

**Initial Environmental Examination
of
Jalbire Bridge (Narayanghat- Muglin Road)**



Submitted By:

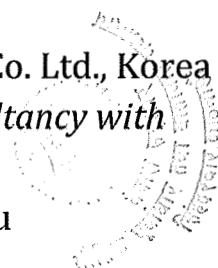
Geo-Environmental and Social Unit
Department of Roads
Chakupat, Lalitpur

Submitted to:

Ministry of Physical
Infrastructure and Transport
Singha Durbar, Kathmandu

Prepared By:

M/s Kunhwa Engineering & Consulting Co. Ltd., Korea
In association in the form of sub consultancy with
ERMC (P) Ltd., Nepal
Mid-Baneshwor, Kathmandu
Tel.: 977-1-447-1884



December, 2016

जलविदे खोला पुल
प्रारम्भिक वातावरणीय परिक्षण
कार्यकारी समिति

१.० प्रस्ताव

प्रस्तावित जलविदे खोला पुल नारायणघाट-मिलङ्ग सडक खण्ड अन्तर्गत विगतन जिल्लाको चन्डीमन्थुङ गा.वि.स.को हिल्दै बग्ने जलविदे खोलामा पर्दछ । प्रस्तावित आयोजना नारायणघाट मुलिन सडक अन्तर्गत २९+२१० कि. मि. मा पर्दछ । यस जलविदे खोला पुल निर्माणको प्रस्तावकको नाम र ठेगाना निम्न अनुसार रहेको छ ।

भू-वातावरण तथा सामाजिक शाखा,

सडक विभाग,

चाकुपट, जलिलपुर

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

सडक क्षेत्र विकास आयोजना,

सडक विभाग,

सानो मौबुर, काठमाडौं

२.० प्रस्तावको विवरण

प्रस्तावित जलविदे खोला पुलको कुल लम्बाई ८७.२० मी.को हुनेछ भने यसको चौडाई ११ मी. को हुनेछ । पक्की ढलान गरेर निर्माण गरिने उक्त पुल भौमिक रूपमा २७°३१'३९" उत्तर र ८५°४०'३९" पूर्व देशान्तरमा अवस्थित छ ।

३.० प्रस्तावको सन्दर्भकाल

वातावरण संरक्षण नियमावली, २०५४ को अनुसूची १ को नियम ३ अनुसार कुनै पनि ठेला पुलहरू निर्माण गर्दा प्रारम्भिक वातावरणीय परिक्षण गर्नु पर्ने कानूनी प्रावधान रहेको छ । गस्विय पुल मापदण्ड २०३७ को अनुसार ४० मी. भन्दा बढी लामो पुलको लम्बाई ८७.२० मी. भएकाले उक्त पुल निर्माण गर्नु पूर्व त्यस पुलको प्रारम्भिक वातावरणीय परिक्षण तथा जलविदे खोला मन्थल्य माफत स्वीकृत गराउनु पर्ने कानूनी व्यवस्था रहेको छ ।

४.० प्रारम्भिक वातावरणीय परिक्षणको उद्देश्य

यस प्रारम्भिक वातावरणीय परिक्षणको मुख्य उद्देश्य प्रस्तावित आयोजनाको कार्यान्वयनबाट आयोजना क्षेत्रको भौतिक, वैश्विक, सामाजिक, आर्थिक, सांस्कृतिक वातावरणमा पर्ने सबै प्रकारका नकारात्मक तथा नकारात्मक प्रभावहरूको अध्ययन गरी सकारात्मक प्रभावहरूको पहिचान गर्न तथा नकारात्मक प्रभावहरूको न्यूनीकरण गर्न उपायहरू पहिचान गर्ने हो ।

५.० कार्याविधि

यो अध्ययन प्रतिवेदन वातावरण संरक्षण नियमावली २०५४ दोस्रो संशोधनको प्रावधान अनुसार तथा यसै प्रतिवेदनको कार्यसूची (Terms of Reference)मा उल्लेख गरिए अनुसार तयार पारिएको हो । यसका लागि सन्दर्भिक ग्राहकको पुनरावलोकन तथा आयोजना क्षेत्रको निधारण गर्ने कार्य गरियो । अध्ययन जेटी छेउ साँम्पिक रूपमा २०७२ साल जेठ महिनामा स्थलगत सर्वेक्षण गर्ने, आवश्यक संचानाहरू संकलन गर्ने र स्थानीय समुदाय र सर्वेकारवालाहरूसँग समन्वयमा छलफल, परामर्श गर्ने कार्य गरियो । स्थलगत अध्ययन अर्थात् सर्वेकारवालाहरूको जानकारीको लागि सँग सम्बन्धित गर्ने कार्य २०७२ साल जेठ ३ गते साँझ ३ गते साँझ गरियो ।

६.० विद्यमान वातावरणीय अवस्था

प्रस्तावित क्षेत्र मध्यमाञ्चल विकास क्षेत्रको त्रिशुली नदीको उपत्यका पर्दछ । प्रस्तावित पुल त्रिशुली-जलविरेको दोभान भन्दा ६० मि. माथि जलविरे तर्फ निर्माण गरिनेछ । खोलाको सतह र हाल विद्यमान सडक विच करिव ३५ मी. अन्तर भएको हुनाले त्यस क्षेत्रमा वढीको न्यून सम्भावना रहेको छ । यसै गरी प्रस्ताव कार्यान्वयन गरिने क्षेत्र वरपर हाल कुनै किसिमको प्राकृतिक प्रकोपको जोखिम समेत नरहेको देखिन्छ । जाडो याममा हलुका चिसो भए पनि गर्मी याममा तापाक्रम उच्च रहने सो क्षेत्रमा सरदर २५०० मी.मी वर्षात हुने गर्दछ । उक्त क्षेत्रमा भूकम्पको दृष्टिले मध्ययम किसिमको जोखिम रहेको पाइन्छ । आयोजना कार्यान्वयन क्षेत्रमा जलविरे मन्दिर र सार्वजनिक द्वारा रहेको छ । उक्त क्षेत्रमा सिसौ, खयर लगायतका वनस्पतीहरूको बाहुल्यता रहेको छ । आयोजना क्षेत्र वस्ती नजिकै भएको हुनाले वन्य जन्तुहरूको वासस्थान आयोजना क्षेत्र भन्दा केही पर रहेको छ । स्थानिय वासिन्दाहरूसँग अर्न्तक्रिया गर्दा बढुलिएको तथ्याङ्क अनुसार आयोजना क्षेत्र वरपर काग, भंगेरा, चिवे, दुकुर, धोवी, परेवा, अदि चराहरू पाइन्छ । चरहरूको सन्दर्भमा आयोजना क्षेत्र वरपर काग, भंगेरा, चिवे, दुकुर, धोवी, परेवा, अदि चराहरू पाइन्छ । जलविर नदीमा पाइने माछाहरूमा तिते, हिले, बाम पर्दछन् ।

जतिय हिसाबले गुरुङ्ग जातिको बासेबास रहेको उक्त क्षेत्रमा शिक्षा, स्वास्थ्यको राम्रो प्रबन्ध रहेको छ । यद्यपी तुलनात्मक रुपमा हर्ने हो भने पुरुषको तुलनामा महिलाहरू निकै कम साक्षर रहेको पाइन्छ । आयोजना क्षेत्रमा खानेपानी र विद्युतको राम्रो प्रबन्ध रहेको छ भने उक्त क्षेत्र खुल्ला दिसा मुक्त क्षेत्र समेत हो । सडक सञ्जाल राम्रो भएका कारण सम्पूर्ण घरहरूमा खाना पकाउन ग्यासको प्रयोग हुने गर्दछ । सञ्चारको विषयमा उक्त क्षेत्रमा सञ्चारका सम्पूर्ण प्रविधिहरू प्रयोगमा आएको पाइन्छ ।

७.० वातावरणीय प्रभावहरू

आयोजना कार्यान्वयन हुँदा आयोजना क्षेत्रको वातावरणमा सकारात्मक र नकारात्मक दुवै खाले प्रभाव हुने देखिन्छ । सकारात्मक प्रभावका कुरा गर्दा स्थानिय रोजगारीको सृजना, सिप प्रवाह तथा अभिवृद्धि, सहज तथा सुलभ यात्रा र राष्ट्रिय विकासको सम्भावनाका ढोक खुल्नु सकारात्मक विषय हुन ।

नकारात्मक प्रभावहरूमा यस आयोजना ले त्यस क्षेत्रमा रहेको जल देबि दुर्गा माता को मन्दिर लाई प्रत्यक्ष असर गर्ने देखिन्छ । यसैगरी पुल निर्माण तथा सडक सुधारका क्रममा भित्ताहरू काट्दा वढ्न जाने पहिरो लगायतका प्रकोपहरूको जोखिम, खानी सञ्चालन गर्दा निम्तने वातावरणीय प्रभावहरू, आयोजनाका औजार तथा सावरी साधन सञ्चालन गर्दा हुने नायु तथा ध्वनी प्रदुष्ण, पुलको जग खन्दा तथा सडक सुधार गर्दा निस्कने ढुङ्गा माटोको व्यवस्थापन गर्ने चुनौती, कामदारका अस्थायी शिविरबाट निस्कने फोहोरहरूले सृजना गर्ने वातावरणीय प्रभावहरू, वनस्पतिमा पर्ने असर, सामाजिक कलह, दुर्घटनाका सम्भावनहरू, पेशागत स्वास्थ्य तथा सुरक्षाका सवालहरू, आदी पर्दछन् ।

८.० वातावरणीय प्रभाव न्युनिकरण तथा वातावरणीय व्यावस्थापन योजना

वातावरणीय प्रभाव न्युनिकरण गर्नका लागि यस प्रतिवेदनमा विभिन्न उपयहरू सुझाव गरिएको छ । जसमा प्राकृतिक प्रकोपको सम्भावना न्युनिकरण गर्न इन्जिनियरिङ तथा जैविक प्रविधिको प्रयोग गर्ने, ढुङ्गा माटोको उचित व्यावस्थापन गर्ने, खानी सञ्चालन गर्दा वातावरणमा प्रतिकुल प्रभाव हुन नदिने, आयोजना प्रभावित परिवारलाई उचित क्षतिपुर्ती प्रदान गर्ने, पेशागत सुरक्षाका उपायहरू प्रयोगमा ल्याउने उपाहरू यस प्रतिवेदनमा उल्लेख गरिएको छ । प्रदान गर्ने जल देबि दुर्गा माता को मन्दिर लाई उपयुक्त स्थानमा पुननिर्माण गर्ने, यसै गरी यस प्रतिवेदनमा वृक्ष रोपणको समेत प्रावधान राखिएको छ । जसमा ३१५ वटा विभिन्न जातका स्थानिय विरुवाहरू रोप्ने गरी प्रस्ताव गरिएको छ । आयोजना संग सम्बन्धित कमदारहरूले स्थानिय जैविक विविधतामा प्रतिकुल प्रभाव नपर्न भनेर प्रतिवेदनमा उनीहरूलाई रुख विरुवा काट्न, माछा मार्ने र शिकार गर्न रोक लगाउने कुरा समेत उल्लेख भएको छ । पुल निर्माणका क्रममा हुन सक्ने दुर्घटना कम गर्न संकेतहरू रल्ने, रातको समयमा बत्तीहरू बाल्ने व्यवस्था भिलाउने लगायतका उपायहरू प्रतिवेदनमा समावेश गरिएको छ ।

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Jalbire Bridge

Initial Environmental Examination

Executive Summary

1.0 The proposal

The Jalbire Bridge is proposed over the Jalbire River which is located along the Narayanghat-Mugling Road at Chandibhanjyang VDC of the Chitwan District. The proposed location is 29+210 m along the Narayanghat Mugling Highway. The details of the proponent of the proposed project are as follows:

Geo-Environmental and Social Unit (GESU)
Department of Roads (DoR)
Ministry of Physical Planning and Transport
Chakupat, Lalitpur

Similarly, the name and address of the implementing agency is;

Road Sector Development Project (RSDP)
Foreign Cooperation Branch
Department of Roads
Sanogaucharan, Kathmandu

2.0 Details of the Proposal

The length of the proposed Jalbire Bridge is 87.2 m while its breadth is 11 m. The proposed bridge is prestressed type and the bridge falls under the major bridge category. The geographical location of the proposed bridge is 27°49'31.16"N latitude and 84°31'18.04"E longitude and the elevation 260 m above mean sea level.

3.0 Relevancy of the proposal

As per the mandate on the EPR, 1997, Initial Environmental Examination (IEE) is compulsory prior to the construction of Major Bridge. The Bridge Standard, 2010 defines the bridge with span greater than 25m as the major bridge. Since, the Jalbire Bridge has length 87.2 m, which is greater than 50 m and is categorized as major bridge so accordingly EPR 1997, an IEE report has to be prepared, 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



The IEE report has been prepared based on the mandate of EPR. For this Terms of Reference had been prepared and approved by the MoPIT. Then after literature review, field visit (on March 2016) to collect environmental baseline and publication of public notice was done. Based on the primary and secondary information, impact analysis was carried out, and suitable mitigation measures for each of the significant measures are proposed and finally Environment Management Plan was prepared and the report was finalized.

6.0 Existing Environmental Condition

The proposed location for the implementation of the Jalbire Bridge lies in the Central Development Region of Nepal. The proposed location for the construction of the Jalbire Bridge is 70 m downstream from the existing bridge and 80 m upstream from the Jalbire-Trishuli confluence. Mostly alluvial deposits are available around the proposed bridge location whereas colluvial deposits can be found upstream of the proposed bridge location. The slope stability condition of the proposed location is found to be good. The area experiences the annual precipitation of about 2500mm and during the peak monsoon season the Jalbire Khola is found to be devastating. From the earthquake perspective the area is less vulnerable. Bushes dominate the land use of the area. Electric poles and public tap are found near the proposed bridge location.

Sisso and Khayer are the dominant tree species observed in the forest near the proposed location. The proposed bridge location does not lie on the forested area; hence the area is not the habitat of the wildlife. Neuri musa, rato bandar, langur and shyal are the common wildlife found around the project area. Similarly, dhobi, chibe, bhangera, kaag, parewa, dhukur are the common avifauna in that area. Tite, hile, bam etc. are the common fish species observed in the Jalbire River.

Gurung is the most dominant ethnic group residing around the project area. Likewise, Chepang, Gharti, Magar, Chhetree are the other ethnic groups found around the project area. The status of education and health facilities is satisfactory around the project area; however, the educational status of female is very poor compared to that of male. The local people rely on solar lamp and kerosene to light their dwellings. The households in the project area found to be using LPG and firewood for cooking purpose. Lamo Jharana is the local touristic site of the project area. Majority of the people of the Jalbire are engaged in business followed by agriculture. Likewise, Poultry Grid Industry is also operating in the project area. Similarly, Jal Devi Mata temple is one of the religious sites of the Jalbire. Local people have the deep belief upon that temple.

The construction of the proposed bridge will not affect the private buildings and lands. Two electric poles and one public tap needs to be relocated due to bridge construction. The Chandibhanjyang VDC has been declared as the ODF zone. Hence, the sanitation and toilet facility is found to be very good around the project area.

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, improved mobility and reduction in traffic congestion and positive impact on national economy.

Adverse environmental impact include the direct impact on the Jaldevi Durga Mata Temple which will be severely affected by the project. Other environmental issues associated with the implementation of the project includes land slide and slope stability due to excavation and slope

cutting activities, environmental impacts associated due to quarry and river bed extraction, environmental issues associated with spoils generated due to dredging and excavation activities, air and noise pollution, water pollution, environmental issues associated with spoil management, environmental impacts of solid and liquid waste from labor camp, impact on vegetation, possibility of accidents, issues associated with occupational health and safety, etc.

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 provision for occupational health and safety measures, reduction in air, water and noise pollution, provisioning adequate lighting and signpost to reduce the accidental risk and addresses the impacts resulting from the operation of quarry site and river bed extraction, labor camp et in the IEE report.

The report has proposed for the reconstruction of Jaldevi Durga Mata temple in appropriate nearby place. Furthermore, the document also has the provision for tree plantation. Altogether 315 saplings of local trees have been proposed for the plantation. Other mitigation measures includes to restrict the extraction of fuel wood from the nearest forest for project use, fishing, and hunting of wildlife, this report recommends the formulation of strict code of conduct. 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 to execute the environmental and social safeguard measures. For the successful implementation of Environmental Management Plan, the total budget of NRs. 2,649,850.00 has been allocated.

9.0 Conclusion

The project has very minimal environmental impacts that can be mitigated through the mitigation measures proposed in this document and the construction of the Jalbire Bridge at the new location with straight road devoid of sharp turns will help to reduce the traffic accidents and traffic congestion. There will be smooth operation of the vehicles which will reduce the travel time. Thus, it has been concluded that the project should undergo construction as soon as possible with the implementation of all the mitigation measures proposed in IEE.



Abbreviations and Acronyms

Amsl	:	above mean sea level
CBO	:	Community Based organization
CBS	:	Central Bureau of Statistics
CDO	:	Chief District Officer
CITES	:	Convention on International Trade in Endangered Species of Wild Flora and Fauna
DDC	:	District Development Committee
DFO	:	District Forest Office
DHM	:	Department of Hydrology and Meteorology
DHQ	:	District Headquarters
DoR	:	Department of Roads
EIA	:	Environment Impact Analysis
EMAP	:	Environment Monitoring Action Plan
EN	:	Endangered
EPA	:	Environment Protection Act
EPR	:	Environment Protection Rules
ERMC	:	Environment and Resource Management Consultant
ESMF	:	Environmental and Social Management Framework
F	:	Foliation
FAR	:	Financial Administration Regulation
GESU	:	Geo-Environmental and Social Unit
GIS	:	Geographic Information System
GoN	:	Government of Nepal
HH	:	Household
HS	:	Hill Slope
IEE	:	Initial Environmental Examination
INGO	:	International Non-Governmental Organization
IRC	:	Indian Road Congress
IUCN	:	International Union for Conservation of Nature
J	:	Joint
KII	:	Key Informant Interview
LC	:	Least Concern
LCF	:	Local Consultative Forum
LCLA	:	Local Community Liaison Assistant
LPG	:	Liquid Petroleum Gas
MoPIT	:	Ministry of Physical Planning and Transportation
MoSTE	:	Ministry of Science, Technology and Environment
NEPAP	:	Nepal Environmental Policy and Action Plan
NGO	:	Non-Governmental Organization
N-M	:	Narayanghat-Mugling
NT	:	Near Threatened
PAH	:	Polycyclic Aromatic Hydrocarbons
PSC	:	Pre-Stressed Concrete
PWD	:	Public Works Directive
RAP	:	Resettlement Action Plan
RCC	:	Reinforce Cement Concrete
RSDP	:	Road Sector Development Project
SLC	:	School Leaving Certificate
SPSS	:	Statistical Package for the Social Sciences
SRN	:	Strategic Road Network
TMT	:	Thermo Mechanically Treated
ToR	:	Terms of Reference
VDC	:	Village Development Committee
VOC	:	Volatile Organic Compounds



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CHAPTER 1: Name and Address of the Proponent

1.1 Proponent

The name and address of the institution preparing the report for Initial environmental Examination (IEE) of Jalbire Bridge (Narayanghat- Mugling (N-M) road) is as follows:

*Geo-Environmental and Social Unit (GESU)
Department of Roads (DoR)
Ministry of Physical Planning and Transport
Chakupat, Lalitpur*

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

*Road Sector Development Project (RSDP)
Foreign Cooperation Branch
Department of Roads
Sanogaucharan, Kathmandu*

1.2 Consultant

On behalf of the proponent, Kunhwa Engineering and Consultancy Co., Ltd., Korea in association in the form of sub consultancy with Environment and Resource Management Consultant (ERMC) Pvt. Ltd., has been assigned for Feasibility Study and Detail Design for construction of new bridges, maintenance of existing bridges (Contract No. RSDP/Cons/Bridge/01) and Terms of Reference (ToR) for IEE as per task A 402 assigned for Consultants and accordingly the consultants has prepared the IEE report of the proposed bridge. The name and address of the consultants preparing this 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

One of the main objectives of the Road Sector Development Project (RSDP) is up-grading of about 700 km dry season roads to the sealed pavement connecting in 8 districts headquarters namely Darchula, Baitadi, Dailekh, Jumla, Humla and Jajarkot including improvement of existing intermediate lane to double lane carriageway of the N-M Road.

In order to maximize the benefit from all seasons, sealed roads in the above 8 districts and from the proposed improvement to a double lane carriageway of N-M road, the Government intends to apply a portion of proceeds to engage International Consultant. This intends to undertake design services of construction of new bridges including river training works and approach roads, major and minor maintenance of the existing bridges and provision of traffic safety elements on all bridges. The study will be basis for construction and or maintenance from financing from Government or with the assistance from IDA or other bilateral or multilateral development institutions. For these purposes 18 bridges from Narayanghat-Mungling Road, 2 bridges from Shitalpati-Musikot Road, 3 bridges form SKMTSD Road, 15 bridges from Surkhet-Jumla Road and 13 bridges from Chhinchu-Jajarkot Road are under consideration.

In this regard, the construction of Jalbire Bridge is proposed at the chainage; 29+210 at N-M Road. The proposed bridge is of Prestressed type with the length of 87.2 m. According to the National Bridge standard 2010, this bridge falls under major bridge category and subsequently as per Environment Protection Rule (EPR), 1997 implementation of the proposed project requires IEE.

2.2 Objectives of IEE

The objectives of IEE are as follows:

- Identify and predict the major environmental issues that may arise as a result of proposed works and their likely impact on bio-physical, socio-economic and cultural environment of the project area.
- Identify easily implementable mitigation measures for the negative environmental and social issues and suggest remedial plans in case of residual impacts if any identified.
- Recommend practical and site specific environmental mitigation and enhancement measures, prepare and implement Environmental Monitoring Action Plan (EMAP) for the project.

2.3 Rationality of IEE

As per EPR 1997, construction of a major bridge requires an IEE and its subsequent approval from its concerned ministry (Clause-4 of Road Sector, Schedule-1 Pertaining to Rule-3 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 length of the proposed bridge will be 87.2 m. Hence, the proposed construction work requires IEE.

2.4 Relevancy of the Proposal

The proposed subproject lies on Narayanghat-Mugling Highway. The Narayanghat-Mugling highway experiences the heaviest traffic load in the country, accounting for 90 percent of Nepal's total international trade traffic. More than 20,000 vehicles ply the highway every day. The heavy congestion on the road has led to a number of accidents. The upgrading works of 33 km section to double lane standards of 9-11m has already been initiated. Matching with this double lane NM road the bridges within these section has to be either widened or newly constructed. Most of these bridges in NM road are arch bridge and with intermediate lane carriageways. These bridges are built nearly 33 years ago under financial assistance from Government of China. There are 18 bridges in Narayanghat- Mugling road out of them 4 are proposed for new construction.

The Jalbire Khola is perennial stream; however, its discharge will be relatively high during monsoon season. There is existing bridge over Jalbire Khola, however, bridge is located in sharp bends and do not comply with the double lane standards posing threat for traffic accidents. It is along the Narayanghat-Mugling Highway along chainage 29+210. The construction of new bridge with double lane standard over Jalbire Khola along N-M section will provide the safe and better transport facility for the people of the different part of the country. Furthermore, the design of Jalbire Bridge has been made with seismic analysis and hence the bridge is earthquake resistant.



CHAPTER 3: Project Description

3.1 Project Area

The proposed Jalbire Bridge is located in Chitwan District of Central Development region (CDR) at the chainage of 29+210 in N-M Road Section. The geographical location of the proposed bridge is $27^{\circ}49'31.16''\text{N}$ latitude and $84^{\circ}31'18.04''\text{E}$ longitude and the elevation is 260 m above mean sea level. The area around the proposed bridge is characterized by the settlements, road-side business, unused land and forest. Water mill and lime industry are the some of the small scaled industry located near the bridge location. Jal Devi Durga temple is also present around the project location. Tea stalls, hotels and grocery have well developed in that area which offers breakfast, lunch and dinner to the people travelling through the Highway. The project area is well connected to both district headquarter and capital city. The land around the project area has steep to moderate hill slopes. The proposed bridge has been proposed over the Jalbire River which is a Perennial river.

