



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

Initial Environmental Examination
of
Hanumante Khola Bridge (Kaushaltar- Balkot Road)



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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
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

हनुमन्ते खोला पुल
प्रारम्भिक वातावरणीय परिक्षण
कार्यकारी सारांश

१.० प्रस्ताव

प्रस्तावित हनुमन्ते खोला कौशलटारपुल- बालकोट सडक खण्ड अन्तर्गत भक्तपुर जिल्लाको मध्यपुर ठिमी न.पा. र अनन्तलिङ्गेश्वर न.पा. को सिमाना भएर बग्ने हनुमन्ते खोलामा पर्दछ । प्रस्तावित आयोजना क्षेत्र समुद्री सतहबाट १२९३ मी. मा पर्दछ । यस आयोजनाको प्रमुख उद्देश्य भूकम्पले क्षती गरेको हाल कायम हनुमन्ते पुललाई विस्थापन गरी नयाँ पक्की पुल निर्माण गर्ने रहेको छ । यस हनुमन्ते खोला

पुल निर्माणको प्रस्तावकको नाम र ठेगाना अनुसार रहेको छ ।

भू-वातावरण तथा समाजिक शाखा,

सडक विभाग,

चाकुपाट, ललितपुर

फोन: ०१-५००५५२०

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

सडक क्षेत्र विकास आयोजना,

सडक विभाग,

सानो गौचरन, काठमाडौं

२.० प्रस्तावको विवरण

प्रस्तावित हनुमन्ते खोला पुलको कुल लम्बाई ३७.५ मी.को हुनेछ भने यसको चौडाइ ११ मी. को हुनेछ । पक्क गरेर निर्माण गरिने उलको दया-बाँया थप ११५ मी. सडक सुधार गर्नु पर्ने देखिन्छ । भौगर्भिक रुपमा २७°४०'२२.२८" उत्तर अक्षांश र ८५°२१'४५.२८" पूर्व देशान्तरमा अवस्थित उक्त आयोजना निर्माणका लागि कुल लागत रु. ८३,१६२,१३३.८७ रहेको छ ।

३.० प्रस्तावको सान्दर्भिकता

वातावरण संरक्षण नियमावलीको अनुसूची-१ (नियम ३ सँग सम्बन्धित) को 'इ' सडक क्षेत्रको ४ नं. प्रावधान अनुसार कुनै पनि ठूला पुलहरु निर्माण गर्दा प्रारम्भिक वातावरणीय परिक्षण गर्नु पर्ने कानूनी प्रावधान रहेको छ । राष्ट्र मापडण्ड २०६७ का अनुसार २५ मी. भन्दा बढी लामो स्पान भएका पुलहरु ठूला पुल भित्र पर्दछन् । प्रस्तावित हनुमन्ते खोला पुलको स्पान ३७.०५ मी. भएकाले उक्त पुल निर्माण गर्नु पूर्व त्यस पुलको प्रारम्भिक वाताव परिक्षण तयार गरी भैतिक पूर्वाधार तथा यातायात मन्त्रालय मार्फत स्वीकृत गराउनु पर्ने कानूनी 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 त्मकक या च्भाभचभलअभ० मा उल्लेख गरिए अनुसार तयार पारिएको हो ।

प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गर्ने क्रममा सान्दर्भिक ग्रन्थहरुको पुनरावलोकन कभअयलमबचथ प्लायकबतष्यल गरी सङ्कलन गरियो भने स्थलगत अध्ययन गरी उच्चबचथ प्लायकबतष्यल गर्ने कार्य गरियो । अयोजना सँग प्रत्यक्ष सरोकार राख्ने स्थानिय सरोकारवालाहरुबाट राय सुझाव पठाउन आवहान गर्दै मिति २०७३ साल कार्तिक २७ 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 स्थानियसरोकारवालाहरूसँग 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 न्यूनीकरण गर्ने उपायहरु पहिचान गरियो र अन्तत वातावरणीय अनुगमन योजना समेत तयार गरी प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गरियो ।

६.० विद्यमान वातावरणीय अवस्था

प्रस्तावित हनुमन्ते खोला पुल मध्यमाञ्चल विकास क्षेत्र, बागमती अञ्चल, भक्तपुर जिल्लाको मध्यपुर ठिमी न.पा. र अनन्तलिङ्गेश्वर न.पा.को सिमाना भएर बग्ने हनुमन्ते खोलाम भक्तपुर जिल्लाको कौशलटार र बालकोट भन्ने ठाँउलाई जोड्ने गरी प्रस्ताव गरिएको छ । उक्त पुल मनहरा-हनुमन्ते दोभान भन्दा १.५ कि.मी. माथी समुद्री सतहभन्दा १२९३ मी. उचाइमा रहेको छ । काठमाडौं उपत्यका तलाउ रहदा थेग्रीएर रहेको माटोको भू-बनोट रहेको उक्त क्षेत्रमा भूक्षय

तथा बाढीनै मुख्य प्रकृतिक प्रकोप रहेको छ । समसितोष्ण किसिमको जलवायु रहेको उक्त क्षेत्रमा गर्मी अधिकतम तापक्रम 30° से भन्दा अधिक रहने गर्दछ । हनुमन्ते खोलाको पुल बन्ने स्थान भन्दा मथि जलाधारको क्षेत्रफल ९५.९६ वर्ग कि.मी. रहेकोछ । आयोजना निर्माण गर्नका लागि पानीको १०० वर्षको उच्च बहाव ३२१ क्यूसेक लिइएको छ । बाक्लो सहरी क्षेत्रमा निर्माण गर्न प्रस्ताव गरिएको उक्त पुल निर्माण स्थल वरपर न्यून मात्रामा खेती योग्य जमिन रहेको छ । पुल निर्माण स्थल वरपर सवारी चाप उच्च रहेकाले वायु तथा ध्वनीको गुणस्तर खस्केको देख्न तथा महसुस गर्न पाइन्छ । साथै हनुमन्ते खोलामा जिल्लाको विभिन्न सहरी क्षेत्रको ढल मिसाइएकाले पानी अधिकतम रूपमा प्रदूषित रहेको छ ।

आयोजना निर्माण क्षेत्र सहरी बाक्लो बस्तीको विचमा भएकाले कुनै पनि किसिमको वन, जंगल छैन । हनुमन्ते खोलाको किनारामा रहेका केही केरा, बकेनो, रबर, कन्के फुल, काइयो फुल, भिमसेनपाती, अडीर, सिस्नु, गाँजा र नर्कटनै त्याँहा रहेका वनस्पतीहरु हुन । यसै गरी अयोजना क्षेत्रमा कुनै पनि वन्य जन्तुहरु पाइदैन ।

आयोजना प्रभावित मध्य अनन्तलिङ्गेश्वर न.पा.मा ३७,९८९ र मध्यपुर ठिमी न.पा.मा ८३,०३६ ख्याजनसंरहेको छ । दुवै न.पा.हरु मध्य मध्यपुर ठिमी न.पा. मा नेवार जातीको बाहुल्यता रहेको छ भने अनन्तलिङ्गेश्वर न.पा.मा क्षेत्री जातीको बाहुल्यता रहेको छ । भक्तपुर जिल्लानै खुल्ला दिसा मुक्त जिल्ला भई सकेको अवस्थामा आयोजना प्रभावित न.पा.हरु समेत खुल्ला दिसा मुक्त हुन् । आयोजना प्रभावित न.पा.हरुमा धाराको पानी अधिकांश घरहरुमा पुगेको भए पनि इनार, कुवा, ढुङ्गे धाराहरुको प्रयोग समेत उल्लेखनिय मात्रामा भएको पाइन्छ । उर्जाको सवालमा दुवै न.पा.हरुमा मुख्य खाना पकाउन ग्यास र बत्ती बाल्न विजुलीको प्रयोग गर्ने गरिएको छ । आयोजना प्रभावित न.पा.हरुका भन्दा ८०% धेरै मानिसहरु साक्षर रहेका छन् । उक्त क्षेत्रमा सञ्चार सम्बन्धि नेपालमा उपलब्ध सम्पूर्ण साधनहरु प्रयोगमा आएका छन् ।

७.० वातावरणीय प्रभावहरु

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

नकारात्मक प्रभावहरुको सन्दर्भमा यस हनुमन्ते खोला पुल सहरी क्षेत्रमा निर्माण गर्ने प्रस्ताव गरिएको हुनाले प्राकृतिक वातावरणमा पर्न सक्ने प्रभाव निकै न्यून रहेका छन । हाल साँधुरो भूकम्पले असर गरेको पुल भएको अवस्थामा फराकिलो पक्की पुल निर्माणले सावरी आवागमन सहज भइ वायु तथा ध्वनी प्रदुषण समेत कम हुन जान्छ । यद्यपी आयोजना निर्माण अवधिमा भने उक्त क्षेत्रमा सावरी आवागमन अस्त व्यस्त हुने सम्भावना उच्च रहेको छ । आयोजना निर्माण गर्नाले ०.१२ हेक्टर जमिन स्थाई रूपमा आवश्यक पर्ने देखिन्छ । यसै गरी आयोजना निर्माण गर्दा एउटा बकाइनोको विरुवा र एउटा केराको बोटनु काटपर्ने देखिन्छ । यसै गरी आयोजना निर्माण गर्नु पूर्व ६ कित्ता निजी

जग्गा र ५ वटा निजी संरचनाहरू अधिग्रहण गर्नु पर्दछ, साथै ४ वटा विजुलीका खम्बाहरू र एउटा ट्रान्सफर्मर समेत स्थानान्तरण गर्नु पर्ने हुन्छ ।

८.० वातावरणीय प्रभाव न्यूनीकरण तथा वातावरणीय व्यवस्थापन योजना

वातावरणीय प्रभाव न्यूनीकरण गर्नका लागि यस प्रतिवेदनमा विभिन्न उपायहरू 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 ५० वटा विभिन्न जातका स्थानिय विरुवाहरू पुल निर्माण स्थल भन्दा तल र माथी गरेर खोलाको दुवै किनारामा रोप्ने । सडक निर्माण क्रममा हुन सक्ने दुर्घटना कम गर्न संकेतहरू राख्ने, रातको समयमा बत्तीहरू बाल्ने व्यवस्था मिलाउने लगायतका उपायहरू प्रतिवेदनमा समावेश गरिएको छ ।

यसरी प्रस्तावित हनुमन्ते खोला पुल निर्माण गर्दा स्थानिय वातावरणमा पर्न सक्ने प्रतिकूल प्रभावहरू न्युनिकरण गर्न 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. १,५१७,४२०.०० विनियोजन गरिएको छ ।

९.० निष्कर्ष

प्रस्तावित हनुमन्ते खोला पुललाई आयोजना क्षेत्रका वासिन्दाहरूले अत्यधिक आवश्यकताको विषयका रूपमा लिएका छन् । उक्त पुल निर्माण गर्दा वातावरणमा कम मात्र नकारात्मक प्रभावहरू पर्ने सो प्रभावहरूलाई प्रतिवेदनमा उल्लेख गरिएको उपायहरू अवलम्बन गरेमा सजिलै समाधान गर्न सकिने हुनाले यस पुल निर्माण प्रस्तावअधि यथाशिघ्र बढाउन निष्कर्ष निकालिएको छ ।

EXECUTIVE SUMMARY

1.0 Proposal

Proposed Hanumante River Bridges lies in the Kaushaltar – Balkot Road Section, at the boundary of Madhyapur Thimi Municipality and Anantalingeshwor Municipality in Bhaktapur District. The project is 1293 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 Hanumante River Bridge is 37.5 m, while its width is 11m. The construction of the Hanumante River Bridge should even require the construction of additional 115 m approach road. The geographical location of the proposed bridge is 27°40'22.2" N latitude and 85°21'45.28" E longitude. The estimated cost for the construction of the proposed bridge is NRs. 83,162,133.87.

