants. The pollutants considered by the standard are CO, HC, PM, and NO_x. In order to test the compliance with the standard five different tests on vehicles are performed. Those tests include; (i) verifying exhaust emission after a cold start, (ii) carbon monoxide emission at idling speed, (iii) verifying emission of crankcase gases, (iv) determination of evaporative emission, and (v) durability of pollution control devices.

5.7 International Conventions and Treaties

5.7.1 Convention on Wetlands of International Importance (Ramsar Convention), 1971

The convention on Wetlands of International Importance, called the Ramsar Convention, is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. There are three pillars of the Convention under which the contracting parties commit to:

- Work towards the wise use of all their wetlands;
- Designate suitable wetlands for the list of Wetlands of International Importance (Ramsar list) and ensure their effective management;
- Cooperate internationally on trans-boundary wetlands, shared wetland systems and shared species.

CHAPTER - 6: EXISTING ENVIRONMENTAL CONDITION**6.1 Physical Environment****6.1.1 Physiography and Geomorphology**

The proposed site for the construction of Narugad Khola Bridge is located at Rayal VDC-2 of Bajhang District. The proposed bridge is located at the distance of 60m upstream of the Narugad-Seti Confluence at the elevation of 878m amsl. The average gradient of the Narugad Khola is 26.2% with maximum slope of 90.7%. The steepness of the Narugad Khola is very high at the upstream region from the proposed construction site.



Figure 6.1: Photographs of proposed bridge location

6.1.2 Geology and Soil

The proposed bridge construction location lies in Lakharpata Formation. The rock type observed within this formation includes fine grained light, blue, grey, limestone and dolomite with thin interstratifications of grey shales, white, pink dolomite, limestones, purple quartzites and green shales.

The surface geology around the bridge axis is characterized by the presence of thick alluvial and colluvial deposits. Bed rocks are exposed on the hill slopes, on both banks of the river. The depth of alluvial deposits on both sides of the river is more than 3 m. Several scars of land slides are observed on both banks of river, along the hillslopes.

The surface soil of the bridge area consists of mainly alluvial soil deposits at riverbed. The alluvial deposits are mainly found in the riverbeds of the Narugad. The thicknesses of alluvial deposits are more than 3 m. The alluvial deposits are composed of boulders, cobbles, pebble and sands. Boulder, cobbles and pebbles are mainly granite, quartzite from the Lesser Himalaya (0.5 to 2 m in diameter). The nature of the surface soil is characterized by lack of calcareous cementing material so the surface soils are loose in nature.

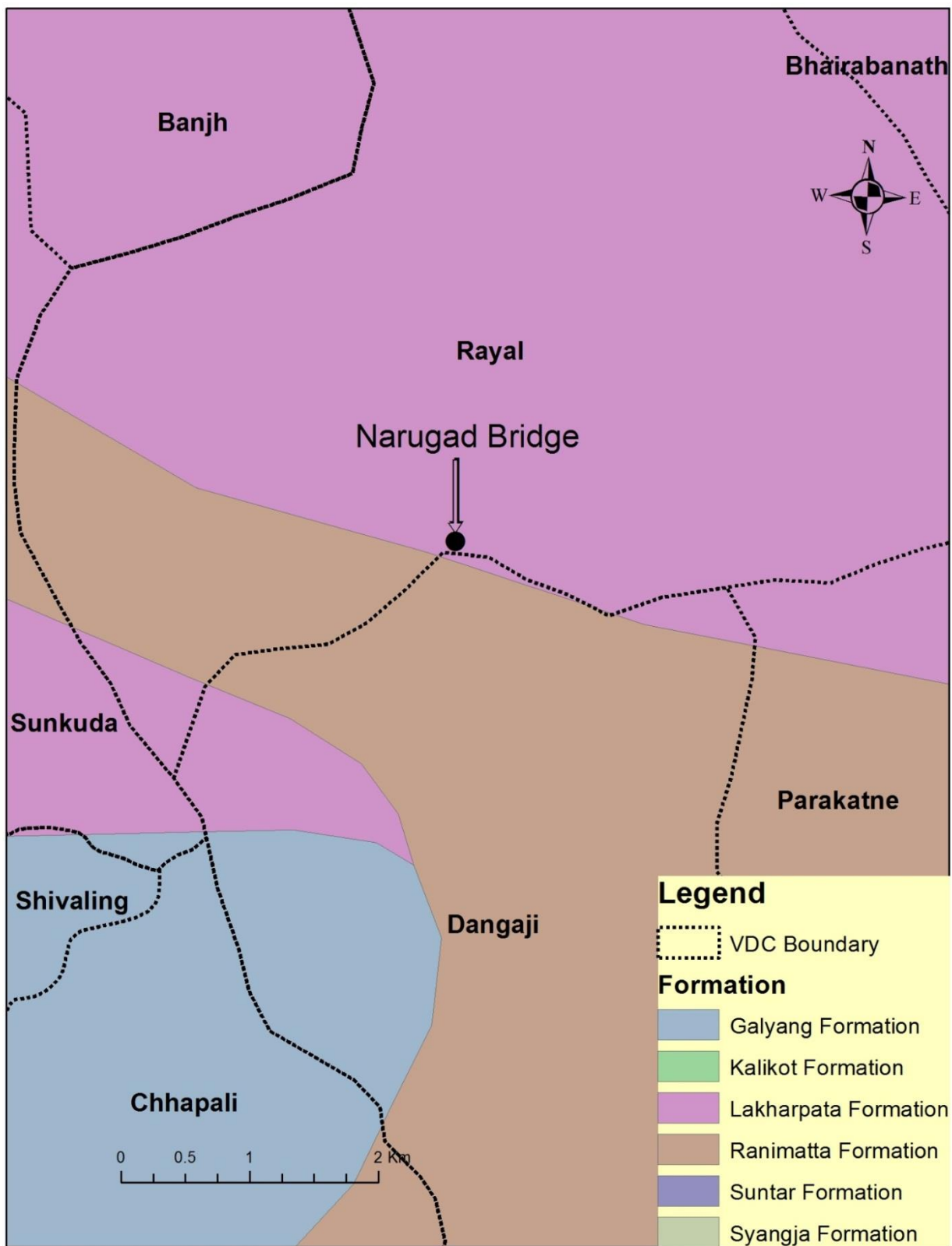


Figure 6.2: Geological map around the project area

6.1.3 Slope Stability

The slope stability condition around the bridge location is found to be vulnerable to landslides and soil erosion. Sun Dhunga Landslide is observed at about 1 Km upstream of the bridge location. Likewise, dry landslide is observed at about 470m upstream from the project location.

6.1.4 Seismological Study

The proposed area located far from remarkable thrust. So, the activity of the fault movement is considered as nominal. The analysis is basically made by deterministic evaluation of earthquake sources in the vicinity with the state of art consideration of attenuation for the Himalayan terrain. It should be acknowledged that the problems of seismo-tectonic events of Himalaya are not fully understood and the knowledge is increasing with more and more accumulation of research results and data analysis. The study has considered the latest results of seismo-tectonic study of the Himalaya and the vicinity. For comparison purpose, both deterministic and probabilistic assessments of seismic hazards have been considered.

For the minimum acceleration of 200 gal, reduction factor of 0.50 the calculated effective design seismic coefficient is approximately 0.10.

For the maximum acceleration of 250 gal (reduction factor of 0.50 the calculated effective design seismic coefficient is approximately 0.13. Hence, the design horizontal seismic coefficient ranges from 0.10 to 0.13 (calculated values).

6.1.5 Climate

Sub-tropical climate is found around the proposed project site. The maximum average temperature around the project area during summer season is 16°C, while the temperature decreases up to -1°C. The annual precipitation around the project area recorded is about 1769 mm.

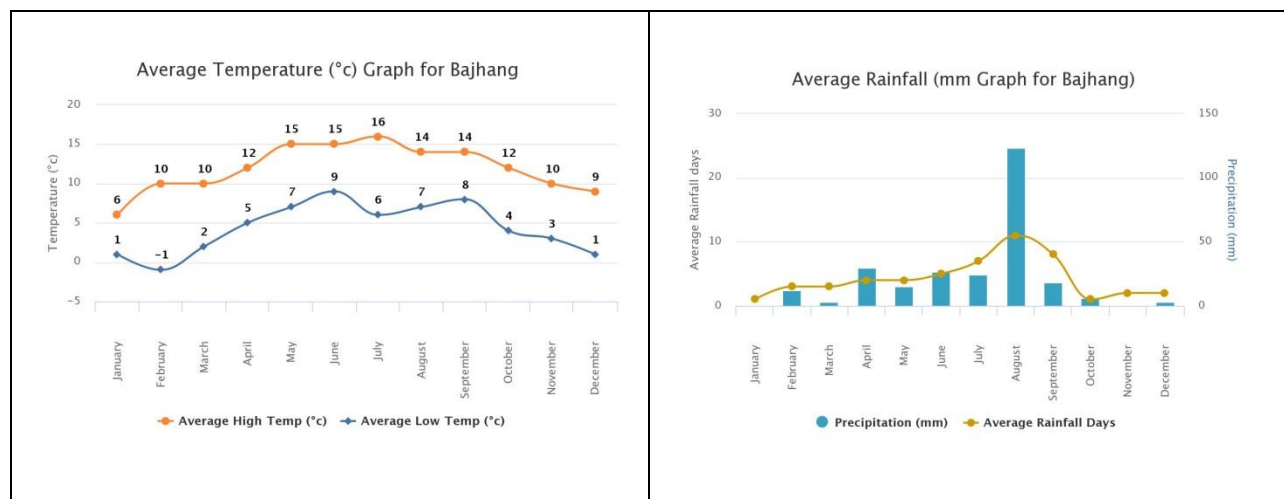


Figure 6.3: Average temperature (left) and Average Rainfall (right) of Bajhang District

Source: DHM

6.1.6 Drainage and Hydrology

The Narugad River is a perennial river originating from the Lesser Himalayan Range. The flow in the river diminishes during the dry season. The gradient of river in the upstream region is very high as a result of which the river carries huge amount of sediments from upstream that is deposited in the

form of alluvial fan around the downstream region of the bridge. The total catchment area of the proposed project is 14.28 km². The river shows the complex dendritic pattern comprising of many rivers making the confluence with it. The Narugad River makes confluence with Seti River at 60 m downstream.

The design discharge (Q_{100}) considered for the construction of the proposed bridge is 104.26 m³/s. Similarly, the lowest bed level is 1005.20 m and the highest flood level is 1008.59 m. the scour depth is 4.61 m from the HFL.

6.1.7 Land use

The land use around the proposed bridge is grassland and cultivated land. The grassland area is characterized by the presence of few scattered trees. The grassland around the observed around the bridge location belongs to the private owners. Forests are present at a considerable distance from the bridge construction location.