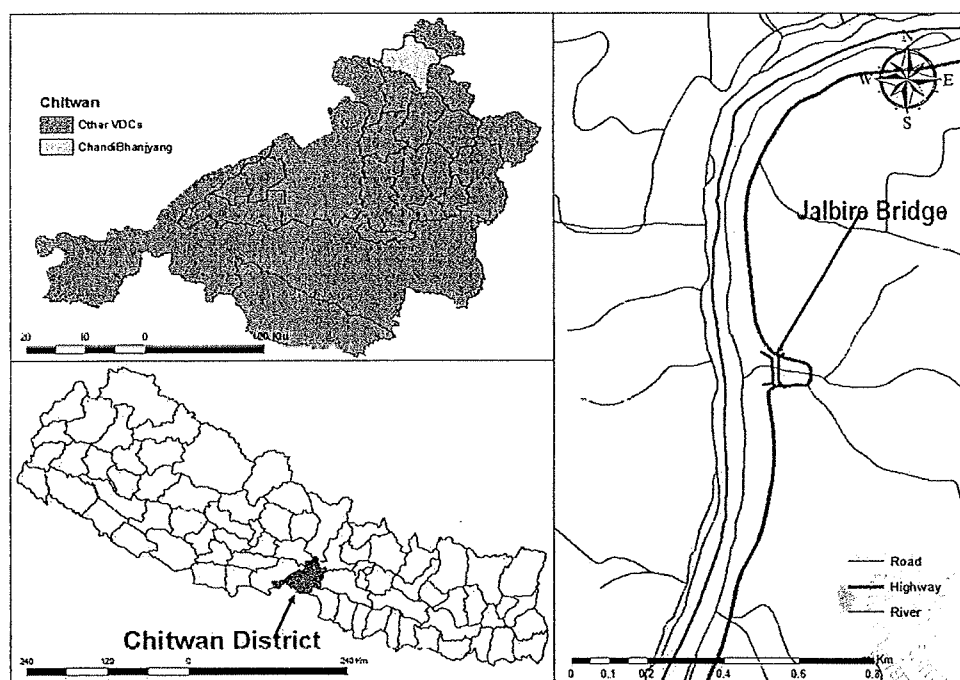


Figure 3-1: Location of the proposed bridge site.

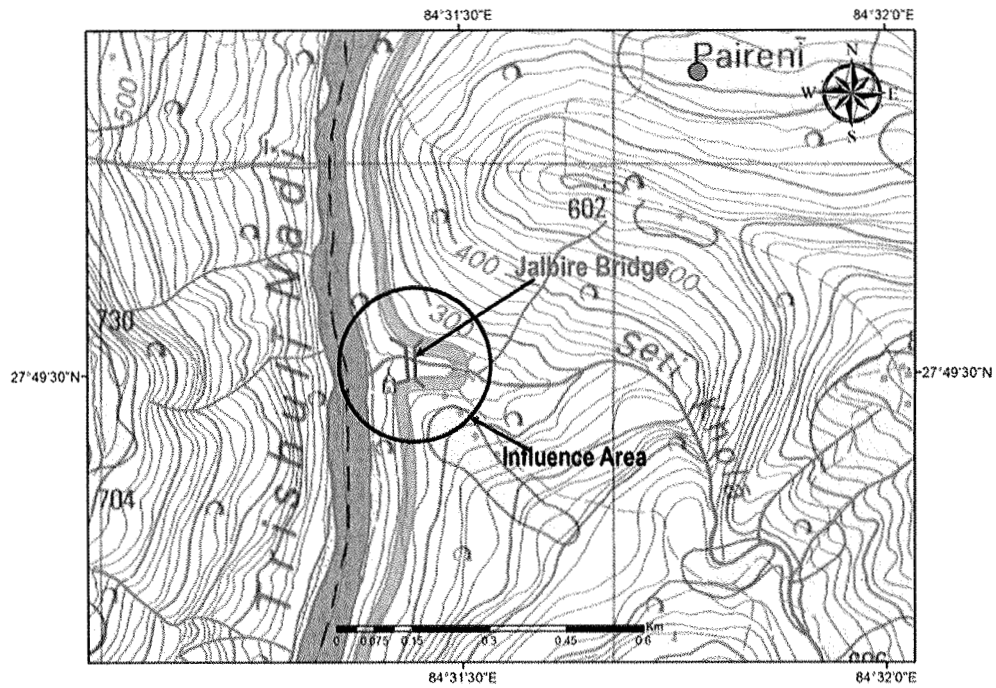


Figure 3-2: Topographical Map showing study area and project impact area.



Figure 3-3: Project Site in Google Map

3.2 Salient Features

The salient features of the proposed bridge are presented in the table below:



Table 3-1: Salient Features of the Project

Name of the Project	Jalbire River Bridge
Location	
Development Region	Central Development Region
Zone	Narayani
District	Chitawan
Village/ Town	Chandi Bhanjyang-09
Name of the Road	Narayanghat-Mugling Road
Chainage of the Bridge site	29+210
Geographical Location	551604.2 E; 3078583N
Classification of Road	National Highway
Type of Road Surface	Bituminous
Terrain / Geology	Hilly
Structure	
Total length of the Bridge	87.2 m
No of span	1*20+1*40+1*20 m
Total width of the bridge	11.0 m
Width of Carriage way	7.5m
Width of Footpath with railing	1.5m
Kerbs	0.350
Type of Structure	RCC
Type of Superstructure	Pre Stressed +RCC T beam
Type of Bearing	Pot cum PTFE
Type of Abutment	Rectangular RCC with Return Wall
Type of Foundation	Open Foundation
Design Data	
Live Load	IRC Class 70R, Class A
Net bearing capacity of soil	490 KN/m ²
Design Discharge	84 m ³ /s
Minimum Clear waterway	25.00 m
Grade of Concrete	
In superstructure	M 35
In substructure	M 25
In foundation	M 25
Grade and Quantity of Reinforcing Steel	TMT having characteristic of strength of 500 N/mm ²
Total environmental cost	Nrs. 2649850
Total civil cost	Nrs. 109455304.29
Total Project Cost	Nrs. 112105154.29

Source: Design Report of Jalbire Bridge, 2015

3.3 Project Requirements

3.3.1 Land Requirements

Construction of proposed project requires 0.347 ha land out of which 0.23 ha is required temporarily and remaining 0.117 ha land permanently. All the land requirement belongs to the public land. The land requirement for the proposed project is given in Table 3-2.

Table 3-2: Land Requirement for the Project

Project Component	Private		Government		Total (ha)
	Temporary	Permanent	Temporary	Permanent	
Approach Road and Bridge axis and river training	0	0	0	0.117	0.117
Construction Yard and Stockpiling Area	0	0	0.08	0.0	0.08
Construction Camp	0	0	0.06	0.0	0.06
Spoil Disposal			0.09	0.00	0.09
Total	0	0	0.23	0.117	0.347
	0				0.347

3.3.2 Construction Camp

Construction camp can be established in Jalbire gau, which is located 100 m u/s nearby the road heading towards Chandibhanjyang VDC office/Icchakamana from Jalbire. The proposed land is under government ownership. Since the number of construction crews will be in small in number, the nearby houses can also be rented in.

3.3.3 Material Stockpiling Site

There is availability of the land (within RoW of NM road) near the existing Jalbire Bridge which can be used for the stockpiling of the construction materials. Stockpiling on particular site will not affect the smooth movement of vehicles during the construction period of the Jalbire Bridge.

3.3.4 Spoil disposal Site

Around 3680 m³ of spoil is likely to be generated during construction of foundation. About 1250 m³ can be utilized as filling materials and remaining 2430 m³ should be managed. The spoil generated will be disposed safely on the both banks of Jalbire Khola nearby the bridge construction site with appropriate retaining wall protection, with the provision of Toe wall. In managing the spoil in such manner will serve as the river bank protection measure.

3.3.5 Construction activities and scheduling

- **Construction technology**

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

- **Construction Activities**

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

- **Construction scheduling**

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

- **Construction raw materials**

Cement, sand, aggregates and steel reinforcement will be used as raw material for bridge construction while Gabion wires will be used for river training structures. Similarly, use of bitumen, paints, and chemicals used to operate the equipment and vehicles will be used. The design parameters for the proposed bridge has been adopted the design standard of DoR/IRC.

Flood plain of Trishuli River within 12 km from the project location (Near Gaighat) will be used for sand and gravel required for the project. The collection of sand and gravel will be done by the use of machineries like excavators, loaders, tippers, etc. For crushed materials, the project can acquire crusher plant being operated in Gaighat, and other licensed suppliers. Similarly, other resources such as cement, rod, bitumen, chemicals, petroleum etc., can be acquired from Narayanghat or Birgunj.

- **Water requirement during construction**

Water from Jalbire Khola will be used during the construction purposes. Similarly, construction water can also be acquired from Trishuli River.

- **Energy required during construction**

The energy required for the construction of the Jalbire Bridge will be generated from electricity supply around the project area. Likewise, diesel generators will also be used during the load shedding period.

- **Human Resource Requirements**

The construction of the proposed bridge requires an estimated, 6600 man-days of unskilled workforce, and 1900 man-days of skilled and semi-skilled workforce. The project will prioritize the local people in proposed bridge construction works.

3.3.6 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.

3.3.7 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 Jalbire 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.

3.3.8 Maintenance approach

In the case of maintenance, persons assigned to NM road 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.

3.3.9 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 Jalbire 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 Chitwan, Village Development Committee, CBS, NGOs, INGOs, CBOs and other governmental and non-governmental organizations and various research papers. Data on rainfall and other meteorological conditions were also acquired from DHM.

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

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

4.2 Field Survey

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

4.3 Impact Area Delineation

The project the impact areas were identified during the preparation of ToR. 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 Areas	Project implementation site, the adjacent land plots, built up structures, houses and property within 500 m from the project site
Indirect Impact Areas	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 VDC i.e., Chandibhanjyang VDC, Chitwan District

4.4 Collection of Environmental Baseline Data/ Information

The following table presents a synopsis for the baseline information to be 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 Requirement	Methods/ Tools
Physical and Cultural Environment	
Physiology, Topography, Land use type and land use classification,	Remote Sensing and GIS analysis on the topographical maps published from the Department of Survey, Google image.
Hydrology - drainage network and drainage density	Remote Sensing and GIS (QGIS Brighton 2.6.1) analysis on the topographical maps published from the Department of Survey, Google image.
Geology – rock types and rock classification, seismicity, stability	Field Investigation / Direct Observation, Analysis of geological map as published by Department of Mine and Geology.
Soil Type and soil condition	Field observation, soil analysis
Sound / Noise conditions	Field observation, available secondary information
Weather and Climate conditions – Temperature, precipitation, climatic	Secondary information from Department of Hydrology and Meteorology (DHM), other published literatures.

Data Requirement	Methods/ Tools
and bio-climatic classifications	
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.	Direct field observation / Interaction with design engineers, local stakeholders.
Traffic conditions	Direct observation, information from the stakeholders, traffic data from feasibility report
Public Utilities	Direct Filed Observation, Consultation with the locals
Cultural sites and cultural activities, historical sites, foot trails etc.	Consultation with local, Direct observation of cultural and historical sites.
Air Quality	Direct Field Observation and available secondary information
Water Quality	Visual inspection of water around project area
Biological Environment	
Vegetation analysis	Field enumeration / survey
Faunal Environment	Key Informant Interview (KII)
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

4.5 Data Analysis

The experts of the relevant field analyzed the primary and secondary information qualitatively and quantitatively. Physical, chemical, biological, socio-economic, and cultural information were assembled and tabulated. The information were crosschecked and analyzed by the respective

experts. The data were processed using computer-based spreadsheet (Excel) and SPSS and were presented in tabular and pictorial forms.

4.6 Impact Identification/ Prediction and Evaluation

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

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.

The specific criteria used in evaluating the significance of the impacts are based on the following criteria. These criteria are not exhaustive but are 'forward looking approach' to develop a practice of impacts evaluation in the Nepalese EA system.

- If the species protected under the legal system of Nepal and the species as included in the CITES appendix I and II are to be cleared/felled, the impact has been considered significant. Any loss of rare, endangered and endemic species' or critical or productive habitat will result to significant impact.
- Any impact(s) to PAFs have been considered significant.
- Displacement of any family and temple and public utilities has been considered significant.
- Also direct impact on women and disadvantage group has been considered significant.
- Impacts resulted due to demolition of social services and infrastructure facilities including archaeological, historical and cultural sites also been considered significant. In addition, an impact is assessed as long-term if it lasts for 20 years or more. An impact is assessed as medium term if it lasts for 3 to 20 years, and an impact is assessed as short-term if it lasts only for 3 years or the construction period. In classifying the extent, impacts limited up to the project area is site-specific, limited up to the affected VDC's is local and an impact extending beyond the project area would be termed as regional impact (National EIA Guidelines, 1993). In case of beneficial impacts, the following criteria have been used in the study.
 - ✓ Impacts that generate socio-economic benefits such as employment generation, local income and poverty reduction without depleting the natural resource base have been considered significant.

4.7 Public Involvement

Public Notice: 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 16th March, 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 Consultations: The IEE team carried out a consultation meeting on 2072-12-07 at Jalbire in Chandibhanjyang VDC. 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 Jalbire VDC and Chitwan DDC office desk for stakeholders references. The copies will be made available in Ministry of Physical Infrastructures and Transport (MoPIT), Road Sector Development Project (RSDP) office, Office of Geo-environmental and Social Unit of Department of Roads, World Bank Nepal office and electronic copy will be made available in RSDP official website for public disclosure.

Table 4 3: Summary of Public Consultation Meetings

Date	Venue	Address	Participant		Issues and suggestion of local people during public consultation
			Male	Female	
2072/12/07 (September , 2013)	Jalbire	Jalbire, Chandibhanjyang-09, Chitwan	6	0	<ul style="list-style-type: none"> • Temple if affected seriously due to project, it should be reconstructed in the nearby locality. • Local people should be employed during project construction. • Resting place (Chautari) at Jalbire should be constructed.

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 VDC was collected for the environmental clearance and implementation of the project.

4.8 Study Team

IEE study team of Jalbire bridge includes the following members.

S.N	Name	Study Area
1	Kaushal Raj Adhikari	Team Leader/Environmental
2	Ujjwal Tiwary	Physical Environment
3	Manish Kumar Singh	Civil Engineer
4	Tara Bhattarai	Geologist
5	Rishikesh Pokarel	Hydrologist
6	Shiva Dhakal	Sociologist



CHAPTER 5: Legal Review

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 Acts

5.2.1 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.

5.2.2 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.

5.2.3 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.

5.2.4 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 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.

5.2.5 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.

5.2.6 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.

5.2.7 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.

5.2.8 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).

5.2.9 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.

5.2.10 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.

5.2.11 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.

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

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

5.3 Regulations

5.3.1 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.

5.3.2 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.

5.3.3 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.

5.4 Policies and Plans

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

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

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

Upon evaluation of these impacts, a strategy on land acquisition and compensation must be framed for low-risk projects. But in the case of high- and medium-risk projects, a detailed resettlement and rehabilitation plan must be designed. Also, families should be entitled to compensation if works like installation of transmission, telephone and underground drinking water pipe lines affect livelihood. And in case the projects affect yields of registered commercial crop, fruit or flower producers, compensation equivalent to five years of revenue must be given

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

5.4.2 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.

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

Nepal Environmental Policy and Action Plan (NEPAP) has been prepared as a part of Government of Nepal's continuing effort to incorporate environmental concerns into the country's 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.

5.4.4 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.

5.4.5 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.

5.5.6 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.

5.4.7 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 transboundary 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 (i.e., construction of Sija Khola Bridge) falls within Category project. As per World Bank Operational Policies a proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

For sector investment loans (SILs), during the preparation of each proposed subproject, the project coordinating entity or implementing institution carries out appropriate EA according to country requirements and the requirements of this policy. The Bank appraises and, if necessary,

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

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

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

World Bank Operational Policy (OP 4.36): Forest

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

biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services.

Involuntary Resettlement (OP 4.12)

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

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

The policy covered the following impact;

This policy covers direct economic and social impacts that both result from Bank and or Bank assisted investment projects, and are 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.

5.5 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.

5.5.2 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.

5.5.3 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 guidelines also outlines implementation methods for undertaking mitigation measures for activities related to these issues.

5.5.4 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.

5.5.5 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.

5.5.6 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
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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- 2027 (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 test 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 Conditions

6.1 Physical and Cultural Environment

6.1.1 Topography

The construction of new bridge at Jalbire is proposed for shifting 70 m downstream from existing bridge site towards left bank of the Trishuli River. The proposed bridge site is located at about 80 m upstream from the confluence of Jalbire and Trishuli River. The proposed bridge site has gentle slope on the right bank on uphill side whereas, the downhill side has steep slope. The average gradient of 15.3% is observed along the course of Jalbire River considering from confluence of Jalbire- Trishuli to 80m upstream. The proposed bridge site lies at an elevation of 260 amsl where the left bank is superficially comprised of colluvial deposits and the right bank comprised of bedrocks and thin layers of colluvial deposits as well. The topographic setting of the Jalbire watershed is shown in figure below:

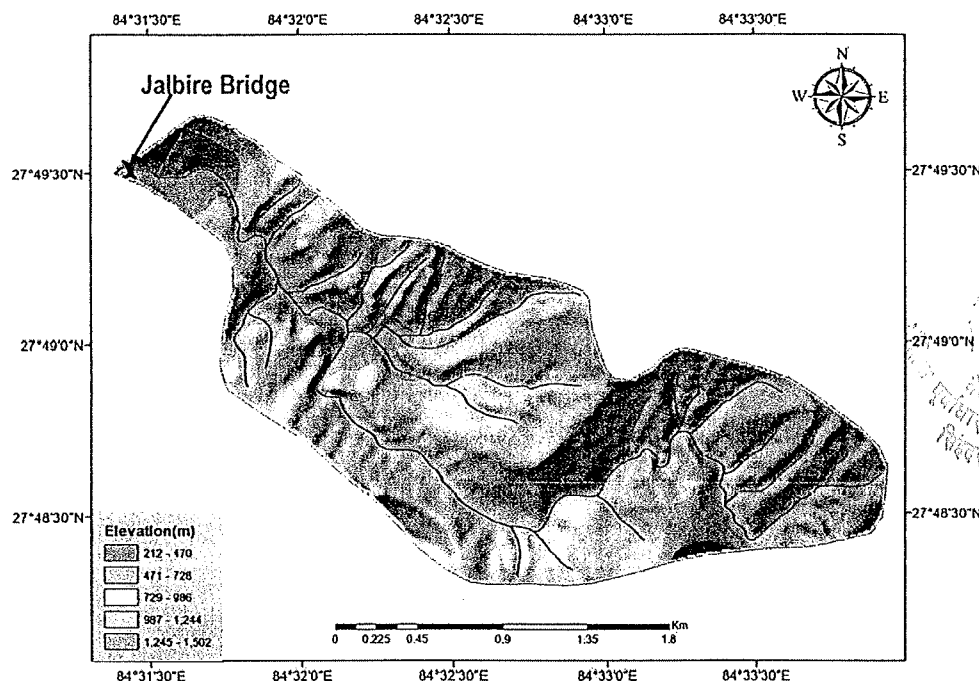


Figure 6-1: Hillshade map showing the topographic setting of the Jalbire Bridge.

6.1.2 Geology and soil

6.1.2.1 Regional Geology

The bridge site is geologically located in the rocks of the Nawakot Group of Lesser Himalaya, Central Nepal. The Nawakot Group is geologically subdivided into the Lower and Upper Nawakot groups in ascending order (Figure 2). The Lower Nawakot Group is subdivided into the Kuncha Formation, Fagfog Quartzite, Dandagaon Phyllite, Nourpul Formation and Dhading Dolomite in ascending order (Table 1).

The proposed bridge site is located in the rocks of the Nourpul Formation. The litho unit Formation is comprised of quartzite and slate. Major geological structures like faults can find around the location of the bridge (Figure 1).

Table 6-1: Lithostratigraphy of Central Nepal (after Stocklin and Bhattarai, 1977)

Group	Formation	Lithology	Age
SIWALIKS			
MAIN BOUNDARY THRUST (MBT)			
Lower Nawakot	Dhading Dolomite	Dolomite	Pre-Cambrian
	Nourpul	Quartzite, phyllite, dolomite	
	Dandagaon Phyllite	Slate	
	Fagfog Quartzite	Quartzite	
	Kuncha	Quartzite, phyllite	
Mahabharat Thrust (MT)			

6.1.2.2 Geology of the proposed bridge site

The proposed bridge site belongs to Nourpul Formation. The Nourpul Formation is comprised of grey slate and quartzite. The bridge site is composed of alluvial soil deposits on the downstream of the existing bridge. The alluvial deposits are composed of cobble of quartzite, slate and phyllite. Thickness of alluvial soil is less than 2 m on both banks whereas bedrocks exposed below the alluvial deposits. The foundation falls on the bedrocks of slate. The bearing of the proposed bridge axis is 150 degrees. The flowing direction of the Jalbire Khola around the proposed bridge site is 240-060 degrees.

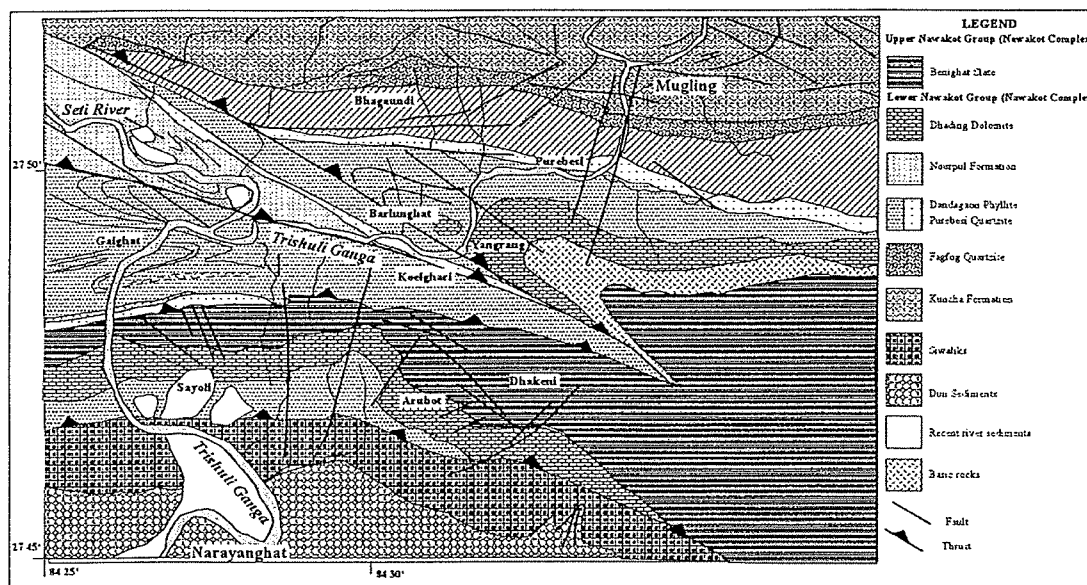


Figure 6-2: Geological map of Muglin- Narayanghat Area.

Colluvial deposits can be observed at the left bank of Jalbire Khola. Some alluvial deposits are also found, which comprises of boulders (60%), cobble and pebbles (40%) on the left bank. Bedrocks of quartzite and slate are exposed on hill (upstream and downstream of the proposed bridge site). Likewise, the right bank of the Jalbire Khola is comprised of bedrocks and thin layer of colluvial deposits. The bedrocks are exposed around the proposed bridge site. The foundation of the bridge falls on the bedrocks.

6.1.2.3 Soil

The surface soil of the bridge area consists of mainly alluvial deposits at riverbed and colluvial deposits at the upstream. The alluvial deposits are mainly found in the riverbeds. Bedrocks are also exposed on the riverbed. Thicknesses of alluvial deposits are less than 1 m. The alluvial deposits are composed of boulders, cobbles, pebbles which are mainly granite, quartzite from the Lesser Himalaya (0.5 to 5 m in diameter). The surface soil lacks of calcareous cementing material so the surface soils are loose in nature.

6.1.3 Slope Stability

Although there is presence of loose materials along the river banks, the slope stability condition is found to be good. The foundation of the bridge on both the banks falls on the bedrocks. The right bank seems to be relatively weak because of the high possibility of occurrence of plane failure whereas the left bank seems to be stable.

In general the slope stability is more or less good on the right bank whereas on the left bank there is less possibility of occurrence failure. The wedges formed by the intersection of the joints and foliation plane seem to be stable.

