Initial Environmental Examination
of
Khahare Bridge (Chhinchu- Jajarkot Road)

Submitted By:

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Submitted to:

Ministry of Physical
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कार्यकारी सारांश

१.० प्रस्ताव

प्रस्तावित खहरे पुल छिन्चु-जाजरकोट सडक खण्ड अन्तर्गत सुर्खेत जिल्लाको राकम गा.वि.स. हुदै बग्ने खहरे खोलामा पर्दछ । यस आयोजनाले सल्यान, जाजरकोट, सुर्खेत र डोल्पाका वासिन्दाहरुलाई प्रत्यक्ष लाभ पुऱ्याउने देखिन्छ । यस खहरे खोला पुल निमार्णको प्रस्तावकको नाम र ठेगाना निम्न अनुसार रहेको छ ।

भू-वातावरण तथा समाजिक शाखा,

सडक विभाग,

चाकुपाट, ललितपुर
फोनः ०१-५००५५२०
ईमेलः gesunit@dor.gov.np

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

सडक क्षेत्र विकास आयोजना,

सडक विभाग,

सानो गौचरन, काठमाडौं

२.० प्रस्तावको विवरण

प्रस्तावित खहरे पुलको कुल लम्बाई ३१.२० मी.को हुनेछ भने यसको चौडाइ ११ मी. को हुनेछ । पक्की ढलान गरेर निर्माण गरिने उक्त पुलको दँया-बाँया थप १२० मी. सडक सुधार गर्नु पर्ने देखिन्छ । भौगर्भिक रुपमा २८°३१'१९.६१" उत्तर अक्षांश र ८२°००'४९.८२" पूर्व देशान्तरमा अवस्थित छ ।

३.० प्रस्तावको सान्दर्भिकता

वातावरण संरक्षण नियमावली, २०५४ को अनुसुची १ को नियम ३ अनुसार कुनै पनि ठूला पुलहरु निमार्ण गर्दा प्रारम्भिक वातावरणीय परिक्षण गर्नु पर्ने कानुनी प्रावधान रहेको छ । राष्ट्रिय पुल मापडण्ड २०६७ का अनुसार २५ मी. भन्दा बढी लामो स्पान भएका पुलहरु ठूला पुल भित्र पर्दछन् । प्रस्तावित खहरे खोला पुलको स्पान १×३० मी. भएकाले उक्त पुल निमार्ण गर्नु पूर्व त्यस पुलको प्रारम्भिक वातावरणीय परिक्षण तयार गरी भैतिक पूर्वाधार तथा यातायात मन्त्रालय मार्फत स्वीकृत गराउनु पर्ने कनुनी व्यावस्था रहेको छ ।

४.० प्रारम्भिक वातावरणीय परिक्षणको उद्देश्य

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

५.० कार्यविधि

यो अध्ययन प्रतिवेदन वातावरण संरक्षण नियमावली २०५७ दोस्रो संसोधनको प्रावधान अनुसार तथा यसै प्रस्तावको कार्यसुची (Terms of Reference) मा उल्लेख गरिए अनुसार तयार पारिएको हो । यसका लागि सान्दर्भिक ग्रन्थहरुको पुनरावलोकन तथा आयोजना प्रभावित क्षेत्रको निर्धारण गर्ने कार्य गरियो । अध्ययन टोली द्वारा सामूहिक रुपमा २०७२ साल चैत महिनामा स्थलतग सर्वेक्षण गर्ने, आवश्यक सूचनाहरु संकलन गर्ने र स्थानीय समुदाय र सरोकारवालाहरु सँग समूहगत छलफल, परामर्श गर्ने कार्य गरियो । स्थलगत अध्ययन अर्थात सरोकारवालाहरूको जानकारीको लागि राष्ट्रिय दैनिक राजधानिमा मिति २०७२ साल चैत १८ गते सार्वजनिक सूचना प्रकाशित गरियो ।

६.० विद्यमान वातावरणीय अवस्था

प्रस्तावित क्षेत्र मध्यपश्चिमाञ्चल विकास क्षेत्रको पहाडी भेगमा पर्दछ । उक्त पुल भेरी नदी र खहरे खोलाको दोभान भन्दा ४८० मी. माथि खहरे खोलामा पर्दछ । उक्त पुल निमार्ण क्षेत्र वरपर मुख्य गरी खोलाले बगाएर ल्याएको ढुङ्गा, माटो प्रसस्त मात्रामा देख्न सकिन्छ । भौगर्भीक पक्षबाट आयोजना स्थल रानिमाटा फर्मेसनमा पर्दछ । पुल बन्ने क्षेत्रमा हल्का भिरालो देखी समथर जमिन पर्दछ । यसै गरी प्रस्ताव कार्यान्वयन गरिने क्षेत्र वरपर हाल कुनै किसिमको प्राकृतिक प्रकोपको जोखिम समेत नरहेको देखिन्छ । यद्यपी खहरे खोलाको बहाब क्षेत्र खासै गहिरो नभएको हुनाले वर्षा याममा वरपरको क्षेत्रमा वाढीको जोखिम देखिन्छ । आयोजना स्थल उष्ण जलवायु क्षेत्रमा पर्दछ । यहँको अधिकतम तापाक्रम बढीमा ३७.८°से देखि न्यूनतम ४.५° से सम्म रहने गर्दछ भने कुल वार्षिक वर्षा १६०३ मी.मी. रहने गर्दछ । आयोजना क्षेत्रको हावा, पानी तथा ध्वनीको गुणस्तर सन्तोषजनक रहेको पाइन्छ ।