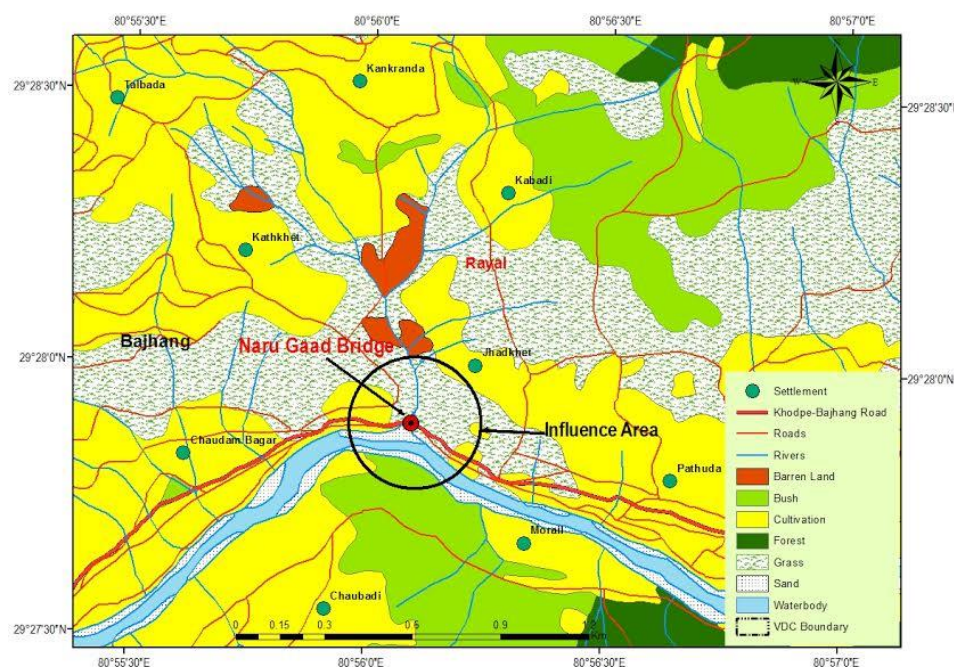


Figure 6.4: Land use around the proposed Narugad Bridge

[Source: GIS (QGIS Brighton 2.6.1) analysis on the topographical maps published from the Department of Survey

6.1.8 Public Structures

The public structures located nearby of the project location site are two irrigation canals namely Narugad- Chaudam Bagar 'Siku' and Narugad – Ghattae Bagar 'Siku-2' at the right and left bank of the Narugad Khola respectively, and one water mill located about 50m downstream from the proposed bridge location.



Figure 6.5: Water mill affected by the project.

6.1.9 Air Quality, Water Quality and Noise Levels

There are no stationary sources of air, water and noise pollutants, and the vehicles moving through the Khodpe Bajhang Sadak are only responsible for the deterioration of ambient air and noise quality.

6.2 Biological Environment

The immediate area near the proposed bridge location is devoid of forest and vegetation. The proposed bridge project affects 3 China-berry 'Bakaino' (*Melia azederach*) tree species and a Banana tree (*Musa paradisiaca*). Hence those tree species need to be cut for the bridge construction. The Community forests near the site are Dashae Community forest (500 m. far), Khakrae Khola Community Forest (1 km. far) left side from the project site and Pokaro Community forest (about 500m. far) right side from the project site. The following headings deal with the biological environment found around the project area.

6.2.1 Floral Diversity

The project area being situated in the higher altitude, tropical forests can be found covering the long ridges of the area dominated by Khayer (*Acacia catechu*). The other plants that can be found in the area are China-berry 'Bakaino' (*Melia azederach*), Chir Pine 'salla' (*Pinus roxburghii*), Simal (*Bombax ceiba*) and Tuna Tuni (*Toona ciliate M. Roem.*)

6.2.2 Faunal Diversity

The temperate forest around the project area is the habitat for many wild animals and birds. Some of the commonly found wild animals around the project area are Jackal (*Canis aureus*), Leopard (*Panthera pardus*) and Rhesus Macaque (*Maccaca mulata*). Likewise, the birds include Crow (*Corvus splendens*), Koel (*Eudynamys scolopacea*), Kalij Pheasant (*Lophura leucomelanos*), Black Francolin 'Titra' (*Francolinus francolinus*) and Black Kite 'Chil' (*Milvus migrans*).

6.2.3 Protected Species of Flora and Fauna

Some of the wild flora and fauna found around the project area are protected by GoN, and enlisted in IUCN red list and CITES Appendices. Those flora and fauna are enlisted in the table below:

Table 6.1: Conservation status of the flora and fauna.

S.N	Local Name	Scientific Name	Categories		
			GoN	IUCN	CITES
Fauna					
1	Leopard	<i>Panthera pardus</i>		T	I
2	Jackal	<i>Canis aureus</i>		LC	
Flora					
1	Khayer	<i>Acacia catechu</i>	P		
2	Salla	<i>Pinus roxburghii</i>	P		
3	Simal	<i>Bombax ceiba</i>	P		
Avifauna					
1	Kalij	<i>Lophura leucomelanos</i>		LC	I
2	Titra	<i>Francolinus francolinus</i>		LC	
3	Crow	<i>Corvus splendens</i>	P		
4	Chil	<i>Milvus migrans</i>	P		
5	Koel	<i>Eudynamys scolopacea</i>)		LC	

IUCN Red List Categories: Endangered (EN), Vulnerable (VU), Near Threatened (NT), Threatened (T), LC (Least Concern)

GoN Categories: P Protected by legislation

CITES Categories: I -Appendix I (are species that are threatened with extinction and are or may be affected by trade), II - Appendix II (re species that are not necessarily threatened with extinction, but may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with the survival of the species in the wild), and III - Appendix III (are species that are listed after one member country has asked other CITES Parties for assistance in controlling trade in a species).

6.3 Socio-economic and Cultural Environment

6.3.1 Project Affected VDC

The proposed Narugad Khola Bridge project lies in Rayal VDC-2 of Bajhang district. Rayal VDC is the project affected VDC of proposed Narugad Khola Bridge. The socio-economic information of the project affected VDC is given below:

a. Demography

According to National Population Census of 2011, the total population of Rayal VDC-2 of Bajhang District is 6,395. The population of female is slightly greater than that of male. The details of population distribution are presented in the following table:

Table 6.2: Demographic Characteristics of the Project affected VDCs

District	VDC/ Municipality	Household	Population			Average household size	Sex Ratio
			Total	Male	Female		
Bajhang	Rayal	1,152	6,395	2,941	3,454	5.55	85.15

Source: CBS, 2011

b. Ethnic Composition

According to the National Population Census of 2011, Chhetri is the dominant ethnic group in terms of population in the project affected VDC. Thakuri is the second large ethnic groups found in the VDCs. Other ethnic groups within the project affected VDC are Brahmin, Kami, Damai, Gurung, Sarki, etc. The ethnic composition of the project VDCs is presented in the following table:

Table 6.3: Population distribution around project VDCs according to ethnicity

VDC/ Municipality and Ethnicity/ Caste	Total	Percentage (%)
Royal		
Chettri	4,447	69.53
Thakuri	380	5.94
Brahman-Hill	191	2.98
Kami	236	3.69
Damai/Dholi	88	1.37
Sarki	24	0.37
Rai	24	0.37
Gurung	12	0.18
Others	27	0.42
Dalit Others	966	15.10
All Caste	6,395	100

Source: CBS, 2011

c. Sanitation and Drinking water facilities

According to the National Population Census of 2011, about 90% of the household of Royal VDC do not have toilet facility. The proportion of households with flush toilet is found to be much greater than the ordinary toilet in the VDCs. The sanitary facility is found to be not satisfactory. The table below shows the status of toilet facility in project affected VDCs.

Table 6.4: Household proportion with and without toilet facility around project VDCs.

District	VDC/ Municipality	Total Households	Households without toilet facility	Household with facility of		Toilet facility not stated
				Flush Toilet	Ordinary Toilet	
Bajhang	Royal	1,152	1,037	107	6	2

Source: CBS, 2011

Pipe line covers large fraction of households as the source of drinking water in the project affected VDC. Besides, piped water supply systems, few of the households are still relying on traditional water sources such as spout water, well, etc. The details of the source of drinking water in project affected VDC are given in the table below.

Table 6.5: Drinking water facilities in project VDCs

District	VDC/ Municipality	Total Househo ld	Main Source of Drinking Water				
			Tap/ piped water	Covered well/ kuwa	Uncovered well/ Kuwa	Spout water	River/ Stream
Bajhang	Royal	1,152	504	69	191	324	97

Source: CBS, 2011

d. Energy usage

The project VDC has majority of households that use firewood as the main source of fuel for cooking while other sources do not contribute to any. Only five of the households in Rayal VDC is found using Biogas as fuel for cooking purpose. The details of the source of fuel for cooking in project affected VDCs are given in table below.

Table 6.6: Fuel used for cooking purpose

District	VDC/ Municipality	Total Household	Fuel usually used for cooking		
			Wood/ Firewood	Biogas	Not Stated
Bajhang	Rayal	1,152	1,144	5	2

Source: CBS, 2011

Solar covers significantly larger proportion of energy source for lighting in Project area. Moreover, kerosene lamps for lighting are found still prevalent in some of the households. However, none of the households are found to be using biogas to light their houses. The details of the source of fuel for lighting in project affected VDCs are given in table below.

Table 6.7: Fuels used for lighting purpose

District	VDC/ Municipality	Total Household	Fuel usually used for lighting				Other
			Electricity	Kerosene	Biogas	Solar	
Bajhang	Rayal	1,152	2	43	0	548	557

Source: CBS, 2011

e. Education and health facilities

As per the National Population Census of 2011, the literacy rate of Rayal VDC is 51.49%. However, the male literacy rate (70.33%) is higher than that of the female literacy rate (36.06%). The details of the literacy status of the project VDC are given in the table below:

Table 6.8: Literacy Status of the Project VDC

District	VDC/Municipality and sex	Population who			Literacy Rate (%)
		Can read & write	Can read only	Can't read & write	
Bajhang	Rayal				
	Both Sex	2,841	167	2,508	51.49
	Male	1,747	82	653	70.33
	Female	1,094	85	1,855	36.06

Source: CBS, 2011

f. Communication facilities

Radio and mobile phones are the major and most widespread communication facilities available within the project VDCs. Other sources of modern communication facilities like television, computer, and telephone are very less. However, none of the households are found to have cable television and internet facilities. The details of the available communication facilities in the project VDCs are given in the table below:

Table 6.9: Communication facilities in project affected VDCs

District	VDC/ Municipality	Total	Household having facilities of					
			Radio	TV	Cable TV	Telephone	Internet	Mobile Phone
Bajhang	Royal	1,152	587	13	2	45	1	153

Source: CBS, 2011

6.3.2 Project affected families**6.3.2.1 Demographic Composition**

The construction of bridge affects three households. Altogether, 27 family members will be affected in which the number of male is higher than female. The average family household size is 9.0.

Table 6.10: Population of Affected Households

Name of bridge	Affected HHs	Male	Female	Total	HHs size
Narugad	3	16	11	27	9.0

Source Field Survey: January 2016

6.3.2.2 Ethnic Composition

The project construction site is located in far-western of Nepal. Bhandari and Rawals are affected from the bridge construction. The table below shows the ethnic composition.

Table 6.11: Ethnic Composition

Caste/ethnicity	Households	%
Bhandari	2	66.7
Rawal	1	33.3
Total	3	100

Source Field Survey: January 2016

6.3.2.3 Age Distribution

Among the projected affected population, majority (51.9%) are economically active and about 14.8% population are dependent which indicates that these age group populations are economically inactive and dependent for their livelihood.