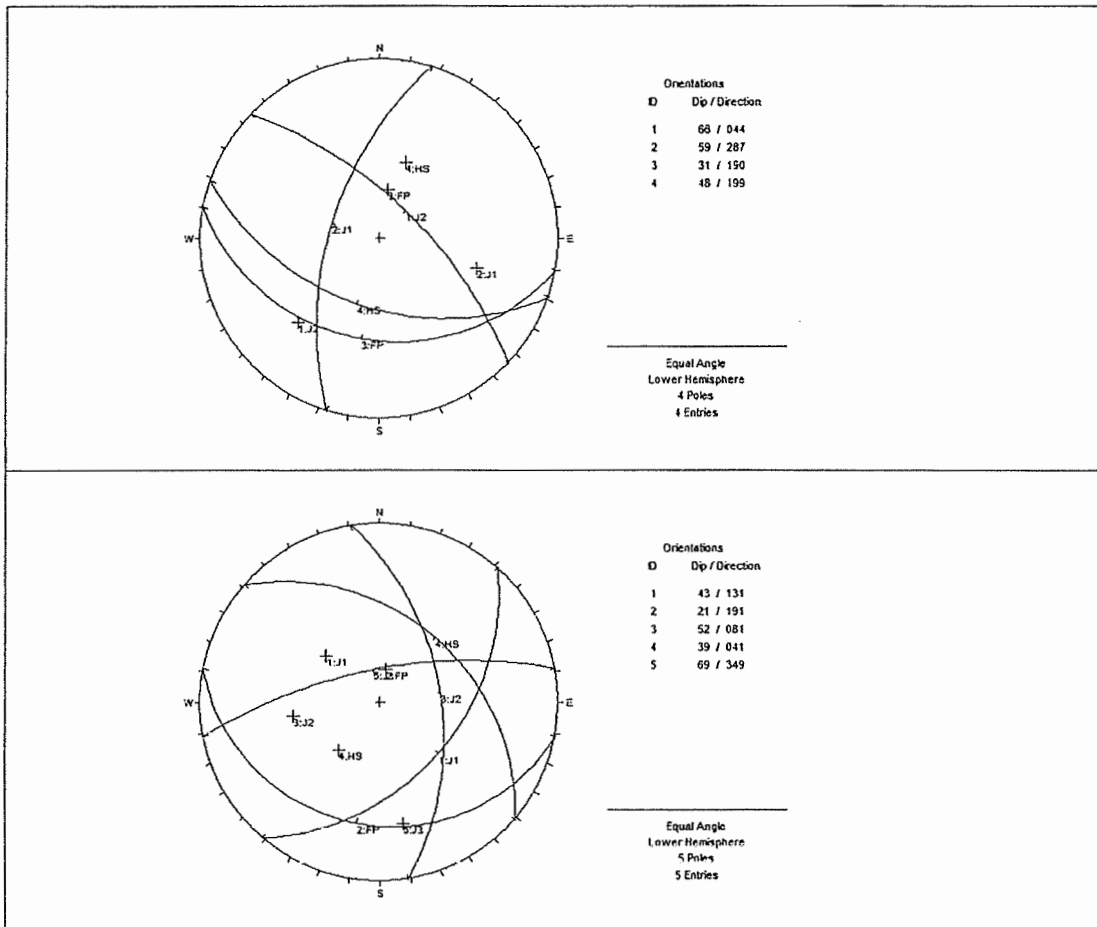


Figure 6-3: Stereographic Projection of the Proposed Bridge Site Area

Table 6-2: Condition of slope stability of the rock

Location	HS and F	F and J1	F and J2	F and J3	J1 and J2	J2 and J3	J1 and J3
Right Bank River side	Very unstable	Very unstable	Stable		Stable		
Right Bank Road side	Stable	Stable	Stable		Less stable		
Left Bank River side	Stable	Less stable	Stable	Stable	Stable	Stable	Stable

Left Bank	Stable	Unstable	Stable	Stable	Stable	Stable	Stable
Road side							

HS-Hill slope, F-Foliation Plane, J-Joint

6.1.4 Seismological Study

The proposed area is located about 1-2 km periphery from the remarkable thrust and faults. So, the activity of the fault movement is considered as nominal. The analysis is basically made by deterministic evaluation of earthquake sources in the vicinity with the state of art consideration of attenuation for the Himalayan terrain. It should be acknowledged that the problems of seismo-tectonic events of Himalaya are not fully understood and the knowledge is increasing with more and more accumulation of research results and data analysis. The study has considered the latest results of seismo-tectonic study of the Himalaya and the vicinity. For comparison purpose, both deterministic and probabilistic assessments of seismic hazards have been considered.

For the minimum acceleration of 150 gal, reduction factor of 0.65 the calculated effective design seismic coefficient is approximately 0.09.

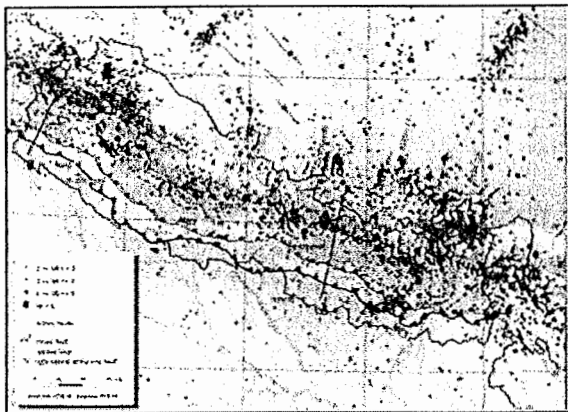


Figure 6-4: Epicenter of earthquake in Nepal Himalaya

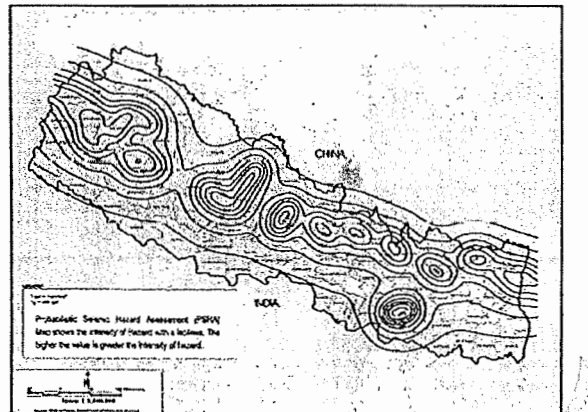


Figure 6-5: Seismic hazard map of Nepal Himalaya

For the maximum acceleration of 200 gal (reduction factor of 0.65 the calculated effective design seismic coefficient is approximately 0.11. Hence, the design horizontal seismic coefficient ranges from 0.09 to 0.11 (calculated values).

6.1.5 Climate

The climate around the project area is sub-tropical type. During summer months temperature almost reaches 40°C, while in winter the temperature remains above 10°C. According to the record from Department of Hydrology and Meteorology, the annual total precipitation of the area is about 2500mm, large fraction of which occurs during monsoon season (i.e. June to September). Moreover, during monsoon season due to sudden cloud burst, the streams like Jalbire Khola remains active and devastating.

6.1.6 Drainage and Hydrology

The catchment of Jalbire Khola is of fern shape having mild slope in upper catchment and steep drops in lower side and small drainage network. The catchment area is about 5.02km². The head water begins from an elevation of 1419m and the site of proposed bridge is located at 255m altitude from mean sea level. The main channel length is about 5.09km. The average slope of main channel is 22.9%.

The proposed bridge has been proposed over the Jalbire River which is a Perennial river. The gradient of the river d/s of the bridge is found to be lower than its u/s. The gradient of river channel u/s of the bridge is high which exceeds 30%. The river gradient of the Jalbire River is given in the figure below:

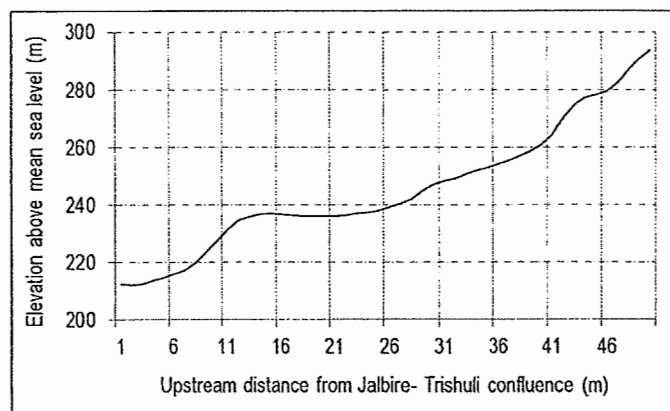


Figure 6-6: Longitudinal profile of Jalbire River.

Jalbire Khola is a perennial stream, however, the variability in seasonal discharge is high. Jalbire Khola has deep and constricted channel so flooding around the area is not the concern during high discharge, however bank cutting is the prominent feature. The design discharge (i.e., expected maximum flood in 100 years) of the Jalbire Khola is 84m³/s. The lowest river bed level is 233.71m at the U/S inlet and 232.71m D/S outlet of bridge. Likewise, the high flood level (HFL) is 234.94m at U/S inlet and 234.04m at D/S outlet of bridge. The minimum free board is 1m. Furthermore, the recommended scour depth from lowest river bed level is 2m.

6.1.7 Land Use

The land use around the proposed bridge is dominated by bushes. The land use on both the banks of the river around the proposed bridge is dominated by bushes. Settlements with cultivated land can be found 90m away from the bridge location. Similarly, Jal Devi Durgamata temple, tea stalls, water mill, lime industry, hotels and grocery shops are also located around the project area. The land use around the Jalbire Bridge is shown in figure below:

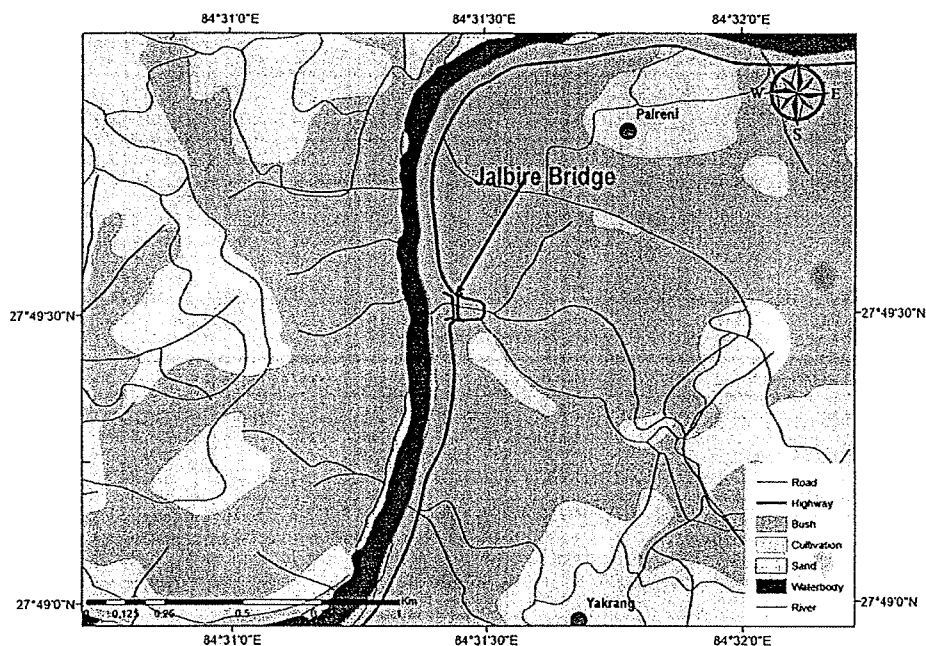


Figure 6-7: Land use around the Jalbire Bridge.

6.1.8 Air Quality

There are no permanent sources of air pollution in the project area. Vehicular movement, is the major source of air pollution, as more than 20,000 vehicles move on the road daily. Air quality of the project area was found to be fair during the field study period.

6.1.9 Water Quality

There are no significant sources of water pollution in the area. Waste released from households, animal wastes and soil erosion and landslides in u/s section are the major water polluting sources of the area.

6.1.10 Sound Quality

Vehicular movement is the main source of noise pollution in the area as their number is significantly larger as more than 2000 vehicles move on this road section on the daily basis. Besides this natural events such as stream flow, breezes and thunderstorms are the natural sources of noise in the area.

6.1.11 Public Infrastructures

1 public tap and 1 temple i.e., Jaldevi Durga Mata Temple are the major public structures likely to be affected during the construction of the bridge

6.1.12 Historical, Cultural and Religious Sites

Jal Devi Durga Mata Temple is the religious site located within the immediate vicinity of the proposed bridge construction area and will be affected. Jal Devi Durga Mata Temple was

constructed about fifteen years back under the initiation of local people to reduce road accident at the sharp turning near the current temple location. Since, the temple is of recent origin, it does not have any kind of archaeological and historical importance.

6.2 Biological Environment

6.2.1 Floral Diversity

The forest around the proposed bridge lies in the tropical bio-climatic zone. A rich bio-diversity is observed in the proposed area consisting of significant composition of flora and fauna. The dense forest around the project area provides excellent habitats of wildlife.

- **Vegetation around the project area**

The vegetation around the project area comprises of Sal (*Shorea robusta*). The other major species include Sisso (*Dalbergia sisso*), Simal (*Bombax ceiba*), Aanp (*Magnifera indica*), Kadam (*Anthocephalus chinensis*), Pipal (*Ficus religiosa*), Khayer (*Acacia catechu*), Bijaysal (*Pterocarpus marsupium*), Siris (*Albigia spp.*), etc.

- **Vegetation likely to be affected by the Project**

About 14 trees of different species have to be removed during the construction of the proposed bridge. These include 2 Peepal (*Ficus religiosa*), 2 Bar, 4 Mango tree, and 4 sisso, and 2 Khayer tree and 13 number of Banana plants. Similarly, the construction of the proposed project requires the removal of 7 saplings of Khayer and 8 saplings of Sisso.

The total wood volume of Peepal, Bar, Mango, Sisso and Khayer are 36.92 ft³, 38.85 ft³, 69.69 ft³, 24.78 ft³, and 16.68 ft³ respectively. The market value of Peepal, Bar, Mango tree is not available. However, as per Annex 2 of Forest rule (2051), per ft³ market rate of Sisso and Khayer includes Nrs 400 and 600 respectively.

6.2.2 Wildlife and Avifauna

The proposed bridge area is not a natural habitat of wild animals but some of the wildlife has been reported around the project area which includes Neuri Musa (*Herpestes edwardsi*), Rato Bandar (*Macaca mulata*), Langur (*Semnopithecus entellus*) and Syal (*Canis aureus*). Similarly, Jureli (*Pycnontus jocosus*), Kaag (*Corvus splendens*), Bhangera (*Passer domesticus*), Parewa (*Columba livia*), Dhukur (*Streptopelia spp.*), Dhobi (*Copsychus spp.*), Chibe (*Dicrurus leucophaeus*) etc. are the avifauna recorded in the project area.

6.2.3 Fishes

The Jalbire Khola serves a potential habitat for many aquatic lives. The major fish species found in the Jalbire khola are Buduna (*Garra annandalei*), Katile (*Acrossocheilus hexagonolepis*), Bam (*Anguilla bengalensis*), Hile Bam (*Monopterusuchia*) etc.

6.3 Socio-economic and Cultural Environment

6.3.1 Project Influence VDC

6.3.1.1 Demographic Characteristics

The proposed bridge site is located at the Chandibhanjyang VDC of Chitwan District. Chandibhanjyang VDC has altogether 847 households with 4,978 populations. Among the total population, 2460 are male and 2518 are female. The sex ratio of the Chandibhanjyang VDC is 97.7 with average household size 5.88.

6.3.1.2 Ethnic Composition

Gurung is the dominant ethnic group of the Chandibhanjyang VDC. Gurung shares about 48% of the total population in Chandibhanjyang VDC. Likewise, Chepang/ Praja stand second comprising 32% of the total population and Gharti/ Bhujei share about 13% of the total population standing third dominant ethnic group.

The ethnic composition of the people of the Chandibhanjyang VDC is presented in the figure below:

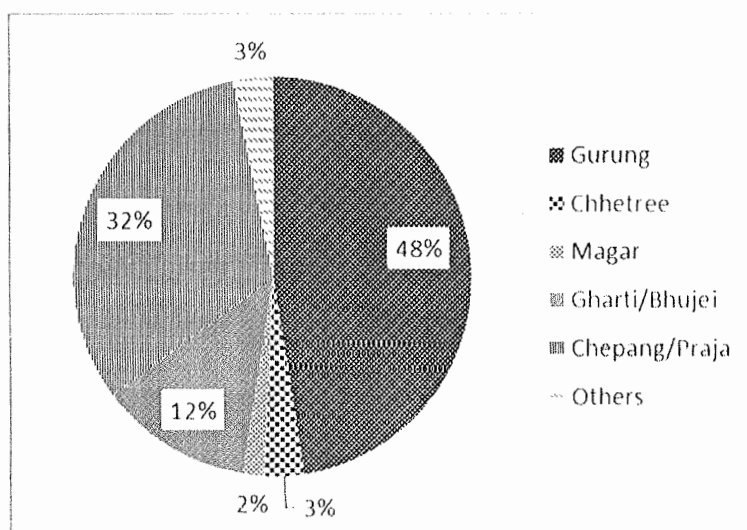


Figure 6-8: Ethnicity of the Chandibhanjyang VDC.

6.3.1.3 Literacy and education

The literacy rate of the people of the Chandibhanjyang VDC is 59% where the literacy rate of male (62.54%) is greater than that of female (54.6%). The detail of the education status of the Chandibhanjyang VDC is presented in the table below:



Table 6-3: Education status of the Chandibhanjyang VDC.

	Population aged 5 years & above	Population Who are			Literacy not stated	Literacy rate
		Can read & write	Can read only	can't read & write		
Both Sex	4,353	2,548	311	1,492	2	59
Male	2,157	1,349	160	646	2	62.54
Female	2,196	1,199	151	846	0	54.6

Source: CBS, 2011

6.3.1.4 Energy Use

• **Lightning**

Kerosene is mostly used by the people of the Chandibhanjyang VDC for lightning purpose (41.68%). Likewise, Solar (26.09%) comes second and the Grid electricity (18.89%) stands third for the lightning purpose.

• **Cooking**

Firewood is the major source for cooking purpose in Chandibhanjyang VDC. About 97% of people use firewood for cooking purposes. This signifies the dependence of people of Chandibhanjyang VDC towards the forest. The use of LPG for cooking is found to be only 1.89% and the other sources contribute only minimum proportion.

6.3.1.5 Sanitary facilities

The use of toilet in Chandibhanjyang VDC is found to be good as 89% of the household have toilet in their homes and open defecation is less. The use of flush toilets is found to be 44% and ordinary toilet is 56%. This signifies the people of Chandibhanjyang VDC are more aware about the sanitation.

6.3.1.6 Drinking water

Tap and piped water is the main source of drinking water in Chandibhanjyang VDC. About 91% of the households have drinking water pipe in their houses. Uncovered well serves about 4% of households for drinking water and about 3% of households depends on river.

6.3.2 Direct Impact Zone

6.3.2.1 Demographic Features and Ethnic Composition

The proposed bridge site lies at Jalbire, ward no. 9 in Chandi Bhanjyang VDC of Chitwan district. There are altogether 16 households in Jalbire with the total population of 64. Among them, 13 of the households belong to Gurungs, 1 belong to Brahmins and 2 households are of Tamang. The average household size is found to be 4. About 95% of the people are Gurung in the area. Likewise, small proportion of the people belongs to Brahmins and Tamang.



6.3.2.3 Religion and Culture

Being dominated by the Gurungs, Buddhism is followed by the majority of the people (95%) of Jalbire. The major festival celebrated by them is Loshar. Besides Loshar, Buddha Jayanti, Dashain, Tihar, Maghe Sangranti are also celebrated by them.

6.3.2.4 Literacy and Education

The project location lies in Chandi Bhanjyang VDC of Chitwan district and the VDC has been declared as the fully literate VDC. Hence, almost all the people residing in the Jalbire are literate. There is also good facility of the educational institutions. Primary level, Lower secondary level and Secondary level schools are available in the VDC. The primary school is about 2 km far and Lower Secondary School is about 3 km far from the proposed bridge location. For obtaining the higher level education, students travel to Muglin and Kurintar.

6.3.2.4 Occupation

Majority of the people of the Jalbire are engaged in business followed by agriculture. Tea shops, grocery shops and hotels are the major business of the people. About 35% of the people in Jalbire are engaged in business. Likewise, the proportion of the people engaged in agriculture is 24%, foreign employment is 21%, service is 5%, wage labor is 8% and rests are students and elders.

6.3.2.4 Migration Pattern

The survey indicates that people have been living in Jalbire since years i.e. more than one generation. During the survey, it was found that only one family has been migrated in that area. Rest of all the households had been living there since many generations. Likewise, the trend of migrating out from that area is also not significant. But some people have moved out to foreign countries like Malaysia and Quatar for the foreign employment.

6.3.2.5 Health and Sanitation

Jalbire is located at the ward no. 9 of the Chandi Bhanjyang VDC. There is absence of health post and sub-health post in Jalbire. But the Chandi Bhanjyang VDC has one health post which is far for the people of Jalbire to reach there as they have to walk for about 3 hours. Instead, they prefer visiting the health clinics and hospitals of Muglin and Narayanghat.

The Chandi Bhanjyang VDC has been declared as ODF zone in 2068. Hence, there is availability of toilets in all households of the Jalbire. Ordinary type of toilets is generally available in each household.

6.3.2.6 Drinking water Supply

All of the households in Jalbire have the provision of tap water supply. There is no problem of drinking water in Jalbire as the water is available through the pipeline throughout the day. Since, there is adequate water supply; people do not have to depend on other water sources.

6.3.2.7 Energy Use

It was found that all the people in Jalbire depend primarily on fuel wood and LPG for cooking purpose. However, the people involved in hotel business uses fire wood for cooking Likewise,



electricity is the only source of lightning in the houses of the people. There is no use of solar and other energy source in Jalbire

6.3.2.8 Business and Industries

Road side business such as tea shops, small hotels and retail shop can be found in Jalbire. As the Jalbire is the initial point to travel to Lamo Jharana which is the one of the local touristic site, hotel business has been flourished in Jalbire. Likewise, there is one Poultry Grid industry in Jalbire which produces raw materials for poultry feed. That industry produces about 1500- 2000 kg of raw materials daily and has been employing 10-12 local people.

6.3.2.9 Religious, Cultural, Historical and Archaeological sites

Jal Devi Mata temple is one of the religious sites of the Jalbire. Local people have the deep belief upon that temple. Local people said that there used to be many accidents on that road. But after the establishment of the Jal Devi Mata temple, the accidents have drop down significantly. Likewise, Icchyakamana temple is also located in the Chandi Bhanjyang VDC which is believed to be fulfilling all the wishes.

6.3.2.10 Non-governmental Organization and Activities

There is absence of any NGOs in Jalbire. But Paryatan Bikash Kosh which is one of the governmental organizations has been working in Jalbire to enhance the tourism site of the Chandibhanjyang. This organization has been working to promote the Lamo Jharana as the touristic destination locally and regionally.

6.3.2.11 Tourism

As the tourism destination, Lamo Jharana is the one in Chandibhanjyang VDC which can be approached through Jalbire. People can enjoy the scenic beauty of the nature and water fall. Likewise, people can relish playing in the water fall.

6.3.2.12 Perception about the project

Most of the people in the area were found to be acquainted about the project. They said that they were acquainted about the project during the survey for design of the proposed project. People in the area were highly positive towards the project. They believed that construction of the bridge will help to reduce the traffic accident. They said that if the construction of bridge will affect the Jaldevi Durga Mata temple, it should be reconstructed nearby the existing temple area. They suggested that area around existing road which will be unutilized after the construction of the bridge will be appropriate place for relocation of the temple.



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

Construction Stage

- **Employment Generation**

Several skilled, semi-skilled and unskilled workers are required for the construction of the new bridge over the Jalbire River. Hence, the project shall generate the employment to 6600 man-days of unskilled workforce, and 1900 man-days of skilled and semi-skilled workforce. The project will prioritize the local people in proposed bridge construction works. Thus, the people of around the project area will be benefitted by the employment opportunity resulting in income generation. *This impact will be moderate in magnitude, local in scale and short term in nature.*

- **Enhancement of technical skills**

The project will provide the skills and technical know-how especially on masonry and associated works during construction of the project. The workforce will have opportunity to gain skills in construction techniques, small engineering structures and bioengineering works and river training works. The knowledge and skills gained by the unskilled workers could apply on other projects of similar nature. *This impact will be of medium magnitude, local in scale and long term in duration.*

- **Increase in Awareness**

The project will organize environmental awareness program to aware the local people regarding . The awareness program will mainly highlight the following issues:

- ✓ Discuss the demerits of solid waste and sewage disposal around the bridge abutments and how they cause corrosion over metal and cement surface.
- ✓ Solid waste management technique at household level
- ✓ Discuss the demerits of extracting construction materials within the 500m u/s and d/s of bridge.
- ✓ Training related to the conservation of forest and biodiversity.
- ✓ Other relevant environmental issues related to sub-project.

The envisaged impact will be of medium in magnitude, local in extent and long term in duration.