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 Hanumante 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 2073-07-27 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 Hanumante Khola Bridge is located in the Central Development Region, Bagmati Zone, Bhaktapur District. The proposed location for the construction of the bridge lies at the boundary of Madhyapur Thimi Municipality and Anantalingeshwor Municipality, connecting Kaushaltar – Balkot Road. The bridge location is 1.5 km upstream from Hanumante – Manahara Confluence and lies above 1293 m from mean sea level. The geological characteristics around the bridge shows the thick fluvo-lacustrine deposits of Kathmandu Valley. The climate around the bridge construction location is of temperate type, where summer temperature rises more than 30°C. The total catchment area of Hanumante River, u/s from the bridge location is 95.96 km². The design discharge for the construction of the bridge is 321 m³/s. Settlement is the major land use pattern around the construction area. Due to high vehicular flow, the air and noise quality around the project area is quite deteriorated. Furthermore, due to direct sewage disposal into river, from the residential area of Bhaktapur, the water quality is highly polluted.

There are no any forested or highly vegetated areas around the project location. Few species present around the construction location area Banana, Bakaino, Rubber plant, Kanke Ful, Kaiyo Ful, Bhimsenpati, Aadir, Sisnu, Ganja, and Narkat. Likewise, there is no any wildlife species observed around the project area.

Among the two project affected municipalities Anantalingeswor Municipality has 37,989 populations, while Madhyapur Thimi Municipality has 83,036 populations. Both project affected municipalities are dominated by Newar ethnic group followed by Chhetris. As Bhaktapur district is an open defecation free district, all the households of both municipalities have toilet facilities. Although most of the households in the project affected municipalities have drinking water supplied through tap, drawing water from well and water spout is still prevalent. Large fraction of households in both municipalities are using LPG for cooking and electricity of lighting. More than 80% population of project affected municipalities are literate. All the communication facilities available within country are available in project affected municipalities.

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 11 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 0.12 ha of land permanently and clearing one sapling of Bakaino and one banana plant.

Acquisition of 6 parcels of private land and 5 private structures, relocation of 4 electrical poles and 1 electric transformer, etc. are among the adverse impact of the project.

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 50 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. 1,517,420.00 has been allocated.

9.0 Conclusion

The local people around the project area have felt the immediate need for the construction of new bridge. The construction of the proposed project will have minimal adverse impact in the surrounding environment, which can be mitigated through the measures suggested in the document. Thus, it has been concluded that the bridge should be constructed as soon as possible with the implementation of all possible mitigation measures.

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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 Hanumante Khola Bridge (Kaushaltar- Balkot Road) is as follows:

Geo-Environmental and Social Unit (GESU)

Department of Roads (DoR)

Ministry of Physical Planning 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 had prepared the Terms of Reference (ToR) for IEE as per task A 402 and the IEE Report of this Hanumante Khola Bridge. The name and address of the consultants preparing the IEE report is as follows:

Kunhwa Engineering and Consultancy Co. Ltd., Korea

In association with

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 Headquarters namely: Darchula, Baitadi, Dailekh, Kalikot, Bajhang, Jumla, Musikot, and Jajarkot, including improvement of existing intermediate lane to double lane carriageway to Narayanghat- Muglin Road.

Apart from the above mentioned projects, RSDP is going to construct three new bridges in earthquake affected areas, as a part of Emergency Earthquake Assistance program. Under the program, two bridges, i.e. Hanumante Khola Bridge is located in Bhaktapur District and Bhalam Bridge is located in Lamjung District.

The Hanumante Khola is located at a distance of 180 m South from Kaushaltar Chowk (towards Balkot), and the total length of the proposed Hanumante Khola Bridge is 37.05m, while its width is 11m. The proposed bridge is located at the Boundary of Madhyapur Thimi Municipality (Right Bank) and Anantalingeswor Municipality (Left Bank) of Bhaktapur District. The construction of the proposed bridge will facilitate for the all season transportation to the south-western part of Bhaktapur district, which even links several parts of south-eastern part of Lalitpur District.

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 37.5m and hence, the proposed construction work requires IEE. Therefore, this IEE Report is prepared in accordance with the Rule-5 and Schedule-3 of EPR’97.

2.4 Relevancy of the Proposal

Among the districts that are severely affected by the Gorkha Earthquake, 2015, Bhaktapur is also one of them. Poor infrastructure development and many other reasons have posed difficulty during the rescue operations. The older villages around the Anantalingeshwor Municipality and Suryabinayak Municipality are typically vulnerable to earthquake because of their traditional settlements and medium economic status of the people. The road networks connecting those settlements are at a very poor condition and it is very essential to upgrade them to smoothen the vehicular movement to those settlements. This would help in both normal and emergency situations. The existing bridge over the Hanumante River near Kaushaltar is very narrow and the condition of that bridge is very poor. Everyday traffic jam is the evidence for the urgent need for the construction of new bridge. Under all above circumstances, it is very relevant to construct new 11m wide bridge over the Hanumante Khola.

CHAPTER - 3: PROJECT DESCRIPTION

3.1 Project Area

The proposed Hanumante Khola Bridge is located at the boundary of Madhyapur Thimi and Anantalingeshwor Municipality of Bhaktapur District, Bagmati Zone in the Central Development Region. The geographical position of the proposed bridge is $27^{\circ}40'22.28''\text{N}$ and $85^{\circ}21'52.88''\text{E}$, and its elevation from the mean sea level is 1293m. The proposed location for the construction of Hanumante Khola Bridge is at a distance of about 180m towards south from Kaushaltar Chowk.

The land use around the proposed bridge location is characterized by the presence of dense settlement on both the banks of the river with the considerable agricultural land along the bank of river (especially on left bank).

The location of the proposed Hanumante Khola Bridge is presented in the following maps.

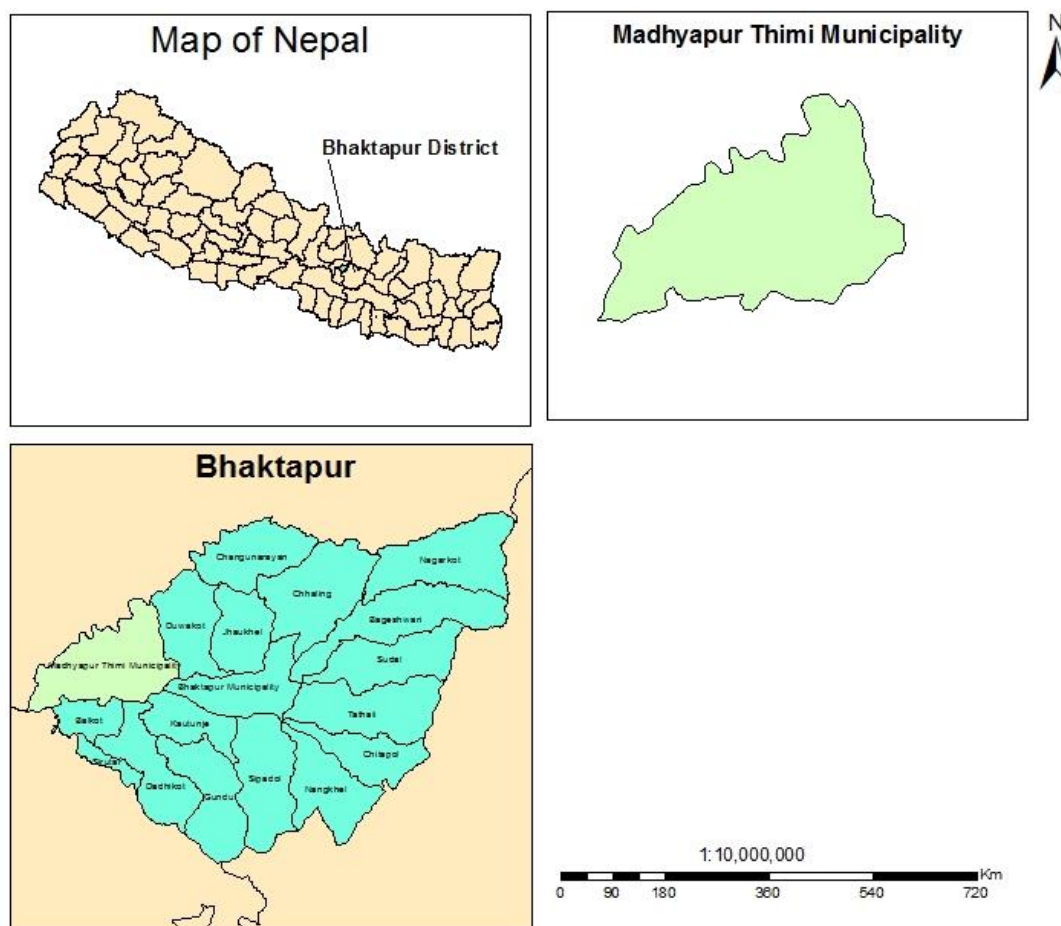


Figure 3.1: Location map of the proposed Hanumante Khola Bridge

(Source: - GIS 10.3)