Table 6.12: Age Distribution

Age Distribution	Population	%
Below 5 Years	3	11.1
6-15 years	9	33.3
16-60 years	14	51.9
Above 60 Years	1	3.7
Total	27	100

Source Field Survey: January 2016

6.3.2.4 Education and Literacy Status

There is one secondary school located nearby the location. About 7.4% are literate and same in illiterate category. The student's dropout rate seems increasing in higher education. Majority of the affected population, 33.3% are in primary level which decreased and 25.9% in class 6 to 10, about 7.4 have passed SLC and about 11.14% have passed bachelor. The table below shows the education level.

Table 6.13: Literacy Status

Education	No.	%
Illiterate	2	7.4
Literate	2	7.4
Class 1-5	9	33.3
Class 6-10	7	25.9
SLC	2	7.4
Intermediate	1	3.7
Bachelor	3	11.1
Master's above	1	3.7
Total	27	100

Source Field Survey: January 2016

6.3.2.5 Sources of Income

The affected households were asked for their major sources of income. They depend in multiple source of income. Among them wages, service and foreign employments are the main source of income.

Table 6.14: Major Source of Income

Major source of Income	Households	%
Wages (Out)	1	33.3
Services	1	33.3
Foreign Employment	1	33.3
Total	3	100

Source Field Survey: January 2016

6.3.2.6 Level of Income

Local business is the major sources of income among the affected HHs. The range of income shows that they have not sufficient income level. All of the affected households earn about NRs 200,001 to 300,00 per year. The table below shows the income level of affected households.

Table 6.15: Level of Income

Income Range	Households	Percentage
200,001-300,000	3	100
Total	3	100

Source Field Survey: January 2016

6.3.2.7 Level of Expenditure

There seems similarity between income and expenditure of affected households. Among the affected households, all affected households expenses is in 200,001 to 300,00 per year. The table below how the expenditure pattern of affected households.

Table 6.16: Level of Expenditure

Expenditure Level	Households	Percentage
200,001-300,000	3	100
Total	3	100

Source Field Survey: January 2016

6.3.2.8 Health and Sanitation

District hospital located in district headquarter is center for treatment but the treatment centers are not easily accessible to the people due to road access. Mostly people visit Dhangadi and Mahendranagar for better treatment but minor cases are treated in village based service centers. Sub-health post located in one hour travel is the nearest health facility received by the affected households.

6.3.2.9 Source of water

The water source is local springs. They have tapped the water from source to their yard. 24/7 hour water supply facility is available in the project area. The water of Narugad River can be used for irrigation purpose.

6.3.2.10 Toilet facility and Defecation Practice

Open defecation practice is highly prevailed in bridge construction site. Only 25% of the affected households have toilet facility. Rivers banks and open spaces are the regular locations for defecation those who have not toilet facility. During the group discussion among villagers, they told that even though we have toilet facility but we have not practice of proper defecate system. Those who have toilet also visit open space for defecation.

6.3.2.11 Gender Situation

Gender relation primarily depends upon the existing socio cultural phenomena of society. Gender discrimination is very widespread in project districts. Women are far behind to receive the facilities and access in mainstreaming sector. The girls enrolment in schools are very poor. The early marriage is prevalence in project districts. Women are mostly engaged in households and unproductive sector. Male partners enjoy outside households and have access to outer world.

CHAPTER - 7: ENVIRONMENTAL IMPACTS

Several impacts are identified, predicted and evaluated considering the project activities on the physical, chemical, biological and socio-economic environmental condition of the project site. The impacts are both beneficial as well as adverse. The impacts are analyzed with quantified information of changes, alternation and losses based on the characteristics of existing condition and sensitivity of environmental aspects. The possible beneficial and adverse impacts from the project during its construction and operation stage are discussed below:

7.1 Beneficial Impacts**7.1.1 Construction Phase****7.1.1.1 Employment Generation**

The construction of bridge over the Narugad Khola requires a number of skilled, semi-skilled and unskilled manpower. The project shall generate the employment opportunity to 50 local workers per day, among them 20 will be skilled and semi-skilled whereas 30 will be unskilled. This will create employment opportunities to the people of project municipalities which will result in enhanced income generation. *This impact will be of high magnitude, local in scale and short term in duration.*

7.1.1.2 Transfer of technical skills

The unskilled manpower would get the chance to be involved in different construction works with the skilled people which will help to transfer construction skills to the unskilled ones. Thus, the unskilled people can get the experience from this project which can be beneficial for them in similar kinds of projects. *This impact will be high magnitude, local in scale and long term in duration.*

7.1.1.3 Business opportunities

The skilled and unskilled manpower sourced from outside of the project area need to stay at the project area during the construction of the bridge. During their stay at the project area, they will use the local markets, local vegetables, and local products. Likewise, the business of the tea stalls around the project area is also increased. Hence, the business opportunities around the project area are enhanced. *This impact will be of moderate magnitude, local and medium term in nature.*

7.1.2 Operation Phase**7.1.2.1 Improved Mobility**

The absence of bridge over the Narugad Khola obstructs the vehicular movement during the monsoon period when the water level in the Narugad Khola increases. The bridge over the Narugad Khola will enhance the year round vehicular movement in Khodpe Bajhang Sadak and the people will have access to the District Headquarter Chainpur. It will also increase the access to the facilities such as education, health, etc. *The impact will be of high significance, local and long term in nature.*

7.2 Adverse Impacts

7.2.1 Physical Environment

Construction Phase

- **Land use change**

The construction of the bridge and approach road requires 0.23 ha of land permanently. Likewise, for the construction camp and stockpiling of the construction materials need to acquire some private and public land temporarily. About 0.12 ha of the land is occupied by the construction camp and about 0.04ha of land is required for the stockpiling of construction materials. *The impact due to change in land use is of low magnitude, site-specific and short-term.*

- **Land degradation (Due to leakage of waste fuels, grease and lubricants)**

The transportation of the hazardous materials during the construction of bridge may be leaked into the ground which can contaminate the soil. Likewise, the waste fuels, grease and lubricants if not managed properly can also lead to land degradation. This can lead to impair the growth of vegetation and affect the productivity of the nearby agricultural land. But the proposed bridge is located near the barren land. Hence, this impact will not have serious impact and tends to be localized, affecting only a narrow zone. Hence, the impact will be low significance, *site specific and long term in nature.*

- **Air pollution, Noise and vibration**

The operation of machineries during the construction period for the excavation of river terraces in order to construct the foundation of the bridge will be the main source of air pollution, noise and vibration around the surrounding area. Furthermore, the project vehicles carrying construction materials will cause air, noise pollution. The operation of generators even contributes to the air and noise pollution. The impact is of low significance, *site specific and short term in nature.*

- **Degradation of water quality**

The mishandling of chemicals and oils used in machineries if get contaminated with the river water, it could result the water pollution. This would increase the turbidity and contribute the water pollution. *This impact is envisaged to be medium in magnitude, local in extent and medium term in duration.*

- **Solid waste generation**

The construction camps near the proposed bridge location will generate the domestic wastes such as food waste and other inorganic wastes. These solid wastes not only cause bad odor but can also pollute water. But the solid waste generated will be minimal and these wastes will be dumped in environment friendly manner. *Thus, the impact is of low magnitude, site-specific and short-term in nature.*

- **Erosion and sedimentation**

Since the construction of the bridge will be done as per the standard design approved by the DoR with the implementation of all the activities as per design (including river training works), the chances of river bank erosion and sedimentation is very low. *This impact will be insignificant during operation phase.*

- **Environmental issues associated with change in water regime and flow pattern during construction**

The proposed bridge is single span. Hence, the construction work shall not have impacts of change in water regime and flow pattern. Likewise, the construction of the bridge will be done in the dry period when the flow is minimal. *Thus, the impact is low significance, site-specific and short term in nature.*

- **River flooding and bank erosion at both banks of river**

The Narugad River is an ephemeral river. Hence, the water flow during the monsoon is very high. The gradient of the river is high but at the bridge construction site the gradient decreases significantly. During the flooding in monsoon season, the river will create the problems of bank erosion. The construction of the bridge is commenced during the dry period when the water flow is minimal. *The impact is of moderate significance, site specific and short term in duration.*

- **Environmental impacts associated with spoil management**

The excavation of soil for the foundation of the bridge and approach road will generate about 2500 m³ of spoil. Out of the total spoil generated about 1200m³ will be used for backfilling. Similarly, some amount of excavated materials is even used for river training works and just about 1300 m³ of spoil have to be disposed. The random and improper disposal spoil can be very hazardous as the runoff during rainy season would wash the materials causing water pollution in the nearby water bodies and even resulting in several water borne diseases. *Hence, the impact will be medium, local and medium term in nature.*

- **Environmental issues associated with quarry operation**

The sand and gravel required for the construction of the bridge will be sourced locally. The flood plain of Seti where annual river deposits are collected will be used as construction materials. The extraction of construction materials from the river flood plain is only sustainable when the materials deposited during the preceded year are used in the following year. Over extraction of the construction materials could result in bank cutting, river bank erosion and even landslides. Furthermore, quarrying over the hill slope is particularly vulnerable as it could trigger into large scale landslides. *This impact will be of medium magnitude, site-specific in nature and medium term in duration.*

- **Environmental issues associated with construction materials stockpiling**

Materials like sand, gravel, rod, cement, chemicals required during construction are stockpiled. The leakage, mishandling and misuse of these materials could result in soil and water contamination. The impact will be severe in case of chemicals as chemicals released in either soil or water could severely impact terrestrial and aquatic life. However, proper management of stockpiling yard could easily manage this issue. *This impact will be low significance, site specific and short term in duration.*

- **Occupational health and safety**

During the construction stage, different heavy machines and equipment would be operated which can pose the threat to the safety of the workers. Similarly, smoke and dust emission, noise generated during the operation of the machines and generators can also causes the occupational health impact to the workers. *The envisaged impact is moderate, site specific and medium in duration.*

- **Accidental risk**

During the construction period of the proposed bridge, external interventions like movement of vehicles, daily activities of local people, etc. could pose threat to the safe construction of the bridge. Since, the vehicular movement through the proposed bridge construction section is relatively low and activities of people around the construction are minimal. *This impact is envisaged to be medium in magnitude, site specific in extent and short-term in duration.*

- **Environmental issues associated with approach road construction**

The construction of the Narugad Khola Bridge requires the construction of approach road on either side of the bridge. The dry landslide is located at the 470 m away from the bridge location and the excavation work for the approach road construction can trigger the slope instability and landslide. Mechanical activities around such rocky terrain are highly likely to cause instabilities around those slopes. *This impact is envisaged to be highly significant, site-specific and short term in duration.*

- **Environmental issues associated with transportation of construction materials**

The proposed project is a point project and do not require significantly large amount of construction materials as in road, hydropower, etc. Construction materials like sand, gravel and stone will be obtained from the river bed of Seti, while rod, cement, etc. should be transported from Chainpur. The major issues associated with the transportation of construction materials are the traffic congestion and air pollution. *This impact will be medium significance, local and short-term in nature.*

Operation Phase

- **Reinstatement of environmental components (stockpiling yard, labor/contractor's camp, quarry, etc.)**

Upon the completion of the project the project facilities like stockpiling yard, labor/contractors camp, etc. should be reinstated, otherwise they would cause the secondary environmental impacts like soil and water contamination, solid waste problem, etc. *This impact will be medium significance, local in extent and medium term in nature.*

- **Air pollution**

The operation of the bridge would create the easy access to the vehicles and there would be increase in number of vehicles transporting the goods and other materials as well as public vehicles. The increase in number of vehicles would increase the emission of smoke and gas from the vehicles which would increase the air pollution. *The impact is low, local and long term in nature.*

- **Noise and Vibration**

The increase in movement of the vehicles would create the noise and vibration. The vibration induced by the resonance of traffic noise can have a detrimental effect on structures near the road and bridge. *The impact is low, site-specific and long term in duration.*

- **Backwater Effect during Floods**

The operation of the bridge would not block the flow of the water as the foundation of the bridge would not be located at the river. Hence, the backwater effects would be insignificant during floods as the flow of water would not be obstructed by the operation of the bridge.