Operation Stage

- **Improved Mobility**

The existing Jalbire Bridge is at the sharp turn. The sharp turn enhances the traffic congestion around the bridge location as two vehicles from opposite direction cannot pass at a time on the bridge location and the vehicles have to wait for their turn. Likewise, there is higher accidental risk at that location. The operation of the new bridge at the proposed site will reduce the chances of traffic congestion and accidental risks as the proposed bridge will reduce the existing problem of sharp turn. *The impact will be high in magnitude, regional in scale and long term in duration.*

7.2 Adverse Impacts

7.2.1 Physical and Cultural Environment

Construction Stage

- **Change in morphology, longitudinal profile/ river bed and hydrological character of regime of river and inundation in upstream section**

The construction of the bridge will be during the dry season when the river flow is minimal. Thus the impact such as change in morphology and hydrological character will not be significant. Likewise, the gradient of the river is very high. However, 3 piers will be constructed which will have impact on longitudinal profile and river morphology of the Jalbire Khola. *The envisaged impact is low in magnitude, site specific in extent and short term in duration.*

- **Change in land use**

Construction of proposed project requires 0.389 ha land out of which 0.23 ha is required temporarily and remaining 0.117 ha land permanently. All the land requirement belongs to the public land category. Since the project being small in nature the construction of bridge does not require large land area. *The impact due to change in land use is of low magnitude, site-specific and long term.*

- **Landslides, slope destabilization and soil erosion**

Slope stability and landslides can be upset by the creation of cuts or embankments. The construction of the proposed bridge does not require cutting slopes. But the disturbance during construction such as vibration, quarry site operation etc. can destabilize the balance and cause landslides and soil erosion adjacent areas of proposed bridge have steep slopes. *The impact is of moderate magnitude, site specific in nature and medium term in duration.*

- **Management and operation of quarries and river bed extraction**

Locally available construction materials such as sand, stone and gravel can be acquired from the flood plain of Trishuli River near Gaighat (approximately 12 km from the proposed bridge location). The site can be accessed with small sized trucks and tractors during dry period. There are also other possible options to acquire construction materials from the flood plain of Trishuli River. The required quantity of such materials is relatively low as the proposed project is comparatively of small nature. The proposed site can be approached through vehicles. Use of

excavator will be done while extracting river bed materials. By removing sediment from the active channel bed, in-stream mines interrupt the continuity of sediment transport through the river system, disrupting the sediment mass balance in the river downstream and inducing channel adjustments (usually incision) extending considerable distances beyond the extraction site itself. Use of excavator during river bed extraction will cause air pollution, water pollution due to leakage of fuels and lubricants and compression of river bed materials, which alters the flood plain characteristics. *This impact will be of medium magnitude, site-specific in nature and medium term in duration.*

- **Spoil and construction waste disposal**

Around 3680 m³ of spoil is likely to be generated during construction of foundation. About 1250 m³ can be utilized as filling materials and remaining 2430 m³ should be managed. The random and improper disposal spoil can be detrimental as the runoff during rainy season would wash the materials causing water pollution in the nearby water bodies and even resulting in several water borne diseases. *Hence, the impact will be medium, local and medium term in nature.*

- **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 different injuries and health impact to the workers. The workers camp if not provided sufficient hygiene, workers may suffer different types of diseases. *The envisaged impact is moderate, site specific and short term in duration.*

- **Water flow diversion**

The construction of the bridge does not require the diversion of the river and the construction of the bridge will be carried out during the dry season when the water flow of the river will be minimal. Hence, it will not have the significant impact.

- **Environmental issues associated with Labour camp**

The construction camps near the proposed bridge location will generate the domestic wastes such as organic 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. Construction camp can be established in Jalbire, which is located 100 m u/s nearby the road heading towards Chandibhanjyang VDC office/Icchakamana from Jalbire. The proposed land is under government ownership. Labor camp is not likely to affect any of the agricultural land. *The envisaged impact is of medium magnitude, site-specific and short-term in nature.*

- **Degradation of Water Quality**

The chemicals and oils used in machineries if get contaminated with the river water, it could result the water pollution. Similarly, runoff during monsoon season would erode and transport the earthen materials from the fresh cut surfaces for approach road and foundation to the river. This would increase the turbidity and contribute the water pollution of Jalbire Khola. Similarly, wastes released from construction camps if remains unmanaged, it will have its ultimate fate to

the water bodies resulting in pollution. *This impact is envisaged to be medium in magnitude, local in extent and short term in duration.*

- **Bridge Safety**

The bridge will be constructed nearby the existing road in which large numbers of vehicles ply each day. During construction period potential disruption of vehicles and obstruction to access is likely, increasing the risk of accidents and even collapse of partly constructed bridge structures. Vehicular movements, improper drainage management will pose concerns of bridge safety during construction. *The envisaged impact will be medium in magnitude, site specific in nature and short term in duration*

- **Impacts associated with the transportation of construction materials**

The proposed project is of small sized and do not require significantly large amount of construction materials as in road, hydropower, etc. Construction materials like sand, gravel and stone will be sourced locally, while rod, cement, etc. should be transported from Narayanghat or Brigunj. The major issues associated with the transportation of construction materials are the traffic congestion and air pollution. *This impact will be of low significance, local and short-term in nature.*

- **Use of bitumen**

Bitumen heating is hazardous as different toxic chemicals like SO_x, NO_x, Polycyclic Aromatic Hydrocarbons (PAHs), Volatile Organic Compounds (VOCs), etc. These substances when inhaled could cause severe respiratory and skin related hazards. Moreover, long term exposure to such pollutants can result the cancer related to respiratory system. For this particular project the use of bitumen is very less and the heating place will be away from the settlement and even the bitumen will be heated whenever necessary. *Thus, this impact is medium in magnitude, local in extent and short term in duration.*

- **Approach road and related issue**

The construction of bridge requires 20 m long approach road (15 m on left bank, and 5 m on right bank) to connect the existing the Narayanghat-Mugling Road, the construction of approach doesnot require excavation works, however, the Jaldevi Durga Mata Temple, 1 public tap and few trees such as Bar, Peepal and Sisso is likely to be affected. The impacts and mitigation measures will be separately dealt in different impacts such as loss of vegetation, loss of public properties and others

- **Road diversion and related issue**

During construction period existing bridge will serve as diversion and no diversion required. The envisaged impact is insignificant to the proposed project.

- **Contamination of soil (Due to leakage of waste fuels, grease and lubricants, Paints)**

The transportation of the hazardous materials during the construction of bridge is likely to be released into the ground which can contaminate affected land surface. Spent fuels, grease and lubricants if not managed properly can also causes land degradation. This can lead to impair the

growth of vegetation and affect the productivity of the nearby agricultural land. However, intensity of vehicular use will be relatively low as the sized of the proposed sub-project is comparatively small, *The envisaged impact will be direct, low in magnitude, site specific and short term in duration.*

- **Impact on Public Properties**

The construction of bridge will affect the Jaldevi Durga Mata Temple and 1 public tap located nearby it. The temple is one of the most believed temple along the Narayanghat- Mugling Road. *The envisaged impact is high in magnitude, local in extent and long term in duration.*

- **Fire hazard (Use of combustible materials)**

Various combustible like petroleum products including petrol, diesel, kerosene, LPG, will be used for various purposes during project construction. Mishandling of these materials and accidental release can result fire and related hazards. Improper management of combustibles will result in disasters. However, the project is nearby the forest area and litters deposition can be found around the area. *The impact is considered moderate in magnitude, Local in extent and short term in duration and is a significant impact.*

- **River Flooding and Bank Erosion**

Jalbire Khola near the proposed bridge construction axis is narrow, relatively deep and steep, river flooding is not the major concern. However, during high discharge, river bank erosion will posed threat to the bridge construction activities. *The envisaged impact is low in magnitude, site specific in extent and short term in duration.*

- **Environmental Issues Associated with Material Stockpiling**

The construction materials will be stockpiled at the barren land located near the existing bridge which will be used as the diversion. 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 medium term in duration.*

- **Air and noise pollution**

Air pollution due to vehicle emission and dust raised by plying of construction vehicles and operation of machineries, crushing plant etc. may cause nuisance. Likewise, the use of heavy machinery equipment and vehicles creates loud noise. *This impact will be of moderate magnitude, site-specific in scale and short term in duration.*

Operation and management stage

- **Air and Noise 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. *This is the residual impact resulting from the implementation of the project.*

- **Encroachment of DIZ area of Bridge**

Encroachment of RoW of NM road is the familiar phenomenon. The construction of the bridge and its operation is likely to attract the people to establish road side business creating encroachment of the RoW of the existing bridge and approach road. *The envisaged impact is low in magnitude, site specific in extent and long term in duration.*

- **Scouring Effects**

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

- **Congestion around the adjoining area of Bridge abutment**

Except a temple there are no private and public infrastructures around the proposed bridge abutment. The construction of bridge and its operation will not affect due to congestion around the adjoining areas of bridge abutment. The envisaged impact is not relevant to the proposed project.

- **Backwater effect during floods**

The bridge will be constructed with three piers among them one is likely to be near the main stream course, which can hinder the general flow pattern of the Jalbire Khola. However, river bed characteristic (confined with limited flood plain, and deep and steep channel) the back water effect during flow will be very nominal.

- **Riverbank erosion and River Channel Shifting**

The construction of the proposed bridge will include the river training works and the stream flood plain area is constricted with steep gradient the possibility of river channel shifting is very negligible for the stream around the proposed bridge

- **Water pollution due to washing of vehicles nearby the river due to availability of existing diversion through river bed**

The diversion through the river bed is not required as the existing bridge will be used as the diversion road. And there is no possible way that reaches to the Jalbire Khola. Thus, water pollution due to washing of vehicles in the river is insignificant in this project.

- **Stockpiling of materials during bridge maintenance**

The materials used for periodic maintenance during operation phase will be very low and the environmental impact from such activities will be of *low magnitude, site-specific and short term.*

7.2.2 Biological Environment

Construction Stage

- **Loss of Vegetation**

About 14 trees of different species have to be removed during the construction of the proposed bridge. These include 2 Peepal (*Ficus religiosa*), 2 Bar, 4 Mango tree, and 4 sisso, and 2 Khayer tree and 13 number of Banana plants nearby the Temple will be lost. Similarly, the construction of the proposed project requires the removal of 7 saplings of Khayer and 8 saplings of Sisso. *The impact is medium in magnitude, site-specific in nature and long term in nature.*

- **Impact on Aquatic life**

Resuspension of sediment in the water column is likely to occur as a result of dredging action at the sediment-water interface, transfer of the sediment to a transporting vessel, leakage from the vessel, and disposal of the sediment. Resuspension of the sediments causes increased turbidity which may adversely affect aquatic life by clogging gills, decreasing visibility, and preventing oxygen diffusion. However, since the increased turbidity is expected to be short term and only cover a limited area, the impact will be less significant. Similarly, Jalbire Khola is not significant habitat of aquatic life because of its harsh (steep, deep and high speed flow) characteristics, *the envisaged impact will be low in magnitude, site specific in extent and short term in duration.*

- **Impact on Wildlife**

Since the proposed site for the construction of Jalbire Khola Bridge is not a wildlife movement corridor, there is no direct impact of the proposed project on wildlife. On the other hand, involvement of construction crews in illegal hunting of wild life species will pose risk to wild life. *This impact is envisaged to be low magnitude, local and short term in duration.*

Operation and Maintenance Stage

No negative impact is envisaged on the biological environment of the area during the operation of the proposed bridge.

7.2.3 Socio-economic and Cultural Environment

Construction Stage

- **Social Conflicts**

The locals will be given the priority to work as a workforce for construction of the proposed bridge. However, other specified and skilled workers are also required for the bridge construction that is sourced from the different places. Hence, the social conflicts would not be significant in this project. *This impact is envisaged to be indirect in nature, medium in magnitude, site specific in extent and medium term in duration.*

- **Loss of productive land**

Productive land will not be lost by the construction of the proposed project and thus this issue is insignificant for this project.

- **Land and property acquisition, compensation, resettlement and rehabilitation**

The construction of the Jalbire Bridge does not need to acquire the private land and properties of the local people. Hence, this impact is insignificant.

- **Impacts on vulnerable indigenous people and Dalits**

The construction of the Jalbire Bridge does not need to acquire the private land and properties hence none of the indigenous and marginalized people will be affected by the bridge construction activities.

- **Issue of Child labor**

It is likely that children will be exploited by the contractors in the construction and related works. *The envisaged impact will of low magnitude, short term in duration and local in extent.*

- **Gender Discrimination**

As with various rural areas in Nepal, gender discrimination is prevalent. Discrepancy in wage distribution among male and female workers is also prevalent. Similarly, different forms of harassment to female workers by male counterparts can happen during jobs. *The envisaged impact will be of medium magnitude, short-term in duration and local in extent.*

Operation Phase

- **Accidental Risk**

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

7.3 Issues Raised by Local People

Following are the issues raised by local people:

- Construction of bridge should be done as soon as possible.
- Jal Devi Mata Temple should be relocated as soon as possible.
- Project should construct structures to prevent any further slope instabilities.
- Local people should be sourced from construction activities.
- Project should give special attention for pollution reduction.



CHAPTER 8: Alternative Analysis

The objectives of carrying alternative analysis for the proposed Jalbire 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 Jalbire Bridge, three different alternatives were analyzed. These three alternatives include, alternative 1: upgrading the existing bridge, alternative 2: construction of new bridge without affecting the Jal Devi Temple and alternative 3: construction of new bridge along the Jaldevi Temple without any turnings on the road. The third alternatives have been selected in this project as the new alternative have a very sharp turning which would enhance the accidental risks. Similarly, second alternative also have its draw back as the elevation at both end were not same and soil filling was not possible. Thus, the third alternative can overcome all the drawback and even no turnings will exist.

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 overall N-M Road is being upgraded. At this condition there is a very urgent need for the construction of double lane bridge to facilitate the movement of vehicles. No project option will deprive the people for having safe and reliable transportation facility. The proposed bridge is along the N-M road which holds majority of the trade traffic of the country. So considering this scenario, no project option is refused and project implementation option is admitted.



CHAPTER 9: Impacts 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 can be implemented nearby the project area. To be efficient, these measures must be defined in cooperation with all stakeholders.

9.1 Beneficial Impact Augmentation Measures

9.1.1 Construction Stage

- **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 given 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**

Capacity building trainings will be provided to both skilled and unskilled workforce. Regular training and guidance to the employee will be provided during the project construction period. As local people are also used in construction activities they will be directly benefited to gain skills in construction technologies.

- **Increase in Awareness**

A three day awareness raising program will be conducted by the project. The participant will be mainly from the local people belonging to the people of DIZ area. For this a notice seeking participant will be pasted 2 weeks before the program in different places within DIZ of the proposed project.

9.1.2 Operation Stage

- **Improve mobility and reduce traffic congestion**

Augmentation Measures: During the operation of the bridge, regular and routine, emergency and if required major maintenance will be conducted.

9.2 Adverse Impact Mitigation Measures

Physical Environment

Construction Phase

- **Change in morphology, longitudinal profile/river bed and hydrological character of regime of river and inundation in the upstream section**
 - During the construction of the proposed project, unnecessary scouring of the river bed will be avoided.
 - Furthermore, the spoil generated during the excavation for the abutments will be disposed on a designated spoil disposal site and contamination with the river water will not be made.
 - Since, the gradient of the Jalbire Khola is very high, the inundation of the upstream region is not possible. But river training work will be carried parallel to the bridge construction. The provision of river training work has been included in the project design.
- **Change in Land Use**
 - Only required land will be acquired for construction purpose.
 - Agricultural land, will be avoided for temporary use.
 - Permanently acquired private land will be compensated.
- **Mitigation measures for landslides, Slope instabilities and soil erosion**

The mitigation measures proposed for the prevention of landslides, instabilities and soil erosion are as follows:

- Minimize cut slope activities in design as much as possible.
- Selection of cut and fill slope will be done at correct angle depending the soil type.
- The retaining structures along with bio-engineering will be applied
- 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

- **Management and Operation of Quarries and River Bed Extraction**

Following measures will be adopted to mitigate the environmental and social damage associated with quarry site operation

- Consent from local authorities (VDC offices and DDC office) will be taken prior to the use of quarry and burrow pit site.

- The river bed materials will be extracted by taking necessary permission from the local bodies.
- In case of river bank quarry, only the materials deposited during the previous year will be collected without disturbing the sedimentation cycle of the river. Permitted mining volume will only be acquired.
- Extraction of riverbed materials from active channel will not be done. Removal of riparian vegetation will be avoided.
- The excavator will be used only when required. Washing and cleaning of excavator in river water will be avoided. Excavator operator will be well informed about the safe operating procedures to be adopted while extracting river bed materials.
- The maximum depth of floodplain extraction will be above the channel thalweg. Side slopes of floodplain excavation will range from 3:1 to 10:1. Extracted materials will be transported through available access road.
- River bed materials will only be extracted by paying necessary royalty to the local body. Unstable sites, erosion prone areas, dense forest, settlements, fertile farm land will be avoided for quarry operation.
- Quarry sites, burrow pit area and river bed extraction site will be rehabilitated.

- **Management of Spoil**

Wherever possible, surplus spoil will be used backfilling materials depressed areas, etc. Remaining spoil will be disposed in the recommended spoil disposal site in a controlled manner. For this particular project appropriate place for spoil will be disposed of in bank of Jalbire Khola in both banks. Following measures are recommended for managing the surplus spoil.

- 5 meter high gabion structures will be built (as river training) along the bank of river prior to the spoil disposal so that the spoil would not get contaminate with the river water.
- After the spoil is filled up to five meter, additional two meter spoil can be adjusted at each site by making a sloppy surface (Toe wall) of 60° on the river side.
- As soon as the spoil disposal gets completed the site will be planted with trees. Altogether 40 saplings of different species will be planted around the spoil disposal site.

- **Occupational Health and Safety Measures**

- Construction workers will be prior informed about job hazards, emergency procedures and any other relevant safety measures.
- Safety equipment such as helmets, boots, gloves, safety belts, safety glasses and masks will be provided to the workers working in the construction sites.
- Contractor will arrange the First Aid Kit Box and standby medicine for workforce during working period and emergency situations. Warning signs, posts, barriers and guards will be installed to restrict access of unauthorized persons to construction sites.
- Only authorized person will be allowed to operate heavy machinery and equipment. Temporary drinking water supply and latrine pit will be established at site.
- Labor camp will be provided with good quality of beds, well ventilated rooms, good water quality for drinking purpose.
- Dust control will be done by spraying water on access road and other construction areas.

- **Mitigation Measures for Environmental Issues associated with Labor Camp**

- Bio-degradable waste will be disposed in a separate pit away from the water bodies. The pit will be reinstated along with the labor camp after the work ceases.
- Liquid and semi-liquid waste will be disposed in a separate ditch and disinfectant (Chlorination) will be continuously spread to avoid contamination.
- Upon the completion of the project, ditch containing waste will be covered with sufficient earth materials and left over for natural anaerobic decomposition.
- Haphazard littering of solid waste by construction crews will be restricted, for this a strict code of conduct will be implemented.
- Separate toilet facility will be constructed near the construction camp with the facility of septic tank.
- Provision of clean drinking water will be made at the construction camp.

- **Degradation of Water Quality**

Following mitigation measures will be adopted to minimize the impact on the Jalbire River water:

- Disposal of soil, sludge and other waste directly into water bodies will be avoided.
- Prohibition of activities like washing – cloth, dish, etc. by construction workforce near water bodies that contribute to water pollution will be prohibited.
- 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.

- **Bridge Safety**

- Fencing and lighting of construction and staging areas will be done, recognized safety practices for the utilization of heavy equipment, and the movement of construction materials will be implemented to avoid accidents.
- Lane blockages, and vehicles entrance locations will be well signed.
- Water flow in the stream will not be blocked through properly designed temporary draining structures.

- **Impact Associated with the Transportation of Construction Materials**

- The construction materials will be transported by covering it with tarpaulin.
- Vehicles carrying construction materials will not be parked nearby the sensitive public places and market areas.

- **Use of Bitumen**

- Bitumen heating will be done at least 100 m away from the nearby settlements and public places.
- Bitumen storage will not be done on nearby fertile land and water sources.

- The excess bitumen will not be discharged into the drain structure while overlaying on the sub-base material.
- Use of bitumen will be on time other than the rainy condition.
- Workers will be provided with necessary protective equipment such as face mask, gloves etc.
- Bitumen heating place will be reinstated after the works completed.
- **Contamination of soil (Due to leakage of waste fuels, grease and lubricants, Paints)**
 - Storage of chemicals including hazardous materials will be done on safe place and the storage facility will be sealed.
 - The facility will be well protected from strangers and scavengers.
 - Paints will be applied only where required. Accidental leakage of paints and chemicals will be strictly regulated.
 - Contaminated containers, packaging materials and worn plastic will be disposed of in separate spoil disposal areas.
 - Containers will be recycled/reused or managed properly.
 - Accidental leakage of fuels, grease, lubricants and other hazardous materials will be recovered soon and managed safely in designated area.
- **Mitigation Measures for Impact on Public Properties**
 - Prior consent will be taken from the users community before the temple and public water tap is affected.
 - As per the suggestion provided by the locals, the temple and water tap will be rehabilitated on nearby the existing crossing which is proposed to be utilized for materials stockpiling for the proposed project.
- **Fire Hazards**
 - Combustibles will be placed in safe place in sealed containers.
 - Unauthorized entry to the site will be prohibited. Deposition of rags, litters, papers, plastics will be avoided and they will be managed safely.
 - Gaseous fire suppression will be used i.e., use of Clean Agent Fire Suppression (CAFS) will be done in different areas such as camp site, materials stockpiling sites, equipment and vehicles parking yards. A total of 5 CAFS will be used during construction.
 - The construction workers will be well informed about the fire safety precaution to be taken during the start of the construction works.
- **Mitigation of environmental issues associated with material stockpiling**

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

- ✓ The land allocated for the storing of construction materials will be far from agricultural land and water bodies.
- ✓ The permission from local stakeholders will be taken before commencing the stockpiling of the construction materials.
- ✓ Construction materials will 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.

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

- Construction equipment and vehicles will be regularly examined and maintained in proper condition.
- Water will be sprinkled along access road at least two times a day to reduce the dust emission.
- Proper protection works like fencing by GCI sheets or walls will be done at excavation and disposal site.
- Construction materials will be properly covered during conveyance. Enforcing vehicle speed limit using signals and speed breakers.
- Workers will be encouraged to use masks. Concrete mixer, vibrator, etc. will be maintained in proper condition.
- Sound producing equipment will be preferred to use only in daytime. Earplug will be provided to the worker involved in equipment operations.

- **Mitigation Measures for River Flooding and Bank Erosion**

- River bank cutting will be minimized
- Loss of river bank trees and vegetation will be minimized
- The flow of the river will be ensured through the designation of temporary draining structures

- **Impact on Cultural Religious and Historical Site**

- Jaldevi Durgamata Temple will be rehabilitated in the location nearby the existing temple. All the necessary activities will be conducted by the project.

Operation Phase

- **Air and noise Pollution**

This is the residual impact so mitigation measures has not been proposed. However, speed limit will be placed on both banks of the bridge which will help in attenuating noise resulting due to high speed vehicles.

- **Encroachment of DIZ area of Bridge**

- The project will coordinate with the local authority i.e., VDC, DDC to regulate the activities of roadside encroachment.
- Awareness raising program will also be conducted to the people of DIZ area so that they can regulate these activities or inform the regulatory bodies.

- **Stockpiling of Materials during Maintenance**

- The storage facility will be at least 50 m away from the agricultural land and water sources.
- Construction materials will be covered with tarpaulin to prevent from scattering from wind and water and other agents.
- The stockpiling site will be used only after the prior consent from the respective owner or authority.
- Adequate fencing should be provided to protect the stockpiled materials from scavengers and livestock.

Biological Environment

Construction Phase

- **Mitigation measures for clearing of forest**

The mitigation measures proposed for the clearing of forest are discussed below:

- Compensatory plantation will be done at the ratio 1:25 for the number of trees that need to be cut for the bridge construction. For this project, for the loss of 14 tree species, 350 saplings of lost tree species and assuming 30% mortality further 105 saplings of lost tree species will be planted. In this way total of 350 number of saplings will be as a part of compensatory plantation. The location of the plantation will be fixed by the DFO.
- The compensatory plantation will mainly focus on the plantation of Sisso and Khayer that are locally available around the forest of project area.
- Construction camp will be supplied with LPG and the use of fuel wood will be discouraged.
- Contractor will arrange/buy energy resource for bitumen heating from the authorized source.

- **Mitigation Measures for Impact on Aquatic Lives**

- The river channel will be disturbed only in required extent.
- Spoil will be safely managed soon after their generated.
- Haphazard disposal of garbage into the stream channel will be regulated.
- Chemicals used in construction activities will be handled carefully and stored in fallow land away from the riverbeds.
- Illegal fishing activities by the construction crews will be regulated.

- **Mitigation Measures to Reduce Impact on Wildlife**

- Illegal hunting, harassment to wildlife will be strictly controlled.
- Construction activities will be confined to day time.
- Construction fuel requirements will be supplemented through alternative sources other than fuel wood.
- A code of conduct will be enforced to construction workers through contractor that prohibit illegal, collection, sale, distribution of wildlife and plant product.

Socio-economic and Cultural Environment

Construction Phase

- **Mitigation for Social conflicts**

- Code of conduct for all the construction crew will be enforced 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.