सिसौ, बकाइनो, खयर, इपिलइपिल, सिमल, बेल, किम्मु, आदि यस क्षेत्रमा पाइने मुख्य रुख प्रजातिहरु हुन् । आयोजनाले प्रत्यक्ष प्रभाव पर्ने क्षेत्रमा कुनै पनि जंगल क्षेत्र रहेको छैन् । त्यसै गरी साना वनस्पतीहरुमा केरा, वयर, अजम्बरी, सिस्नु, वेसरम, असुरो, दत्तकुने, आदी पाइन्छ । यहाँ पाइने वन्य जन्तुहरुमा स्याल, लङ्गुर, रातो वाँदर, आदि पर्दछन् । त्यसै गरी चराहरुमा भंगेरा, काग, तित्रा, आदि पाइन्छ । सरकारको संरक्षित सूचिमा रहेको १ प्रजातिको वनस्पती र १ प्रजातिका वन्यजन्तु पाइन्छन् ।

जतिय हिसाबले क्षेत्री, ठकुरी, ब्रामण र दलित जातिको बासेबास रहेको उक्त क्षेत्रमा शिक्षा, स्वाथ्यको राम्रो प्रवन्ध रहेको छ । यद्यपी तुलनात्मक रुपमा हर्ने हो भने पुरुषभन्दा महिलाहरु निकै कम साक्षर रहेको पाइन्छ । आयोजना क्षेत्रमा बान्देपिपल प्रशारण केन्द्र मार्फत विद्युत सेवा उपलव्ध छ । सडक सञ्जाल राम्रो भएका कारण केही घरधुरीहरुमा खाना पकाउन ग्यासको समेत प्रायेग हुने भएपनि आयोजना क्षेत्रमा दाउरानै खाना पकाउने उर्जाको मुख्य श्रोत हो । सञ्चारको विषयमा उक्त क्षेत्रमा हाल नेपाल दुरसञ्चारको सञ्चार सुविधाहरु प्रयोगमा आएको पाइन्छ ।

आयोजना निमार्णबाट ४ परिवारका १ संरचना र जग्गाहरुमा असर पर्ने देखिन्छ । शिक्षका दृष्टीले आयोजना प्रभावित परिवारका सदस्यहरुको अधिकतम शिक्षा प्रमाणपत्र तह रहेको छ । व्यापार, कृषी र वैदेशिक रोजगारी आयोजना प्रभावित परिवारको मुख्य अयश्रोत हो र त्यस बापत वार्षिक १००,००० देखि १५०,००० आम्दानी हुने गर्दछ । आयोजना प्रभावित घरहरुमा शौचालय प्रयोगको अवस्था निकै कम्जोर रहेको छ र हाल समेत खुल्ला ठाँउमा चर्पी बस्ने चलन विद्यमान छ । आयोजना क्षेत्र वरपरनै लैङ्गीक भेदभाव विद्यमान छ र विकासको पहुचका हिसाबले महिलाहरु निकै पछी रहेका छन् ।

७.० वातावरणीय प्रभावहरु

आयोजना कार्यान्वयन हुदाँ आयोजना क्षेत्रको वातावरणमा सकारात्मक र नकारात्मक दुवै खाले प्रभाव हुने देखिन्छ । सकारात्मक प्रभावका कुरा गर्दा स्थानिय रोजगारीको सृजना, सिप प्रवाह तथा अभिवृद्धी, सहज तथा सुलभ यात्रा र छिन्चु - जाजरकोट सडक सञ्जालले जोड्ने क्षेत्रको विकासको सम्भावनाका ढोका खुल्नु, आदी हुन् ।

नकारात्मक प्रभावहरुमा पुल निमार्ण तथा सडक सुधारका क्रममा भित्ताहरु काट्दा वढ्न जाने पहिरो लगायतका प्रकोपहरुको जोखिम, खानी सञ्चालन गर्दा निम्तने वातावरणीय प्रभावहरु, आयोजनाका औजार तथा सावरी साधन सञ्चालन गर्दा हुने वायु तथा ध्वनी प्रदुष्ण, पुलको जग खन्दा तथा सडक सुधार गर्दा निस्कने ढुङ्गा माटोको व्यवस्थापन गर्ने चुनौती, त्यसतै खानी सञ्चालन तथा नदी बाट निमार्ण सामाग्रीहरु उत्खनने गर्दा हुने असर, कामदारका अस्थायी शिविरबाट निस्कने फोहोरहरुले सृजना गर्ने वातावरणीय प्रभावहरु, अवैध रुपमा हुने रुख विरुवा, माछा लगायतका जलचरमा पर्ने असर, जडिबुटी र वान्यजन्तुको चोरी शिकारी, घर जग्गा अधिग्रहण, सामाजिक कलह, दुर्घटनाका सम्भावनहरु, पेशागत स्वास्थ्य तथा सुरक्षाका सवालहरु, आदी पर्दछन् ।

८.० वातावरणीय प्रभाव न्युनिकरण तथा वातावरणीय व्यावस्थापन योजना

वातावरणीय प्रभाव न्युनिकरण गर्नका लागि यस प्रतिवेदनमा विभिन्न उपयहरु सुझाव गरिएको छ । जसमा प्रकृतिक 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 उपायहरु प्रयोगमा ल्याउने, धार्मिक तथा साँस्कृतिक संरचनाहरुको जर्गेना गर्ने, लगाएतका उपाहरु यस प्रतिवेदनमा उल्लेख गरिएको छ ।