- **Embankment Erosion**

Since the construction of the bridge will be done as per the standard design approved by the DoR with the implementation of all the activities as per design (including river training works), the chances of river bank erosion is very low. *This impact will be insignificant during operation phase.*

- **Water pollution**

The operation of the bridge will not pollute the water. Hence the impact is insignificant.

- **River channel shifting**

The construction of the proposed bridge will include the river training works along with it, thus the chances of river channel shifting during the operation phase is very low. *This impact will be insignificant during operation phase.*

- **Scouring around the bridge abutments**

Since, there are no river bed extraction activities conducted both in u/s and d/s of Narugad Khola from the proposed bridge axis. The scouring effect on bridge abutment is not expected. *The envisaged impact will be insignificant.*

7.2.2 Biological Environment

Construction Phase

- **Vegetation clearing**

The project needs to clear only 3 numbers of trees namely Banana (1), and Bakaino (2). Likewise, some shrub species needs to be cleared during the construction of approach road. Since large number of trees is not required to be cleared, *the impact is of low significance, site specific and long term in duration.*

- **Impact on aquatic Life**

Since the Narugad Khola does not harbor significant aquatic lives, the impact is insignificant.

- **Trees cutting to meet energy requirement in labor camp**

The construction site is located far from the settlement area, the labors have to depend upon the forests their energy requirement by cutting the trees of the community forest which will result in the vegetation loss. *The impact is moderate significance, site-specific and long term in nature.*

- **Illegal hunting and trade of wildlife and their parts**

The wild animals such as leopard, jackal, rhesus macaque, etc. are found in the project area. These are the animals with the conservation significance as well. The illegal hunting and trade of these animals can make them shrinkage in number. *The impact is moderate significance, local and short term in duration.*

Operation Phase

- **Illegal hunting and trade of endangered flora and fauna**

The operation of the bridge will not facilitate for the illegal hunting and trade of endangered flora and fauna.

- **Barrier Effects on Aquatic Organisms**

The Narugad Khola does not have significant aquatic organisms as the water is much polluted. Hence, the impact is insignificant.

7.2.3 Socio-economic and Cultural Environment

Construction Phase

- **Loss of land**

The survey identified that 3 household lose 5 land parcel during the construction of bridges. The detail of land is tabulated below:

Table 7.1: Detail of the affected land

Chainage	Ward No	Land Owner Name	Household Name	Distance from Center	Structure's Types	Currently Use	Year
69+150	2	Gyanu Rawal	Jaya Bahadur Rawal	5	Kachhi	living	2063
69+150	2	Kopila Devi Bhandari	Jaya Bahadur Rawal	5	Kachhi	Living	2063
69+150	2	Kopila Devi Bhandari	Jaya Bahadur Rawal	5	Kachhi	Not in used	2063
69+150	2	Jaya Bahadur Rawal	Jaya Bahadur Rawal	8	Kachhi	Pani ghatta	2065
69+150	2	Gyanu Rawal	Gyanu Rawal	8	Kachhi	Pani ghatta	2065

Source: Draft RAP, 2016

- **Impact on private and public properties**

The two irrigation canals and one dam of one water mill are affected by the project. About 10 m of each irrigation canal is affected by the project. Likewise, the dam of the water mill is located at the bridge construction will be affected. The construction of approach road affects two residential houses and one old house. *The impact is of moderate significance, local and medium term in nature.*

- **Social Conflicts**

For the construction of the Narugad Khola Bridge, local people would be given high priority to work as a workforce. However, some specified workers would be sourced from other areas. Thus, their presence around the project area would cause dispute with local people. The situation would worsen if the people involved in dispute are drunk. *This impact is envisaged to be indirect in nature, medium in magnitude, site specific in extent and medium term in duration.*

- **Obstruction to social services and facilities**

No social services and facilities like drinking water supply, schools, etc. need to be displaced for the bridge construction. Hence, the impact is insignificant for this project.

- **Change in crop productivity due to land use change**

The construction camp and stockpiling site will be located at the barren land. Hence, the productivity of the crop will not be affected by the land use change.

- **Impact on cultural, religious and historical sites**

The project does not have impacts on cultural, religious and historical sites.

- **Public grievance related to project construction**

The local people heartily welcome for the construction of the proposed project. However, some issues associated to environmental and social problems resulted during the project construction phase might arise and to address this provision for grievance redress mechanism have been included in the mitigation measures of the project. This impact is envisaged to be medium magnitude, site-specific and medium term in duration.

Operation Phase

- **Traffic accidents**

The vehicles will ultimately have greater speed over the concrete bridge and as a consequence there would be increased risk of traffic accidents. However, this impact is probabilistic only and is of less significance only.

CHAPTER - 8: ALTERNATIVE ANALYSIS

The objectives of carrying alternative analysis for the proposed Narugad Khola Bridge Project is to identify and recommend best technical, operational and resource options to ensure the minimized environmental and social damage during construction phase, recommend best available and practicable mitigation measures and signal the long term, sustainable operation of the project.

Following are the alternatives considered during the IEE study of the proposed project.

8.1 Location Alternatives

The construction of the Narugad Khola Bridge in the proposed location has minimum environmental impacts and small length of approach road needs to be constructed. This also results in low cost in construction. Hence, other alternative has not been studied.

8.2 Design and Construction Alternatives

The construction of the proposed bridge will involve the environmentally sensitive approach in which the extensive use of heavy machineries and explosives will be avoided. The locally available workforces will be given first priority in the construction related works. The environmentally sensitive (vulnerable to landslides) areas will first be stabilized considering the fragility of the mountainous areas. The design of the proposed bridge has been carried in such a way that the environmental impact due to bridge construction and the possible impact of environmental hazards on the bridge structures are either minimized or prevented through the application of river training works and other design measures.

8.3 Time Schedule Alternatives

The construction of the proposed bridge will be carried during dry period so that there would not be obstacle on construction activities due to rainfall. Furthermore, during the construction period the construction time and vehicular movement will be synchronized in such a way that both smooth vehicular movement and undisturbed construction activities can be carried out.

8.4 Resource Alternatives

The project will mainly rely on locally available resources to be used as construction materials. The excavated materials during the construction of the approach road will be used for the construction purpose as far as possible. The sand and gravel required for the construction of the proposed bridge will be extracted from the designed quarry site and the minimum environmental damage will be ensured during the extraction.

8.5 No Project Alternative

Due to the absence of the bridge over the Narugad Khola, people face problems in travelling to the District headquarter yearly during the rainy season. Large boulders are brought during the flooding in Narugad Khola which halts the transportation. No project option will deprive the people for having safe and reliable transportation facility. So considering this scenario, no project option is refused and project implementation option is admitted.

CHAPTER - 9: IMPACT MITIGATION MEASURES

This chapter presents the measures and actions proposed for augmenting the identified benefitted aspects of the project, as well as proposing a set of mitigation and precautionary measures to minimize or set off the potential adverse impacts. Four categories of environmental and social mitigation measures are generally identified:

- Preventive or Impact avoidance measures are usually implemented at the project planning and design stage, in order to eliminate or minimize from the onset all anticipated adverse impacts.
- Corrective or Reductive measures are those used to eliminate a source of impact or reduce its intensity to an optimal or acceptable extent.
- Compensatory measures seek to compensate for impacts that cannot be mitigated and for residual impacts of the project after implementation of mitigation measures.
- Enhancement or Benefit Augmentation measures are used to improve existing environmental or social conditions, which are not directly affected by the project. Such measures may be implemented outside the study area. To be efficient, these measures must be defined in cooperation with all stakeholders.

9.1 Beneficial Impact Augmentation Measures

9.1.1 Construction Phase

- **Employment Generation**

During the construction stage of the proposed project, local people will be given opportunities as laborer and among them poor, marginalized, women and dalits will be more emphasis. The contractor will have to source at least 80% of the total construction workers from the local area, and the workers will engage in works as per their skills and knowhow.

- **Enhancement of skills**

During the construction of the bridge, labors will be given training in bridge construction, and even get chance to understand some engineering structures and bioengineering works. They will also be provided with on-the-job training as a part of benefit augmentation measures. The skills they learned while being involved in the construction of Narugad Khola Bridge can benefit them as they will be able to do construction related works in other projects too.

9.1.2 Operation Phase

- **Improve mobility**

The project as a part of benefit enhancement measure will make a provision of plantation around the bridge location, and this will not only enhance the aesthetics of the area but also helps to prevent natural disasters. Furthermore, the project will install solar lamp along the approach road and the bridge and this will facilitate the local people to cross the bridge during night time also and even reduces the probability of accidents.

9.2 Adverse Impact Mitigation Measures

9.2.1 Physical Environment

Construction Phase

- **Mitigation measures for land use change**

Since, the project is a point project and requires small amount land area, huge land use change is not anticipated. The private land lost during the project construction will be compensated as per the compensatory fixation committee. Loss of tress will be compensated through compensatory plantation in ratio 1:25. The river bank will be permanently converted into bridge and approach road, which is a residual effect of bridge construction, which cannot be mitigated.

- **Degradation of water quality**

Following mitigation measures will be adopted to minimize the impact on the Narugad Khola water:

- ✓ Disposal of soil, sludge and other waste directly into water bodies will be avoided.
- ✓ Prohibition of activities like washing – cloth, dish, etc. near water bodies that contribute to water pollution will be avoided.
- ✓ Oils and chemicals used in construction vehicles and machineries will be handled properly to avoid the contamination with the water bodies.
- ✓ Separate toilet facilities will be provided to the construction crew with proper septic tank facilities.
- ✓ Liquid waste generated within the camp site will be disposed safely without releasing into the water bodies.
- ✓ Accidental spillage of the oil, grease and other chemical substances will be captured immediately without allowing them to contaminate the water bodies.

- **Mitigation measures for air and noise pollution**

During the construction phase, the contractor will use the well-conditioned vehicles and machineries. The well-conditioned vehicles used for transporting the construction materials will generate less smoke that will minimize the air pollution. Likewise, the well-conditioned machineries will produce less noise. Similarly, alternative schedule will be adopted during the operation of vehicles and machineries so that there will not be disturbance on the livelihood of the local people.

- **Mitigation of soil, water and air pollution due to bitumen handling and heating**

The mitigation measures proposed for the minimization the effects of bitumen handling and heating are as follows:

- ✓ Proper handling of bitumen to avoid soil and water contamination.
- ✓ Bitumen heating site will be at least 200m away from the settlement.
- ✓ Unnecessary quantity of bitumen will not be heated.
- ✓ Occupational health and safety measures will be adopted while heating the bitumen.
- ✓ If bitumen is spread over the land accidentally and in improper place then it will be cleared immediately.
- ✓ Bitumen related work will not be carried out during rainy season.
- ✓ Bitumen will not be used discharged into the drain structure while overlaying on the sub-base material.