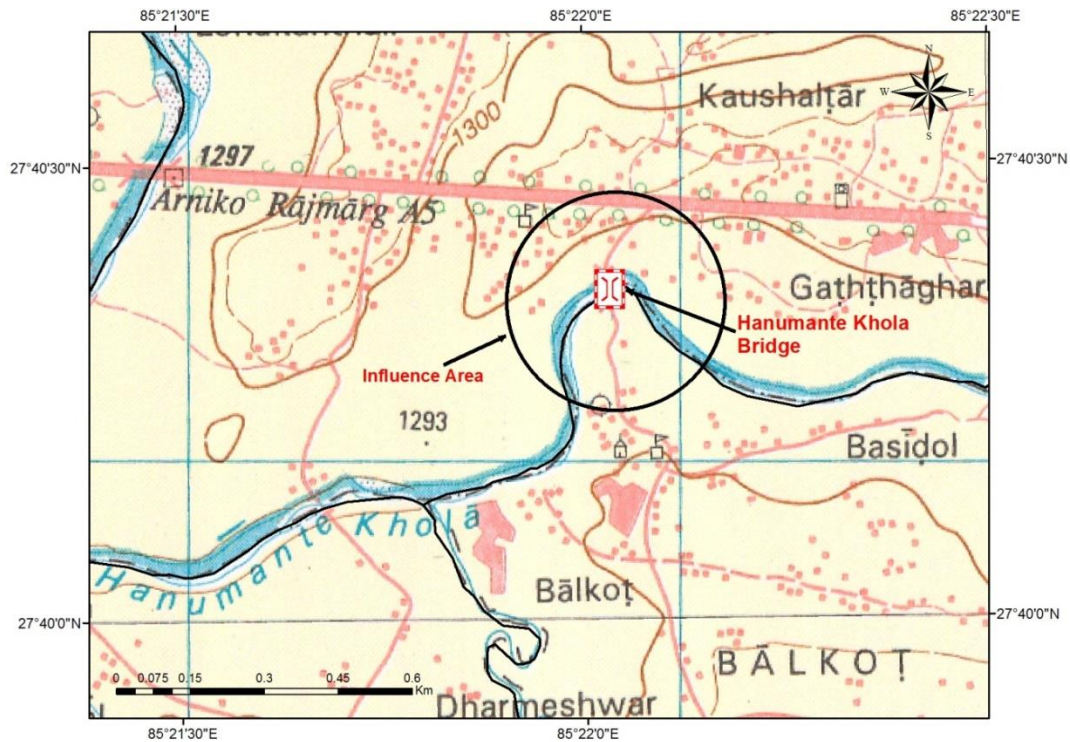


Figure 3.2: Location of the proposed bridge in a Topographical map

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

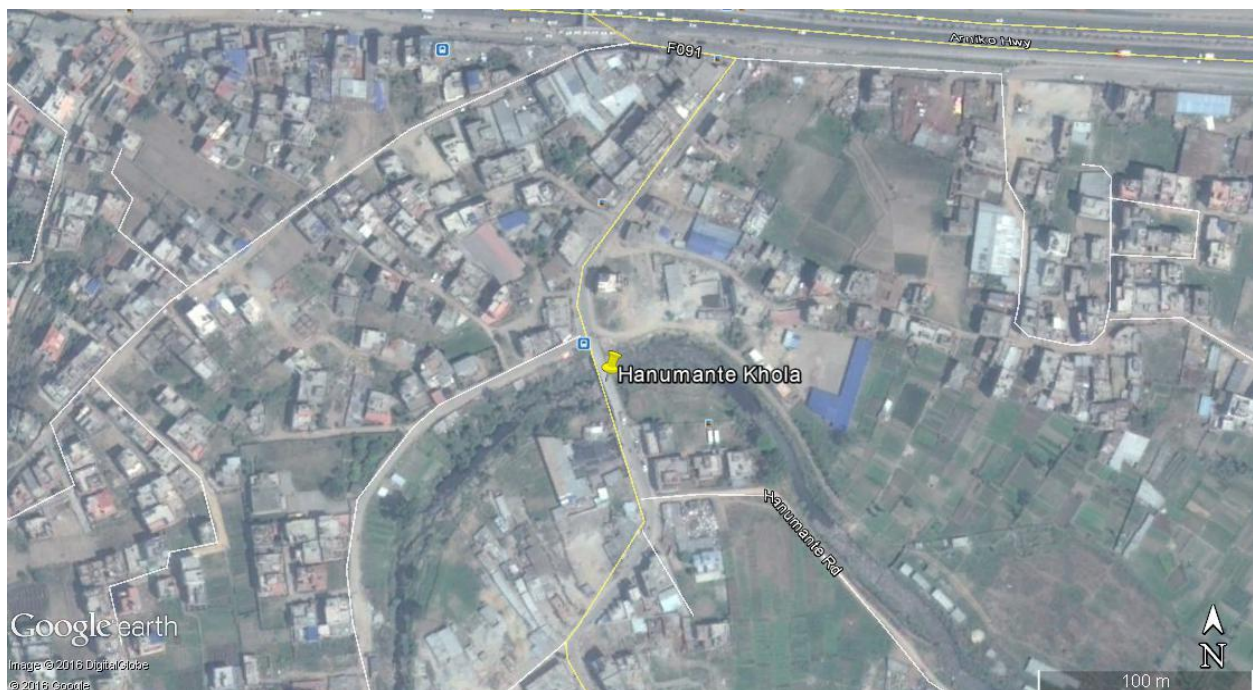


Figure 3.3: Location of the Proposed Bridge in the Google Earth Image

(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 Hanumante Khola Bridge.

Particulars	Required information / number / range / value(s)
Name of the project:	Initial Environmental Examination of Hanumante Khola Bridge
Location:	
Development Region	Central Development Region
Zone	Bagmati
Affected Municipalities	Madhyapur Thimi and Anantalingeswor
Name of the Road:	Kaushaltar-Balkot Road
Origin and Destination of the Road	Kaushaltar (Madhyapur Thimi Municipality) and Balkot (Anantalingeswor Municipality)
Chainage of the Bridge Site	About 180 m far from the Kaushaltar Chowk (Araniko Highway)
Geographical Location:	
Easting	85°21'53.03"E
Northing	27°40'21.95"N
Road Classification	
Classification of the Road	City Road
Type of the Road Surface	Black Top
Terrain/Geology	Valley
Information on structure:	
Total length of the Bridge	37.05
Span arrangement	1 x 35 m (single span)
Total width of the Bridge	11.00 m

Particulars	Required information / number / range / value(s)
Approach Road	115m (75 m on right bank and 40m on left)
RoW	50 m
No. of Vehicles on Bridges after construction	800-1000
Width of:	
Carriageway:	7.5 m
Footpath(s):	1.50 m both sides
Kerbs	0.35 m
Type of superstructure:	2-Webbed Pre stressed Concrete Slab deck
Type of Bearings:	Pot Bearing
Type of abutments:	Rectangular RCC with cantilever return wall
Type of foundations:	Open Foundation
Design Data:	
Live load:	IRC Class AA (wheeled & track vehicle) & IRC Class A (two nos.)
Net bearing capacity of soil	362 kN/m ²
Design discharge	321.00 m ³ /sec
Catchment Area	95.96 km ²
Linear waterway	35.00 m
Summary of quantities of concrete:	
Grade and quantity of concrete:	
In superstructure:	M45, 229 m ³ M35, 52.83 m ³ M25, 26.29 m ³
In substructure:	M20, 202.98 m ³

Particulars	Required information / number / range / value(s)
	M25, 23.42 m ³
In foundation:	M20, 1361 m ³
Grade and quantity of reinforced steel:	
In superstructure:	39.5 mt
In substructure:	21.12 mt
In foundation:	148.51 mt
Summary of cost:	
General Items:	NRs. 2,130,184.53
In foundation:	NRs. 47,731,797.20
In substructure:	NRs. 8,171,368.96
In Super Structure	NRs. 17,356,973.50
Approach road cost	NRs. 7,759,809.68
Miscellaneous works:	NRs.12,000.00
Summary of Cost (NRs.)	
Environmental monitoring cost	980,000.00
Physical Impact mitigating cost	525,000.00
EMP Implementation Cost	1,517,420.00
Total net cost of the bridge:	NRs. 83,162,133.87
Total gross cost of the bridge:	NRs. 102,289,424.65
Cost per meter run:	NRs. 2,684,948.89

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

3.3 Details of Project Requirements

3.3.1 Land Requirement

The construction of the proposed Hanumante Khola Bridge and approach road will require only 0.12 ha of land belonging to various land use categories. The land use categories within the

construction area mainly comprises of existing road, river bank, river channel, and small parcel of agricultural land, etc. The stockpiling of the materials will be done near the flood plain, 50 m downstream from the existing bridge on the left side of the river and houses will be rented for the labor and contractor. Hence, land is not required for labor camp and stockpiling site.

3.3.2 Source of Construction Materials

The construction materials such as sand, gravel, cobbles etc. will be sourced through the licensed supplier and other materials such as cement, and rod etc. will be derived from the wholesale supplier as per the convenience.

3.3.3 Source of Energy during Construction

The project area is facilitated with the electricity. Hence, electricity will be used during the bridge construction. In case of load-shedding, diesel generators will be used.

3.3.4 Labor Camp and Material Stockpiling Site

There is lack of barren land around the bridge construction site. So, houses will be rented for the labors and contractors. The construction materials are easily available in the Bhaktapur, so only limited construction materials will be sourced and stockpiled near the flood plain, 50 m downstream from the existing bridge on the left side of the river.

3.3.5 Spoil management Site

The spoil generated from the excavation for the foundation of the bridge will be used for backfilling. A greater proportion of the spoil generated will be used for backfilling and the river training work.

3.3.6 Approach road and Diversion

Approach road of 75 m on right bank and 40 m on left bank needs to be constructed to connect the bridge axis with existing road alignment. No diversion facility is required as the vehicles can be operated through the existing crossing. The bridge will be constructed almost 5 m d/s from the available existing crossing.

3.3.7 Construction Activities and Scheduling

- **Construction technology**

The construction of proposed bridge will be conventional mechanized methods with partially labor 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, 18900 man-days of unskilled workforce, and 8100 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 Hanumante 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 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 Hanumante 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 Bhaktapur, 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 was 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 project site
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 Municipalities i.e., Madhyapur Thimi Municipality and Anantalingeswor Municipality (Bhaktapur)

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
Physical Environment	
Physiography, Topography, Land use type and land use classification,	GIS 10.3 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 / 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

Data Collected	Methods/ Tools
Water Quality	Visual inspection of water around project area
Biological Environment	
Vegetation analysis	Field enumeration / survey
Faunal Environment	Key Informant Interview (KII)
Aquatic Animals	Field Sampling of Macro-invertebrates/ Macrophytes, Visual Observation/ Key informant Survey, past literatures for Fishes
Socio-economic and Cultural Environment	
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 structured 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 was 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 Kartik 26th, 2073 (11th November, 2016). 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 2073-08-01 at Anantalingeshwor Municipality-1, Balkot. 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 Madhaypurthimi Municipality and Anantalingeshwor Municipality 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
2073-08-01	Anantalin geshwor Municipali ty-1, Balkot.	Madhaypurthimi-15, Kaushaltar Anantalingeshwor-1, Balkot	14	• 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.

4.8 Study team member

Following team of experts are involved in the preparation of Initial Environmental Examination of Hanumante Bridge.

Table 4.3: Study Team Members

Name	Designation
Ujjwal Tiwari	Team Leader (Environmentalism)
Suprabha Shrestha	Biological Expert
Manish Singh	Civil Engineer
Shiva Dhakal	Sociologist
Tara Sharma	Geologist

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 Tarai. 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.

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 from 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 Hanumante Khola Bridge is located at the boundary of two municipalities of Bhaktapur District namely Madhyapur Thimi Municipality and Anantalingeswor Municipality. The proposed bridge is located 180m south from the Kaushaltar Chowk towards Balkot. The average gradient of 2% is observed along the Hanumante Khola at the bridge location. The bridge is located at the distance of about 1.5km from the Hanumante-Manahara Confluence at 1295 m amsl.

6.1.2 Geology and Soil

The geology around the proposed bridge site is characterized by the recent fluvio-lacustrine deposits. The left and right abutments rest on dark grey to greyish grey stiff and low plastic clayey silt with sands. Colluvial and alluvial soils are mainly found around the bridge location. The engineering geological log presented below shows the geological characteristics of the bridge site.