यसै गरी यस प्रतिवेदनमा वृक्ष रोपणको समेत प्रावधान रखिएको छ । जसमा १२० वटा विभिन्न जातका स्थानिय विरुवाहरु ढुङ्गा माटो व्यवस्थापन गर्न छुट्याइएको स्थान ४० वटा र पुलको दाँया-वाँयाका सडकहरुमा ८० वटा रोप्ने गरी प्रस्ताव गरिएको छ । आयोजना सँग सम्बन्धित कमदारहरुले स्थनिय जैविक विविधतामा प्रतिकुल प्रभाव नपरुन भनेर प्रतिवेदनमा उनीहरुलाई रुख विरुवा काट्न, माछा मार्न र शिकार गर्न रोक लगाउने कुरा समेत उल्लेख भएको छ । सडक निमार्णका क्रममा हुन सक्ने दुर्घटना कम गर्न संकेतहरु रख्ने, रातको समयमा बत्तीहरु बाल्ने व्यवस्था मिलाउने लगायतका उपायहरु प्रतिवेदनमा समावेश गरिएको छ ।

यसरी प्रस्तवित खहरे खोला पुल निमार्ण गर्दा स्थानिय वातावरणमा पर्न सक्ने प्रतिकुल प्रभावहरु न्यूनिकरण गर्ने, सकारात्मक प्रभावहरुलाई बढोत्तरी गर्ने र प्रतिवेदनमा उल्लेख गरिएका गतिविधिहरु निरिक्षण गर्ने प्रावधान सहित वातावरण व्यवस्थापन योजना समेत प्रतिवेदनमा उल्लेख छ । वातावरण व्यवस्थापन योजना कार्यान्वयन गर्नका लागि रु. १,८९९,४५९.०० विनियोजन गरिएको छ ।

९.० निष्कर्ष

प्रस्तवित खहरे पुललाई उक्त क्षेत्रको विकासको मुख्य द्धार रुपमा त्यस क्षेत्रका वासिन्दाहरुले लिएका छन् । उक्त पुल निमार्ण गर्दा वातावरणमा कम मात्र नकारात्मक प्रभावहरु पर्ने सो प्रभाहरुलाई प्रतिवेदनमा उल्लेख गरिएको उपायहरु अवलम्बन गरेमा सजिलै समाधान गर्न सकिने र यस पुल निमार्ण गर्नका लागि प्रारम्भिक वातावरणीय परिक्षण अध्ययननै पर्याप्त भएको हुनाले यस प्रस्तावलाई यथाशिघ्र कार्यान्वयन गर्नका लागि सुझव सहितको निष्कर्ष निकालिएको छ ।

Executive Summary

1.0 The proposal

The Khahare Bridge is proposed over Khahare Khola along Chhinchhu-Jajrkot road section, which is located at Rakam VDC of Surkhet District. The construction of bridge will facilitate the people of Salyan, Jajrkot, Surkhet, Dolpa Districts. The name and address of the proponent preparing the report is as follows:

Geo-Environment and Social Social Unit,

Department of Roads,

Chakupat, Lalitpur

Phone no.: 01-5005520

E-mail: gesunit@dor.gov.np

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

Road Sector Development Project,

Department of Roads

Sanogaucharan, Kathmandu

2.0 Details of the Proposal

The bridge is to be constructed over Khahare along Chhinchhu Jajarkot road. The Khahare Khola is a tributary of Bheri River and, make confluence with Bheri River approximately at 0.48 km d/s from the project site. The geographical location of the proposed bridge is 28°31'19.61"N latitude and 82°0'49.82"E longitude and the elevation is 590 m above mean sea level (amsl). The proposed bridge is of simply supported RCC type with 31.2 (1*30) long and 11 m wide. The construction of bridge is also supplemented by constructing 90 m approach road (including both sides) which includes upgrading of existing road.

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 Khahare Bridge has span of 30 m, an IEE report has to be prepared for it, which has to be approved by Ministry of Physical Infrastructure and Transport (MoPIT).

4.0 Objectives of IEE

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

5.0 Methods adopted for IEE study

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 April 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 Khahare Bridge lies in the hilly region of Mid-Western Development Region. The proposed bridge location is located at 0.48 km u/s of Khahare Khola and Bheri river confluence. The proposed bridge site is located in the rocks of the Ranimatta Formation. The land around the bridge has steep to moderate slopes with stable features on both banks. The slope stability condition is good even there are loose materials along the river banks. Both banks of Khola are dominated with agricultural land and barren land. The catchment area of Khahare Khola upto the proposed bridge location is 37.8 km^2. Temperate climate is found around the proposed project site. Average temperature ranges from 37.1^0C maximum to 4.5^0C minimum and average precipitation of the area is 1603 mm. Air, water and noise quality of the project area is relatively fair in the area.

The project area does not lie in the forest area however, scattered tree species including Khayer (*Acacia catechu*) Sisso (Dalbergia sisso), Bakenu (*Melia azederach*), Simal (*Bombax ceiba*), Bel (*Aegel marmelos*), Ipilipil (*Leucaena leucoecphala),* Salla (*Pinus roxburghii*), Kimbu (*Morus sp*.) Shrubs and herbs found around the proposed bridge area includes Kera (*Musa paradisiaca),* Bayar (*Zyziphus mauritiana*) *Sisno (Urtica dioeca),* Ajambari *(Kalanchoe pinnata),* Besharam *(Ipomea carnea*). Jackal (*Canis aureus*), Langur (*Colobinae ajax*) and Rhesus Macaque (*Maccaca mulata*) are some of the wildlife found around the project area. Bhangera (*Passer domesticus*), Parewa (*Columba palumbus*), Teetra (Francolinus fracolinus) are the avifauna found around the project are. Altogether 1 plant species and 1 animal species recorded in the area belongs to Government Protected species.

Dalit, Thakuri, Chhetri, and Bramhin-hill are the ethnic group residing 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 project has the electricity supply through the Bandepipal Substation (33 kV). Due to improved road access, some of the households in the project area found to be using LPG for cooking purpose. NTC, CDMA phone and local radio and TV are the most common means of communication in the project area.