- **Mitigation of environmental issues associated with the mishandling of chemical substances**

Safety measures will be adopted while handling the hazardous chemicals like oil, grease, etc. Combustible substances like petrol, diesel, etc. will be stored separately in a safe container. Furthermore, the project will have the provision of fire extinguisher throughout the construction period.

- **Mitigation for environmental pollution due to release of solid and liquid waste**

Following are the mitigation measures proposed for environmental pollution due to the release of solid and liquid waste from the work camp:

- ✓ Solid waste will be managed following 3 R principle.
- ✓ Bio-degradable waste will be disposed in a separate pit away from the water bodies.
- ✓ Liquid waste will be disposed in a separate ditch and disinfectant will be continuously spread to avoid contamination.
- ✓ Separate sanitary toilet will be construction near the construction camp with the facility of septic tank.
- ✓ Provision of clean drinking water will be made at the construction camp.

- **Prevention of soil erosion and sedimentation**

The mitigation measures proposed for the prevention soil erosion are as follows:

- ✓ The retaining structures proposed in the project design will be constructed.
- ✓ Approach road construction will be supplemented with the construction of properly designed side drain.
- ✓ Check dams and gabion structures will be constructed to check landslides and erosion.
- ✓ Re-vegetation of cut and fill slope or exposed area will be done as soon as possible by using species that are recommended in the “DoR Roadside Bio-engineering Reference Manual and Site Handbook, 2002”.
- ✓ Minimum damage of vegetation during construction will be ensured.
- ✓ Use of explosives will be avoided during the construction of the bridge and approach road.

- **Prevention of landslides and slope failure due to approach road construction**

The mitigation measures proposed are as follows:

- ✓ Minimum damage to vegetation during the construction.
- ✓ Exposed slopes will be planted with suitable vegetation.
- ✓ Newly eroded channels will be backfilled and restored to natural contours.

- **Mitigation measures for river flooding and bank erosion**

River training works will be adopted for the mitigation of embankment erosion.

- **Mitigation of environmental issues associated with spoil disposal**

Following mitigation measures are proposed for the prevention of environmental issues associated with spoil disposal.

- ✓ Whenever possible, surplus spoil will be used to fill eroded gullies, quarries and borrow pits, depressed areas, etc.
- ✓ Remaining spoil will be disposed in the right bank d/s in a controlled manner.

- ✓ Disposal of spoil on fragile slopes, farmland, marshy land, forested areas, natural drainage path, canals and other infrastructures will be prohibited.
- ✓ A disposal site will be provided with proper drainage, vegetation and adequate protection against erosion.
- ✓ Vegetation plantation will be done over the spoil disposed surface to reclaim the area.

- **Mitigation of environmental issues associated with material stockpiling**

The mitigation measures proposed for the minimization of environmental issues associated with material stockpiling are as follows:

- ✓ The land allocated for the storing of construction materials will be far from agricultural land and water bodies.
- ✓ The permission from local stakeholders will be taken before commencing the stockpiling of the construction materials.
- ✓ Construction materials should be covered with tarpaulin during stockpiling to prevent from rain water and dust emission generated from the stockpiling site.
- ✓ Construction materials will be further encircled with side barriers and covered to avoid mix up with deleterious materials.

- **Occupational health and safety**

To ensure the occupational health and safety of the construction workers following measures have been proposed.

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

- **Accidental Risk**

The mitigation measures proposed to reduce the accidental risk are as follows:

- ✓ Various warning sign post will be installed around the construction area.
- ✓ Local people and visitors will not be allowed to enter the working area.
- ✓ Emergency siren will be installed around the construction area.
- ✓ Provision of lighting facilities will be made during night time throughout the construction period.

- **Environmental issues associated with transportation of construction materials**

This impact will persist during construction period only and cannot be avoided at all. Adoption of alternative schedule is the only solution to this impact.

Operation Phase

- **Reinstatement of project components**

Several project components like labor/contractor's camp, material stockpiling yard, etc. will be cleaned after the completion of the project. The project will put its effort to bring back the natural condition of those sites.

- **Air and Noise Pollution**

This is a residual impact and can't be avoided. Thus, mitigation measures are not proposed for this impact.

9.2.2 Biological Environment**Construction Phase**

- **Vegetation clearing**

The number of trees that needs to be cleared will be compensated through the compensatory plantation in the ratio 1:25.

- **Trees cutting to meet energy requirement in labor camp**

The labor camp will be provided with the LPG to reduce the cutting of the trees for energy fulfillment. If the LPG is not available in the project area, the contractor will supervise and prevent the random cutting of trees. Contractor will be responsible for buying the firewood from the nearest community forest.

- **Illegal hunting and trade of wildlife and their parts**

The project will closely coordinate with Forest Office and its outlets to control the illegal poaching and trapping by the project stakeholders or other outside wildlife poachers, wildlife traders and timber smugglers.

Operation Phase

- **Illegal hunting and trade of endangered flora and fauna**

Since the impact is insignificant, the mitigation measures are not proposed.

9.2.3 Socio-economic and Cultural Environment**Construction Phase**

- **Social Conflicts**

There will be special code of conduct for all the construction crew and they have to strictly follow the code. As per the code the workers will not be allowed to involve in any kind of conflicts and any of the workers are found guilty, they will be punished as per the code.

- **Impact on private and public properties**

The project will repair the damaged portion of irrigation canals located at the both the banks. Likewise, the project will be responsible to construct the dam of the water mill at another location as suggested by the local people

- **Public grievance related to project construction**

To address the public grievance related to bridge construction following measures have been proposed:

- ✓ Project will form, activate, and maintain Grievance Redress Mechanism around the project area.
- ✓ Activate and maintain Grievance Redress Mechanism in concerned Manager's Office, Resident Engineer's Office, and Contractor's Office.
- ✓ Inform local stakeholders of Grievance Redress Mechanism's existence.
- ✓ Inform local stakeholders about how they can lodge grievance against contractor's fault work for his ratification.

Operation Phase

- **Traffic accidents**

The impact is probabilistic only and is of less significance. Hence, the mitigation measures are not proposed.

CHAPTER - 10: ENVIRONMENT MANAGEMNET PLAN

The **Environmental Management Plan** has been formulated to guide for the implementation of environmental safeguard mechanism during pre-construction, construction and operation phase of the project. The plan will include the mechanism for the implementation of environmental mitigation measures, selection of monitoring parameters, monitoring schedule, indicators to ensure the best monitoring practices and the responsibilities of stakeholders of various levels in ensuring the environmental and social safeguard during the implementation of the project.

The stakeholders that are involved for the environmental and social safeguard during the construction and operation of the proposed Narugad Khola Bridge are presented in table 10.1.

Table 10.1: Institutions and their roles in EMP implementation.

Institution	Roles	Responsibilities	Remarks
Ministry of Population and Environment	Formulation and implementation of environmental plans, policies and programs at national level	✓ Providing technical and legal base for the formulation of environmental safeguard measures ✓ Providing guidance during evaluation and monitoring of environmental safeguard mechanism	
Ministry of Physical Infrastructure and Transport (MoPIT)	It is the concerned ministry and has the role of project execution	✓ Review and approval of Initial Environmental Examination (IEE) document ✓ Coordinate with project implementing bodies during the implementation of environmental safeguard mechanism and their monitoring	
Department of Road (DoR)	It is a department under MoPIT and has the role of project execution	✓ Responsibility for the implementation of the project alongside the environmental safeguard measures	
Road Sector Development Project (RSDP)	Foreign cooperation project under the DoR, which coordinates with donors to invest for the road projects in Nepal	✓ Coordination with the donor agencies to invest for the construction of the road ✓ Execution of the road projects	
Geo-Environment and Social Unit (GESU)	Unit under the DoR responsible for technical advice for IEE	✓ Review, comment, and forward ToR and IEE for the approval by the concerned ministry (MoPIT)	

World Bank	Role in decision making for the execution of the project	✓ Responsible for overseeing DoR's project design, implementation of mitigation measures in accordance with their grant/loan conditions including environmental and social safeguards	
Design Consultant	Project design, environmental assessment and social assessment	✓ Prepare a detail engineering design for the project ✓ Prepare IEE report and get approval from the concerned ministry ✓ Prepare resettlement plan for the affected households ✓ Prepare Environmental and Social Management Plan	
Supervision consultant	Role in monitoring the compliance of environmental mitigation measures during construction as guided by the EMP	✓ Oversee the overall implementation of the EMP, provide expertise knowledge, suggestions and recommendations when and where are necessary to minimize/avoid/prevent any adverse environmental damage	
Construction contractor	Role of complying environmental measures into the bridge construction work	✓ The contractor/s must implement all the mitigation measures described in EMP during construction period to mitigate all environmental impacts associated with the construction activities	

Following flow chart shows the hierarchy of agencies responsible for EMP implementation. The MoPIT being the concerned ministry remains at the highest position of the order and the implementing contractor will work at the base level.

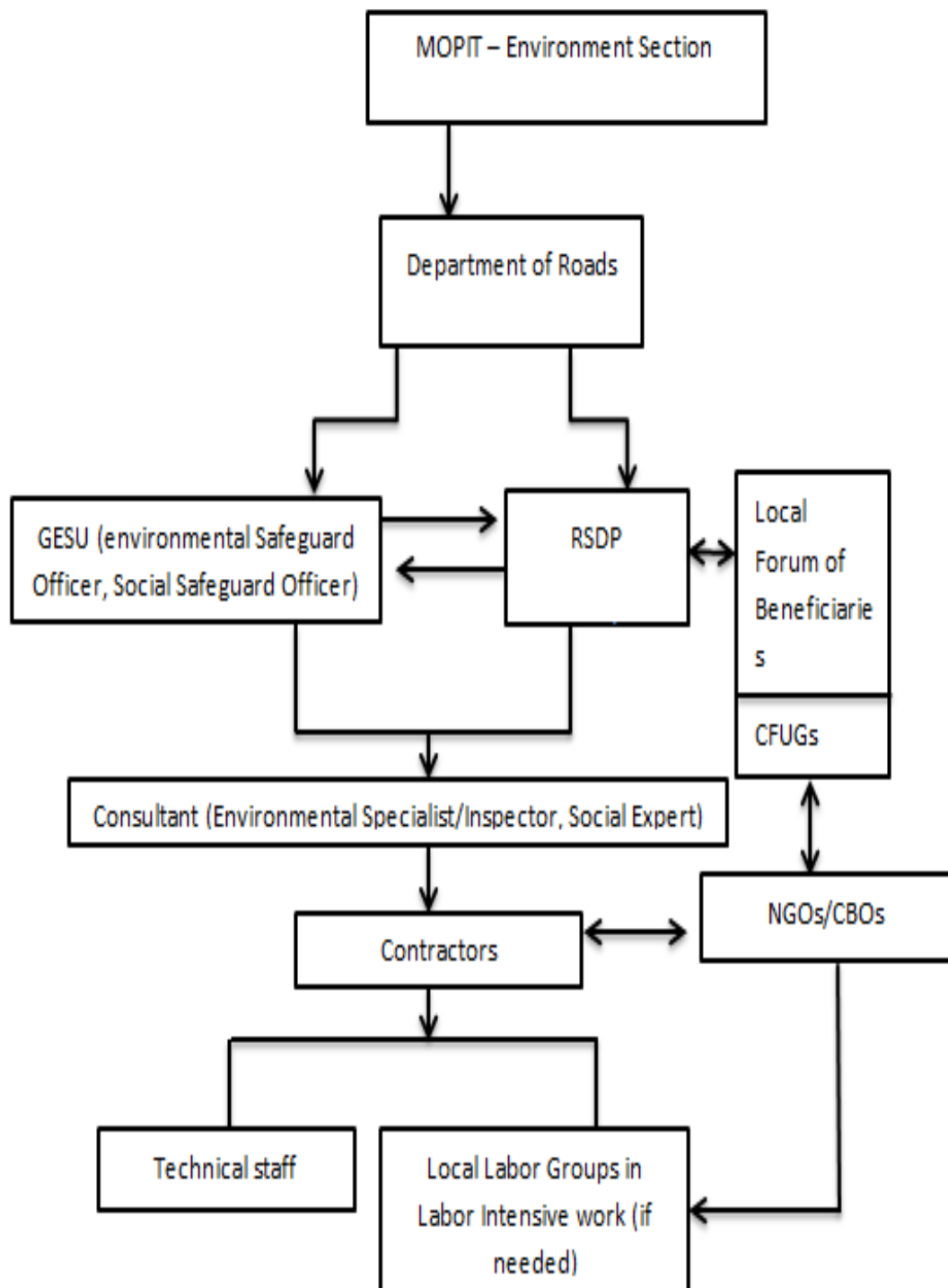


Figure 10.1: Agencies responsible for the implementation of EMP

10.1 Environmental Monitoring and Reporting

Environmental monitoring is classified into baseline, impact and compliance monitoring depending on the stage of project for which environmental monitoring is carried out.