- **Mitigation measures for obstruction of social services and facilities**

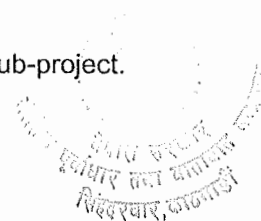
- The contractor will manage some utilities like communication, lighting and cooking energy, drinking water supply, etc. within the camp so as to avoid the pressure on local services.
- Local people will be consulted to build consensus on sharing the community infrastructures such that it will not significantly affect the local people.
- The contractor will be responsible for reconstruction and rehabilitation of damages due to their activities; any damage to existing road in project location will be controlled and rehabilitated.
- The drinking water tap and temple will be rehabilitated to the nearest safest location

- **Mitigation measures for Issue of Child Labour**

- Child labour use of any form during maintenance works will be strictly regulated.
- If it is found it should be treated with criminal guilt and project will lodge complaints to the local authority if it is found.
- The contractor will abide by Contractors Mitigation Plan prepared for the sub-project.

- **Gender Discrimination**

- Project will establish agreement with contractors to consider male and female equally for wage distribution for works of similar nature.
- Male workers will be instructed to respect their female counterparts.
- The contractor will abide by the Contractor Mitigation Plan prepared for the sub-project.



Route Selection Criteria for 132 kV Transmission Line Alignment.

For the selection of proposed 132 kV transmission line route, a basic set of criteria was defined at the outset of the study. The criteria are listed below:

- The shortest possible route, consistent with the terrain that is encountered.
- All alignment should be easily accessible both in dry and rainy seasons to enable maintenance throughout the year.
- The line route should avoid large habitants, densely populated areas and forest.
- The route should have minimum crossing of Major River, National highways, Overhead EHV power line and communication lines.
- The number of angle points shall be kept to minimum.
- Flooding areas, Marshy and low lying areas, River beds and earth slip zones shall be avoided to minimize risk to the foundations.
- Environment impact study shall be done.
- Situation calling for abnormally long spans and high deviation angle are avoided.
- In hilly tracks, the line is to be routed, as far as possible, along the side of the hills or through valleys rather than over high points.

After making the various probable routes on the maps, comparative study was made on the basis of the following guidelines:

- Total length of the line
- Number of houses affected and crossing of highway and densely populated area.
- Number of the angle points.
- Reaches through protected or reserved forest.
- Nature and number of river crossing.
- Close parallelism with telecommunication line.
- Accessibility along the route.

It's worth mentioning that neither are these criteria assigned any order of priority nor are they expected to be incorporated in totality in the field. The selected alignment, in effect, would be a trade-off between these idealized criteria and the actual site conditions with due consideration for technical and economic aspects.

Transmission Line Route Alignment

The proposed BG HPP 132kV single circuit transmission line will start from its Switchyard which is proposed at right bank of Budhi Ganga river at Simalkot village of Bajura district and will be connected to 132kV Budhi Ganga Substation situated at the Samatada Village of Achham district.

To determine the viable transmission route alignment during desk study, the preliminary field walk over survey along the proposed three transmission line route alternatives, Alternative-1,

Alternative-2 and Alternative-3 are carried out and its route alignments are shown in Google image map and the topographic map respectively.

In this study, the topography of the region along the line passing is studied with the available topographical maps of the region covering a scale of 1:25000 and 1:500000 prepared by Survey Department/GoN. (Sheet no. – 2981 – 09D & 2981 – 10)

Description of the Alternative Route Alignment

All the proposed alternative routes are surveyed thoroughly and the geological structures are also examined. The angle points are also located accordingly during the survey. The descriptions of all the route alternatives are presented below.

Alternative -1

The first angle tower AP-1 of the transmission line, situated at an elevation of 1000 masl, starts from the 132kV BG HPP Switchyard and crosses from right bank to left bank at Pipalsain village. It runs through the left bank of Budhi Ganga river to reach finally to the interconnecting 132 kV Budhi Ganga Substation at an elevation of 626 masl (AP-32) located at left bank of Budhi Ganga river at Samatada village of Achham district. Numbers, the ground profile and the location of towers in the profile are also shown below. The total length of the transmission line is about 13.5 km.

During walkover survey the transmission line route alignment along Alternative-1 was not found satisfactory as this route alignment is bit longer and takes sharp bend to reach the destination. This route is not suitable for selection as this line has to cross a school, some houses. The transmission line angle poles details and are shown below.

Alternative -2

The first angle tower AP-1 of the transmission line situated at an elevation of 1000 masl, starts from the 132kV Budhi Ganga HPP Switchyard and runs through right bank of Budhi Ganga river. It crosses the river from right to left at Bhuwagada village reaches finally to the interconnecting 132 kV Budhi Ganga Substation at an elevation of 626 masl (AP - 31) located at left bank of Budhi Ganga river at Samatada village of Achham district. Numbers, the ground profile and the location of towers in the profile are also shown below. The total length of the transmission line is about 12 km.

During walkover survey, the transmission line route alignment along alternative-2 was not found satisfactory.

Alternative -3

The first angle tower AP-1 of the transmission line situated at an elevation of 1000 masl, starts from the 132kV Budhi Ganga HPP Switchyard and runs through right bank of Budhi Ganga river. It crosses the river from right to left at Thapagau & reaches finally to the interconnecting 132 kV Budhi Ganga Substation at an elevation of 626 masl (AP - 29) located at left bank of Budhi Ganga river at Samatada village of Achham district. Numbers, the ground profile and the location of towers in the profile are also shown below. The total length of the transmission line is about 12 km.

During walkover survey, the transmission line route alignment along alternative-3 was found satisfactory. Easily accessible from the village walking road, passes through gentle slope with forest, less Kholsi crossings and without any major obstacles.

Selection of Transmission Line Route Alignment for Detailed Survey

After a thorough walkover survey of the three proposed transmission line alternative route alignments, a clear picture of the transmission line route alignment is made clear to the survey team viewing the landscape of the surveyed area from different locations from top, middle and from bottom, that is from Powerhouse area. A comparative chart of the transmission line features is made for evaluation purpose.

All the three alternatives are compared on the basis of the environmental condition, social issues, type of the land and other different factors associated. The alternative which satisfied all the above factors was selected and further detail survey of that alternative has been done. The detailed survey would help for the further processing of the design of the transmission line system.

Table below shows the comparison between all the three alternatives.

Comparative Chart for Detailed Survey

132 KV TRANSMISSION LINE ROUTE ALIGNMENT			
Transmission line parameters and other details	ALTERNATIVE- 1	ALTERNATIVE- 2	ALTERNATIVE - 3
Total length in km	13.5 km	12 km	12 km
Number of angle points	1	5	3
Deflection angle (0-2)	0	0	0
Deflection angle (3-15)	0	0	0
Deflection angle (16-30)	0	4	2
Deflection angle (31-60)	1	1	1
Number of river/Khola crossings	4	4	2
Crossing of Existing Lines (33KV T/L)	0	0	0
Number of village crossing	15	11	11
Number of Tower	32	31	29
Any other permanent structure	School	School	Not Seen
Forest	Forest area	Forest area	Forest area
Any other impacts	None	None	None

Advantages	No walking road	No walking road	Walking road available
Disadvantages	Difficult access	Difficult access	Easy access
Order of Priority	3	2	1

With comparative study of the alignment details, the Alignment -3 is found to be a better option compare to other two options as this route is easier and friendly from environmental and social factors.

So, **Alignment -3** is selected for detail survey. This route is surveyed thoroughly by walkover survey and through the total station, the alignment has been surveyed.

Detailed Survey

Map Study and Identified Route

Topographical maps of 1:25,000 and 1:50,000 maps of different scales are obtained for careful study of the possible re-route alignment from BG HPP Switchyard to Interconnecting BG substation at Samatada village of Achham district in various sections. During this desk study, necessary pre-cautionary measures are being taken to minimize effect on the settlement areas. Due consideration is being paid with regard to forest encroachment, road crossing, etc. coming along the proposed route alignment. On the basis of the above-mentioned factors, a base map with final routes was prepared.

Field Survey

A field investigation survey was intended to formulate a technically sound and cost effective detail route alignment of transmission line and construction for the proposed line. A team consisting of geologist, electrical engineer, senior surveyors visited the site. The team made an attempt to incorporate factors of local origin, which may influence its alignment of the transmission line. The team examined in details the features and obstacles in the line route area.

Objective of the Field Survey

The main objective of the field investigation survey is to verify the final route alignments of transmission line at site that was proposed during the desk study as well as route proposed by the Employer and finally to select the best route. At the same time, final investigation survey helped us to make the final construction of 132 kV transmission line.

Methodology of the Work

A prolonged field investigation survey was conducted by study team to examine suitability of the selected alignment in the field. The reconnaissance team carried out walkover survey along the entire route using hand GPS for appropriate location of angle points, road crossings, river crossings, LT line and distribution line crossings, bridge crossings etc.

The main objective of the field survey was to examine the corridor of the route alignment. During the investigation survey, all the angle points are fixed and permanent sign had been given to these points at the sites and all the required information around the area are noted with location sketch. The coordinates and tentative deflection angle are taken with the help of Total Station Survey Equipment and GPS. Finally, selected route with all the angle points are

CHAPTER 10: Environmental Management Plan

The Environmental Management Plan (EMP) 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 Jalbire Bridge are presented in following table:

Table 10-1: Institutions and their role in EMP implementation.

Institution	Roles	Responsibilities	Remarks
Ministry of Environment and Population	Formulation and implementation of environmental plans, policies and programs at national level	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ Review, comment, and forward ToR and IEE for the approval by the concerned ministry (MoPIT) 	

Initial Environmental Examination IEE of Jalbire Bridge

World Bank	Role in decision making for the execution of the project	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> ✓ 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 	

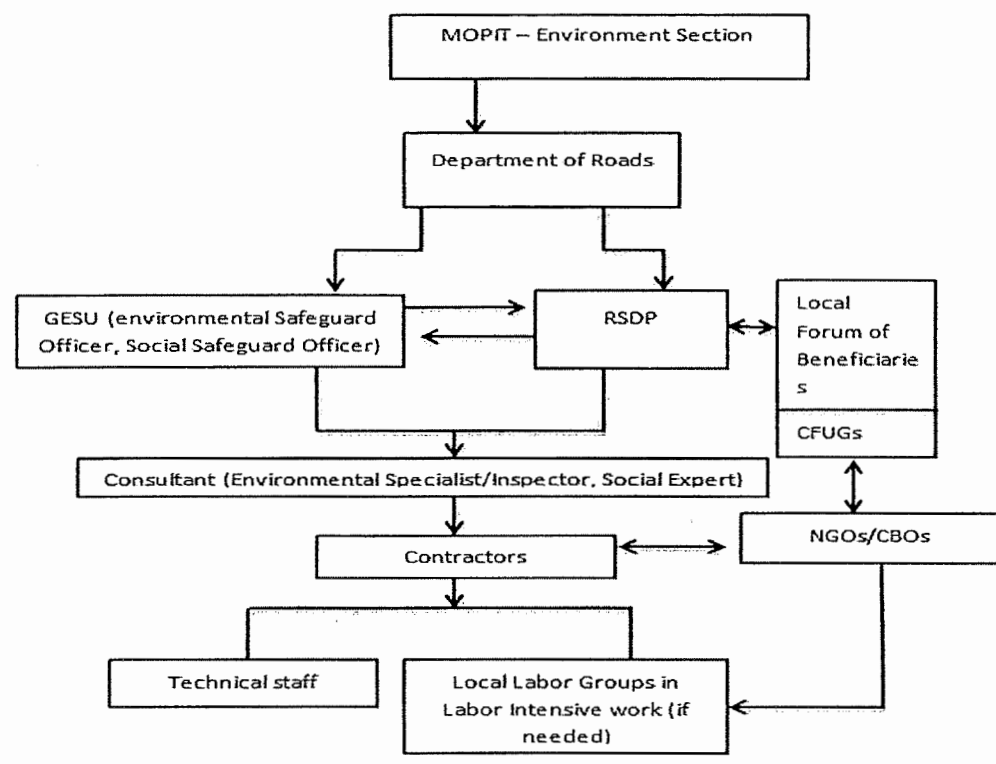


Figure 10-1. Agencies Responsible for the Implementation of CMP

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 though 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 below:

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	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ Nos and magnitude of local seismic activities and respective damage to structures
Water use and pollution status for both surface and sub-surface flows	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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
Socio-economic development around bridge location	<ul style="list-style-type: none"> ▪ Demographic, economic and educational status ▪ Nos of HHs and extent of market expansion around the bridge ▪ Nos and extent of new business ▪ Nos and extent of new services and utilities

The monitoring task and reporting work shall be undertaken by the concerned bridge builders, supervising consultants and contractors; during the construction and post-construction period of the bridge as outlined in the EMP framework given below.

10.1.1 Pre-construction Phase Monitoring

The pre-construction phase monitoring shall mainly focus on the existing environmental baseline and evaluate its deviation from the baseline mentioned in IEE report. Furthermore, the pre-construction phase monitoring will emphasize on the evaluation of location for the campsite, material stockpiling site, and quarry site. Similarly, activities like land acquisition, site clearance, etc. will be monitored during the pre-construction phase.

10.1.2 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.

10.1.3 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.

10.1.4 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 following tables:



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/ 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/ DoR
Use of local labor, particularly vulnerable groups and women	Number of local labors 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 labor work is contracted	Contractor	Proponent/ DoR
Occupational Health and Safety Issues	Health and safety regulation, first aid and medical arrangements, provision of safety equipment and measures, sanitation of labor	Spot checks at camps and work sites, photos, accident records, causes	Once a month throughout the construction phase	Contractor	Proponent/ DoR
Environmental protection measures, including pollution prevention, water and soil management, slope stabilization, cut and fill, spoil and waste management, environmental and	Arrangement specified in the code of practice and in manuals relating to environmental protection; records and observations on pollution, waste management, spoil disposal. Training programmes for laborers to prevent impacts on wildlife sensitive habitats, forests	Site inspection, discussion with project management, consultants, and local people. Quantifying site-specific impacts, photos, laboratory tests where required. Existing patrol, control and enforcement mechanisms, enforcement records.	Before and during construction period	Consultant	Proponent/ DoR

socially critical sites, protection of fauna and flora	and fuel wood use.				
Compensatory Plantation	Plantation of the lost vegetation in the ratio of 1:25 and their growth status	Site inspection and consultation with locals and verification from DFO	During and after construction	Contractor	Proponent/ DoR
Pressure on forest and wildlife	Use of firewood or fossil fuel by construction crew, events of hunting and poaching of wildlife	Inspection and interview	Regular by contractor, once a month by consultant	Contractor	Proponent/ 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/ DoR
Water pollution	Visual inspection, open defecation and waste disposal around water sources near construction sites and labor camp	Site inspection, interview	Regular by the contractor, once a month by the supervision consultant	Contractor	Proponent/ DoR
Public health and accident risk	Health and safety regulations, first aid and medical arrangements, contingency plan, safety awareness programme. Provision of toilet and waste management facility to the construction crew	Spot checks at camps and work sites, photos, accident records from Traffic Police, Training records and materials, road signs	Once in two months by consultants	Contractor	Proponent/ DoR
Adequate technical and environmental	Adequate number of technicians mobilized regularly at site.	Check number and type of technicians available at site.	During construction by	Consultant	Proponent/ DoR

supervision	Ability to implement labour based bridge construction concept	Skill of work carried out. Discussion.	contractor. Once a month by consultant		
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/ DoR
Rehabilitation of Public infrastructure	Rehabilitation site of Public infrastructure (Temple and Water Tap),	Site observation, comparative photos, consultation with locals	At the end of construction period	Contractor	Proponent/ DoR

Table 10-4: Parameters selected for the 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/ 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/ 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/ DoR
Quarrying of Conservation Materials	Initiated erosion, change in river regime, erosion by river systems, landslide due to quarrying, degradation of vegetation, water logging, waterborne diseases	Site observation, photos Records from local health centers	Quarry site areas	During construction	Contractor	Proponent/ DoR
Disruption of Drainage System	Status of rehabilitation Service status of irrigation and water supply system, Operation and maintenance requirement	Observation and interviews, photos, fisheries data, wildlife records	Disrupted aquatic system, irrigation schemes	During construction	Contractor	Proponent/ 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/ DoR
Air Quality	Atmospheric dust	Visual inspection	At construction sites and at sensitive spots (Schools, hospitals)	During construction and operation	Contractor	Proponent/ DoR
Forest and vegetation	Numbers of trees, presence of group vegetation, signs of illicit logging	Observation, DFO record, photos, stakeholder	In and around the construction	During construction and operation	Contractor	Proponent, consultant

		interviews	sites, markets			
Encroachment of Bridge and adjoining area	Number of shops increased or decreased, rental of houses and land spaces	Records, interview, observations, photos	Project Area	Throughout project	Consultant	Proponent, VDC
Occupational Safety and Hazard	Type of number of accident occurred during construction, Adequacy of occupational safety measured provided Compensation provided in case of fatal accidents or invalidity	Observation, photos, spot checks, Contractors and health center records interview with labors	Project Area	During construction	Contractor	Proponent, Consultant Health Authorities



10.2 Environment Management Plan

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

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 Generation	Project Impact area	Local people will be given higher priority in project related works during construction of Jalbire Bridge	No additional Cost	Contractor	Supervision consultant/ DoR
Enhancement of Skills	Project Impact area	Pre-construction orientation to the senior level bridge engineer and mid-level bridge engineer and unskilled workforce	PS. Nrs 50,000	Contractor	Supervision consultant/DoR
Improved mobility	Entire project area	Construction of permanent bridge will ultimately serve as the benefit augmentation measure.	No additional cost	Contractor	Supervision consultant/ DoR
Increase in Awareness	Project impact area	Sub-project will provide awareness trainings related to solid waste management, river bank safety, health and sanitation issue, and conservation of wildlife and biodiversity. For this a 3 day training program will be provided to the locals of the project impact area (both	PS 30,000 (@10, 000 per day)	Project Implementation agency (RSDP)	Supervision consultant/ DoR

Initial Environmental Examination IEE of Jalbire Bridge

		DIA and IIA)			
Safe and Upgraded Transportation facilities	Project area	Regular and routine, emergency and if required major maintenance will be conducted.	No additional Cost	Project	Supervision consultant/ DoR



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	<ul style="list-style-type: none">• Project will not unnecessarily scour the river bed.• River diversion will be done whenever necessary.• Minimum disturbance will be done during the construction phase.• The spoils generated during the excavation will be disposed-off immediately.	Bridge construction area	During construction	No additional cost required	Contractor	Supervision consultant/ DoR
Site clearance and bridge construction	Change in Land Use	<ul style="list-style-type: none">• Only required land will be acquired for construction purpose.• Agricultural land, will be avoided for temporary use.• Permanently acquired private land will be compensated.	Bridge construction area	Pre- construction and construction phase	No additional cost required	Contractor	Supervision consultant/ DoR
Bridge and approach road construction	Landslide, slope instabilities and soil erosion	<ul style="list-style-type: none">• Minimize cut slope activities in design as much as possible.	Quarry site and river bed extraction site	Construction phase	No additional cost required	Contractor	Supervision consultant/ DoR

		<ul style="list-style-type: none"> • Selection of cut and fill slope will be done at correct angle depending the soil type. • The retaining structures along with bio-engineering will be applied • 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 	foundation works site and approach road				
Quarry management and river bed extraction	Slope stability, water pollution and impact on river regime	<ul style="list-style-type: none"> • Consent from local authorities (VDC offices and DDC office) will be taken prior to the use of quarry and burrow pit site. • The river bed materials will be extracted by taking necessary permission from the local bodies. 	Quarry site and river bed extraction site	Construction phase	Provisional Sum (PS): Nrs. 60,000 for reinstatement of quarry and river bed extraction site	Contractor	Supervision consultant/ DoR

		<ul style="list-style-type: none"> • In case of river bank quarry, only the materials deposited during the previous year will be collected without disturbing the sedimentation cycle of the river. Permitted mining volume will only be acquired. • Extraction of riverbed materials from active channel will not be done. Removal of riparian vegetation will be avoided. • The excavator will be used only when required. Washing and cleaning of excavator in river water will be avoided. Excavator operator will be well informed about the safe operating procedures to be adopted while extracting river bed materials. • The maximum depth of floodplain extraction will be above the channel thalweg. Side slopes of floodplain excavation will range from 3:1 to 10:1. Extracted materials will be transported through available access road. • River bed materials will only be extracted by paying necessary royalty to the local body. Unstable sites, erosion prone areas, dense 					
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		<p>forest, settlements, fertile farm land will be avoided for quarry operation.</p> <ul style="list-style-type: none"> Quarry sites, burrow pit area and river bed extraction site will be rehabilitated. 					
Construction activities	Spoil generation and likely impact on water and soil	<ul style="list-style-type: none"> 5 meter high gabion structures will be built (as river training) along the bank of river prior to the spoil disposal so that the spoil would not get contaminate with the river water. After the spoil is filled up to five meter, additional two meter spoil can be adjusted at each site by making a sloppy surface (Toe wall) of 60° on the river side. As soon as the spoil disposal gets completed the site will be planted with trees. Altogether 40 saplings of different species will be planted around the spoil disposal site. 	Spoil disposal site	Construction phase	PS Nrs. 40,000 for reinstatement of spoil disposal site. Plantation cost has been separately provided.	Contractor	Supervision consultant/ DoR
Construction activities	Occupational health and safety hazards	<ul style="list-style-type: none"> Construction workers will be prior informed about job hazards, emergency procedures and any other relevant safety measures. Safety equipment such as helmets, boots, gloves, safety belts, safety glasses and masks will be provided to the workers working in the 	Bridge construction area	construction phase	PS Nrs. 90,000 for safety gadgets	Contractor	Supervision consultant/ DoR

		<p>construction sites.</p> <ul style="list-style-type: none"> • Contractor will arrange the First Aid Kit Box and standby medicine for workforce during working period and emergency situations. Warning signs, posts, barriers and guards will be installed to restrict access of unauthorized persons to construction sites. • Only authorized person will be allowed to operate heavy machinery and equipment. Temporary drinking water supply and latrine pit will be established at site. • Labor camp will be provided with good quality of beds, well ventilated rooms, good water quality for drinking purpose. • Dust control will be done by spraying water on access road and other construction areas. 					
Operation of Labour camps	Environmental Impacts associated with labour camps	<ul style="list-style-type: none"> • Bio-degradable waste will be disposed in a separate pit away from the water bodies. The pit will be reinstated along with the labor camp after the work ceases. • Liquid waste will be disposed in a separate ditch and disinfectant 	Labour camp area	construction phase	PS 180,000 Nrs. for operation of labour camps	Contractor	Supervision consultant/ DoR

		<p>(Chlorination) will be continuously spread to avoid contamination.</p> <ul style="list-style-type: none"> • Haphazard littering of solid waste by construction crews will be restricted, for this a strict code of conduct will be implemented. • Separate toilet facility will be constructed near the construction camp with the facility of septic tank. • Provision of clean drinking water will be made at the construction camp. 					
Construction activities	Degradation of water quality	<ul style="list-style-type: none"> • Disposal of soil, sludge and other waste directly into water bodies will be avoided. • Prohibition of activities like washing – cloth, dish, etc. by construction workforce near water bodies that contribute to water pollution will be prohibited. • 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 	Entire project area	construction phase	No additional cost required	Contractor	Supervision consultant/ DoR

		<p>bodies.</p> <ul style="list-style-type: none"> Accidental spillage of the oil, grease and other chemical substances will be captured immediately without allowing them to contaminate the water bodies. 					
Construction activities	Bridge safety	<ul style="list-style-type: none"> Fencing and lighting of construction and staging areas will be done, recognized safety practices for the utilization of heavy equipment, and the movement of construction materials will be implemented to avoid accidents. Lane blockages, and vehicles entrance locations will be well signed. Water flow in the stream will not be blocked through properly designed temporary draining structures. 	Bridge construction area	construction phase	5000 for warning signs and post	Contractor	Supervision consultant/ DoR
Transportation of Construction materials	Air pollution and environmental nuisance	<ul style="list-style-type: none"> The construction materials will be transported by covering it with traupalin. Vehicles carrying construction materials will not be parked nearby the sensitive public places and market areas. 	Project influence area	construction phase	No additional cost required	Contractor	Supervision consultant/ DoR
Bitumen heating	Air, water and noise pollution	<ul style="list-style-type: none"> Bitumen heating will be done at least 100 m away from the nearby settlements and 	Around bitumen heating place	During construction	Provisional Sum Nrs.	Contractor	Supervision consultant/DoR