The construction of the proposed bridge will affect 4 households with the loss land including 1 private structure. Business and foreign employment are the main occupation of the members of project-affected families and they earn about NRs. 100,000 to 150,000 per year from their regular occupation. The status of toilet use is very poor around the project-affected area and open defecation is still prevalent. Gender discrimination is very high and women in the project-affected areas do not have developmental access.

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, rise in awareness, improved mobility and the initiation of new avenue for the overall development of the region.

Adverse environmental impact includes the risk of disasters due to excavation of hill slope for the construction of the approach road, environmental issues associated with quarry site and river bed extraction using excavator, and spoil disposal, air and noise pollution associated with the operation of machineries and vehicles, environmental issues associated with spoil management, environmental impacts of solid and liquid waste from labor camp, illegal hunting, fishing and trade of wildlife and medicine, social issues associated with land acquisition, possibility of accidents, issues associated with occupational health and safety, etc.

8.0 Environmental Impact Mitigation and Environmental Management Plan

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

Furthermore, the document also has the provision for tree plantation. Altogether 120 saplings of local trees have been proposed for the plantation. Out of the 120 saplings, 40 will be planted to reclaim spoil disposal sites, 80 along the approach road. Riverbed extraction will be done using excavator, all the environmental safeguard measures will be applied to reduce the impact of using excavator while extracting riverbed materials. To avoid the extraction of fuel wood from the nearest forest, 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 signboards and lighting system.

In this way the report includes all possible measures for the enhancement of positive impacts and mitigation of adverse impacts. There is a separate chapter called Environment Management Plan which guides for the implementation of mitigation measures and monitoring provision for those mitigation measures. For the successful implementation of Environmental Management Plan NRs. 1,899,459.00 has been allocated.

9.0 Conclusion

The project has some environmental impacts that can be mitigated through the mitigation measures proposed in this document and the construction of the Khahare Bridge will open all the possibility for the overall development of area. Thus, it has been concluded that the project should undergo construction as soon as possible with the implementation of all the mitigation measures.

Acronyms and Abbreviations

AAPA:	Aquatic Animals Protection Act
Amsl:	Above Mean Sea Level
AP:	Affected Person
CDO:	Chief District Officer
CJ:	Chhinchhu-Jajarkot
DDC:	District Development Committee
DFO:	District Forest Office
DHM:	Department of Hydrology and Meteorology
DHQ:	District Headquarters
DoR:	Department of Roads
EA:	Environmental assessment
EIA:	Environmental Impact Assessment
EMAP:	Environmental Management Action Plan
EMP:	Environment Management Plan
EPR:	Environment Protection Rules
ERMC:	Environment and Resource Management Consultant
ESMF:	Environmental and Social Management Framework
FAR:	Financial Administration regulations
FCB:	Foreign Cooperation Branch
GESU:	Geo-Environmental and Social Unit
GoN:	Government of Nepal
IEE:	Initial Environmental Examination
IRDST:	Income Restoration and Skill Development Training
KII:	Key Informant Interview
LCF:	Local Consultative Forum
LCLA:	Local Community Liaison Assistant
MoPE:	Ministry of Population and Environment
MoPIT:	Ministry of Physical Infrastructure and Transport
MWDR:	Mid-Western Development Region
NEPAP:	Nepal Environmental Policy and Action Plan

N-M:	Narayanghat- Mugling
NT:	Near Threatened
PAH:	Polycyclic Aromatic Hydrocarbons
PAP:	Project Affected Person
PSC:	Pre-Stressed Concrete
PWD:	Public Works Directive
RAP:	Resettlement Action Plan
RCC:	Reinforce Cement Concrete
RoW:	Right of Way
RSDP:	Road Sector Development Project
RSDP:	Road Sector Development Project
SIL:	Sector Investment Loan
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
ZoI:	Zone of Influence

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CHAPTER-1: INTRODUCTION

1.1 Name and Address of Institution Preparing the Report

The name and address of the institution preparing Initial Environmental Examination (IEE) of Khahare Khola Bridge within Chhinchu-Jajarkot road is as follows:

Geo-Environmental and Social Unit (GESU)

Department of Roads (DoR)

Ministry of Physical Infrastructure and Transport (MoPIT)

Chakupat, Lalitpur

Phone no.: 01-5005521

E-mail: gesunit@dor.gov.np

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

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

Road Sector Development Project (RSDP), Foreign Cooperation Branch, Department of Roads (DoR) under the Ministry of Physical Infrastructure and Transport (MoPIT), Government of Nepal (GoN), has initiated upgrading of the existing roads to all season bituminous seal pavements to increase accessibility and connect all district headquarters. The main objective of RSDP is upgrading of about 700 Km of existing dry season roads to the seal pavement connecting in 8-districts headquarters namely, Darchula, Baitaidi, Dailekh, Kalikot, Bajhang, Jumla, Musikot and Jajarkot including improvement of existing intermediate lane to double land carriageway of Narayanghat-Mugling (N-M) road. In order to maximize the benefit from all season sealed roads in above 8-districts and from the proposed improvement to double land carriage way government intends to undertake design services for construction of new bridges including river training works and approach roads, maintenance of the existing bridges and traffic safety elements on all the bridges.

In this regard, the construction of Khahare Bridge was proposed at the chainage of 47+888 at Chhinchu-Jajarkot Road. The proposed bridge is of Pre stressed type with the span length of 31.2 m with a single span of 30 m. Khahare Bridge lies in Rakam VDC-5 in between Rakam Bazaar and Jamune Bazaar. The geographical location of the proposed bridge is 28°31'19.61"N latitude and 82°0'49.82"E longitude and the elevation is 590 m above mean sea level (amsl). The area around the proposed bridge is characterized by the presence of agricultural land, settlement, barren land and river floodplain. Social facilities like health posts, schools, police post, market place, electricity are found around the project area. The Khahare Khola remains dry during most part of the year, however, during high rain periods the flow in the stream often obstruct the free movement of the vehicles. The proposed bridge is located almost 1.5 km from the newly constructed Bridge at Bheri River. The construction of bridge over Khahare Khola will ensure the year round movement of vehicles providing safer and reliable mode of transport of people of Surkhet, Salyan, Jajarkot, Dolpa Districts. The project area is connected to both district headquarter and capital city.