Baseline monitoring is done prior to the project implementation, in order to identify existing environmental condition. Baseline monitoring is in general carried for all physical, chemical, biological and socio-economic variables. For this particular project baseline monitoring will not be carried since environmental baseline incorporated in **Chapter 6** will cover all the environmental issues prior to the project implementation.

Impact monitoring is in general carried out during the project construction and post construction phases. This type of monitoring mainly focuses on the environmental impacts due to the construction of the project and their mitigation through the appropriate mitigation measures as proposed in the IEE document.

Compliance monitoring focuses on the compliance of technical and legal requirement as mandated in the IEE document. Furthermore, the compliance of standards, rules and regulations formulated by the DoR are also monitored as a part of compliance monitoring. The compliance monitoring is in general carried out during the construction stage of the project.

The specific monitoring indicators selected for this IEE document are presented in table 10.2.

Table 10.2: Specific monitoring indicators selected for the IEE document.

Monitoring Field	Parameters Selected for the Monitoring
Land use, erosion, landslides and waste management	- Area (ha) of land, forested and properties deformed (changed) - Number, location and extent of slope failures - Cause analysis for slope failure (natural or man-made) - Nos and extent of gully erosions and pavement failures - Nos of days and nature of traffic delays due to slides - General condition of waste management site - Drainage and erosion condition of the waste management site
Seismicity	Nos and magnitude of local seismic activities and respective damage to structures
Water use and pollution status for both surface and sub-surface flows	- Nos and extent of water-logging around the construction sites - Nos of irrigation canals, drinking water taps, etc. that lie within the project construction site - Incidents and trends of waterborne diseases - Blockage of waterways – extent and secondary impacts - Water pollution incidents due to unsafe disposal of spoil - Trend analysis for local fisheries - Records of seasonal groundwater fluctuations - Laboratory tests for river water quality
Air, noise and vibration in relation to	- Point measurement of noise near the construction site - Qualitative analysis of wind borne dust particles during the construction stage of

traffic volume	- the project ▪ Qualitative assessment of vibrations sensed around the nearby households of the project construction site
Bridge/Road safety	▪ Speed measurement at both sides of the bridge ▪ Nos and type of accidents recorded by the Traffic Police Office and local health service centres that occurred around the bridge ▪ Effectiveness of safety signs
Wildlife habitat disturbance and impacts on forest resources and its mitigation	▪ Nos and extent of accidents inflicting wildlife ▪ DFO records on illegal medicinal plant, wildlife exploitation and trade ▪ Nos, extents and causes of forest fires ▪ Observations and handling of invasive species ▪ Success/failure/effectiveness of roadside plantation
Socio-economic development around bridge location	▪ Demographic, economic and educational status ▪ Nos of HHs and extent of market expansion around the bridge, land and structure ▪ Nos and extent of new business ▪ Nos and extent of new services and utilities

10.1.1 Construction Phase Monitoring

The construction phase monitoring will mainly focus on the proper implementation of mitigation measures, compliances with the design standards and norms as mandated by the IEE report. The supervision consultants will carry the monitoring during the construction phase of the project and conduct the supervision on daily basis and prepare both weekly and monthly progress report.

a. Daily Supervision

Various activities in the construction period like cutting the hill slope for the construction of access road, excavation for the erection of abutments, daily management of spoils, etc. shall be inspected daily. The supervision consultant shall collect daily data and prepare the weekly progress to submit at the project office.

b. Weekly Supervision

In weekly inspection, the Supervising Consultant shall visit the site together with the Contractor to inspect all the works like retaining and breast wall constructions along the approach road, drain construction, quarry/borrow pits, spoil disposal site and disposal practice, etc.

If any activities show noncompliance with EMP then supervising consultants shall document defective works and suggest corrective measures in the weekly report. The supervising consultant shall provide a copy of the weekly report to the contractor and the project within 2 days of the inspection.

c. Monthly Supervision

The monthly inspection will include the field based review of work progress, their compliance with the measures mentioned in the EMP section of the IEE document. The deviation from the mandate of the EMP during construction will be immediately reported and the correction measures will be recommended. The supervising consultant shall prepare a monthly progress report and mention clearly the extent to which the mitigation measures are adopted the construction activities. The

supervising consultant shall provide a copy of the monthly report to the project and the contractor within 4 days of the inspection of action.

10.1.2 Post-construction Phase

Supervising consultant shall undertake a post-construction certification inspection of each completed activities including the bridge, approach road, spoil management site, quarry site, camp site and material stockpiling site. If any of the mitigation measures as proposed by the EMP of the IEE are either not implemented or have defects, the monitoring consultant will immediately report to the project office and the contractor for its correction. If everything implemented are as per the mandate the project shall be approved for the operation.

10.1.3 Operation Phase

Environmental monitoring of the bridge during the operation phase shall focus on the key environmental issues identified during project design including river channel, condition of approach road, drainage, etc.

DoR's GESU shall also undertake at most two inspections in a year. These inspections will include a visual assessment of:

- ✓ River channel
- ✓ Condition of slope around the approach road
- ✓ Condition of spoil management site
- ✓ Drainage condition along the approach road
- ✓ Socio-economic condition around the bridge

The details of guideline for compliance and impact monitoring are presented in table 10.3 and 10.4.

Table 10.3: Compliance monitoring parameters with respective indicators.

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Final location and design as per IEE/EMP recommendation	Incorporation of IEE/EMP recommendations into location and design selection and finalization	Site observation and verification	Preconstruction phase	Consultant	Proponent/RSDP, DoR
Site selection and preparation of construction logistics	Project's arrangement of material storage, and construction activities (e.g.: campsite, material stockpiling site, etc.)	Site inspection, general sketch and photographs	Beginning of construction phase	Technical consultant, contractor	Proponent (RSDP, DoR)
Use of local labour, particularly vulnerable groups and women	Number of local labours employed in project	Records of the local recruitment bodies who facilitate and coordinate the process for local people's employment, interview	Once a month for the entire construction period where labour work is contracted	Contractor	Proponent (RSDP, DoR)
Occupational Health and Safety Issues	Health and safety regulation, first aid and medical arrangements, provision of safety equipment and measures, sanitation of labour	Spot checks at camps and work sites, photos, accident records, causes	Once a month throughout the construction phase	Contractor	Proponent (RSDP, DoR)

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Environmental protection measures, including pollution prevention, water and soil management, slope stabilization, cut and fill, spoil and waste management, environmental and socially critical sites, protection of fauna and flora	Arrangement specified in the code of practice and in manuals relating to environmental protection; records and observations on pollution, waste management, spoil disposal. Training programmes for labourers to prevent impacts on wildlife sensitive habitats, forests and fuel wood use.	Site inspection, discussion with project management, consultants, and local people. Quantifying site-specific impacts, photos, laboratory tests where required. Existing patrol, control and enforcement mechanisms, enforcement records.	Before and during construction period	Consultant (for baseline survey) Contractor	Proponent, (RSDP, DoR)
Pressure on forest and wildlife	Use of firewood or fossil fuel by construction crew, events of hunting and poaching of wildlife	Inspection and interview	Regular by contractor, once a month by consultant	Contractor	Proponent, (RSDP, DoR)
Air and noise pollution	Visual inspection and frequency of air borne respiratory infection with the consultation with local people Noise level measured around the construction	Interview data, photographs, noise level meter record	Regular by contractor, once a month during construction by consultant	Contractor	Proponent, (RSDP, DoR)

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
	area				
Water pollution	Visual inspection, open defecation and waste disposal around water sources near construction sites and labour camp	Site inspection, interview	Regular by the contractor, once a month by the supervision consultant	Contractor	Proponent, (RSDP, DoR)
Public health and accident risk	Health and safety regulations, first aid and medical arrangements, contingency plan, safety awareness programme. Provision of toilet and waste management facility to the construction crew	Spot checks at camps and work sites, photos, accident records from Traffic Police, Training records and materials, road signs	Once in two months by consultants	Contractor	Proponent, (RSDP, DoR)
Adequate technical and environmental supervision	Adequate number of technicians mobilized regularly at site. Ability to implement labour based bridge construction concept	Check number and type of technicians available at site. Skill of work carried out. Discussion.	During construction by contractor. Once a month by consultant	Consultant	Proponent, (RSDP, DoR)
Clean up and reinstatement of the construction site,	Decommissioned sites should not indicate any adverse and residual	Site observation, comparative photos,	At the end of construction period	Contractor	Proponent, (RSDP, DoR)

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
camps, quarries and burrow pits	environmental impacts, and should be rehabilitated to the satisfaction of supervision consultant and land owners	consultation with land owners			

Table 10.4: Parameters selected for impact monitoring.