Engineering Geological Log										
River Name: Hanumante Khola Bridge										
Location: Kausaltar - Balkot Road, Kathmandu										
	(m)									
	Chainage, m	400	300	200	100	0	100	200	300	400
Left Side	Log									
	Rock (W) / Soil (D)	Soil: Sandy Silt with clay								
	Attitudes		NA					NA		
	Hill Slope		NA					NA		
	Hydrology		Dry					Dry		
	Landuse Type	Residential						Agriculture Land	Residential	
	Instablity Type		NA					NA		
		0								
Right Side	Rock (W)/Soil (D)									
	Attitudes		NA					NA		
	Hill Slope		NA					NA		
	Hydrology		Dry					Dry		
	Landuse Type	Residential		Agriculture Land				Agriculture Land	Residential	
	Instablity Type									

6.1.3 Slope Stability

The bridge construction site is located in gentle slope and flat terrain. Hence, the area is not vulnerable to slope stability and landslide. The slope stability condition of the bridge area is found to be good.

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.

To counteract earthquake effect due consideration has to be taken in the structural design of bridge. The project area is location in the area having Seismic Zoning Factor, Z, equal to 0.8 to 0.9 according to the National Building Code (NBC 105: 1994).

6.1.5 Climate

Temperate type of climate is experienced in the sub-project area. Summer season remains warm with temperature sometimes exceeding 35°C , while winter remains chilling cold with occasional temperature drop below freezing point. More than 80% of total annual rainfall occurs during monsoon season.

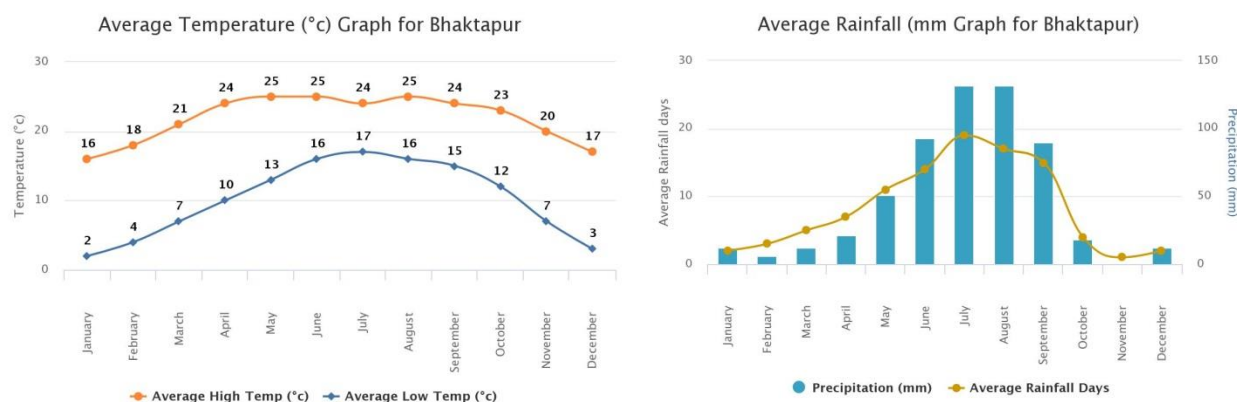


Figure 6.1: Average temperature (left) and average precipitation (right) of the Bhaktapur District.

(Source: DHM)

6.1.6 Drainage and Hydrology

The Hanumante Khola is a perennial river that originates from the Mahabharat Range. The total catchment area of the Hanumante Khola is 95.96 km^2 . The head water begins from an elevation of 2649 m and the bridge site is located at 1290 m altitude. The main channel of the Hanumante Khola is 22.41 km. The average slope of main channel is 0.06108. The Hanumante Khola makes its confluence with Manahara Khola at a distance of about 2 Km.

Furthermore, the design discharge (Q_{100}) for the bridge construction is $321 \text{ m}^3/\text{s}$. The lowest river bed level is 1277 m and the high flood level is 1289 m (3.7 m from lowest river bed level).

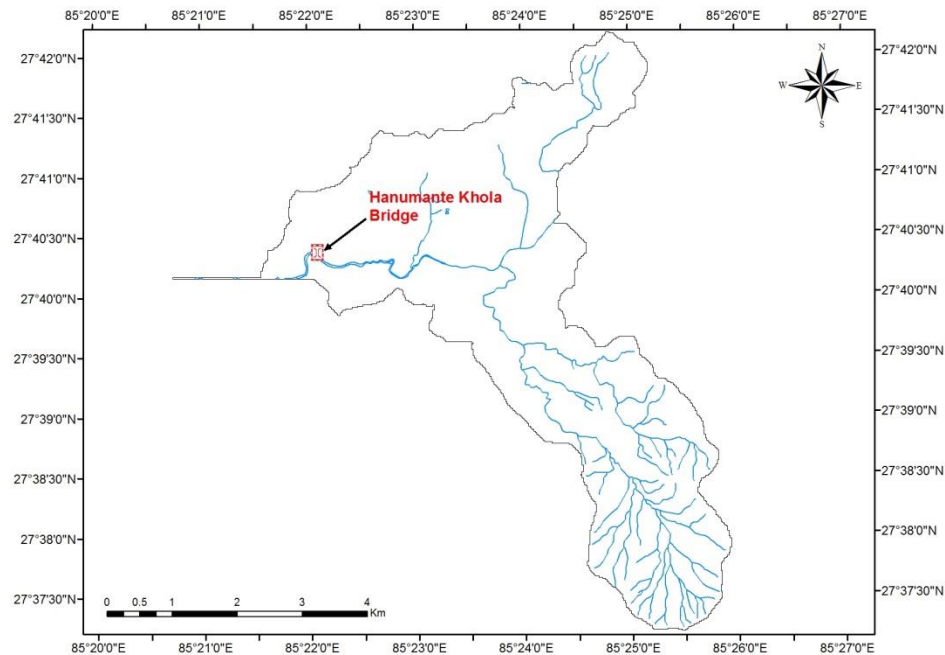


Figure 6.2: Drainage pattern of Hanumante Khola

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

6.1.7 Land use

The land use around the proposed sub-project area is dominated by the presence of thick settlements of Madhyapur Timi and Anantalingeswor Municipality. On the left bank of the river, considerable land area has been still used for farming purpose. Encroachment of RoW and development of vulnerable unmanaged settlements are clearly visible around the project area. The land use around the Hanumante Khola Bridge is shown in figure below:

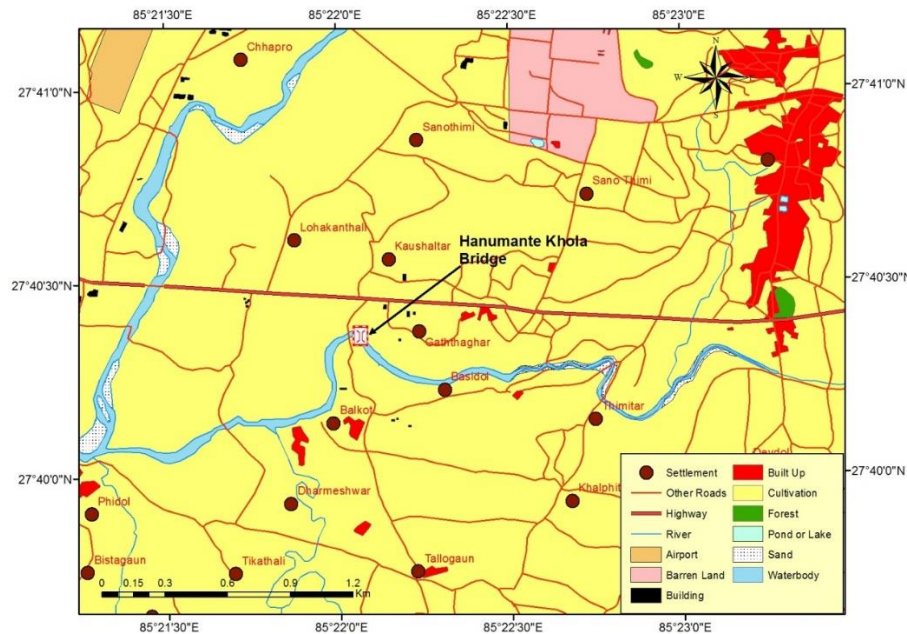


Figure 6.3: Land use around the Hanumante Khola Bridge

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

6.1.8 Public Structures

The public structures that are affected by the bridge construction, and widening and maintenance of approach road are electric transformer and four electric poles.

6.1.9 Air Quality, Water Quality and Noise levels

The vehicular movement along the Kaushaltar- Balkot Road is the main source of air and noise pollution in the bridge location area. Likewise, the Hanumante Khola flows through the settlement of Bhaktapur and the water in the river is found to be polluted.

6.2 Biological Environment

The proposed location for the construction of Hanumante Khola Bridge lies within the highly urbanized area of Bhaktapur and hence no forests are observed around the immediate vicinity of the sub-project area. Some common riverine species are however present around the bridge construction area.

6.2.1 Floral Diversity

Banana, Guava, Bakeno (*Melia azedarach*), Rubber Plant, Kanke Ful, Kaiyo Ful (*Gravella robusta*), Bhimsenpati, Adir, Sisnu, Ganja, Narkat, etc. are the vegetation observed around the proposed location.

6.2.2 Faunal Diversity

The bridge is located at the dense settlement which is devoid of forest. Hence, no wild fauna are present near the bridge location.

6.2.3 Fish Diversity

The Hanumante Khola is highly polluted. Hence, no fish diversity is available in the Hanumante Khola.

6.3 Socio-economic and Cultural Environment

6.3.1 Project Affected Municipalities

The proposed Hanumante Khola Bridge is located at the boundary of Madhyapur Thimi Municipality and Anantalingeswor Municipality of Bhaktapur District. The socio-economic information of the project affected municipalities' i.e Project Impact Area is given below:

a. Demography

According to the National Population Census of 2011, the total population of Anantalingeswor Municipality and Madhyapur Thimi Municipality of Bhaktapur District are 37989 and 83036 residing in 8977 and 20302 households respectively. In Anantalingeswor Municipality, the number of female population is greater than that of male while in Madhyapur Thimi Municipality it is reverse. The average household size of both the municipality is somewhat similar. The detail of the demographic features of the project area is tabulated below:

Table 6.1: Demographic Characteristics of the Project Affected Municipalities.