2.2 Objectives of Initial Environmental Examination (IEE)

The objectives of IEE are as follows:

- Identify and predict the major environmental issues that may arise as a result of construction of new bridge 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 Management Action Plan (EMAP) for the project.
- Allow project proponents, designers, implementing agencies and funding agencies to address environmental issues during project implementation.

2.3 Rationality of IEE

As per Environment Protection Rules (EPR) 1997, construction of a major bridge requires an IEE and its subsequent approval from its concerned ministry (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 and span of the proposed bridge will be 31.2 m (1*30 m) hence the proposed bridge is categorized as major bridge and should undergo IEE study and approved from Ministry of Physical Infrastructures and Transport (MoPIT) before its implementation.

2.4 Relevancy of the Proposal

Khahare Khola is ephemeral stream; however, its discharge will be relatively high during monsoon season often halting the traffic movement across it. It is along the Chhinchu-Jajarkot road section at chainage of 47+888. Due to lack of Bridge in the Khahare Khola, it is difficult for vehicles to cross the stream during monsoon season. Thus, upon the completion of the proposed project, the people around the area will get benefits in multiple of ways. It will provide enhanced access to connect local people with headquarters, markets, schools, health post or hospitals and with other facilities. The year round transportation services will facilitate the local people with their safe, reliable and timely mobility and further help to augment the economic status of the local people, in both direct and indirect manner. Quick access of transportation and minimum time consumption will be the positive sector of this project.

CHAPTER-3: PROJECT DESCRIPTION

3.1 Project Location and Accessibility

The proposed Khahare Khola Bridge is located in Rakam-5 of Surkhet District of Mid-Western Development Region (MWDR). The bridge is proposed over Khahare Khola along Chhinchhu-Jakarkot Road at chainage 47+888. The geographical location of the proposed bridge is 28°31'19.61"N latitude and 82°0'49.82"E longitude and the elevation is 590 m above mean sea level (amsl). The stream is ephemeral and during monsoon season, large flow in the channel often halts traffic movement.

The project area can be assessed through Chhinchhu of Kholapur-Surkhet Road (Ratna Highway) which is about 63 km from Kohalpur from Chhinchhu the project site is located at 47.88 km. Through road network, project site is about 656.5 km from the capital city Kathmandu. The location map of the project area is shown in figure 3-1, 3-2 and 3.3.

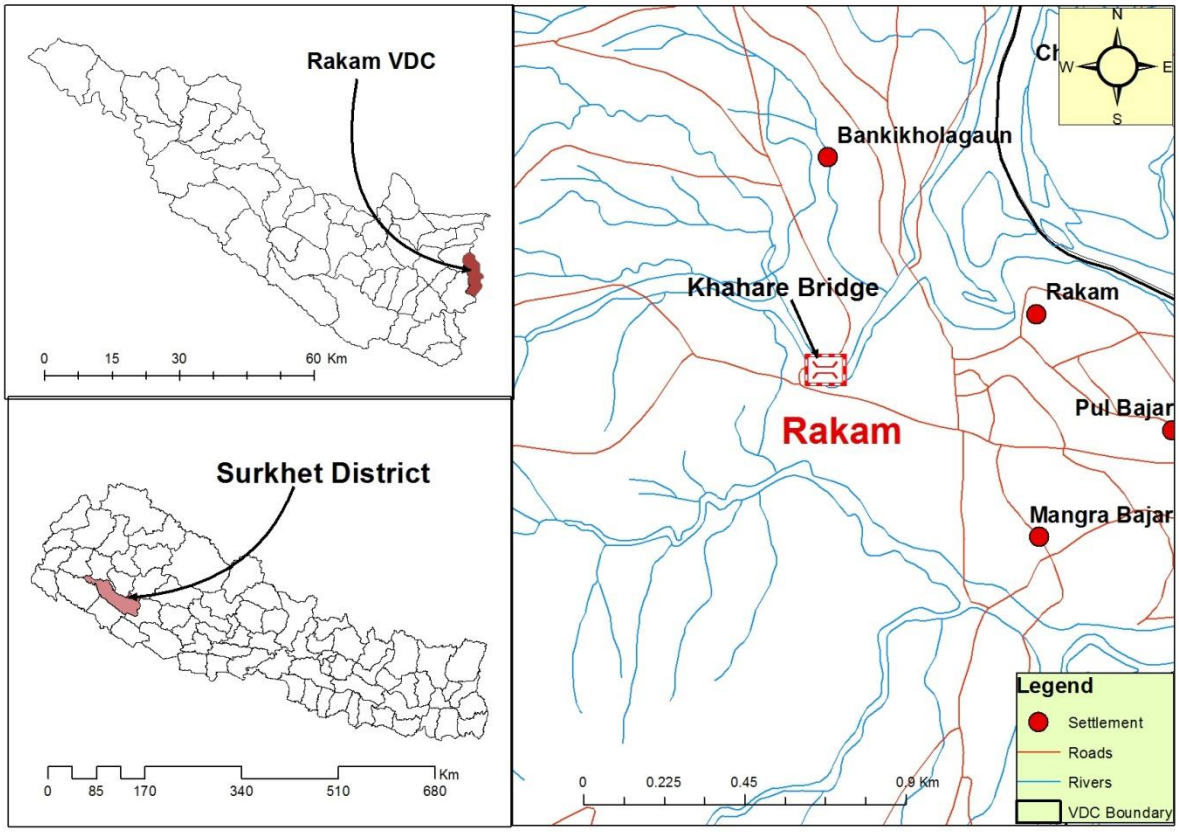


Figure 3.1: Location Map of Khahare Bridge.