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Slope Stability Erosion	Inclination, Slope failures, causes; Drainage facilities such as catch drain, side drains and functionality of DC structures; Fresh gullies and erosion Success/failure of bio-engineering solutions	Site observation, photos Discussion with people and technicians	Near steep slopes and at slide areas and sites where bio-engineering failed	Continuously during construction and operation	Technical consultant Maintenance Division DoR	Proponent, (RSDP, DoR)
Bio-engineering of Disturbed Slopes	Re-vegetation through bio-engineering application on disturbed slope Establishment of nursery	Site observation Inspection of nursery and its production rate; photos, measurements	Cut slop area, where vegetation is cleared; Nursery	During and at end of project construction	Contractor	Proponent, (RSDP, DoR)
Disposal of Spoils and Conservation	Initiated erosion, affected aesthetic value, affected forest and agriculture,	Site observation and interviews, photos, geo-	At specific locations where such	During construction	Contractor	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
wastes	initiated land erosion by local blocked drainage, hazard to downhill slope residents and agricultural lands	referencing sites	sites occur			
Quarrying of Conservation Materials	Initiated erosion, change in river regime, erosion by river systems, landslide due to quarrying, degradation of vegetation, water logging, waterborne diseases	Site observation, photos Records from local health centers	Quarry site areas	During construction	Contractor	Proponent, (RSDP, DoR)
Disruption of Drainage System	Status of rehabilitation Service status of irrigation and water supply system, Operation and maintenance requirement	Observation and interviews, photos, fisheries data, wildlife records	Disrupted aquatic system, irrigation schemes	During construction	Contractor	Proponent, (RSDP, DoR)
Water Quality	Turbidity and general status of nearby water bodies Some physio-chemical properties like pH, DO, conductivity, other chemical parameters	Visual inspection, sampling and laboratory analysis of water quality parameter	Nearby water bodies	During Construction and operation	Contractor	Proponent, (RSDP, DoR)
Air Quality	Atmospheric dust	Visual inspection	At construction sites and at sensitive spots	During construction and operation	Contractor	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
			(Schools, hospitals)			
Forest and vegetation	Numbers of trees, presence of group vegetation, signs of illicit logging and extraction of NTFPs	Observation, DFO record, photos, stakeholder interviews	In and around the construction sites, markets	During construction and operation	Contractor	Proponent, (RSDP, DoR)
Harvest/ trade of Medicinal herbs	Sales of medicinal herbs increased	Observation, interview, photos	Project Areas and markets	During operation	Local stakeholders	Proponent, (RSDP, DoR)
Wildlife	Wildlife hunting trapping and poaching by work force, Trade of Wildlife, Biological survey on selected biota	Interview with local people/DFO, Photos Observations	Forest areas at roadside	Throughout project	Contractor, LCF, DFO	Proponent, (RSDP, DoR)
Change in Economy	Numbers of people employed by the project during construction Numbers of women in work forces Changes in land use pattern	Records kept by the project management, discussion with people	Project Area	Twice a year during construction and operation	Contractor, Consultant,	Proponent, (RSDP, DoR)
Trade and Commerce	Number of shops increased or decreased, rental of houses and land spaces	Records, interview, observations, photos	Project Area	Throughout project	Consultant	Proponent, (RSDP, DoR)
Industries	Establishment of industries in the vicinity of Project	Records and interview, photos	Project Areas/Zone of	Throughout project	Consultant	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
	Area		influence			
Occupational Safety and Hazard	Type of number of accident occurred during construction, Adequacy of occupational safety measured provided Compensation provided in case of fatal accidents or invalidity	Observation, photos, spot checks, Contractors and health centre records interview with laboures	Project Area	During construction	Contractor	Proponent, (RSDP, DoR)

10.2 Environment Management Plan

The complete sets of environmental enhancement and mitigation measures have been formulated for the sustainable implementation of Narugad Khola Bridge. The environmental management plan ensures the involvement of all the parties that are directly and indirectly associated with the construction of Narugad Khola Bridge. The framework for the environmental management plan for beneficial impacts and adverse impacts are presented respectively on table 10.5 and 10.6.

Table 10.5: Framework for benefit enhancement measures.

Beneficial Environmental Impact	Benefit Augmentation Measure	Enhancement Cost	Responsible Agency	
			Implementing Agency	Supervising Agency
Employment Opportunities	Involvement of poor, dalit, women and ethnic minority people in the construction related works and providing life skill training for income generation activities	No additional cost required	Contractor /DoR	Supervision consultant
Enhancement of technical skills	Involvement of the local people in the project construction activities will serve to enhance the level of skills so that they can involve themselves in similar kind of activities in near future. Those involved as labor can learn the skill of Manson, painters, etc. Similarly, there is a provision of training for the project affected family	Cost for IRSDT for the project affected families is included in Resettlement Action Plan. Training to work force will be provided. (NRs. 450,00.00) NRs. 50,000.00 for training.	Contractor /DoR	Supervision consultant
Reduced Traffic accidents and congestion	Unnecessary stoppage of vehicles will be reduced by placing no parking zone around the bridge axis. Similarly, the wide bridge will even help to minimize the traffic accidents	No additional Cost	Contractor /DoR	Supervision consultant

Table 10.6: Framework for adverse impact mitigation measures

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
Physical Environment/Characteristics:							
Bridge Construction	Change in morphology, profile and water regime of river	• Proper River Training work • Use Spur and other velocity reducing techniques if necessary • The spoils generated during the excavation will be disposed-off immediately.	Bridge construction area	During construction	Include in design	Contractor/Supervision Consultant	Supervision consultant/DoR
	River Channel Shifting	• Proper River Training work					
Bridge construction, camp site operation, spoil disposal and quarry site operation	Pollution of water resources	• Spoils generated during the excavation will be disposed-off safely in the designed spoil disposal site. • Remove Suspended Particles • Oils and chemicals used in construction vehicles and machineries will be handled properly to avoid the contamination with the water bodies. • Separate toilet facilities will be provided to the construction crew with proper septic tank facility. • Liquid waste generated within the camp site will be disposed safely without releasing into the water bodies. • Accidental spillage of the oil, grease and other chemicals	Bridge construction area, spoil disposal site and quarry site	During construction and quarrying	No additional cost required	Contractor/Supervision Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		substance will be captured immediately without allowing them to get contaminate the water bodies					
	Solid waste generation	dumped in environment friendly manner					
Approach road construction	Landslides, slope destabilization and soil erosion	- Retaining structures - Bioengineering for embankment of bridge and approach road	Around the approach road	During construction	Included in project design Cost	Contractor/Supervision Consultant	Supervising consultant/DoR
Camp site operation	Loss of productive land	Camp site will be established on recommended barren land to avoid the loss the productive land	Around the camp site	During construction phase	No additional cost	Contractor/Supervision Consultant	Supervising consultant/DoR
Chemical handling	Environmental issues associated with the mishandling of chemical substances	- Proper safety measures will be adopted while handling the hazardous chemicals like oil, grease, etc. - Combustible chemicals like petrol, diesel, etc. will be stored separately in a safe container. - Project will have the provision of fire extinguisher throughout the construction period.	Around the construction site, and camp site	During construction period	NRs. 20,000 for fire extinguisher (five 4kg, cylinder, at the rate of 4000/cylinder)	Contractor/Supervision Consultant project	Supervision consultant/DoR
Construction materials stockpiling	Environmental issues associated with the material stockpiling	- The land allocated for the storing of construction materials will be far from agricultural land and water bodies. - Permission from local authority - far from agricultural land - cover with tarpaulin during to prevent from rain and dust	Material stockpiling site	During construction period	NRs. 10,000 for fencing and covering materials (included in BoQ)	Contractor/Supervision Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		emission generated from rain and dust emission Construction material will be further encircled with side barriers and covered to avoid mix up with deleterious materials					
Spoil disposal	Environmental issues associated with spoil disposal	- Whenever possible, surplus spoil will be used to fill eroded gullies, quarries and borrow pits, depressed areas, etc. - Recommended to build the 200m X 20m X 3m wall along the Seti River at the left bank of Narugad Khola about 50m from the proposed bridge location and use it as the spoil disposal site - Disposal of spoil on fragile slopes, farmland, marshy land, forested areas, natural drainage path, canals and other infrastructures will be prohibited. - A disposal site will be provided with proper drainage, vegetation and adequate protection against erosion. - Vegetation plantation will be done over the spoil disposed surface to reclaim the area.	Spoil disposal area	During construction period	NRs. 40,000 for gabion structure construction	Contractor/Supervision Consultant CBOs/Project	Supervision consultant/DoR
Operation of project vehicles and	Air and noise pollution	Repair and maintenance of machinery as per specification	Construction site and quarry site	During construction period	No additional cost	Contractor/Supervision Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
machineries							
Bitumen handling and heating	Soil, water and air pollution	• Proper handling of bitumen to avoid soil and water contamination. • Provide the Occupational health and safety (OHS) /Personal Protective Equipment (PPE): Mask, Gloves, boots, helmet etc. • Bitumen heating site will be at least 200m away from the settlement. • Secure safe site for bitumen storage • Obtain permission from the land owner before commencing the storage activities • Avoid storage on fertile land and water bodies • Promptly clear bitumen leakage over the land • Avoid bitumen discharged into the drain structure while overlaying on sub-base material • Avoid bitumen related work during the rain and handle carefully by the worker.	Approach road and bridge	During construction period	NRs. 20,000 for cleaning sites after bitumen heating	Contractor/Supervision Consultant	Supervision consultant/DoR
Work camp operation	Environmental pollution due to the release of solid and liquid waste from the	• Solid waste will be managed following 3 R principle. • Bio-degradable waste will be disposed in a separate pit away from the water bodies.	Labour camp	During construction period	No additional cost	Contractor/Supervision Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
	work camp	- Liquid waste will be disposed in a separate ditch and disinfectant will be continuously spread to avoid contamination. - Separate sanitary toilet will be construction near the construction camp with the facility of septic tank. - Provision of clean drinking water will be made at the construction camp - Liquid waste will be disposed through drainage - Separate sanitary toilet will be constructed in camp with the facility of septic tank - Provision of clean drinking water will be made at construction camp					
Vehicular movement	Air and noise pollution	- Provide the Occupational health and safety (OHS) /Personal Protective Equipment (PPE): Mask, Gloves, boots, helmet etc. - Regular sprinkling of water in construction area. - Noise generating activities are prohibited in the night time - Use of face mask while working on dust prone area, - Covering of dust sources, construction materials	Approach road and bridge	During operational period	Include PPE cost in design	-	-

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		Avoid the night time work					
Regular maintenance	Environmental issues due to stockpiling of construction materials during regular maintenance	- Selection of safe and appropriate site for material stockpiling - Permission from local authority - far from agricultural land - cover with tarpaulin during to prevent from rain and dust emission generated from rain and dust emission - Construction material will be further encircled with side barriers and covered to avoid mix up with deleterious materials	Bridge	During operation period	No additional cost	DoR	DoR
Bridge construction	Occupation health and safety of workers	- Drinking water facility and temporary pit latrine will be established at construction sites to control open defecation and pollution of water bodies by the workers. - Workers will be provided with first aid and health facilities. There will be provision for group accidental insurance for the workers. - First aid training will be provided to field staffs like observers, social mobilizers and supervisors. - Work force will be given special training related to construction activities - Helmet, Jackets, Boots, Masks, Google's, etc. will be given	Construction area	During Construction period	Included in project design	Contractor/Supervision Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		Insurance for workers - Physical injury as per existing act and rules.					
Operation of bridge	Road accident	- Installation of sign boards at accident-prone spots and busy spots. - Traffic safety sign as per DoR standard (warning sign, Permanent/temporary barrier, prone area enforce speed limit ,etc.	Around the project area	During operation stage	NRs. 5,000 for sign posts	Contractor/Supervision Consultant	Supervision consultant/DoR
Biological Environment:							
Bridge construction	Disturbance to wildlife and biodiversity	3 trees - Banana (1), and Bakaino (2) needs to be cleared during construction activity. - Construction camp will be supplied with LPG and the use of fuel wood will be discouraged. - Depending on the local conditions and logistic constraints, meat and fish for contractor's workforce should be supplied by the contractor by purchasing them from market in the area. - Contractor will arrange/buy energy resource for bitumen heating from the authorized source	Construction camp	During construction period	NRs15,130 for 75 sapling plantation	Contractor/Supervision Consultant	Supervision consultant/DoR
Socio-economic and Cultural Environment:							
Bridge construction	Social conflicts	The labour should comply with the code of conduct set by the contractor		During construction period	Not applicable	Contractor/Supervision Consultant	Supervision consultant/DoR
Bridge	Obstruction of	Separate facilities of drinking	Around	During	No	Contractor/S	Supervision