		<p>public places.</p> <ul style="list-style-type: none"> • Bitumen storage will not be done on nearby fertile land and water sources. • The excess bitumen will not be discharged into the drain structure while overlaying on the sub-base material. • Use of bitumen will be on time other than the rainy condition. • Workers will be provided with necessary protective equipment such as face mask, gloves etc. • Bitumen heating place will be reinstated after the works completed. 		phase	20,000 for reinstatement of bitumen heating place		
Use of chemicals and hazardous materials	Contamination of soil due to leakage of spent fuels, grease, lubricants and paints	<ul style="list-style-type: none"> • Storage of chemicals including hazardous materials will be done on safe place and the storage facility will be sealed. • The facility will be well protected from strangers and scavengers. • Paints will be applied only where required. Accidental leakage of paints and chemicals will be strictly regulated. • Contaminated containers, packaging materials and worn plastic will be disposed of in separate spoil disposal areas. • Containers will be recycled/reused or managed 	Entire Project area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR

		<p>properly.</p> <ul style="list-style-type: none"> Accidental leakage of fuels, grease, lubricants and other hazardous materials will be recovered soon and managed safely in designated area. 					
Site clearance	Impact on public infrastructures like relocation of Jaldevi Durga Mata Temple	<ul style="list-style-type: none"> Prior consent will be taken from the users community before the temple and public water tap is affected. As per the suggestion provided by the locals, the temple and water tap will be rehabilitated on nearby the existing crossing which is proposed to be utilized for materials stockpiling for the proposed project. 	Entire project area	During construction period	Provisional sum Nrs 1,000,000 for rehabilitation of Jaldevi Durgamata Temple and 15,000 for rehabilitation of drinking water tap	Contractor	Supervision consultant/DoR
Handling of chemicals and combustibles	Fire Hazards	<ul style="list-style-type: none"> Combustibles will be placed in safe place in sealed containers. Unauthorized entry to the site will be prohibited. Deposition of rags, litters, papers, plastics will be avoided and they will be managed safely. Gaseous fire suppression will be used i.e., use of Clean Agent Fire Suppression (CAFS) will be done in different areas such as camp site, materials stockpiling sites, equipment and vehicles parking yards. A total of 5 CAFS will be used during construction. The construction workers will be well informed about 	Around the construction site, and camp site	During construction period	NRs. 20,000 for fire extinguisher (five 4kg, cylinder, at the rate of 4000/cylinder)	Contractor	Supervision consultant/ DoR

		the fire safety precaution to be taken during the start of the construction works.					
Stockpiling of Construction materials	Land and water pollution, impact on agricultural land	<ul style="list-style-type: none"> The land allocated for the storing of construction materials will be far from agricultural land and water bodies. The permission from local stakeholders will be taken before commencing the stockpiling of the construction materials. Construction materials will 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. 	Around Stockpiling areas	During construction period	Nrs. 20,000 for reinstatement of material stockpiling site	Contractor	Supervision consultant/ DoR
Construction activities	Air and noise pollution	<ul style="list-style-type: none"> Construction equipment and vehicles will be regularly examined and maintained in proper condition. Water will be sprinkled along access road at least two times a day to reduce the dust emission. Proper protection works like fencing by GCI sheets or walls will be done at excavation and disposal site. Construction materials will 	Material stockpiling site	During construction period	No additional cost required	Contractor	Supervision consultant/ DoR

		<p>be properly covered during conveyance. Enforcing vehicle speed limit using signals and speed breakers.</p> <ul style="list-style-type: none"> Workers will be encouraged to use masks. Concrete mixer, vibrator, etc. will be maintained in proper condition. Sound producing equipment will be preferred to use only in daytime. Earplug will be provided to the worker involved in equipment operations. 					
Excavation works during construction piers and abutment	River flooding and bank erosion	<ul style="list-style-type: none"> River bank cutting will be minimized Loss of river bank trees and vegetation will be minimized The flow of the river will be ensured through the designation of temporary draining structures 	Bridge construction area	During construction period	No additional cost required	Contractor	Supervision consultant/ DoR
Relocation of Jaldevi Durga Mata Temple	Impact on cultural and religious site	<ul style="list-style-type: none"> Jaldevi Durgamata Temple will be rehabilitated in the location nearby the existing temple. All the necessary activities will be conducted by the project. 	Project influence area	During construction period	Cost included in rehabilitation of public infrastructures	Contractor	Supervision consultant/ DoR
Operation Phase							
Regular maintenance	Environmental issues due to	<ul style="list-style-type: none"> The storage facility will be at least 50 m away from the 	Bridge	During operation	No additional cost	DoR	Supervision consultant/DoR

	stockpiling of construction materials during regular maintenance	<p>agricultural land and water sources.</p> <ul style="list-style-type: none"> Construction materials will be covered with tarpaulin to prevent from scattering from wind and water and other agents. The stockpiling site will be used only after the prior consent from the respective owner or authority. 		period			
Bridge operation	Operation of vehicles through the bridge and air and noise pollution	<ul style="list-style-type: none"> Speed limit will be placed in both banks of the bridge 	Bridge construction area	During operation phase	Included in Detail Design	DoR	Supervision consultant/DoR
Bridge operation	Encroachment of DIZ area of Bridge	<ul style="list-style-type: none"> The project will coordinate with the local authority i.e., VDC, DDC to regulate the activities of roadside encroachment. Awareness raising program will also be conducted to the people of DIZ area so that they can regulate these activities or inform the regulatory bodies. 	Bridge construction area	During operation phase	No additional cost required	DoR	Supervision consultant/DoR
		<ul style="list-style-type: none"> 					

Biological Environment:**Construction Phase**

Bridge construction	Loss of vegetation (10 tree of different species will be lost)	<ul style="list-style-type: none"> Compensatory plantation will be done at the ratio 1:25 for the number of trees that need to be cut for the bridge construction. Construction camp will be supplied with LPG and the use of fuel wood will be discouraged. Contractor will arrange/buy energy resource for bitumen heating from the authorized source 	Construction camp	During construction period	69,000 for compensatory plantation and management (Refer plantation cost for breakdown)	Contractor	Supervision consultant/DoR
Construction activities including excavation and dredging of river channel	Impact on aquatic lives	<ul style="list-style-type: none"> The river channel will be disturbed only in required extent. Spoil will be safely managed soon after their generated. Haphazard disposal of garbage into the stream channel will be regulated. Chemicals used in construction activities will be handled carefully and stored in fallow land away from the riverbeds. Illegal fishing activities by the construction crews will be regulated. 	Bridge construction area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR
Illegal hunting activities by the construction workforce	Impact on wildlife	<ul style="list-style-type: none"> Illegal hunting, harassment to wildlife will be strictly controlled. Construction activities will 	Entire project area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR

		be confined to day time. <ul style="list-style-type: none"> Construction fuel requirements will be supplemented through alternative sources other than fuel wood. A code of conduct will be enforced to construction workers through contractor that prohibit illegal, collection, sale, distribution of wildlife and plant product. 					
Socio-economic and Cultural Environment:							
Bridge construction	Social conflicts	<ul style="list-style-type: none"> Code of conduct for all the construction crew will be enforced 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. 	Project influence area	During construction period	Not applicable	Contractor	Supervision consultant/DoR
Use of local resources during construction by the project	Obstruction to the social service facilities	<ul style="list-style-type: none"> The contractor will manage some utilities like communication, lighting and cooking energy, drinking water supply, etc. within the camp so as to avoid the pressure on local services. Local people will be consulted to build consensus on sharing the community infrastructures 	Entire project area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR

		<p>such that it will not significantly affect the local people.</p> <ul style="list-style-type: none"> The contractor will be responsible for reconstruction and rehabilitation of damages due to their activities; any damage to existing road in project location will be controlled and rehabilitated. The drinking water tap and temple will be rehabilitated to the nearest safest location 					
Use of construction workforce	Issue of Child labour	<ul style="list-style-type: none"> Child labour use of any form during maintenance works will be strictly regulated. If it is found it should be treated with criminal guilt and project will lodge complaints to the local authority if it is found. The contractor will abide by Contractors Mitigation Plan prepared for the sub-project. 	Entire project area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR
Use of construction workforce	Gender Discrimination	<ul style="list-style-type: none"> Project will make agreement with contractors to consider male and female equally for wage distribution for works of similar nature. Male workers will be instructed to respect their female counterparts. 	Entire project area	During construction phase	No additional cost required	Contractor	Supervision consultant/DoR

		<ul style="list-style-type: none"> The contractor will abide by the Contractor Mitigation Plan prepared for the sub-project. 					
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10.3 Cost for Execution of EMP

10.3.1 Details of specific cost

a) Cost for Mitigation and Augmentation Measures

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
Camp site <ul style="list-style-type: none"> Contractor Office/ Workshop Labor camp 	Provisional Sum (PS)	180,000	180,000	Contractor will bear the cost of labor force site including land/house hire, fuel, drinking water supply, electricity etc.
Capacity Building <ul style="list-style-type: none"> Pre-construction orientation to the senior level bridge engineer and mid-level bridge engineer Training (work force) 	<ul style="list-style-type: none"> Lump sum 	30,000	30,000	Contractor will conduct all necessary trainings related to bridge construction
<i>Training and Awareness to work force will be related to occupational health and safety, to machine operators, labors and other concerned stakeholders, orientation to EMP/SSEMAP to Senior level road builders and decision makers, contractor group and others</i>	<ul style="list-style-type: none"> Lump Sum 	20,000	20,000	

Initial Environmental Examination IEE of Jalbire Bridge

Safety gadget for occupational health and safety	18 months	LS	90,000	Contractor will provide safety gadgets to the worker, visitors and monitoring officers will be provide to work force, visitors, supervision consultant.
Awareness Raising Program to the local (Training related to river safety like awareness reagarding 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, demerits of encroachment of RoW	3 day	10,000	30,000	
Quarry, Rock break, river bed extraction site and reinstatement of quarry site.	PS	60,000	60,000	Reinstatement of quarry and river bed extraction site
Safe disposal of spoil including transportation and reinstatement of site	PS		40,000	The cost includes transportation of spoil to the designated site, and rehabilitation of the site
Bitumen Heating (Safe storage, heating and handling and closure)	PS	20,000	20,000	

Construction of Berms and fencing of stockpiling materials and reinstatement of site	LS	20,000	20,000	Contractor will bear the cost for protecting the stockpiling materials
Relocation and rehabilitation of Temple and Water tap	PS	1,000,000 for rehabilitation of temple and 15,000 for rehabilitation of water tap	1,015,000	
Fire Safety Gadget	4	4,000	20,000	
Warning Signs and post	LS		5,000	
Sub-Total			1,530,000	

a) Cost of tree Plantation

Altogether the plantation of 315 trees has been proposed in this report. The cost estimate for the plantation of trees is presented in table 10-7.

Table 10-7: cost of tree plantation

Activities	Cost In Rs.	Remarks
Plantation of 350 saplings of different species as a part of compensatory plantation. Out of total plantation 40 saplings will be planted as a reinstatement of spoil disposal area, including site preparation, pitting and mulching	70,000	Lump sum cost of NRS. 200/sapling (including cost for site preparation, pitting and mulching)
Replacement of 105 dead saplings (assuming 30% mortality) at the rate of Rs. 170	17,850	Assuming 30% mortality
Tools	2,000	Lump sum
Tending and maintenance for	50,000	Lump sum

5 years		
Sub-total	139,850.00	

b) 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 10-8: 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 to be included in BOQ for EMP Implementation

The breakdown of cost for the implementation of Environmental Management Plant is presented in table 10-9.

Table 10-9: Total cost of implementation of EMP

S.N.	Activities	Cost	Remarks
1	Mitigation and Augmentation measures including plantation cost	1,669,850.00	
3	Environmental Monitoring	980,000.00	
Total Cost of EMP implementation		2,649,850.00	

10.4 Grievance Redress Mechanism

At project level a grievance redress mechanism will be established allow project affected persons (PAPs) to appeal any disagreeable decisions, practices and activities arising compensation for

assets, and technical and general project-related disputes. As specified in ESMF the PAPs will be made fully aware of their rights and the procedures for doing so verbally and in writing during compensation, survey, and time of compensation.

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

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

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

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

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

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

CHAPTER 11: CONCLUSION AND RECOMMENDATION

The construction of Jalbire Bridge of 87.2 m long bridge is essential for ensuring safe and reliable transport facility along Narayanghat- Mugling Highway. Besides these, implementation of this proposal is expected to bring several immediate short term benefits like employment generation, increase in the local economy and enhancement of the technical skills. However the implementation of the sub-project is likely to create long term benefits on national economy as the bridge is constructed in the road section through which holds nations 90% of the trade traffic. There are very few environmental impacts due to the construction of the proposed bridge. Rehabilitation and relocation of Jalbire Temple is one of the major impacts during project implementation. Other general impacts due to the construction of the Jalbire Bridge includes, the potential of landslides and soil erosion due to excavation, management of spoil, loss of vegetation, challenges in the management of wastes released from the camp site, etc. are some of the anticipated adverse environmental impacts.

The IEE study of the proposal has proposed cost effective and easily implementable mitigation measures. The implementation of the EMP proposed for the sub-project will not have large cost and resource liability. The total cost proposed for the implementation of the EMP is NRs. 2,649,850.00.

Implementation of safeguard measures described in Environmental Management Plan is essential for the sustainability of the proposed project. Similarly, all the social and environmental issues related to project should be settled down before implementation of project works. The active participation of all the agencies responsible for implementing the EMP is recommended. In addition, scope of proposed bridge construction do not surpass any of the threshold mentioned by EPA, 1997 and EPR, 1997 (First amendment, 1999) and other relevant acts and rule. So, IEE is sufficient for implementation of project.



Annexes

**Annex A: Approved Letter of Terms of Reference
(ToR)**





नेपाल सरकार
भौतिक पूर्वाधार तथा यातायात मन्त्रालय
सडक विभाग
योजना तथा डिजाइन महाशाखा
भू-वातावरण तथा सामाजिक शाखा

फ्याक्स: ५५२९१०९
फोन नं. ५२६०६९९
हाल: पाटन, ललितपुर
ई-मेल: gesunit@dor.gov.np
वेब साइट: www.dor.gov.np
मिति : २०७२/१०/०८

चलानी नं-१०९/२.२.२/०७२/७३

श्री वैदेशिक महाशाखा
बबर महल, काठमाडौं ।

विषय: Jalbire Bridge (Narayanghat-Muglin Road) को IEE को ToR स्वीकृत भएको सम्बन्धमा ।

उपरोक्त सम्बन्धमा त्यस महाशाखा अन्तर्गत Jalbire Bridge (Narayanghat-Muglin Road) Chitwan को IEE को ToR भौतिक पूर्वाधार तथा यातायात मन्त्रालयको प.सं.०७३०७३२.३ च.नं. ६०९ मिति २०७३०९१२ को पत्रानुसार नेपाल सरकार (सचिवस्तर) को मिति २०७३११२४ को निर्णयानुसार शर्त सहित स्वीकृत भएको व्यहोरा अनुरोध गरिन्छ ।

संलग्न: १. भौतिक पूर्वाधार तथा यातायात मन्त्रालयको पत्र छौयाप्रति - १ थान

२. स्वीकृत ToR - २ प्रति

V. K. Mahato
विजय कुमार महतो
इकाई प्रमुख
विजय कुमार महतो
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भू-वातावरण तथा सामाजिक शाखा

बोधार्थ: (आवश्यक कार्याधको लागि)

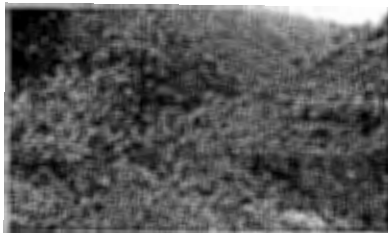
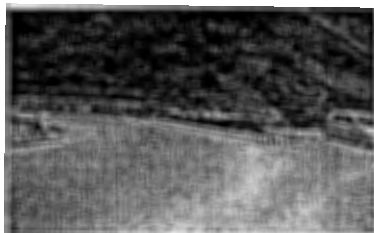
श्री M/S Kunhwa Engineering and Consulting Co. Ltd Korea in association in the form of Sub Consultancy with ERM Co Pvt. Ltd., Nepal
Baneshwor, Kathmandu (संलग्न: १. भौतिक पूर्वाधार तथा यातायात मन्त्रालयको पत्र छौयाप्रति - १ थान

२. स्वीकृत ToR - १ प्रति)



Government of Nepal
Ministry of Physical Infrastructure and Transport
DEPARTMENT OF ROADS
Road Sector Development Project
Foreign Cooperation Branch
Babarmahal, Kathmandu

Consulting Services
for
Feasibility Study and Detail Design for Construction of New Bridges
and
Maintenance of Existing Bridges
Contract No.: RSDP/Cons/Bridge/01



Terms of Reference
for
Initial Environmental Examination (IEE)
Of
Jalbire Bridge (Narayanghat- Mugling Road)

Submitted By:
Geo-Environmental and Social Unit
Department of Roads
Chakupat, Lalitpur, Lalitpur

Submitted to:
Ministry of Physical Infrastructure and Transport
Singha Durbar, Kathmandu

Prepared by:

January, 2016



M/s Kunhwa Engineering & Consulting Co. Ltd., Korea
in association in the form of sub consultancy with



ERMC (P) Ltd., Nepal
(Environment & Resource Management Consultant)

Office Address:

126/23, Puja Pratisthan Marg
Mid- Baneshwor, Kathmandu
Tel.: 977-1-447-1884
P.O. Box: 12419, Kathmandu
Fax: 977-1-4479361

Acronyms and Abbreviations

amsl	above mean sea level
BoQ	Bill of Quantity
CBS	Central Bureau of Statistics
CBO	Community Based Organization
DDC	District Development Committee
DHM	Department of Hydrology and Meteorology
DoR	Department of Roads
EMAP	Environmental Management Action Plan
EPA	Environment Protection Rules
EPA	Environment Protection Act
GESU	Géo-environmental and Social Unit
GI	Galvanised Iron
GIS	Geographic Information System
HFL	High Flood Level
IEE	Initial Environmental Examination
IRC	Indian Roads Congress
MoPIT	Ministry of Physical Infrastructures and Transport
NGO	Non-Governmental Organization
RCC	Reinforced Cement Concrete
RSDP	Road Sector Development Project
SRN	Strategic Road Network
ToR	Terms of Reference



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CHAPTER-1: NAME AND ADDRESS OF THE PROPONENT

1.1 Name and Address of Institution Preparing the Report

The name and address of the institution preparing the Term of Reference (ToR), for Initial Environmental Examination (IEE) of Jalbire Bridge (Narayanghat-Mugling road) is as follows:

Geo-Environmental and Social Unit (GESU)

Department of Roads (DoR)

Ministry of Physical Planning and Transport

Chakrpati, Lalitpur

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

Road Sector Development Project (RSDP)

Foreign Cooperation Branch

Department of Roads

Sanogaucharan, Kathmandu

On behalf of RSDP, Kunhwa Engineering and Consultancy Co., Ltd., Korea in association in the form of sub consultancy with Environment and Resource Management Consultant (ERMC) Pvt. Ltd., has been assigned for Feasibility Study and Detail Design for construction of new bridges and maintenance of existing bridges (Contract No. RSDP/Cons/Bridge/01), and accordingly the consultants has prepared Terms of Reference (TOR) for Initial Environmental Examination (IEE) as per task A 402 assigned for Consultants. The name and address of the consultants preparing this report is as follows;

Kunhwa Engineering and Consultancy Co., Ltd., Korea

In association with

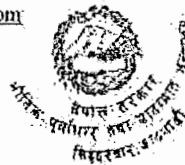
Environment & Resource Management Consultant (ERMC) Pvt. Ltd.

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

One of the main objectives of the Road Sector Development Project (RSDP) is up-grading of about 700 km dry season roads to the sealed pavement connecting in 8 districts headquarters namely Darchula, Baitadi, Dailekh, Jumla, Humla and Jajarkot including improvement of existing intermediate lane to double lane carriageway of the Narayanghat-Mugling Road (N-M Road).

In order to maximize the benefit from all seasons, sealed roads in the above 8 districts and from the proposed improvement to a double lane carriageway of N-M road, the Government intends to apply a portion of proceeds to engage International Consultant. This intends to undertake design services of construction of new bridges including river training works and approach roads, major and minor maintenance of the existing bridges and provision of traffic safety elements on all bridges. The study will be basis for construction and/or maintenance from financing from Government or with the assistance from IDA or other bilateral or multilateral development institutions. For these purposes 18 bridges from Narayanghat-Mugling Road, 2 bridges from Shitalpali-Musikot Road, 3 bridges from SKMTSD Road, 15 bridges from Surkhet-Jumla Road and 13 bridges from Chhinchu-Jajarkot Road are under consideration.

In this regard, the construction of Jalbire Bridge is proposed at the chainage 29+210 on Narayanghat-Mugling Road. The proposed bridge is of Prestressed type with the span length of 120 m. According to the National Bridge standard 2010, this bridge falls under major bridge category and subsequently as per Environment Protection Rule (EPR), 1997 implementation of the proposed project requires Initial Environmental Examination (IEE). This Terms of Reference has been prepared in order to systematize working procedures and fitting the IEE study within the legal context.

2.2 Objectives of Terms of Reference (ToR)

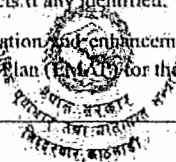
The general objectives of the ToR are as follows:

- To list and delineate the specific activities to be performed during IEE study
- To provide the technical guidance in order to accomplish the work within the time frame.
- To list the major issues and impact to be address during IEE study

2.3 Objectives of IEE

The objectives of IEE are as follows:

- Identify and predict the major environmental issues that may arise as a result of proposed works and their likely impact on bio-physical, socio-economic and cultural environment of the project area.
- Identify easily implementable mitigation measures for the negative environmental and social issues and suggest remedial plans in case of residual impacts if any identified.
- Recommend practical and site specific environmental mitigation and enhancement measures, prepare and implement Environmental Monitoring Action Plan (EMAP) for the project.



2.4 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 (Clause-4 of Road Sector, Schedule-I Pertaining to Rule-3 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 length of the proposed bridge will be 120 m (3x40m) to be built on both sides of the existing bridge. Hence, the proposed construction work requires IEE. Therefore, this ToR is prepared in accordance with the Rule-5 and Schedule-3 of EPR '97.

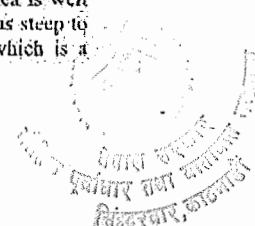
2.5 Relevancy of the Proposal

The Jalbire Khola is perennial stream; however, its discharge will be relatively high during monsoon season. There is a existing bridge over Jalbire khola; however, bridge is located in sharp bends and does not comply with the double lane standards, posing threat for traffic accidents. It is along the Narayanghat-Mugling Highway along chainage 29+210. The Narayanghat-Mugling highway is important road section connecting capital city Kathmandu and Pokhara to most part of the country. The construction of new bridge with double lane standard over Jalbire khola along N-M section will provide the safe and better transport facility for the people of the different part of the country.

2.6 Description of the Proposal

2.6.1 Project Area

The proposed Jalbire Bridge is located in Chitwan District of Central Development region (CDR) at the chainage of 29+210 in Narayanghat- Mugling Road Section. The geographical location of the proposed bridge is 27°49'31.16"N latitude and 84°31'18.04"E longitude and the elevation is 260 m above mean sea level. The area around the proposed bridge is characterized by the settlements, road-side business, unused land and forest. Water mill and lime industry are the some of the small scaled industry located near the bridge location. Jal Devi temple and Durga temple are also present around the project location. Tea stalls, hotels and grocery have well developed in that area which offers breakfast, lunch and dinner to the people travelling through the Highway. The project area is well connected to both district headquarter and capital city. The land around the project area has steep to moderate hill slopes. The proposed bridge has been proposed over the Jalbire River which is a Perennial river.