Municipality	Household	Population			Average House hold Size	Sex Ratio
		Total	Male	Female		
Anantalingeswor	8977	37989	18878	19111	4.36	96.99
Madhyapur Thimi	20,302	83,036	42,723	40,313	4.09	105.98

Source: CBS, 2011

b. Ethnic Composition

The Madhyapur Thimi Municipality is dominated by the Newar community. Newars are present in Madhyapur Thimi Municipality in 41%, while the other dominating castes are Chhetree (18%) and Brahmin (20%). Whereas, Chhetree (36%) is the dominating caste in Anantalingeswor Municipality followed by Newar (26%) and Brahmin (22%). The detail of the caste of the project affected municipalities is presented in the table below:

Table 6.2: Population distribution around project municipalities according to ethnicity

Caste/ Ethnicity	Madhyapur Thimi		Anantalingeswor	
	Total	Percentage	Total	Percentage
All	83036	100.00	37989	100.00
Chhetree	14601	17.58	13672	35.99
Brahman	16184	19.49	8449	22.24
Magar	2298	2.77	884	2.33
Tamang	6749	8.13	2258	5.94
Newar	34094	41.06	9680	25.48
Rai	1814	2.18	439	1.16
Others	6594	7.94	2607	6.86

Source: CBS, 2011

c. Sanitation and Drinking water facilities

The Bhaktapur District has now been declared as the Open Defecation Free (ODF) Zone. Hence, sanitation facility of both the affected municipality is very good. Out of the total households in the affected municipalities, 86 % of households in Anantalingeswor Municipality has flush toilet in their households and the remaining 14% has ordinary toilets. Likewise, 97% of the households in Madhyapur Thimi Municipality has Flush toilet and only 3% has the ordinary toilet. Both the municipalities are having very good sanitation practices. The detail of the toilet facility of the project municipalities is given in the table below:

Table 6.3: Toilet facility of the project area.

Municipality	Total Households	Household with toilet facility of (%)		Total facility not stated
		Flush toilet	Ordinary toilet	
Anantalingeswor	8977	85.42	14.02	49
Madhyapur Thimi	20,302	97.02	2.34	129

Source: CBS, 2011

Tap water is the major source of drinking water in both the project affected municipalities. In Anantalingeswor Municipality, 81% of the households depends on tap water followed by tube well (7%) and Kuwa (6%). Likewise, 66% of the households in Madhyapur Thimi Municipality use tap water for drinking water purpose followed by Kuwa (10%), tube well (7%) and Spout water (7%). The details of the source of drinking water in project affected municipalities are given in the table below.

Table 6.4: Source of Drinking water.

Municipality		Madhyapur Thimi	Anantalingeswor
Total Household		20,302	8,977
Main Source of Drinking Water (%)	Tap/piped Water	66.16	81.19
	Tubewell/handpump	6.95	6.96
	Covered Well/Kuwa	10.27	5.58
	Uncovered Well/Kuwa	2.97	1.31
	Spout Water	6.84	3.05
	River/stream	0.01	0.00
	Others	6.22	1.45
	Not Stated	0.58	0.46

Source: CBS, 2011

d. Energy Usage

In both the municipalities, LPG covers the highest proportion as the source of fuel for cooking. In Anantalingeswor Municipality about 71% and in Madhyapur Thimi Municipality about 90% of the households depend on LPG for cooking purpose. Significant proportion of the households in Anantalingeswor (25%), still use firewood for cooking as well. In Madhyapur Thimi Municipality, the use of other source for cooking is not very significant. The detail of the fuels used for cooking in both the municipalities is presented in the table below:

Table 6.5: Fuel used for cooking

VDC		Anantalingeswor	Madhyapur Thimi
Total Household		8,977	20,302
Fuel usually used for cooking (%)	Wood /firewood	25.29	5.62
	Kerosene	2.16	3.71
	LP gas	70.83	89.49
	Santhi/guitha(cow dung)	0.25	0.04
	Bio gas	0.20	0.04
	Electricity	0.01	0.09
	Others	0.75	0.41
Not Stated		0.52	0.59

Source: CBS, 2011

Electricity is the major source of lightning in both the municipalities. The use of other source for lightning is not significant. About 98% of households in both the municipalities depend on electricity for lightning purpose. The detail about the lightning is presented in the table below:

Table 6.6: Fuel used for lightning.

Municipality	Total Household	Fuel usually used for lightning (%)					
		Electricity	Kerosene	Bio gas	Solar	Others	Not stated
Anantalingeswor	8977	98.25	0.71	0.33	0.09	0.07	0.55
Madhyapur Thimi	20,302	97.86	0.91	0.33	0.05	0.21	0.64

Source: CBS, 2011

e. Literacy and Health facilities

Both the project municipalities have good education facilities and the literacy rate of these municipalities is good as well. The literacy rate of the Anantalingeswor Municipality is 82.38 whereas in Madhyapur Thimi Municipality 83.84% of people are literate. In Both the municipalities, the literacy rate of male is higher than that of female. The detail of the literacy rate of the project municipalities is tabulated below:

Table 6.7: Literacy rate of the project municipalities.

Sex	Population aged 5 years & above	Population Who are			Literacy not stated	Literacy rate
		<i>Can read & write</i>	Can read only	can't read & write		
Anantalingeswor						
Both	35494	29697	554	5240	3	82.38
Male	17522	16275	222	1025	0	92.68
Female	17972	13422	332	4215	3	72.61
Madhyapur Thimi						
Both	77,366	64,866	1,424	11,046	30	83.84
Male	39,679	36,006	601	3,063	9	90.74
Female	37,687	28,860	823	7,983	21	76.58

Source: CBS, 2011

Health facilities in both the project municipalities are very good. In Anantalingeswor municipality, there are several private clinics and medical stores whereas, in Madhyapur Thimi municipality, there are hospitals as well. In case of serious health problems, people in both the municipalities either visit the hospitals of Madhyapur Thimi or Kathmandu.

f. Communication facilities

Both the project municipalities have good communication facilities. Mobile, Landline phones, internet facilities are widely used means of communication in the project municipalities. The details of the available communication facilities in the project Municipalities are given in the table below:

Table 6.8: Communication facilities in the project municipalities.

Municipalities	Anantalingeswor	Madhyapur
Total Households	8977	20,302
Radio	5632	12,262
Television	7544	16,307
Cable Television	4963	13,285
Computer	3014	7,529
Internet	1345	3,863
Telephone	2846	5,626
Mobile	7818	18,540

Source: CBS, 2011.

6.3.2 Project Affected Families

a. Demographic Composition

The construction of bridge affects 5 households (household survey was conducted 3 households). Altogether, 15 family members will be affected in which the number of male is higher than female. The average family household size is 5.0.

Table 6.9: Demographic Characteristics of PAF

Name of VDC	No of HHS	Gender		Total	Ave. HH Size
		Male	Female		
Madiyapur Thimi, Lokhanthali	3	10	5	15	5.5
Total	3	65.85	35.15	100	4.85

Source: Field Survey, March 2016

b. Ethnicity Composition

The project construction site is located in central region of Nepal. Among the affected households 1 HHs belonging Brahmin and remaining two are *Janajati*. The table below shows the ethnic composition.

Table 6.10: Ethnic Composition of PAF

VDC	Caste		Total
	Brahmin	Janjati	
Lokhanthali	1	2	3
%	33.43	66.67	100.0

Source: Field Survey, March 2016

c. Age Distribution

Among the project-affected population, majority (86%) populations are economically active and about 6.1% populations are between 6.00% are above 60 years, which indicates that these age group populations are economically inactive and dependent for their livelihood. The table shows the age distribution.

Table 6.11: Age distribution of PAF

S.N	Age Distribution	Population	Percentage
2	6-15	1	6.18
3	16-60	13	87.91
4	Above 60 Years	1	6.09
Total		15	100.0

Source: Field Survey, March 2016

d. Education and Literacy Status

All together there is a 100% literate population among the survey households. About 20% populations have received informal education and can read and write only. Of the affected population, about 30% have passed SLC and 30% have intermediate and remaining 20 percent have above Bachelor and Master's. The table below shows the education level.

Table 6.12: Literacy status of PAF

S.N	Education	No.	Percentage
1	Literate	2	20.0
2	SLC	3	30.0
3	Intermediate	3	30.0
4	Bachelor	1	10.0
5	Master's above	1	10.0
Total		15	100.00

Source: Field Survey, March 2016

a. Occupation of Affected HHs

The affected households are engaged in different occupation. Majority of them are students. Of the total affected household 46.78 percentage are student, about 7% are engaged in own agriculture land. The table below shows the occupational division of affected households.

Table 6.13: Occupation of PAF

S.N	Occupation	No.	%
1	Occupation	No.	%
2	Adhiya Agriculture	1	6.67
3	Business	3	20.00
4	Student	7	46.67
5	Housewife	4	26.67
Total		15	100.0

Source: Field Survey, March 2016

b. Food Sufficiency level

Out of the total project affected households no one have enough food that sustains them for more than six months from their own production. Most of the people depend on imported food grains. It's a highly populated no more land for cultivation besides this there are some land for cultivation near Hanumante stream. Majority of the affected 2 hhs have no agricultural production from their own land only one 33.67 percent of households have enough food for 3-6 month. Table 7 presents the food security status of the project affected households.

Table 6.14: Food sufficiency level of PAF

Range	HHS	%
No agriculture	2	66.7
3-6 Months	1	33.3
Total	3	100.0

Source: Field Survey, March 2016

c. Sources of income

The households were asked the major sources of income of the affected households. They depend in multiple source of income. Among them, 33 percent HHs business, 33 percent services, 33 percent at foreign employment is the main source of income. Following table shows major sources of income of affected people.

Table 6.15: Sources of Income of PAF

S.N	Major source of Income	Households	Percentage
1	Services	1	33.31
2	Business	1	33.33
3	Foreign Employment	1	33.33
Total		3	100.00

Source: Field Survey, March 2016

d. Level of Income

Local business is the major sources of income among the affected HH. The range of income is different, about 66 percent affected household earns more than five lakh per annum per year and remaining 33 percent have more than 33.33 percent. The table below shows the income level of affected households.

Table 6.16: Level of income of PAF

S.N	Income Range	Households	Percentage
4	100001-500000	1	33.33
5	Above 500000	2	66.66
Total		3	100.00

Source: Field Survey, March 2016

e. Level of Expenditure

There seems similarity between income and expenditure of affected households. Among the affected households, 100 percentage household expenses above 100000 per year The table below shows the expenditure pattern of affected households.

Table 6.17: Level of expenditure of PAF

S.N	Expenditure Level	Households	Percentage
4	Above 100000	3	100.00
Total		3	100

Source: Field Survey, March 2016

f. Health and Sanitation

District hospital is located in district headquarters of Bhaktapur districts but people visited at private and government hospital of the Kathmandu. Mostly people visit Bir Hospital, Teaching Hospital at Kathmandu for better treatment but minor cases are treated in Kaushaltar based

service centers. Sub-health post is located in 15 minute travel is the nearest health facility received by the affected households.

g. Source of Water

The water source is supply by drinking water supply cooperation. Among the total affected households' about 100 percent HHs have used a private supply water

h. Toilet Facility and Defecation Practice

There is no open defecation practice in these areas. 100% of the affected households have toilet facility.