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
construction	social services and facilities	water and other services will be made on camp site. Construction schedule will be developed to facilitate the smooth movement of vehicles.	construction area	construction period	additional cost required	upervision Consultant	consultant/DoR
Bridge construction	Impact on public and private properties (2 Irrigation canals and 1 water mill)	Project has prepared a separate resettlement plan which address the issues related to loss of public and private properties under Land Acquisition 2034.	Around the pre-construction area	During pre-construction stage	NRs. 150,000	Project	Supervision consultant/DoR
Bridge construction	Public grievance related to bridge construction	- Project will form, activate, and maintain Grievance Redress Mechanism around the project area. - Activate and maintain Grievance Redress Mechanism in concerned Manager's Office, Resident Engineer's Office, and Contractor's Office. - Inform local stakeholders of Grievance Redress Mechanism's existence. - Inform local stakeholders about how they can lodge grievance against contractor's fault work for his ratification.	Around the pre-construction area	During pre-construction and construction stage	No additional cost	Project/ Contractor/Supervision Consultant	Supervision consultant/project
Bridge construction	Land and property acquisition,	Project has prepared a separate resettlement plan which address the issues related to the land and	Project area	During pre-construction stage	Cost included in resettlemen	Project	Project/local stakeholders/local government

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
	(0.23 ha of land loss)	property acquisition, compensation, resettlement and rehabilitation under Land Acquisition 2034.			total plan (NRs. 1,484,250.00)		authority

10.3 Cost for Execution of EMP

10.3.1 Details of specific cost

a. Income Restoration and Skill Development Training

One member of each affected households will be provided income restoration measures under the **Income Restoration and Skill Development Training (IRSDT)** program according to the requirements of the ESMF. RSTD include trainings on income generating activities which will be delivered through trainings and other supplementary investments. These programs are expected to re-establish PAPs' lost livelihood options and uplift of new income generating opportunities. Regarding the information from the consultation some list of training is listed below and this training will deliver as per their need basis during construction phase.

Table 10.7: Proposed Training and Cost Estimate.

S.N.	Name of Trainings	Targeted Participants		Duration	Start date	Cost (NRs)
		Male	Female			
1	Mobile repairing	3	3	15 days	During construction	100,000
2	Motorcycle Repairing Training	2	1	45 days	During construction	350,000
	Total	5	4		450,000	

Source: RAP, 2016

b. Land, properties acquisition, resettlement and rehabilitation cost

The project has already prepared Resettlement Action Plan (RAP). The specific cost estimated as mentioned in draft RAP is presented here. ***This cost will not be added in this report.***

Table 10.8: Cost associated with resettlement and rehabilitation.

1. Direct Cost			
A. Compensation & Rehabilitation			
I) Estimated compensation for private structures (including dismantling cost)	Number	5	545,000
II) House displacement allowance	Number	2	60,000
III) Transportation allowance	Number	2	20,000
IV) Business displacement	Number	2	40,000
V) Support Allowance	Number	2	20,000
VI) Compensation of Land	Number	3	300,000
Sub Total of 1			985,000
2. Indirect Cost			
I) LEST Cost	Lump sum		450,000
5% provisional sum of heading 2 (I)			49,250
Sub Total of 2			499,250
Total (1+2)			1,484,250

Source: RAP, 2016.

c. Cost of tree plantation

Compensatory tree plantation for the trees that need to be cut in the ratio 1:25 will be done. Likewise, tree plantation will also be done for the restoration of spoil disposal site, road side plantation and plantation to enhance the aesthetics. Altogether the plantation of 30 trees has been proposed in this report. The cost estimate for the plantation of trees is presented in table below:

Table 10.9: Cost of sapling plantation maintenance

Activities	Cost in Rs.	Remarks
Plantation of 75 saplings, including site preparation, pitting and mulching	7,500	Lump sum cost of NRs. 100/sapling (including cost for site preparation, pitting and mulching)
Replacement of 9 dead saplings at the rate of Rs. 70	630	Assuming 30% mortality
Tools	2,000	Lump sum
Tending and maintenance for 5 years	5,000	Lump sum
Sub-total	15,130.00	

d. Cost for Physical Impact Mitigation

The cost for the mitigation of physical impacts is presented in table below. The cost includes all the cost included in EMP matrix.

Table 10.10: Cost of Physical Impact Mitigation

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
Camp site - Contractor Office/ Workshop - Labor camp	Provisional Sum (PS)	200,000	200,000	Contractor will bear the cost of labor force site including land/house hire, fuel, drinking water supply, electricity etc.
Capacity Building - Pre-construction orientation to the senior level bridge engineer and mid-level bridge engineer - Training (work force)	Lump sum Lump Sum	30,000 20,000	30,000 20,000	Contractor will conduct all necessary trainings related to bridge construction
Safety gadget	18 months	5000	90,000	Project is planned to be completed in 24 months however, working

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
				period will be 18 months avoiding 3 monsoon months. Safety gadget will be provided to work force, visitors, supervision consultant.
Awareness Raising Program to the local (Training related to river safety like awareness regarding wastes not to be disposed in river banks, river bed extraction within 500 m u/s and d/s from the bridge location, health and sanitation, biodiversity conservation)	3 day	10,000	30,000	
Safe disposal of spoil including transportation and rehabilitation of site	PS		40,000	The cost includes transportation of spoil to the designated site, and rehabilitation of the site
Traffic Sign Post	PS	1500*3+500	5,000	NRs. 1500 per post and 500 installation charge
Bitumen Heating (Safe storage, heating and handling and closure)	PS	20,000	20,000	
Construction of Berms and fencing of stockpiling materials	Lump Sum	10,000	10,000	Contractor will bear the cost for protecting the stockpiling materials
Fire Safety Gadget	5	4,000	20,000	
Maintenance of two irrigation canals and a dam of water mill	Lump Sum		150,000	NRs. 120,000 for irrigation canal and NRs. 30,000 for water mill
Sub-Total			615,000.00	

e. Cost of environmental monitoring

This report assumes that the supervision consultant will take all the responsibility for the environmental monitoring of the project and the cost of environmental monitoring are allocated according to that.

Table 10.11: Cost of environmental and social monitoring.

Specification	Man Month	Rate	Amount
Environmental Expert	3	100,000	300,000.00
Social Expert	2	80,000	160,000.00
Stationary and computer	Lump Sum		20,000.00
Printing and Photocopies	Lump Sum		50,000.00
Transportation	Lump Sum		150,000.00
Cost of Monitoring by GESU	Lump Sum		150,000.00
Cost of Monitoring by MoPIT	Lump Sum		150,000.00
		Sub-Total	980,000.00

10.3.2 Total Cost for EMP Implementation

The breakdown of cost for the implementation of Environmental Management Plant is presented in table below:

Table 10.12: Total Cost of implementation of EMP.

S.N.	Activities	Cost	Remarks
1	Mitigation measure under physical environment	615,000	
2	Tree Plantation	15,130.00	
4	Environmental Monitoring	980,000.00	
Total Cost of EMP implementation		1,610,130.00	

10.4 Grievance Redress Mechanism

At project level a grievance redress mechanism will be established allow project affected persons (PAPs) to appeal any disagreeable decisions, practices and activities arising compensation for assets, and technical and general project-related disputes. As specified in ESMF the PAPs will be made fully

aware of their rights and the procedures for doing so verbally and in writing during compensation, survey, and time of compensation.

There is potentiality of two types of grievances: grievances related to resettlement requirements, and grievances related to compensation or entitlement.

The PAPs will have access to both locally constructed grievances redress committees specified under ESMF i.e. Local Consultative Forum (LCF) and formal courts of appeal system. Under the latter system, every PAP can appeal to the court if they feel that they were not compensated appropriately. They may appeal to appellate court within 35 days of the public notice given to them.

Grievance recording register will be maintained at PIC office. Project affected people as well as local people can lodge their complaints at these offices related to assets acquisition and construction related activities. Special project grievance mechanisms such as on site provision of complain hearings allows project affected persons to get fair treatment on time. In this sub project one LCF will be formed in bridge location site to handle initial grievances of the project-affected people. The PAPs will have unhindered access to the grievance redress office to forward and file them complains without being intimidated or being deterred by excessive bureaucratic hurdles. The provision of Local Community Liaison Assistant (LCLA) in the project implementation is good practices in this regard. LCLA can be mobilized in order to help PAPs to file the complaints to the concerned agency. APs will be exempted from all administrative fees incurred, pursuant to the grievance redressed procedures except for cases filed in court Proposed mechanism for grievance resolution is given below:

Stage 1: Complaints of PAPs on any aspect of compensation, relocation, or unaddressed losses will be settled in first instance verbally or in written form in field based project office. The concerned personnel to settle the issues at local level can discuss the complaint in an informal meeting with the PAP. The community consultation, involvement of social and resettlement experts will be helpful in this regard. It will be the responsibility of the LCF and Project In-charge to resolve the issue within 15 days from the date of the complaint received.

Stage 2: If no understanding or amicable solution reached or no response from the project office, the PAP can appeal to the CDC. While lodging the complaint, the PAP must produce documents to support his/her claim. The CDC will provide the decision within 15 days of registering the appeal.

Stage 3: If the PAP is not satisfied with the decision of CDC or in absence of any response of its representatives, within 35 days of the complaint, the PAP, in his/her last resort, may submit its case to the court.

CHAPTER - 11: CONCLUSION

The construction of Narugad Khola Bridge results in substantial beneficial impacts. The construction of bridge will improve the mobility due to the year round movement of vehicles. The people will have access to facilities such as educational institutions, health facilities, etc. In case of Narugad Khola Bridge, the environmental impact of bridge construction is low and easily mitigated through the mitigation measures proposed in chapter 9. Only 3 trees needs to be cleared for the construction of the proposed bridge and two irrigation canals and one dam of water mill falls within the construction area affected by the project. One of the significant environmental issues during the construction of the approach road is slope instability and landslide which will require immediate mitigation measures to prevent the future hazards associated.

As a part of social impact, three households loose five parcels of land during the construction of bridge. The construction of approach road affects altogether three private structures owned by four owners. The project affected households will be compensated as per the cost mentioned in resettlement plan.

Largely the impacts due to the construction of proposed bridge are site-specific in nature and can be mitigated immediately during the construction period without much environmental damage and reversible impact. There are several residual impacts like future accidental risk, development of settlement around the bridge area, air and noise pollution due to the movement of vehicles, etc. for which mitigation measures could not be proposed at this stage. The total cost for the implementation of EMP has been estimated to be NRs. 1,610,130.00

Give the above conclusion; the Initial Environmental Examination (IEE) document is sufficient and no further EIA is required. Hence the IEE recommends for the implementation of Environmental Management Plan included herewith the IEE document for the mitigation of adverse environmental impacts, enhancement of beneficial impact and sustainable operation of the proposed bridge.

ANNEXES

Annex A: Approved Terms of Reference (ToR)

Annex B: Public Notice

Annex C: Deeds of Inquiry (Muchulka)

Annex D: Public Consultation

Annex E: Recommendation Letter

Annex F: Approval Letter of ToR

Annex G: Photographs

Annex H: Comments and suggestions Incorporated Matrix For Narugad Bridge