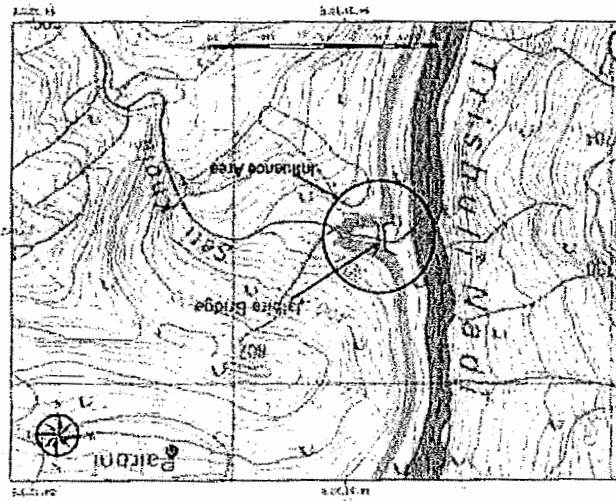


Figure 2-1: Topographical Map Showing Study Area and Project Impact Areas

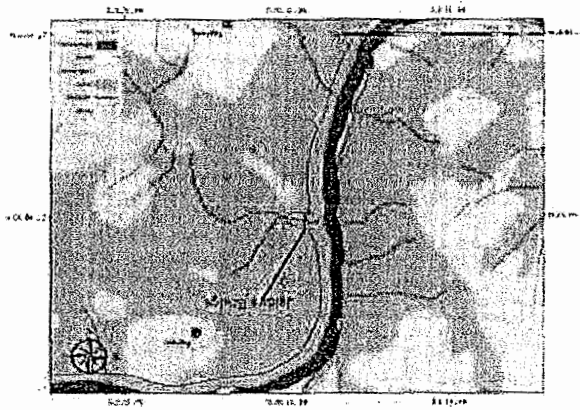


Figure 2-2: Land Use Map of the Project Area

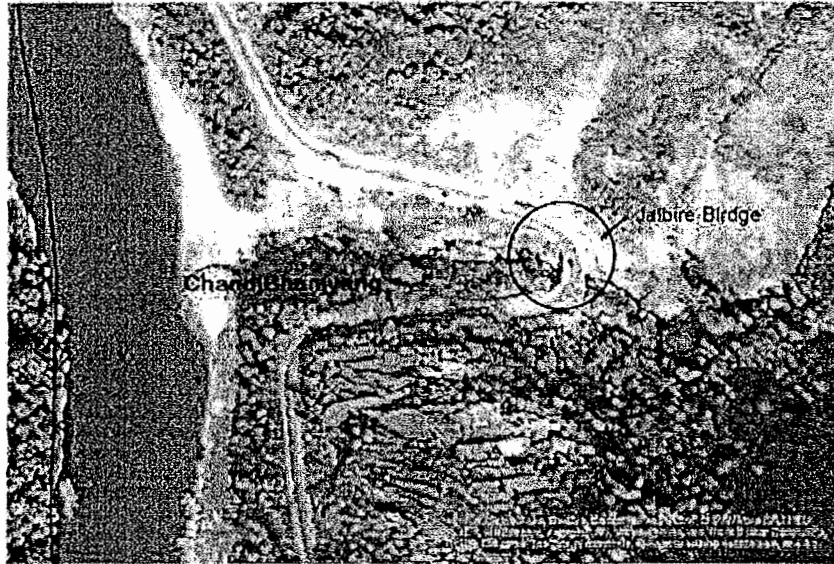


Figure 2-3: Project Site in Google Map

2.6.2 Salient Features

The salient features of the proposed bridge are presented in the Table (2-1)

Table 2-1: Salient Features of the Project

Name of the Project	Jathire River Bridge
Location	
Development Region	Central Development Region
Zone	Narayani
District	Chitawan
Village/ Town	Chandi Bhanjyang-09
Name of the Road	Narayanchat-Mugling Road
Chainage of the Bridge site	29+210
Geographical Location	351604.2 E; 3078583N
Classification of Road	National Highway
Type of Road Surface	Bituminous
Terrain / Geology	Hilly
Structure	
Total length of the Bridge	87.2 m
No of span	1*20+1*40+1*20 m

Total width of the bridge	11.0 m
Width of Carriage way	7.5m
Width of Footpath with railing	1.5m
Kerbs	0.350
Type of Structure	RCC
Type of Superstructure	Pre-Stressed - RCC T beam
Type of Bearing	Pot cum P.I.F.E
Type of Abutment	Rectangular RCC with Return Wall
Type of Foundation	Open Foundation
Design Data	
Live Load	IRC Class 70R, Class A
Net bearing capacity of soil	490 KN/m ²
Design Discharge	34 m ³ /s
Minimum Clear waterway	25.00 m
Grade of Concrete	
In superstructure	M 35
In substructure	M 25
In foundation	M 25
Grade and Quantity of Reinforcing Steel	TMT having characteristic of strength of 500 N/mm ²

Source: Draft Design Report of Jalbire Bridge, 2015

2.6.3 Impact Area Delineation

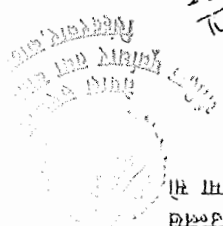
Based on the environmental impacts likely to be resulting from the implementation of the project, the project-impact areas are classified as in Table 2-2.

Table 2-2: Impact Area Delineation of the Project

Direct Impact Areas	Project implementation site, the adjacent land plots, built up structures, houses and property within 500 m from the project site
Indirect Impact Areas	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 borrow 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 VDC i.e., Chandibhanjyang VDC, Chitwan District

20/05/2020

20/05/2020



उपरोक्त संस्था में-बालावर्ग तथा सामाजिक शाखा, सड़क विभाग प्रकाशित रहे की Jalbire Bridge (Narayanghat-Muglin Road), Chitwan की भारतीय वातावरण परीक्षण (IEE) की कार्यवाही नेपाल सरकार (संविदा) की दिनांक 2072/1/22 की नियमानुसार कार्यवाही में चल रही है।

20/05/2020

श्री सड़क विभाग, बालावर्ग तथा सामाजिक शाखा, प्रकाशित, सड़क विभाग।

विषय: भारतीय वातावरण परीक्षण (IEE) की कार्यवाही प्रकाशित भएको सम्बन्धमा।



०७२/०७/२३

०७२/०७/२३

श्रीतक पूर्वा तथा आन्तरिक मन्त्रालय

नेपाल सरकार



CHAPTER-3: PROCEDURES TO BE ADOPTED WHILE PREPARING THE REPORT

The IEE approach, methodology and procedure generally follow the provisions of the EPA and EPR. In this connection, following approach and methodology will be adopted during the IEE report preparation.

3.1 Desk Study and Literature Review

Various information and useful data from reliable sources related with the project's IEE study will be 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 of the Jalhira Bridge Project will be reviewed to determine the nature and scope of activities of the project. Similarly, pertinent sources of secondary information will be 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 Chitwan, 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 will also acquire from DHM.

Map Reading: Reading maps of different types like topographical maps, geological maps and Google maps will build preliminary acquaintance with the general environmental setting of the project area. Similarly, geographical boundary of the influence area will be defined and delineated on the topographical map.

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

3.2 Field Study

The team of multidisciplinary experts (IEE study team) shall be deputed to carry out the field study to collect the baseline information on physical, biological, socioeconomic and cultural environment. Data related to land use stability, site-specific observation of air, water and noise quality and physiographic condition of the project area shall be collected through field study. The data on biological environment shall be collected through the sampling and field survey. To gather information on socio-economic and cultural environment of the project impact areas shall be collected through household's survey using questionnaire and checklist. Interaction and consultation meetings with the people of project impact area will be conducted during field visit.

3.3 Collection of Environmental Baseline Data/Information

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

Table 3-1: Baseline Data Collection Methodology

Data Requirement	Methods/Tools
Physical Environment	
Physiology, Topography, Land use type and land use classification	Remote Sensing and GIS (QGIS Brighton 2.6.1) analysis on the topographical maps published from the Department of Survey, Google image.
Hydrology - drainage network and drainage density	Remote Sensing and GIS (QGIS Brighton 2.6.1) analysis on the topographical maps published from the Department of Survey, Google image.
Geology - rock types and rock classification, seismicity, stability	Field Investigation / Direct Observation, Analysis of geological map as published by Department of Mine and Geology.
Soil Type and soil condition*	Field observation
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 project engineers, feasibility detail design reports
Information on burrow sites / tipping sites / stockpiling sites, camp sites etc.	Direct field observation / Interaction with project engineers, local stakeholders.
Traffic conditions	Direct observation, information from the stakeholders, traffic data from feasibility report
Chemical Environment	
Air Quality	Direct Field Observation and available secondary information
Water Quality	Field observation of Jalbire Khola water around project area
Biological Environment	
Vegetation analysis	Field enumeration / survey
Faunal Environment	Key Informant Interview (KII).
Aquatic Animals	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 will be collected through structured questionnaire survey.
Cultural sites and cultural activities, historical sites, foot trails etc.	Key informant survey, Direct observation of cultural and historical sites.

*Note: * Laboratory/ instrumental analysis is preferable but due to budgetary and time limitations, field observation shall be carried out.*

3.4 Data Analysis

The experts of the relevant field will analyze primary and secondary information qualitatively and quantitatively. Physical, chemical, biological, socio-economic and cultural information will be assembled and tabulated. The information will be cross-checked and analyzed by the respective

experts. The data will be processed using computer-based spreadsheet (Excel) and SPSS and will be presented in tabular and pictorial forms.

3.5 Impact Identification/ Prediction and Evaluation

The environmental impacts as a result of interaction between project activities and baseline condition will be identified in terms of beneficial and adverse impacts, type (direct/indirect/cumulative), 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 may be through checklist, matrix, network or overlaying methods by using GIS software application.

The environmental impacts shall be 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 shall be used for the quantification of the impacts. For the impact evaluation, the matrix method with numerical ranking shall be used for the quantitative ranking of the predicted impacts. Significance of the identified and predicted impacts will be evaluated using the numerical values as proposed in the National EIA Guideline 1993. The environmental impacts identified during the preparation of ToR are categorically listed in Chapter-7.

3.6 Public Involvement

The local people in project area, concerned government organizations, local NGOs, CBOs, etc., will be consulted during IEE study. In accordance with the Rule (7.1) of Environment Protection Rules, 1997, a 15-day public notice will be published in a national daily newspaper. Furthermore, the copies of public notice will be pasted at public places of project area and their evidences (Mushaka) will be collected.

The following organizations will be 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 wards VDCs i.e., Chandibhanjyang VDC will be collected for the environmental clearance and implementation of the project.



CHAPTER-4: POLICIES, LAWS, RULES AND MANUALS TO BE TAKEN INTO ACCOUNT WHILE PREPARING THE REPORT

Relevant legal measures including the constitution, acts and regulations, policies and plans, manuals and guidelines, standards and conventions will be reviewed during the course of IEE study. Such relevant legal measures are listed in the following sub-sections. Any such measures, not listed here, if found to be relevant for the environmental safeguard of the project, will also be reviewed and presented in the IEE report.

4.1 Constitution

- Constitution of Nepal, 2072 BS (2015 AD)

4.2 Acts and Regulations

- Environment Protection Act, 2053 BS (1997 AD)
- Environment Protection Rules, 2054 BS (1997 AD)
- Solid Waste Management Act, 2068 BS (2011 AD)
- Solid Waste Management Regulation 2070 (2013 AD)
- Labor Act 2048 BS (1992 AD)
- Local Self-Governance Act 2055 BS (1998 AD)
- Public Road Act, 2031 (1974)
- Forest Act, 2049 (1993)
- Forest Rules 2051 (1995)
- Aquatic Animal Protection Act 2017 (1961)
- National Foundation for the Development of Indigenous Nationalities Act, 2002
- Land Acquisition Act 2034 (1977)
- Child Labor Act 2056 BS (2001 AD)

4.3 Policies and Plans

- National Transport Policy 2058 BS (2001 AD)
- Nepal Environmental Policy and Action Plan, 2049 BS (1993 AD)
- Three Years Interim Plan 2070/71-2072/73

4.4 Manuals/Guidelines/ Directives

- Environmental and Social Management Framework (ESMF) D6R2064 BS(2007) with Addendum for Bridge 2013 (Revised for Bridge)
- National Environmental Impact Assessment Guidelines 2050 BS (1993 AD)





- Bridge Inspection Manual, 2005
- Bridge Construction Manual, 2005
- 4.5 Standards**
- National Standard about Noise Level 2069 BS
- National Ambient Air Quality Standard 2012 AD
- Nepal Road Standard 2070 BS
- Nepal Bridge Standard 2067 BS
- 4.6 International Conventions and Treaties**
- Convention on Wetlands of International Importance (Ramsar Convention), 1971.

CHAPTER-5: RESOURCE REQUIREMENT FOR THE STUDY

5.1 Time Requirement

The IEE study is estimated to be complete in two months (8 Weeks) after approval of ToR. The time schedule for the IEE study is presented in Table 5-1.

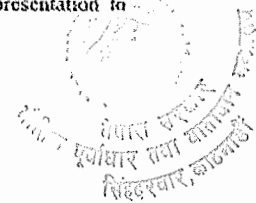
Table 5-1: Estimated Time Required for IEE Study

S.No	Activities	Weeks							
		1	2	3	4	5	6	7	8
1	Desk Study and Literature Review	■							
2	Public notice publication		■	■					
3	Field study and Consultation/Interaction with community			■					
4	Data Analysis and interpretation				■	■			
5	Draft report preparation						■		
6	Comments on draft report							■	
7	Final Report preparation and Submission								■

5.2 Human Resource Requirement

Following team of experts (with their input time in days) will be collectively responsible for the overall completion of IEE study and its subsequent report preparation, including presentation to Mo/PT and incorporation of comments.

- Team Leader (IEE) / Environment Expert (30 days)
- Socio-economic Expert (10 days)
- Civil / Bridge Design Engineer/ (7 days)
- Geologist (7 days)





CHAPTER-6: DELETED

Tor for Heb of Jubilee Bridge

CHAPTER-7: SPECIFIC IMPACTS ON THE ENVIRONMENT DUE TO IMPLEMENTATION OF THE PROPOSAL

Impacts will be identified, predicted and evaluated by considering the projects activities on the physical, chemical, biological and socio-economic environmental condition of the project site. Impacts will be analysed with quantified information of likely changes, alteration, and losses and are assessed based on characteristics of existing condition and sensitivity of environmental aspects. Impacts that are not identified at present level, if identified during course of IEE study, will be promptly considered for and included in the IEE report. The project activities that will be responsible for the impacts in the project area and their likely impacts are categorically listed in the following sections.

7.1 Project Activities

7.1.1 Pre-construction Phase

- Regulatory Permissions (including those related to labour)
- Plant sites-location layout and facilities
- Land and/or Property acquisition
- Preparation of Environmental Management Plan including:
 - Work site safety management (including traffic safety and management; worker safety issues and public safety aspects, including training sessions offered to labours and report of any incidents/accidents affecting workers or the public, their root causes and measures to be taken to address the root cause and prevent future incidents),
 - Occupational health and safety plan
 - First aid and Emergency response arrangements
 - Quarry area management plan (including identification)
 - Other material source management plan
 - Water use and source management plan
 - Labour (Number and Facilities)
 - Material Storage/Stockpiling (including management of toxic/hazardous materials) area management plan
 - Machinery, Equipment and vehicle maintenance plan
 - Pollution management (air, water, noise and soil) (including dust control) plan
 - Drainage (temporary and permanent) management plan
 - Fragile slope management and erosion and silt control plan
 - Spoil management plan (including identification of disposal areas and rehabilitation)
 - Preparation of measures to prevent damage to flora and fauna
 - Monitoring of water quality and any impact on aquatic wildlife downstream of construction sites
 - Preparation of Compliance and Impact Monitoring Plan
 - Public utilities/facilities (including issues related to disruption to access or services, damage to common property resources and their rehabilitation and relocation plan.
 - Grievance received during reporting period and proposed measures to respond to resolve them. (Grievance Redress Mechanism).

7.1.2 Construction Phase

- Site clearance, including demolishing of public and private structures, vegetation removal.
- Transportation of Construction Materials

- o Operation of Construction Machines / Equipment's (Operation of rolling machine, asphalt/concrete Plant, Hot mix Plant; etc.)
- o Land Clearance and Land Preparation
- o Excavation, Fresh Cut, Dredging and Drilling
- o Quarry site construction and operation
- o Blasting, Work on Quarry rock break up
- o River Diversion / River training
- o Material Stockpiling
- o Operation of Power Generators
- o Camp (labors and Contractor) site operation
- o Spoil Disposal
- o Waste Generation and Disposal
- o Concrete Mixing
- o Erection of Piers and Abutments
- o Handling of petroleum and acid
- o Vehicular Operation during bridge construction
- o Use of fuels (fossil/biomass) for construction activities
- o Use of Fuels for camp operation

7.1.3 Operation Phase

- o Regular/Periodic maintenance of the project (Bridge)

Environmental Issues/Impacts likely to be resulting from the Implementation of the Project are summarized in the following sections

7.2 Beneficial Impacts/Issues

7.2.1 Construction Stage

- o Employment Generation
- o Enhancement of technical skills
- o Public awareness

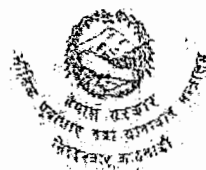
7.2.2 Operation Stage

- o Improved Mobility
- o Reduce cost

7.3 Adverse Impacts/Issues

7.3.1 Pre-Construction Phase

- o Land Acquisition
- o Psychological fear due to loss of land and property
- o Public grievances related to loss of land and property



7.3.2 Construction Stage

7.3.2.1 Physical Environment

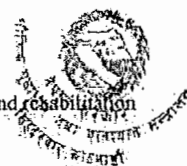
- o Change in morphology, longitudinal profile/river bed and hydrological character of regime of river and inundation in the upstream section
- o Change in land use and loss of productive soil
- o Landslides, slope destabilization and soil erosion
- o Management and operation of quarries and borrow pits
- o Spoil and construction waste disposal
- o Water flow diversion
- o Pollution of water resources
- o Change in river regime
- o Approach road and related issues
- o Road diversion and related issue
- o Contamination of soil
- o Stockpiling of materials/issues related to stockpiling yard
- o Air and noise pollution
- o Combustible and toxic material management
- o Use of bitumen
- o Work Camp location and management

7.3.2.2 Biological Environment

- o Clearing of forest, and habitat destruction and loss
- o Impact on Aquatic Life
- o Disturbance to wildlife and biodiversity
- o Damage to aquatic habitat, and barriers to fish/aquatic movement/migration

7.3.2.3 Socio-economic and Cultural Environment

- o Occupational health and Safety of workers
- o Influx of workforce (Construction Crews) into the project areas.
- o Social Conflicts
- o Obstruction to social services and facilities
- o Accidental risks
- o Impact on private and public properties
- o Public grievance related to project construction
- o Loss of productive land
- o Land and property acquisition, compensation, resettlement and rehabilitation
- o Disruption of community structure and livelihood
- o Conflict in or with nearby host communities
- o Damage of community infrastructures
- o Impact on vulnerable indigenous people and Dalits
- o Occupational health and safety of workers



- Impact on cultural, religious and historical assets
- Impact on landscape aesthetics

7.3.3 Operation & Maintenance Stage

7.3.3.1 Physical Environment

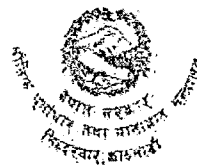
- Air pollution
- Noise and Vibration
- Backwater Effect During Floods
- Riverbank Erosion
- Water pollution due to washing of vehicles nearby the river due to availability of existing diversion through river bed
- River Channel Shifting
- Stockpiling of materials during bridge maintenance

7.3.3.2 Biological Environment

- Barrier Effects on Aquatic animals due to piers and abutments.

7.3.3.3 Socio-economic and Cultural Environment

- Congestion around the adjoining areas of Bridge Abutment



CHAPTER-8: ALTERNATIVES FOR THE IMPLEMENTATION OF PROPOSAL

The study will consider different project alternatives for the selection of the best option to achieve the sustainability of the proposed development works. Following will be the significant alternatives to be considered during the study.

8.1 No Project Alternative

The IEE study shall compare and examine the alternative of not implementing the project and its implication. The alternative analysis will be basically evaluated from two perspectives: (i) whether the project goals could be met without having implemented the project and (ii) Alternative of not implementing the project and its environmental implications.

8.2 Alternative Design

Alternative designs for the Jalbire Bridge will be examined and analysed to select most appropriate design of the proposed project so that the bridge caters best of its services to the project area. In doing so, environmental consideration and safety point of view will be given due considered and accordingly analysed.

8.3 Alternative Sites

Alternative sites for the bridge will be considered and studied in the process so as to avoid significant environmental impacts and project's sustainability.

8.4 Alternative to Technology, Construction Method, Time Period, and Raw Materials

The study will analysed different technology, procedures of operation, time - schedule and raw materials to be used to select the best alternative among them. The technological alternatives will include fully mechanized, semi-mechanized, labour-intensive, labour-based etc. process of proposal implementation.

Procedures of construction will be assessed in terms of round the year construction and seasonal construction of the bridge; Alternative resources required for the proposed works, cement, steel, gabion boulders, gravel, earth, sand, bioengineering sapling will be assessed.

8.5 Other Matters

The study will also consider the conditions if the desired objectives of the project could be effectively met with the alternatives of the bridge project. Any other alternative matters with its environmental implication, if identified during later stages of project development, will also be analyzed and presented.



CHAPTER-9: MATTERS CONCERNING THE PREVENTION OF THE IMPACTS OF IMPLEMENTATION OF THE PROPOSAL ON THE ENVIRONMENT

proposal on the environment. The IEE report will present the mitigation measures for all the identified significant impacts and incorporate them in the report. Site-specific benefit augmentation and mitigation measures will be proposed to optimize the benefits expected from the sub-project and minimize/mitigate avoid or control of proposal's adverse impacts. The benefit augmentation and mitigation measures will be selected based upon appropriateness and cost analysis and these will be suggested for pre-construction, construction and operation and maintenance phase of the project. Mitigation measures with cost will be proposed for the impacts on physical, biological, socio-economic and cultural, chemical environment. The IEE report will propose the organizational structures and agencies to be consulted while implementing the mitigation programs. For this purpose, every statutory requirement shall be strictly followed.

In general, the following area will be covered while preparing mitigation and enhancement measures.

- ✓ Protective measures
- ✓ Compensatory measures
- ✓ Rehabilitation Measures
- ✓ Enhancement Measures

IEE report will also present the Environmental Management plan for the likely impacts resulting from the project implementation. The plan include activity, impacts, mitigation and enhancement measures, organization responsible for the implementation of the mitigation measures and monitoring activities, schedules, cost and mode of co-ordination with the line agencies and local people. The EMP will also identify the human resources require of the monitoring and mitigation works, quantify the man-month schedule and develop an action plan for all identified measures. The plan shall also consist of monitoring procedure especially the mechanism for compliance monitoring by spelling out the responsibilities of each concerned stakeholders.



CHAPTER-10: MATTERS TO BE MONITORED WHILE IMPLEMENTATING THE PROPOSAL.

To monitor the impacts of the proposed project on physical, biological, socio-economic and cultural resources of the area, an environmental monitoring plan shall be formulated. This chapter describes the monitoring parameters (what should be monitored), monitoring schedule (when monitoring should begin), location (where monitoring will occur), methods (which methods should be employed), responsible agency for monitoring and cost of monitoring.

The monitoring plan will include the following aspects:

- Baseline, compliance and impact monitoring in terms of the physical, biological, Socio-economic and cultural environment.
- Compliance and impact monitoring shall include parameters, indicators, methods, schedules and locations, while compliance monitoring shall include parameters, indicators, methods and schedules and agency responsible for monitoring.
- Compliance and impact monitoring shall be categorized in terms of construction and operation phases.



CHAPTER-11: OTHER NECESSARY MATTERS

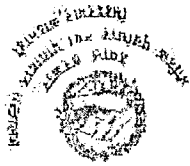
The report shall include all cited information, reference lists, maps, graphs, photographs, tables and charts, graphs, and questionnaires used during the IEE study as per the EPR '97. The IEE Report will be prepared based on Schedule-5 (pertaining to Rule 7) of the EPR '97.





Annexes





Annex A: Checklists for Environmental Baseline



Annex A1: Checklist for Physical and Chemical Environment

A. Topography/Physiography

- o Study of Topographic maps/ other available maps and identify the ground topographic characteristics of land covered by the proposed bridge project.
- o Verify the topographic characteristics of the land in the field
- o Soil Type

B. Climate and Hydrometeorology

- o Study of published data regarding temperature, and precipitation
- o Hydrological analysis: flow duration curve, flood frequency analysis.

C. Air Quality

- o Collect any data on air quality of the area from previous literature
- o Investigate on the air polluting activities of the area (traffic, biomass burning, industries, other anthropogenic activities)

D. Erosion and land Stability

- o Identification of erosion prone area in the vicinity of bridge site
- o Investigate the erosion features and potentials of the Jalbire Khola and its tributaries

E. Land Use

- o Investigate on the land use of the Project Blocks from the topo-maps, and other available land use maps.
- o Investigate the land use affected by the project structures and subsidiary facilities
- o Investigate on the land use potentials of the proposed project area.

Annex A2-BE: Check List for Biological Environment

A. Vegetation Analysis

- o **Wood Stock:** The vegetation lying within the directly affected area (areas required for construction and placement of spoils or other infrastructure facilities), particularly tree species shall be inventoried, for trees above 10 cm DBH for wood stock.
- o **Wildlife** around the project area.
- o **Aquatic Life:** Number and types of macrophytes, and macro-invertebrates and aquatic vertebrates

Annex A2-SCE: Check List for Socio-economic and Cultural Environment

- o Demography, economy and social services of project area from CBS, VDC etc. will be collected to prepare Secondary Information will be collected. Likewise primary, socio-economic and cultural information of project influence area using structured questionnaire and checklist. IEE Report will consider following socio-economic and cultural characteristics of the project impact areas.