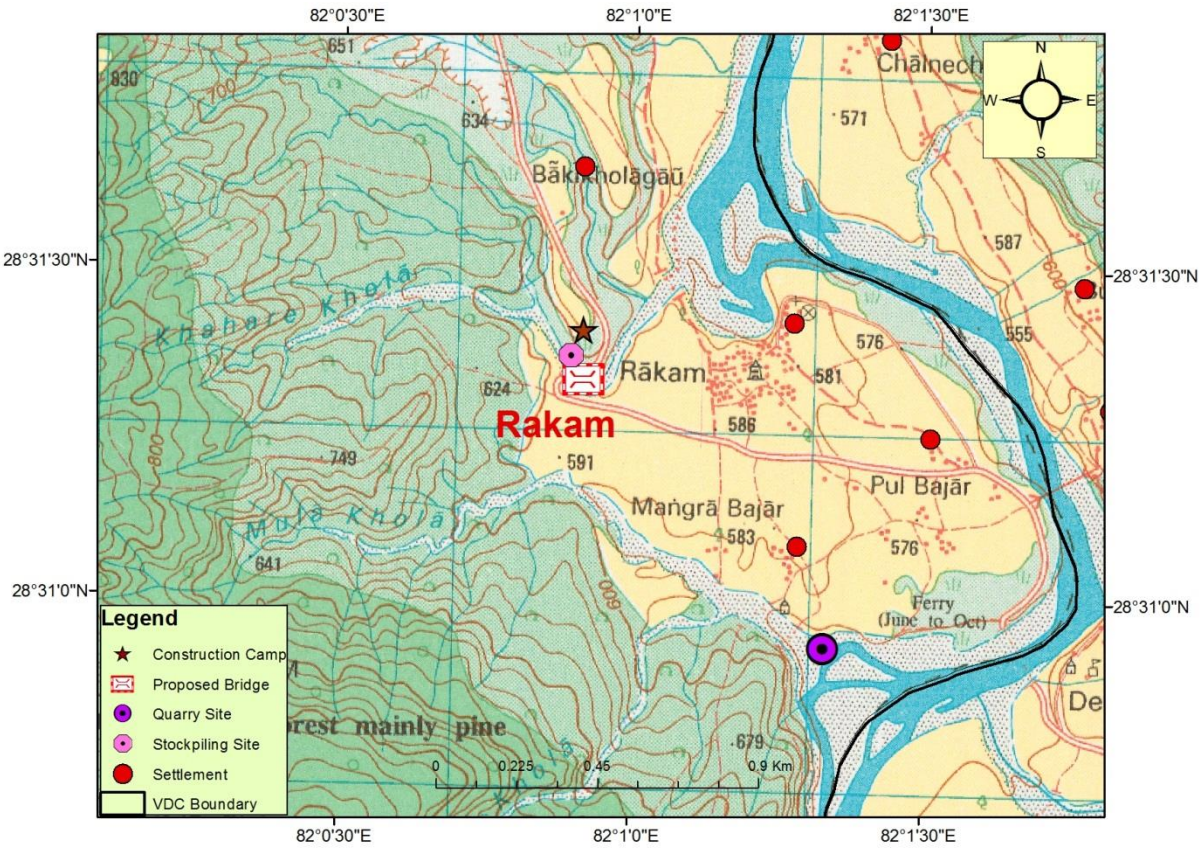


Figure 3.2: Location Map of the Project Area in Topographic Map

Figure 3.3: Project Location in Google Map

3.2 Salient Features of the Project

The design of the bridge has slightly been modified after the approval of ToR. Hence, some of the parameters in the Salient features are different from that of the approved ToR. Salient features of the project are given in Table 3.1.

Table 3.1: Salient features of the Project

1	**Name of Bridge**	Khahare Bridge
2	**Location:**	
	Development Region	Mid-western
	Zone	Bheri
	District	Surkhet
	Village/town	Rakam-5
	Name of the Road:	Chhinchu-Jajarkot Road
	Chainage of the Bridge site	47+888
3	**Geographical Location:**	
	Easting	82°0'49.82"E
	Northing	28°31'19.61"N
	Classification of the road	SRN Road
	Type of road surface	Bituminous surface
	Terrain/Geology	Hilly
4	**Information of Structure:**	
	Total length of bridge	31.2m
	Span arrangement	1*30m
	Total width of bridge:	11m
	Width of Carriageway	7.5 m
	Footpath(s):	1.5m
	Kerbs	0.350m
	Type of Superstructure:	Pre Stressed

	Type of abutments:	RCC (Gravity Type)
	Type of foundation	Open Foundation
	Type of bearing:	Elastomeric bearing
5	**Design data:**	
	Live load:	IRC-70R and 2 lane class A Loading.
	Net bearing capacity of soil	500 KN/m^2
	Design discharge	29m^3/s
	Linear waterway	30m
6	**Summary of quantities of material:**	
	Grade and quantity of concrete:	
	In superstructure:	M35
	In-substructure:	M25
	In foundation:	M25
7	**Grade and Quantity of Reinforcement steel**	
	In superstructure:	TMT having characteristic strength of 500 N/mm^2
	In substructure:	TMT having characteristic strength of 500 N/mm^2
	In foundation:	TMT having characteristic strength of 500 N/mm^2
8	**Total Project Cost (NPR)**	49,498,197.72