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 Hanumante Khola requires a number of skilled, semi-skilled and unskilled manpower. The project shall generate the employment opportunity to 50 workers, among them 15 will be skilled and semi-skilled whereas 35 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.*

7.1.2 Operation Phase

7.1.2.1 Improved Mobility

After the earthquake of 25 April, 2015, the use of existing bridge has been decreased as the existing bridge has faced the damage due to earthquake. The new bridge over the Hanumante Khola will serve the locals of Balkot, Kaushaltar, and Thimi and hence will improve the mobility of the vehicles. *The impact will be high magnitude, regional in scale and long term in duration.*

7.2 Adverse Impacts

7.2.1 Construction Phase

7.2.1.1 Physical Environment

- **Land use change**

The construction of the bridge does not need to acquire large area of the land permanently. About 0.12 ha of land is required for the construction of permanent bridge structures and the approach road. The land acquisition will not affect any kind of forested, agricultural land. *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 if dumped improperly can cause bad odor from the deterioration which increases the flies causing health hazards to the local people. 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.*

- **Landslides and slope failure due to approach road construction**

The bridge construction site is located in relatively plane land and the site is not vulnerable to the landslides and slope failure. Hence, the impact is insignificant in this project.

- **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 a single span bridge in which two abutments will be constructed on either bank of the river and no additional structures will be constructed in the river channel. Due to this

reason the chances of change in water regime and flow pattern is very 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 water flow in Hanumante Khola is less during the dry period. Occasional flooding is experienced by the river during the rainy season. The construction of the bridge is commenced during the dry period when the water flow is minimal. Hence, the flooding will not have the significant impact. Moreover, the loose lacustrine deposits along the bank of

- ***Environmental impacts associated with spoil management***

The excavation work for the foundation and the approach road construction will generate about 2000m³ of spoil. Out of 2000m³, about 1200m³ of spoil will be used for the backfilling during the river training. The remaining 800m³ will be disposed in the safe disposal sites. *Hence, the impact will be medium, local and medium term in nature.*

- ***Environmental issues associated with sand and gravel extraction***

The sand and gravel required for the construction of the bridge will be supplied from the licensed supplier. Hence, the impact of sand and gravel extraction is not relevant in this project.

- ***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 Hanumante Khola Bridge requires the construction of approach road on either side of the bridge. The land around the site have relatively gentle slope and is not vulnerable to landslides, erosion and slope instability. *Hence, the impact is insignificant.*

- ***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 supplies from the licensed supplier, while rod, cement, etc. should be transported from Kathmandu. 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.*

7.2.1.2 Biological Environment

- ***Vegetation clearing***

The project requires clearing of one sapling of Bakaino (tree), one banana plant and some shrubs including Bhimsenpati, Adir. Since, the project does not require clearing significant vegetation; *the impact is low in significance, site specific and long term in nature.*

- ***Impact on aquatic life***

The project will not have impact on aquatic life as the Hanumante Khola does not have significant aquatic life.

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

Instead of firewood, LPG will be used in labor camp to meet the energy requirement. Hence, the impact is insignificant.

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

The project is not located near the forest area. Hence, the impact is insignificant.

7.2.1.3 Socio-economic and Cultural Environment

- ***Loss of land***

The survey identified that five household's loose six parcels of land during the construction of bridges. The detail of affected land is given below:

Table 7.1: Details of Affected land

S. N	Land Owner	VDC	Ward No	Kitta No.	Area (Sqm)	Affected Area(Sqm)
1	Rit Kumari K.C	Dibyaswari (Lokanthali)	2	1292	620.0	127.2
2	Mijal Housing company Pvt. Ltd	Dibyaswari (Lokanthali)	2	2464	164.9	75.5
3	No name	Dibyaswari (Lokanthali)	2	2465	500.7	111.3
4	Kanchho Basnet+Sundari silwal,Shila Silwal	Dibyaswari (Lokanthali)	3	692	230.5	63.6
5	Pardip Sharma	Dibyaswari (Lokanthali)	3	625	325.8	159.0
6	Kedhar Pd Acharya	Dibyaswari (Lokanthali)	3	627	906.1	63.6

Source: RAP, 2016

- Impact on private and public properties**

The bridge construction work will affect 5 structures owned by 4 house owners. Out of the total affected 3 structures are residential cum commercial purpose, one is residential house, and remaining is boundary wall. No Public structure needs to be dismantled during the bridge construction period of the Hanumante Khola. The detail of the affected private structures is tabulated below:

Table 7.2: Affected private structures

S.N	Structure Owner Name	Address	Distance from Bridge (M)	Description of the Structure	No of Story	Affected Area in (Sq.ft)	Type of Structure	Built Year
1	Mohan man Shrestha	Lokhanthi -8	7.50	Bricks & cement mortar wall with RCC roof plastered by cement	1	332	Pakki	2070
2	Mohan man Shrestha	Lokhanthi -8	7.20	Stone & cement mortar wall with RCC roof plastered by cement	1	496	Pakki	2052
3	Rameshwor Upadhyay	Lokhanthi -8	8	Bricks & cement mortar wall with RCC	1	668	Pakki	2060

S.N	Structure Owner Name	Address	Distance from Bridge (M)	Description of the Structure	No of Story	Affected Area in (Sq.ft)	Type of Structure	Built Year
				roof plastered by cement				
4	Ganga Pd. Aryal	Lokhanthi -8	8	Bricks & cement mortar wall with RCC roof plastered by cement	1	624	Pakki	2060
5	Anju Ku. Dahal	Lokhanthi -8	8.00	Bricks wall	1	20.00	Pakki	2068

Source: RAP, 2016

- **Social Conflicts**

For the construction of the Hanumante 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. But the project needs to relocate one electric transformer and four electric poles during the construction of bridge. *The impact is of moderate significance, local and short term in nature.*

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

The Hanumante Khola Bridge is located near the agricultural land but none of the agricultural land is used for the project. Hence, the crop productivity is not affected by the project and the impact is insignificant.

- **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.*

7.2.2 Operation Phase

7.2.2.1 Physical Environment

- **Reinstatement of environmental components (stockpiling yard, labor/contractors 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**

The flow of water in Hanumante Khola is slow and steady. Hence, the slow flowing water will not have significant impact of scouring. But the water is polluted in the river which can have impacts of scouring around the bridge abutments. *The impact is low significance, site specific and long term in nature.*

7.2.2.2 Biological Environment

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

The project area is not significant in terms of flora and fauna. Hence, the impact is irrelevant.

- ***Barrier Effects on Aquatic Organisms***

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

7.2.2.3 Socio-economic and Cultural Environment

- ***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 Hanumante 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

During the design of the proposed bridge, two alternatives were analysed. These two alternatives include, alternative 1: upgrading the existing bridge, alternative 2: construction of new bridge upstream of the existing bridge, and alternative 3: construction of new bridge downstream of the existing bridge. For this particular purpose alternative 3 has been selected as, this will cause minimal damage on physical structures and will utilize available public land.

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

The existing bridge has been extremely hampered by the last year earthquake. The heavy vehicles have been avoided after the earthquake. 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 Hanumante 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 Construction Stage

9.2.1.1 Physical Environment

- ***Mitigation measures for land use change***

The construction of the proposed Hanumante Khola Bridge and approach road will require only 0.12 ha of land belonging to various land use categories. The land use categories are existing road; river bank, river channel and small parcel of agricultural land. Thus, no significant loss of productive land will occur. Furthermore, due to lack of open space, alternative to rent house has been selected instead of setting labor's camp. Stockpiling will be done over the limited land near the flood plain, 50 m downstream from the existing bridge on the left side of the river, so that additional land acquisition is not necessary.

- ***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 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.

- ***Degradation of water quality***

Following mitigation measures will be adopted to minimize the impact on the Hanumante River 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 for environmental pollution due to the 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 are 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.

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

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

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

Excess spoil will be deposited behind the river training structures and plantation will be done over the spoil disposed 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 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, muffles depending on the nature of the construction work.
- ✓ Drinking water facility and temporary pit latrine will be established at construction sites to control open defecation and pollution of water bodies by the workers.
- ✓ Workers will be provided with first aid and health facilities. 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.

9.2.1.2 Biological Environment

- ***Vegetation Clearing***

Although the construction of the proposed project require the removal of two trees, project will plant 50 species of trees on either side of river (both u/s and d/s) from the bridge location to enhance the greenery and avoid bank cutting.

9.2.1.3 Socio-economic and Cultural Environment

- ***Loss of land***

A separate RAP has been prepared which will deal with the compensation of the affected land as per the land acquisition act 2034.

- ***Loss of private properties***

A separate RAP has been prepared which will deal with the compensation of the loss of private properties as per the land acquisition act 2034.

- ***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.

- ***Obstruction to social services and facilities***

The transformer and the electric poles will be relocated to another location.

- ***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.

9.2.2 Operation Phase

9.2.2.1 Physical Environment

- ***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.

CHAPTER - 10: ENVIRONMENTAL MANAGEMENT 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 Hanumante 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.

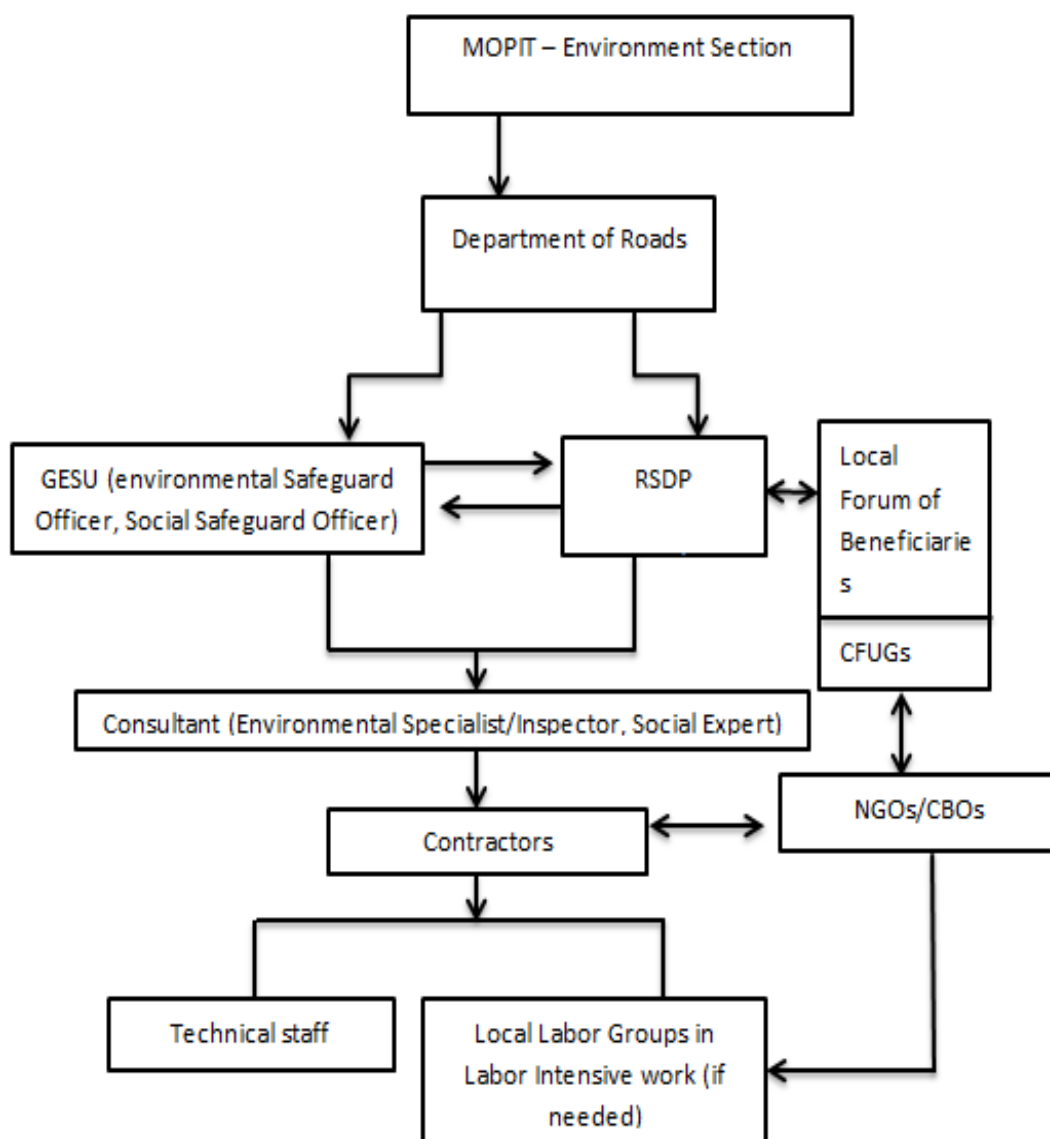


Figure 10.1: Agencies responsible for the implementation of EMP.