- o Demographic Characteristics
- o Caste and Ethnicity
- o Religion and Culture
- o Occupation/Income Sources
- o Settlements and Housing patterns
- o Migration Pattern
- o Public Health and Sanitation
- o Drinking Water Supply
- o Education and Literacy Status
- o Infrastructural Facilities
- o Energy Use
- o Available transportation facilities
- o River Crossing Facilities
- o Availability of Health Care and Educational Facilities
- o Business and Industries
- o Religious, Cultural, Historical and Archaeological sites
- o Non-governmental Organization and Activities
- o Government Service Facilities
- o Perception of people about the project



Annex A 2: Checklist for Identifying Project's Ancillary Structures and their Environmental Features

Bridge Name:

Bridge Location:

1. Camp Site:

- Location from the Bridge Axis:
- Available Area:
- Land Ownership:
- Other Environmental features (Water Bodies, forest, Nearby settlements etc) from the camp site:

2. Material Stockpiling Areas

- Location from the Bridge Axis:
- Available Area:
- Land Ownership:
- Other Environmental features (Water Bodies, forest, Nearby settlements etc.) from the stockpiling area:

3. Quarry Site

- Location from the Bridge axis:
- Distance:
- GPS location:
- Type and Volume of available quarry materials:
- Surrounding Environmental Features (Water Bodies, forest, Nearby settlements etc.):
- Potential Unstable areas around quarry sites:
- Foundation Excavation Site Conditions:
 - Bed Rock (.....), Soil/Rock Mix (.....), others (Specify) (.....)
 - Foundation Excavation Need: Trees Removal (Yes/No)
 - Quantity of foundation excavation works (m^3):
 - Quantity of Materials to be disposed (m^3):
 - Site of Surplus materials safe Disposal:

4. Spoil/Waste Disposal Site

- Location from the bridge axis:
- Nearby Environmental Features:

5. Hazardous Material Yard

- Location from the nearby settlements:
- Nearby environmental Features:

6. Methods of Disposal to be practiced:
- Tipping following by levelling.....
 - Simply side cast.....
 - Side cast with toe wall etc.

7. Availability of Public utilities in project impact areas

Public utilities	Location from the project area (U/S and D/S) (Specify the distance from the project location)	Number of User's Households
Water Supply System		
Irrigation canal		
Electricity Poles		
Schools		
Temples/Stupa/Churches/Mosque		
Chautari		
Cremation sites		
Embankment Structures		
Cross Drainage Structures		
Other social features (Specify)		

8. Relocation Common Property Resources (CPR)

- Electricity Poles.....
- Water supply system.....
- Irrigation pipe.....
- Chautari.....
- Others Specify.....

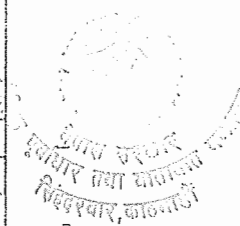
9. Existing Water Use (Within project Impact Areas).....

10. Existing Land Use (Within project Impact Areas).....

11. Nearby Natural Hazards

- ✓ Type.....
- ✓ Nature.....
- ✓ Dimension.....

12. Other Environmental Issues Associated With River Banks.





Annex A3: Questionnaire for Household Survey



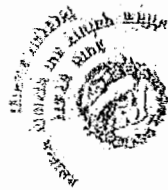
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1. გვერდი

გვერდი



१. यह प्रमाणित है कि निम्नलिखित व्यक्ति/व्यक्तियाँ

२. के द्वारा प्रमाणित किया गया है कि वे

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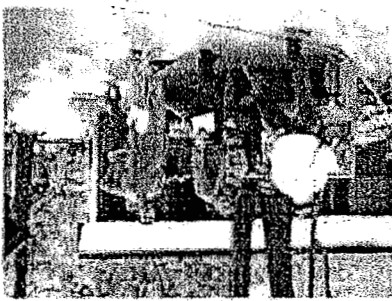
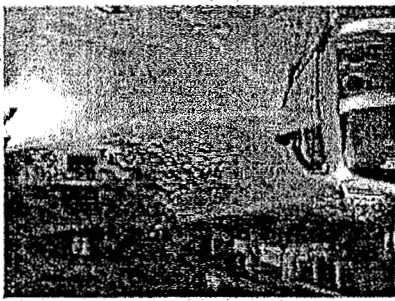
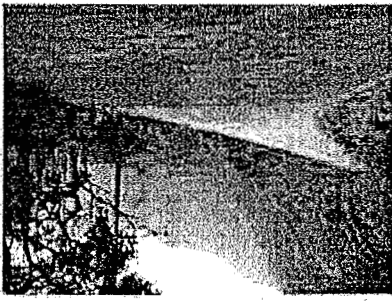

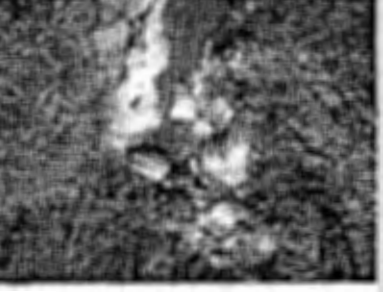

५. के द्वारा प्रमाणित किया गया है कि वे

६. के द्वारा प्रमाणित किया गया है कि वे

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- निम्नलिखित व्यक्ति/व्यक्तियाँ





<p>Photo 6: Consultation with local people</p> 	<p>Photo 5: Access road to Lamo Jharana and Jethhakamau</p> 
<p>Photo 4: Access Road</p> 	<p>Photo 3: Jal Devi Durga Mata Temple</p> 
<p>Photo 2: Jalbire River</p> 	<p>Photo 1: Existing Jalbire Bridge</p> 



Annex B: Public Notice



சுமரி

[illegible]

It is worth noting that the authors of the paper do not provide any evidence to support their claim that the results are not due to the fact that the sample is not representative of the general population. The authors state that the sample is representative of the general population, but they do not provide any evidence to support this claim. This is a significant flaw in the paper, as it undermines the validity of the results.



ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED

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$$(2\text{Al} + 6\text{HCl})_{\text{aq}} = 2\text{AlH}_3(\text{OH})_3 \text{ жб. } 2\text{H}_2\text{O} \text{ илде } 2\text{H}_2\text{HCl}$$
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DATE: 10/10/2012 10:10 AM

1980年，在江蘇省江浦縣、六合縣、儀徵縣、高郵縣、金壇縣、溧水縣、溧陽縣、句容縣、丹徒縣、揚中縣、江都縣、泰縣、東台縣、興化縣、寶應縣、靖江市、如皋縣、海門縣、啟東縣、崇明縣等縣市的調查中，發現了許多新的植物種和變異型。這些新發現的植物種和變異型的分布區域如下：

1994-1995 年 12 月 1 日至 1996 年 12 月 31 日止的 1 年 12 个月期间的损益表。

[illegible]

1960-1961 1962-1963 1964-1965 1966-1967 1968-1969 1970-1971 1972-1973 1974-1975 1976-1977 1978-1979 1980-1981 1982-1983 1984-1985 1986-1987 1988-1989 1990-1991 1992-1993 1994-1995 1996-1997 1998-1999 2000-2001 2002-2003 2004-2005 2006-2007 2008-2009 2010-2011 2012-2013 2014-2015 2016-2017 2018-2019 2020-2021

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1. 在下列各数中，找出所有能被 3 整除的数：(1) 12, (2) 15, (3) 18, (4) 21, (5) 24, (6) 27, (7) 30, (8) 33, (9) 36, (10) 39, (11) 42, (12) 45, (13) 48, (14) 51, (15) 54, (16) 57, (17) 60, (18) 63, (19) 66, (20) 69, (21) 72, (22) 75, (23) 78, (24) 81, (25) 84, (26) 87, (27) 90, (28) 93, (29) 96, (30) 99.

【关键词】 网络 网络成瘾 网络成瘾量表 网络成瘾量表-中国版

1997年12月10日，在北京市公安局东城分局的档案中，发现了一份关于“1997年12月10日，在北京市公安局东城分局的档案中，发现了一份关于‘1997年12月10日，在北京市公安局东城分局的档案中，发现了一份关于’”的档案。

1990年12月1日 星期一 (X) 1990年12月1日 星期一 (X) 1990年12月1日 星期一 (X)

[illegible][illegible]

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ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

10. The following are the names of the persons who have been appointed as members of the committee:

	INDEX	INDEX OF NAMES
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Kunthwa Engineering and Consultancy

Co., Ltd. Korea, in association in the form of

U.S. AIR FORCE

FROM (P) LTD, Nepal

[illegible]

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Annex C: Deeds of Inquiry (Muchulka)





गाउँ विकास समितिको कार्यालय
OFFICE OF THE VILLAGE DEVELOPMENT COMMITTEE

चण्डीभञ्ज्याङ, चितवन, नेपाल
Chandibhanjyang, Chitwan, Nepal

प.सं./Letter No.: ०६२/०६२

स्था.: २०४७/Estd.: 2047 B.S.

द.नं./Dis. No.: १६१

मिति/Date: २०६२/१२/१६

विषय/Subject: सूचना दैँस गरिएको गरि।

श्री/Shree... श्री वातावरण तथा सामाजिक शाखा
सडक विभाग, पाटन (गाल्तिगुप्प)

उपरोक्त सम्बन्धमा मुग्लीन नारायणका सडक (वडा नम्बर १) अन्तर्गत जलविह्रे मा निर्माण हुने पुलको लागि मागिएको वातावरणीय प्रभावको सम्बन्धी सर्पसम्बन्धी सूचना यस कार्यालयको सूचना पत्रमा दैँस गरिएको बाहेर जान-कारीको लागि अनुरोध गरिन्छ ।

२०६२/१२/१६
स.वि.स. अधिकारी

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संज्ञा संज्ञा संज्ञा

Annex D: Recommendation Letter





गाउँ विकास समितिको कार्यालय
OFFICE OF THE VILLAGE DEVELOPMENT COMMITTEE

चण्डीभञ्ज्याङ, चितवन, नेपाल
Chandibhanjyang, Chitwan, Nepal

प.सं./Letter No.: ८०२/०५५
च.नं./Dis. No.: १६६

स्था.: २०४७/Estd.: 2047 B.S.

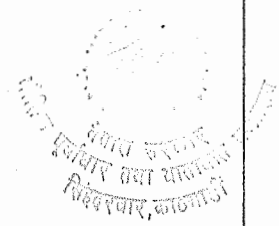
मिति/Date: २०७२/१०/१८

विषय/Subject: सिङ्गरिस गरिएको कोरे।

श्री/Shree... भू-वातावरण तथा सामाजिक शाखा
सडक विभाग पाटन (गण्डकपुर)

अपरोक्ष सम्बन्धमा भुक्तानी नगराएका सडक
अन्तर्गत यस गा.वि.स. को वडा नं. ५ जलबिरे को पुल
निर्माण गर्ने वातावरणमा राम्रो प्रभाव नपरे तर जल
सिँदै डेली चण्डीभञ्ज्याङ जाने बाटो सडक लाई असर
गर्ने रूखले पैदा रोकथामको अभाव उपलब्ध गरी
सुझना कार्य-काल गर्न सिङ्गरिस गरिएको ठपठान
अनुरोध गरिन्छ।

२०७२/१०/१८
गाउँ विकास समिति





Annex E: Minutes of Public Consultation

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
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 3. 1.6.15 8
 4. 1.6.15 6
 5. 1.6.15 13

Handwritten signatures:

Handwritten numbers: 101772 101109





Annex F: Questionnaires for Household Survey

क.सं.	प्र.सं.	लगाव नोंदीस)	मॉडेल कितीच न अन्य-सुलभ नोंदीस)	एकामेक परिचय संयुक्त परिचय विवरणित परिचय
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२. प्रत्येक विवरण

२.१. पारिवाहिक विवरण

क.सं.	वर्गीकरण सदस्यतेचे वर्गीकरण	वर्गीकरण म.	वर्गीकरण म.	वर्गीकरण (२४ घंटे)	वर्गीकरण (२४ घंटे)	वर्गीकरण (२४ घंटे)	वर्गीकरण (२४ घंटे)	वर्गीकरण (२४ घंटे)	वर्गीकरण (२४ घंटे)
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१८.	१८	१८	१८	१८	१८	१८	१८	१८	१८
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संकेत :

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३. अथवा ३१२२

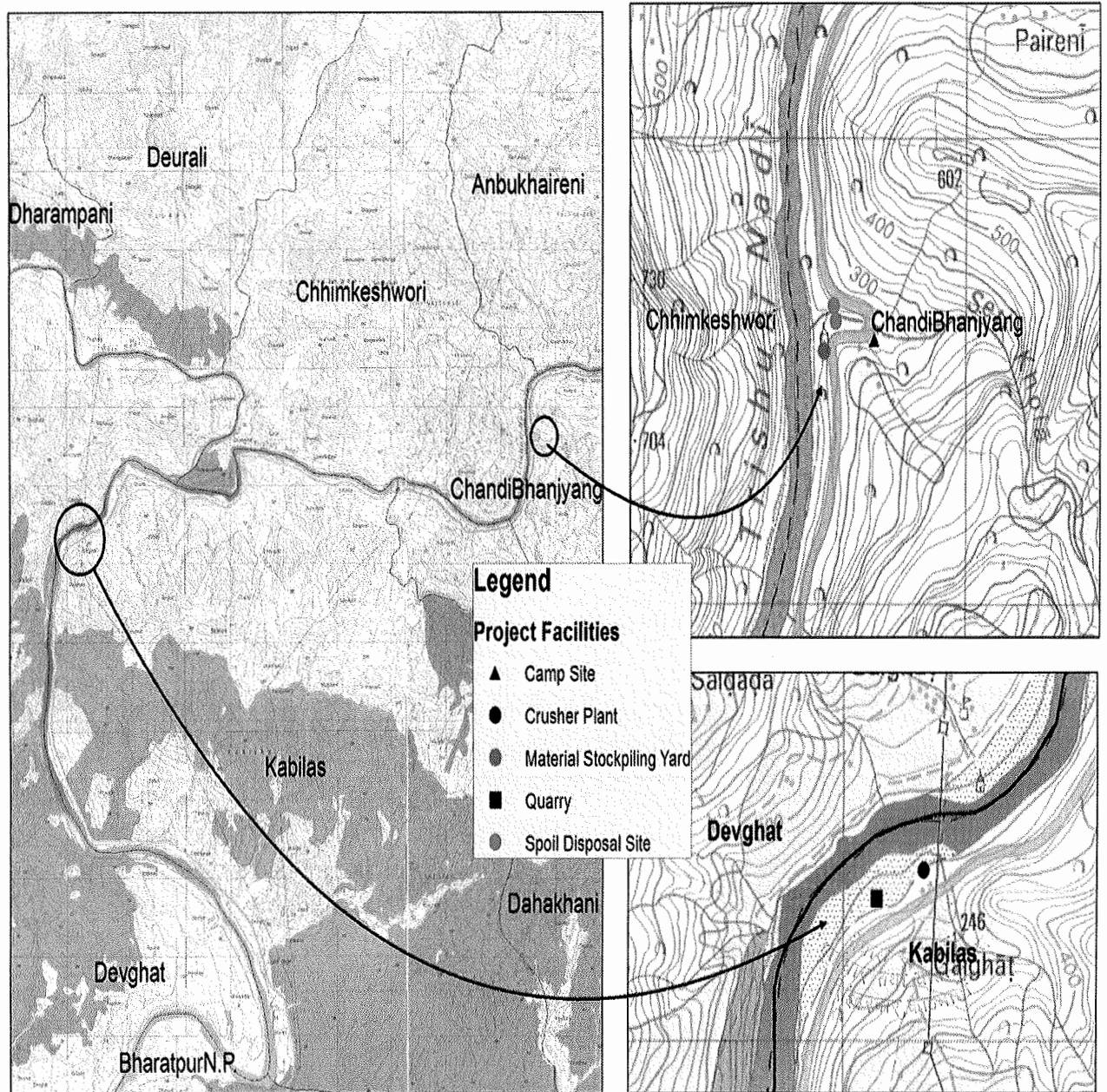
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५. परिचय पत्रिका







Annex G: Project Facilities in Topographic Map

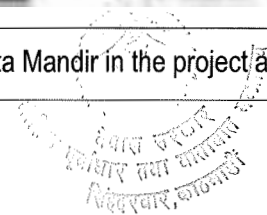






Annex H: Photographs

	
Existing Bridge	Proposed Location for new bridge construction
	
Pasting public notice in the nearby settlement	Consultation with the local people
	
Way to the tourism site in the project area	Jal Devi Mata Mandir in the project area





Comments Incorporation Matrix

S.N.	Comment	Incorporation Section	Remarks
Environmental Aspects			
1.	Revisit Area delineation DIZ, IIZ and ZOI (DIZ is 500 m surrounding, IIZ is adjoining ward no of both sides, ZOI is affected VDC/Municipality)	Section 4.3, Table 4-1, page number 11	
2.	Submit the clear Topo Map including delineation area if possible color Map	Topomap included in Figure 3-2, page number 5	
3.	Page: 3, missing amount, page:11, add public utilities issues in physical aspects. Page - 13, Section Hydrology, Add information drainage and flood pattern information, Page:45, Add labor camp, Page:46, Add- Bridge safety, Occupational health and safety, Congestion around the adjoining area of Bridge Abutment (operation phase) etc.	For missing amount table 3-1, public utilities table 4-2, pg. 11; hydrology section 6.1.6, other issues chapter 7.	
4.	Page 16, Mention clause of Solid Waste Management Act & Rule. Explain it. Public Road Act, 2031(1974),. Review World bank, (EA-OP.01), Natural Habitats (OP-4.04),Forestry (OP.4.36), ESMF, 2007, Environmental Management Guidclincs, GESU/DoR, July 1999.	All the suggested act, rules, policies are incorporated in chapter 5	
5.	Follow the Addendum ESMF, 2013 (Bridge Related site specific issue)		Addendum ESMF, 2013 was followed during report preparation
6.	Add issue: Adverse impact Construction Phase <ul style="list-style-type: none"> Sand and gravel extraction Degradation of water quality Bridge safety 	All the suggested issues are incorporated in chapter 7, section 7.2.1	

	<ul style="list-style-type: none"> • Transportation of construction materials • Approach road for bridge construction areas • River flooding and bank erosion at both banks of river • Occupational Health safety <p>Operation Phase</p> <ul style="list-style-type: none"> • Encroachment of DIZ area of Bridge • Scouring/ Congestion around the adjoining area of Bridge abutment • Embankment erosion • Reinstatement of environmental component (stockpiling Yard, labor/ Contraction camps, quarry etc) 		
7.	<p>Add the bridge related Act, Rules, Policies and Manuals:</p> <ul style="list-style-type: none"> • The Aquatic Animal protection Act, 1961, • Bridge policy , 2005, • Bridge maintenance manuals, 2005, • Environmental assessment (EA)(OP 4.01), cultural property (OPN:11.03) World Bank and other related 	All the suggested act, rules, policies are incorporated in chapter 5	
8.	<p>Training/Awareness</p> <ul style="list-style-type: none"> • River training • Protection of river • Protection of embankment(bioengineering), etc. 	Incorporated in table 10-5 and 10-6	
Social Aspects			
9.	Include Muchulkas & Recommendation letter of affected VDCs published notice	Incorporated in annex B, C and D	
10.	Table of content should as per EPR – 1997	Table of content as per EPR 1997	
11.	Include filled sample checklist	Filled checklist attached in annex F	
12.	Include approved letter of ToR	Approved letter of ToR attached in	

		annex A .	
13.	Baseline/impact/mitigation/monitoring should be correlated and described as phase wise		Baseline/impact/mitigation/monitoring are related to one another and described phase wise
14.	Revisit the chapter 9.1 and 10.1		Revisited
15.	Clarify some line and word like ESMF-Dolidar, group judgment, ethnicity, etc.		Clear meaning of ESMF included in various part of report. Words like Dolidar and group judgment are removed from the report.



Comment Incorporation Matrix (MoPIT)

S.N.	Comments	Incorporation Section	Remarks
1.	The baseline information, impact identification, mitigation measures, mitigation cost and monitoring chapter shall be compatible to each other		All the suggested chapters are compatible to each other.
2.	List of acronyms are missing, rewrite the objectives of IEE. Add the figures of alternative analysis of the project		List of acronyms is included in the list of abbreviations and acronyms.
3.	What are the construction activities, construction planning and methods? Mention the resources required (specific materials) for the project implementation and list the quantity source and capacity of quarry site	Section 3.3.5	
4.	Include project layout in an original colored topographic map distinctly showing road alignment, affected VDCs and their boundaries, location of camp sites, quarry site, disposal sites, batching aggregate crushing and storage facilities.	Annex G	
5.	Differentiate the forest and land into national, community and private with its specific area. Change the cover page. ToR should be fully comply	Refer table 3-2 for breakdown of land use.	Report fully comply with ToR.
6.	What about the mitigation on replantation? Mention the particular area for replantation with specific species. Also add the market value and timber volume of the respected trees.	Visit page number 59, mitigation measures for clearing forest for replantation. Timber volume and market value are presented in section	

		6.2.1 third bullet.	
7.	Add the project cost and in conclusion it is written about karnali issues, so correct it.	Issue of Karnali has been corrected in the conclusion of Nepali executive summary.	
8.	Differentiate the forest and land into national, community and private with its specific area. Add the study team members. Issues about social conflict is confusing, so correct it.	Refer table 3-2 for breakdown of land use. Issues about social conflict corrected.	
9.	Correct spelling and grammatical errors throughout the report		All the spelling and grammatical errors are corrected.
10.	Review current/relevant laws, act, plan and policies, guidelines, etc.	Chapter 5	
11.	Rewrite the cover page (remove the topmost portion)		Suggestion incorporated
12.	In page 1, replace sub section 1.1 with "proponent" along with their address, phone number and email and add sub section 1.2 as "consultant"	The Section 1.1 has been replaced and section 1.2 has been added. Page 1	
13.	In salient features it would be better to add total project cost of the project along with the cost breakdown for EMP and mitigation	Section 3.1 (pg. 6)	
14.	Correct the area of required land with 0.347 ha in page no. 6 and remove total 0.257 ha from table 3-2 in page no. 7	The required land area has been corrected. Section 3.3, sub-heading 3.3.1, Table 3-1, Page 6-7.	
15.	Mention the distance of the bridge from the nearby highway		The comment is not relevant since the entire document reveals that the bridge will be

			constructed along the Narayanghat-Muglin Highway.
16.	It would be better to replace the word "can" with "will" in page 8 (construction material, water requirement...)	The word "can" has been replaced with the word "will". Section 3.3, sub-heading 3.3.5, Page 8.	
17.	It would be better to explain the activities that will be conducted by project for safe management of liquid and semi-liquid wastes (page9)	Refer page number 56, top most bullet, second and third point.	
18.	It would be better to mention whether the design of bridge is earthquake resistant or not	Last line section 2.4.	
19.	Study team members are missing	Section 4.8 (pg. 16)	
20.	In chapter 5, the review should be done in systematic way, i.e. plan, policy, act, regulation, guidelines, standard, convention and so on. Date should be removed from constitution of Nepal	Visit Chapter 5	
21.	In the same chapter, the standard for generator and vehicle emission is missing	Suggested standards have been reviewed.	
22.	In page, demographic characteristics, the number of male and female population should be corrected in comparison to number of population	The number of male and female has been corrected. Section 6.3, sub-heading 6.3.1.1, page 38.	
23.	The date of CBS should be corrected as 2011 (page 39)	The date has been corrected. Section 6.3, sub-heading 6.3.1.3, Page 39.	
24.	Existing condition of road and bridges in the project affected area should be	Information on existing condition	

	included	road in mentioned in section 2.4.	
25.	In page 40, sanitary facilities, it is written that the number of households having toilet is 89% but in page 41, in health and sanitation, it is written that the VDC was declared as ODF, these two sentences contradict with each other	The suggestion has been incorporated. Section 6.3.1.5 and 6.3.2.5.	
26.	It would be better to mention that how old are the temples (Jal Devi Mata and Icchhakamana) and how far are they from the project area in page 41 as the projects going to construct nearby the historical and culturally important places need to do EIA as per EPR	Visit section 6.1.12. The temple is of recent origin and do not have any archaeological and historical importance. (Ichha kamana temple will not be affected)	
27.	The impacts should comply with that of approved ToR		All the impacts comply with ToR
28.	In page 61, the monitoring part of the project should be added in the responsibility of MoPIT	Table 10-1, second row, third column, second bullet.	
29.	The number of trees going to be removed (as mentioned in page 38 and 49) differ and planted (as mentioned in page 92) doesn't comply each other so it seems to be revisited	The number of trees going to be removed has been made uniform. Number of trees to be planted has been corrected accordingly. Page 38, 49 and 92.	
30.	It seems to be like not any issues has been raised during public consultation so it should be mentioned clearly in the report	Issues raised during public consultation mentioned in section 7.3 and are addressed in subsequent chapters.	
31.	In result of household survey should be	Information from	



	explained in report.	household survey are explained in section 6.3.2.	
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