Source: Draft Design Report of Khahare Bridge, 2016

3.3 Ancillary Project Components

3.3.1 Land Requirement

The construction of Khahare Khola Bridge and approach road (on either side of the bridge requires about 0.84 ha of land belonging to various land use categories including private land, barren land, RoW of the existing road, stream bank and flood plain for permanent use. Likewise, 0.14 ha land temporarily. The details of land required for the sub-project is given in table below;

Table 3.2: Land requirement of the project

Project Structures	Land Requirement (ha)	Land Types	Remarks
Bridge Axis	0.0343	Government land	Permanently Required
Approach Road	0.8173	Private Land	Permanently Required
Temporary Camps	0.0508	Private land	Temporarily Required
Stockpiling of Construction Materials	0.0763	Private land	Temporarily Required
Spoil Disposal Site	0.0180	Barren Government Land	Temporarily Required

3.3.2 Materials to be used

The materials to be used for the construction of the Khahare Bridge are presented in table 3.3. The sand, gravel, aggregates and boulders will be collected from the quarry sites mentioned in the section 3.3.3. Cement and rod will be brought from authorized dealer/supplier around Surkhet or Nepalgunj. The remaining materials like steel structures, cable wire and gabion wire will be imported from India or third country.

Table 3.3: Construction material requirement for the proposed project

Construction Materials	Quantity
Steel Structure (without railings and anchorage parts)	105093.116 Kg
Steel Bars (for deck slab, approach slab)	79839.494 Kg
Concrete (for deck slab, approach slab)	1008.2 m^3
Cement	42512 bags
Sand	252.0425 m^3
Aggregate	405.085 m^3
Boulders	150 m^3
Cable wire	6 km Approx.
Gabion wire	299 m^3

3.3.3 Sources of Construction Materials

The construction materials mainly sand can be available along the riverbed from the Bheri. River Boulders and cobble pebbles containing quartzite, dolomite and schist can be found. The riverbed extraction site (Bheri River) can be approached almost 2 km from the project site. The site can be approached nearby Jamune Bazaar. Both excavator and tripper can reach the site.

Table 3.4: Available construction materials at two different quarry sites

Quarry Number	Distance from Proposed Bridge	Quantity of Materials (m^3)		
		Sand	Gravel	Boulders
Q1	2Km from proposed bridge at Jamune Bazaar	15300	9356	6960
Q2	1.5 Km from proposed Bridge at Devsthal	14800	5460	3310

(*Source: Field Survey, 2016*)

Note: The collection of construction materials will involve the use of excavators, dozers, tippers and other relevant mechanical machineries.

Following considerations will be made during quarry operation as a part of quarry management plan:

- Environmentally safe extractable quantity of materials will only be collected from each quarry site.
- Quarry operation will be avoided during rainy season.
- Quarry operation will be carried by the use of excavators and machineries.
- River bed extraction will be avoided during quarry operation.
- Annual sediments deposited along the river bank will only be extracted and the quantity of quarry materials will be as per the volume identified in table 3.3.
- No any trees will be harmed during quarry operation.

3.3.4 Energy required for Construction

The project area is availed with electricity supplied through national grid. However, power shed is frequent in the area so to meet the energy requirements during blackouts diesel generator will be operated. To meet the energy requirement of worker's camp LPG and kerosene will be used. Fuel wood consumption for fulfilling the energy requirement will be avoided.

3.3.5 Labour Camp and Materials Stockpiling Site

The labor camp can be established at around 20 m from the project area on left bank of Khahare Khola. The proposed land is under private ownership. Whereas, materials stockpiling can be done nearby the proposed bridge site (20 m from the proposed bridge axis) at right bank immediately d/s of the construction site. For this purpose, barren land (flood plain terrace) belonging to government property will be utilized.

3.3.6 Spoil Disposal Site

Earthen materials shall be excavated for the construction and maintenance of approach road. Substantial amount of spoil can be reused especially as filling materials during approach road construction. The remaining waste will be disposed safely in on both banks of the Khahare Khola with appropriate protection.

3.3.7 Approach Road and Diversion

The construction of bridge is also supplemented by constructing 90 m approach road (including both sides) which includes upgrading of existing road. The construction of Khahare Bridge does not involve the use of road diversion as the existing crossing can be utilized for this purpose.

3.3.8 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 Grader, Pump, Vibrator roller, Roller, Water Bowser, Loader, Boiler, Sprayer, Air compressor, Hand sprayer, Aggregate spreader, Pneumatic Tyre, Mixer, Vibrator/Compactor, Generator, Bitumen distributer, Chip spreader, Tractor and 10-15 ton Crane will be used during construction period.

- **Construction scheduling**

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

- **Human Resource Requirements**

The construction of the proposed bridge requires an estimated, 18900 man-days of unskilled workforce, and 8100 man-days of skilled and semi-skilled workforce. The project will prioritize the local people in proposed bridge construction works.

3.3.9 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.

3.3.10 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 Khahare 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.

3.3.11 Maintenance approach

In the case of maintenance, persons assigned to Chhinchu- Jajarkot 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.

3.4 Possible Emissions 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, 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 NOx, SOx, 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 IEE report was prepared in compliance with the provisions of EPA (Clause 3) and EPR (Rule 5,7,10 and 11 and schedule 1,3 and 5). An efficient and integrated method of IEE preparation was adopted to meet the objectives of IEE study. The study has followed the approaches and procedures set in approved ToR of Khahare Khola Bridge. In general, the methodologies used for the preparation of IEE study includes desk study, literatures review, field survey/investigations/observations interactions and discussions with the local communities/stakeholders/concerned agencies/project design team, data analysis, application of impact identification methods and expert judgement inter alia. The following sections details out the different methods and approaches adopted during IEE study

4.1 Desk Study and Literature Review

Various information and useful data from reliable sources related with the project's IEE study was collected and reviewed. Such sources of information included existing laws, rules, guidelines and manuals, IEE reports of similar projects, revised Environment and Social Management framework (EMSF) prepared by DoLIDAR, Nepal Bridge Development Program: Environment and Social System Assessment (ESSA), projects engineering survey and design of the Khahare Bridge Project were reviewed, to determine the nature and scope of activities of the project. Past IEE reports of bridge projects were also reviewed. 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 project influence area. These sources included District profile Surkhet, VDC profile of Rakam VDC, climatological data of DHM etc. Preliminary acquaintance with the general environmental setting of the project area was built by reading maps of different types like topographical maps, geological maps. Similarly, project location and geographical boundary of the Zone of Influence (ZoI) was defined and delineated on the topographical map.