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 traffic volume	▪ Point measurement of noise near the construction site ▪ Qualitative analysis of wind borne dust particles during the construction stage of 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)
Environmental protection measures, including pollution prevention, water and soil	Arrangement specified in the code of practice and in manuals relating to environmental protection; records and observations on pollution, waste management,	Site inspection, discussion with project management, consultants, and local people. Quantifying site-specific impacts, photos, laboratory tests where required. Existing patrol, control and	Before and during construction period	Consultant (for baseline survey) Contractor	Proponent, (RSDP, DoR)

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
management, slope stabilization, cut and fill, spoil and waste management, environmental and socially critical sites, protection of fauna and flora	spoil disposal. Training programmes for labourers to prevent impacts on wildlife sensitive habitats, forests and fuel wood use.	enforcement mechanisms, enforcement records.			
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 area	Interview data, photographs, noise level meter record	Regular by contractor, once a month during construction by consultant	Contractor	Proponent, (RSDP, DoR)
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	Health and safety regulations,	Spot checks at camps and work	Once in two	Contractor	Proponent,

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
accident risk	first aid and medical arrangements, contingency plan, safety awareness programme. Provision of toilet and waste management facility to the construction crew	sites, photos, accident records from Traffic Police, Training records and materials, road signs	months by consultants		(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, camps, quarries and burrow pits	Decommissioned sites should not indicate any adverse and residual environmental impacts, and should be rehabilitated to the satisfaction of supervision consultant and land owners	Site observation, comparative photos, consultation with land owners	At the end of construction period	Contractor	Proponent, (RSDP, DoR)

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 wastes	Initiated erosion, affected aesthetic value, affected forest and agriculture, initiated land erosion by local blocked drainage, hazard to downhill slope residents and agricultural lands	Site observation and interviews, photos, geo-referencing sites	At specific locations where such sites occur	During construction	Contractor	Proponent, (RSDP, DoR)
Quarrying of Conservation Materials	Initiated erosion, change in river regime, erosion by river systems,	Site observation, photos Records from local	Quarry site areas	During construction	Contractor	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
	landslide due to quarrying, degradation of vegetation, water logging, waterborne diseases	health centers				
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 (Schools, hospitals)	During construction and operation	Contractor	Proponent, (RSDP, DoR)
Forest and vegetation	Numbers of trees, presence of group vegetation, signs of illicit logging and extraction of	Observation, DFO record, photos, stake-holder	In and around the construction	During construction and operation	Contractor	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
	NTFPs	interviews	sites, markets			
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 Area	Records and interview, photos	Project Areas/Zone of influence	Throughout project	Consultant	Proponent, (RSDP, DoR)
Occupational Safety and	Type of number of accident occurred during construction, Adequacy	Observation, photos, spot checks, Contractors	Project Area	During construction	Contractor	Proponent, (RSDP, DoR)

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Hazard	of occupational safety measured provided Compensation provided in case of fatal accidents or invalidity	and health centre records interview with laboures				

10.2 Environmental Management Plan

The complete sets of environmental enhancement and mitigation measures have been formulated for the sustainable implementation of Hanumante Khola Bridge. The environmental management plan ensures the involvement of all the parties that are directly and indirectly associated with the construction of Hanumante 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	Affected Location	Benefit Augmentation Measure	Enhancement Cost	Responsible Agency	
				Implementing Agency	Supervising Agency
Employment Opportunities	Entire project area	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	Training to work force will be provided.	Contractor/DoR	Supervision consultant

Beneficial Environmental Impact	Affected Location	Benefit Augmentation Measure	Enhancement Cost	Responsible Agency	
				Implementing Agency	Supervising Agency
Reduced Traffic accidents and congestion	Entire project area	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 cost	Contractor/Supervision Consultant	Supervision consultant
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. • 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	Bridge construction area, spoil disposal site and quarry site	During construction and quarrying	No additional cost required	Contractor/Supervision Consultant DoR	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		bodies. Accidental spillage of the oil, grease and other chemicals substance will be captured immediately without allowing them to get contaminate the water bodies					
Approach road construction (115m - 75 m on right bank and 40m on left)	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 detail design	Contractor/Supervision Consultant DoR	Supervising consultant
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 DoR	Supervising consultant
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.	Around the construction site, and camp site	During construction period	NRs. 20,000 for fire extinguisher (five 4kg, cylinder, at the rate of	Contractor/Supervision Consultant project/DoR	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		Project will have the provision of fire extinguisher throughout the construction period.			4000/cylinder)		
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(near the flood plain, 50 m downstream from the existing bridge on the left side of the river) - 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	Material stockpiling site	During construction period	NRs. 10,000 for fencing and covering materials (included in BoQ)	Contractor/Supervision Consultant DoR	Supervision consultant
Spoil disposal	Environmental issues associated with spoil disposal	A disposal site will be provided with proper drainage, vegetation and adequate protection against erosion.	Spoil disposal area	During construction period	NRs. 40,000 for gabion structure construction	Contractor/Supervision Consultant CBOs/Project/	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		- Vegetation plantation will be done over the spoil disposed surface to reclaim the area. - Civil structure - Bioengineering work (benching, toe wall, drainage) - Dispose designated locations			n	DoR	
Operation of project vehicles and machineries	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 DoR	Supervision consultant
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	Approach road and bridge	During construction period	NRs. 20,000 for cleaning sites after bitumen heating	Contractor/Supervision Consultant DoR	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		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.					
Work camp operation	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	Labour camp	During construction period	No additional cost	Contractor/Supervision Consultant DoR	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		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	Approach road and bridge	During operational period	Put the cost	-	-

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		area, - Covering of dust sources, construction materials - 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	Supervision consultant
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	Construction area	During Construction period	Included in project design	Contractor/Supervision Consultant DoR	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
		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 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 DoR	Supervision consultant
Biological Environment:							
Bridge construction	Disturbance to wildlife and	Construction camp will be supplied with LPG and the use of fuel wood will be	Construction	During construction	No additional	Contractor/Supervision Consultant	Supervision consultant

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
	biodiversity	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	camp	n period	cost	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 /DoR	Supervision consultant
Bridge construction	Obstruction to social services and facilities	The affected transformer and four electric poles will be relocated at another location.	Around the construction area	During pre-construction stage	Rs. 20,000 for transformer and Rs. 10,000 for each electric poles.	Project/DoR	Supervision consultant
Bridge	Public	Project will form, activate,	Around	During pre-	No	Project/	Supervision

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
construction	grievance related to bridge construction	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.	the construction area	construction and construction stage	additional cost	Contractor/Supervision Consultant DoR	consultant/project
Bridge construction	Loss of private structures 5 Private structures (4 Household Owners - 3 structures are residential cum commercial purpose, 1	• Project has prepared a separate resettlement plan which address the issues related to loss of private structure under Land Acquisition 2034.	Project area	During pre-construction stage	Cost included in resettlement plan	Project/DoR	Project/local stakeholders/ local government authority

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/ Supervision
	residential house) and remaining is boundary wall.						
Bridge construction	Land and property acquisition, compensation, resettlement and rehabilitation (Loss of 0.12 ha land, 4 Electric Poles and 1 Transformer)	- Project has prepared a separate resettlement plan which address the issues related to the land and property acquisition, compensation, resettlement and rehabilitation under Land Acquisition 2034. - As per NEA estimate(for electric pole)	Project area	During pre-construction stage	Cost included in resettlement plan	Project/DoR	Project/local stakeholders/ local government authority

10.3 Cost for Execution of EMP

10.3.1 Details of specific cost

a. Cost of tree plantation

Tree plantation will be mainly done for the restoration of spoil disposal site, road side plantation and plantation to enhance the aesthetics. Altogether the plantation of 50 trees has been proposed in this report. The cost estimate for the plantation of trees is presented in table below:

Table 10.7: Cost of tree Plantation.

Activities	Cost in Rs.	Remarks
Plantation of 50 saplings, including site preparation, pitting and mulching	5,000	Lump sum cost of NRs. 100/sapling (including cost for site preparation, pitting and mulching)
Replacement of 6 dead saplings at the rate of Rs. 70	420	Assuming 30% mortality
Tools	2,000	Lump sum
Tending and maintenance for 5 years	5,000	Lump sum
Sub-total	12,420	

b. 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 10.8: 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 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	PS		40,000	The cost includes transportation of

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
transportation and rehabilitation of site				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	
Relocation of Transformer and Four electric poles	Lump Sum		60,000	
Sub-Total			525,000	

c. 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 10.9: 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 10.10: Total cost of implementation of EMP.

S.N.	Activities	Cost	Remarks
1	Mitigation measure under physical environment	525,000.00	
2	Tree Plantation	12,420.00	
4	Environmental Monitoring	980,000.00	
Total Cost of EMP implementation		1517,420.00	

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:

Box: 1 Stage of Grievance Mechanism

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 Hanumante Khola Bridge results in a substantial beneficial impacts. The damaged bridge over the Hanumante Khola after the earthquake has caused problems in the smooth operation of vehicles. The environmental impact of bridge construction is very low which can be mitigated through the mitigation measures that have been proposed in Chapter 9. The construction of bridge requires clearing of two trees. Likewise, no public structures fall within the construction area. The electricity facility will be disrupted for 1 day during the relocation of the 1 transformer and 4 electric poles.

As a part of social impact, five households loose six parcels of land during the construction of bridge. The construction of approach road affects altogether five 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, 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. 1517,420.00

Give the above conclusion; the Initial Environmental Examination (IEE) document is sufficient and no further EIA is required. Hence, the report 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

लोकप्रिय राष्ट्रिय दैनिक



राजधानी

काठमाडौं, धरान र बुटवलबाट एकैसाथ प्रकाशित

अंक नम्बर: काठमाडौं, शुक्रबार ०६ कार्तिक २०७३, खानेपानी, जस्ता, ११२०० | www.rajdhani.com.np | Email: rajdhani@rajdhani.com.np | RAJDHANI Nepali National Daily | Kathmandu, Friday 11 November 2016



नेपाल सरकार,
भौतिक पूर्वाधार तथा यातायात मन्त्रालय,
सडक विभाग,
भू-वातावरण तथा सामाजिक इकाई
हनुमन्ते खोला पुलको

प्रारम्भिक वातावरणीय परिक्षण (IEE) गर्नेबारे सार्वजनिक सूचना

प्रथम पटक प्रकाशित मिति : २०७३/०७/२६

नेपाल सरकार, सडक विभाग, सडक क्षेत्र विकास आयोजनाले कौशलटार-बालकोट सडकमा पर्ने हनुमन्ते खोलामाथि निर्माण गर्न प्रस्ताव गरेको ३७.०५मी. लम्बाई (१५.३५मी. स्पान) तथा ११मी. चौडाई भएको पक्की पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने सिलसिलामा वातावरण संरक्षण नियमावली २०५४ (पहिलो संशोधन, २०५५) को नियम ७.२ अनुसार यो सार्वजनिक सूचना प्रकाशित गरिएको छ।

प्रस्तावको नाम र ठेगाना : भू-वातावरण तथा सामाजिक इकाई
सडक विभाग, चाकुपाट, बलितपुर, नेपाल

प्रस्तावको विवरण:

क्र.स.	पुलको नाम	पहच सडक	नगरपालिका	प्रस्तावको विवरण
१	हनुमन्ते खोला पुल	कौशलटार- बालकोट सडक	मकपुर जिल्लाको मध्यपुर ठिनी र अनन्तलिङ्गेश्वर नगरपालिका	PSC Under प्रकारको ३७.०५मी. लम्बाई (१५.३५मी. स्पान) तथा ११मी. चौडाई भएको

माथि उल्लेखित पुलको प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गर्ने क्रममा यो पुल निर्माण हुने क्षेत्रको भौतिक, जैविक, सामाजिक-आर्थिक तथा सांस्कृतिक प्रणालीहरू र यिनका अवयवहरू (Components) तथा यी अवयवहरू बिचको अन्तरक्रिया र अन्तरसम्बन्धमा पर्न सक्ने असरहरू र सो असरहरू न्यूनिकरण गर्नको लागि अपनाउन सकिने उपायहरू समावेश गरी आफ्नो राय सुभाब तल उल्लेख गरिएको ठेगानामा यस सूचना प्रकाशित भएको मितिले १५ दिनभित्र पठाउनुहुन सम्बन्धित क्षेत्रका नगरपालिकाको कार्यालयहरू, विद्यालय, स्थानीय सरकारी, प्रैह सरकारी मध्य संस्थाहरू तथा सम्पूर्ण सरोकारवालाहरूमा हार्दिक अनुरोध गरिन्छ।

राय सुभाबको लागि पत्राचार गर्ने ठेगानाहरू

प्रस्तावक	सम्बन्धित मन्त्रालय/विभाग
भू-वातावरण तथा सामाजिक इकाई, सडक विभाग, चाकुपाट, बलितपुर, नेपाल, फोन नं. : ०१ ५२६०६९६ फ्याक्स नं. : ०१ ५५२९१०६ इमेल: gesunit@dor.gov.np	भौतिक पूर्वाधार तथा यातायात मन्त्रालय, सिंहदरबार तथा सडक विभाग, सडक क्षेत्र सुधार आयोजना, सानो गौचरन, काठमाडौं नेपाल

Annex C: Deeds of Inquiry (Muchulka)



अनन्तलिङ्गेश्वर नगरपालिका

फोन नं. ६६३१२१५



पत्र संख्या: ०६३/०६२
चलानी नं.: ५६६

मिति:- २०७३/०८/०७

विषय:- सूचना टाँस गरिएको सम्बन्धमा ।

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय
सडक विभाग
बैदेशिक महाशाखा, काठमाण्डौ ।

प्रस्तुत विषयमा त्यस कार्यालय बाट मिति २०७३/०७/२९ च नं २०१ को पत्र एक प्रति प्राप्त भई यस कार्यालयको सूचना पाटीमा सुचना समेत टाँस भईसकेको ब्यहोरा जानकारी गरिन्छ ।


०६/०८/७३
लेखनाथ सुवेदी
नायव सुब्बा



मध्यपुर थिमि नगरपालिका

मध्यपुर थिमि नगरपालिका

MADHYAPUR THIMI MUNICIPALITY

मध्यपुर थिमि, नवलपरासी, नेपाल

प.सं. :- ०७३/०७४

च.नं. :- २८३८



663022
663004
663140
663570

Ambulance: 663100

Fax: 977-1-663022

E-mail: info@mthimimun.gov.n

कार्यालय

मिति : २०७३।८।७

विषय : सूचना टाँस गरी जानकारी पठाईएको बारे ।

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय,

सडक विभाग, बैदेशिक महाशाखा,

सानो गौचरण, काठमाण्डौ ।

उपरोक्त सम्बन्धमा तहाँको प.सं. ०७३/०७४, च.नं. २०२, मिति २०७३।७।२९ गतेको पत्र प्राप्त भई व्यहोरा अवगत भयो । सो सम्बन्धमा उक्त सूचना यस नगरपालिकाको सूचना पाटीमा टाँस गरिएको व्यहोरा जानकारीको लागि अनुरोध छ ।


केशव सिलवाल
वरिष्ठ कानून अधिकृत

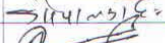
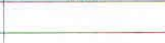
प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सूचना टाँसको मुचुल्का

आज मिति २०७३-०७-२६ गते शुक्रबार का दिन यस मधेशपुर ठिमी नुपा वडा नं १२ स्थित कालिका भन्ने ठाँउमा सन्तुष्टी खोलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा सम्पूर्ण सरोकारवालाहरुलाई प्रस्तावित पुल निर्माण गर्दा त्यस क्षेत्रको भौतिक, जैविक, आर्थिक सामाजिक तथा सांस्कृतिक वातावरणमा पर्न सक्ने असर तथा ति असरहरु न्यूनिकरण गर्न अवलम्बन गर्न सकिने सम्भावित उपयहरु बारे आफ्ना राय सुझावहरु पठाउन आव्हान गर्दै मिति २०७३/०५/२६ को राजधानी राष्ट्रिय दैनिकमा प्रकाशित १५ दिने सार्वजनिक सूचनाको छाँया प्रति हामी निम्न सरोकारवालाहरुको उपस्थितीमा टाँस गरिएको व्यहोरा सही हो भनि यो मुचुल्कामा हस्ताक्षर गर्दछौं ।

क्र.स.	नाम/थर	ठेगाना	पेशा	हस्ताक्षर
१	विष्णु अण्डारी	कालिका - १२	व्यवसाय	
२	सुमित्रा खिवाकोटी	"	विद्यार्थी	
३	सुमित्रा माताङ	"	व्यवसाय	सुमित्रा
४	अञ्जली क्षेत्र	"	"	Anjali
५				
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१०				

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सूचना टाँसको मुचुल्का

आज मिति २०७३-०७-२६ गते बुधवार ०९ दिनु यस अन्तर्लिङ्गस्वर न पा. वडा नं. ०९ स्थित कोइला भन्ने ठाउँमा हनुमन्त पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा सम्पूर्ण सरोकारवालाहरूलाई प्रस्तावित पुल निर्माण गर्दा त्यस क्षेत्रको भौतिक, जैविक, आर्थिक सामाजिक तथा सांस्कृतिक वातावरणमा पर्न सक्ने असर तथा ति असरहरू न्यूनीकरण गर्ने अवलम्बन गर्ने सकिने सम्भावित उपयहरू वारे आफ्ना राय सुझावहरू पठाउन आवहान गर्दै मिति २०७३/०५/२६ को राजधानी राष्ट्रिय दैनिकमा प्रकाशित १५ दिने सार्वजनिक सूचनाको छाँया प्रति हामी निम्न सरोकारवालाहरूको उपस्थितीमा टाँस गरिएको व्यहोरा सही हो भनि यो मुचुल्कामा हस्ताक्षर गर्दछौं ।

क्र.स.	नाम/थर	ठेगाना	पेशा	हस्ताक्षर
१	धुमत श्रेष्ठ	अन्तर्लिङ्गस्वर-६	मिस्त्री	
२	जगपाल कोइराला	"	०२१८/११/२१	
३	पुष्पेन्द्रम पाण्डे	"	समाज सेवक	
४	सुन्दर साह कोइराला	"	०२१८/११/२१	
५				
६				
७				
८				
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१०				

Annex D: Public Consultation

Annex E: Recommendation Letter



अनन्तलिङ्गेश्वर नगरपालिका

फोन नं. ६६३१२१५



पत्र संख्या: ०६३/०६४
चलानी नं.: २६६

मिति: २०७३/०८/०७

विषय:- सिफारिस सम्बन्धमा ।

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय
सडक विभाग
बैदेशिक महाशाखा , काठमाण्डौ ।

प्रस्तुत विषयमा सडक विभाग बैदेशिक महाशाखा सडक क्षेत्र विकास आयोजनाले भक्तपुर जिल्ला मध्यपुर ठिमी न. पा. वडा. नं. १५ र अनन्तलिङ्गेश्वर न. पा. वडा. नं. ०१ को सिमाना भएर बग्ने हनुमन्ते खोला निर्माण गर्न प्रस्ताव गरिएको पक्की पुल आवश्यक भएको र वातावरणमा कुनै असर नपर्ने भन्ने स्थानिय वासिन्दाकव समेत राय बुझिएकोले उक्त योजना कार्यान्वयनका लागि सिफारिस साथ अनुरोध गरिन्छ ।


लेखनाथ सुवेदी
नायव सुबा

Annex F: Approval Letter of ToR

Annex G: Photographs



Annex H: Comments and Suggestions Incorporated Matrix For Hanumante Bridge

S.N.	Comments	Page No.
1.	Link the issues/impact with project site related	All
2.	Change in the Nepali name of catchment	Executive summary
3.	Revisit Objectives	3
4.	Revisit Socio-economic and cultural environment	57
5.	Revisit heading and sub-headings	All
6.	Mention clearly whether crusher plant is component of the project or not	-
7.	Make data requirement to data collected	14
8.	where, when and how many times public consultation where done	16
9.	write source of project map	5,6,33,34
10.	Correct the name of ministry	5,6,33,34
11.	Remove the repeated page of document	
12.	Correction Approach Road- both right side in document	8,9,10
13.	Bring Consistency on the land requirement in Hanumante Bridge	9,45, 55,81
14.	Make a consistency on the distance of project location from confluence of Bridge	Executive Summary,32
15.	Elaborate the compensation for the loss of vegetation	
16.	Make a consistency in the documents and Make arrangement in the alternative analysis of documents	All
17.	Give the Information in Salient features	9
18.	Make the IEE consistant following Approved ToR	All
19.	Revisit the length of the bridge	Executive Summary, 2, 7