Preparation of Checklists and Questionnaire: Based on the desk study and review of past literatures, project specific checklists and questionnaire were prepared to facilitate the data collection regarding physical, biological and socio-economic and cultural environment.

4.1.1 Field Visit

An IEE study team (a multi-disciplinary team comprised of environmentalist, biologist, sociologist and geologist) visited the project site from 2072-12-27 to 2072-12-29 and collected information on physical, biological and socio-economic and cultural environments of the project area through survey/investigation/observation and identified possible issues and impacts likely to be generated during project implementation. Various participatory tools like focus group discussion, key informant interview, consultations and interactions with local people and concerned personnel were adopted during field visit.

Physical Environment: Surveys and field observation were carried out to collect information of project direct impact area whereas map reading, review of DDC and VDC profiles and focal group discussion and interaction with the local people were done to collect information regarding the project surrounding areas.

Information regarding the physiography and topography of the project area was obtained through map reading and was validated through the field investigation. Information regarding hydrology were taken from hydrological study of the project conducted during project design

and field observation. Geological study of the proposed bridge site was done to explore the general geology, geomorphology and other geological features including geological hazards. The information on water, air and noise quality were gathered through field observation. Major air, water and noise polluting sources were investigated and observed using standard checklist.

Biological Environment: Information on flora of the project area were collected through field investigation and walk over surveys likewise information regarding the fauna were collected through walk over surveys and observation, consultation with the local people. Floral species likely to be removed during project implementation were identified and enumerated. For tree species of pole and tree sized measurement of girth and height were performed. Information regarding fishes and aquatic lives were collected through observation and consultation with the local people residing nearby the river.

The socio-economically useful and commercially important timbers as well as Non-Timber Forest Products (NTFP) and the animal products of the project-impact area were investigated by an ethno-botanical survey. This comprised collection of representative plant species during vegetation survey with analysis and recording of local information on their utilities by administering interview/discussion session with the local informants.
The wildlife and birds found in the area were classified according to their conservation status (rare, endangered and threatened) as per IUCN Redbook database, CITES appendices or NPWC protection status.

Socio-Economic and Cultural Environment: Information on socio-economic environment was obtained through group discussion with communities, key informant survey through checklists, onsite observation and household survey. Additional data was collected through District and VDC profiles, CBS data and other published documents. Direct observations of public utilities, including cultural, historical and archaeological sites within project's direct impact area were done. Public consultations were conducted on 2072-12-24 gathering the local people, VDC members and other related bodies to document the information on possible damages of infrastructures and the community services.

4.1.2 Public Involvement and Information Disclosure

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 Notice: A 15-day public notice was published in the "*Rajdhani*" national daily newspaper dated 2072-12-18 to inform the concerned stakeholders and general public about the proposed project and requesting concerned and affected parties to provide in written form, their suggestion and comments regarding environmental impacts of the proposed project. The notice was pasted in different places in the project area. The Deeds of Enquiry (Muchulka) of pasting copies of notice was obtained from the relevant stakeholders.

Public Consultations: The IEE team carried out a consultation meeting on 2072-12-27 at Jamune Bazaar Rakam 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 Rakam VDC and Surkhet DDC office desk for stakeholder's 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 4.1: Summary of Public Consultation Meetings

Date	**Venue**	**Address**	**Participant**		**Issues and suggestion of local people during public consultation**
			Male	**Female**	
2072/12/27	Jamune Bazaar	Rakam-5	8	5	• Bridge should be made as soon as possible as during rainy season flow in the stream disrupts the smooth movement of the vehicles. • Appropriate compensation has to be made, if private properties is to be affected. • The project should be completed in the designated time. The project should closely monitor the activities of contractor. The projects fate should not be that of Bridge at Bheri River whose construction works went nearly for a decade. • If possible emphasis shall be provided to employ the local people in bridge construction activities. • They are ready to provide the land and properties on rent if suitable payment is made.

(Source: Field survey, 2016)

4.1.3 Data Collection methods and Analysis

This section deals with the specific method of data collection and analysis for different environmental domains as physical, biological and socio-economic and cultural environment to establish a preliminary baseline on various components of these environmental domains. The following table describes the specific methodology used for collection of information on specific environmental component. Regarding the analysis technique, mainly descriptive analysis technique was used. Nonetheless, simple quantitative analysis techniques (eg percentage and average) were used for some environmental components.

Table 4.2: Methods to collect the baseline data

Data Requirement	Methods/ Tools
• ***Physical Environment***	
Physiography, 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 and bio-climatic classifications	Secondary information from Department of Hydrology and Meteorology (DHM), other published literatures.
Type, volume and source of construction material requirement	Secondary information from design engineers, feasibility / detail design reports
Information on burrow sites / tipping sites / stockpiling sites, camp sites etc.	Direct field observation / Interaction with design engineers, local stakeholders.
Traffic conditions	Direct observation, information from the stakeholders, traffic data from feasibility report
Information on public utilities	Direct field observation/Interaction with local stakeholders
• ***Chemical Environment***	
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

Data Requirement	Methods/ Tools
Faunal Environment	Key Informant Interview (KII)
Aquatic Animals	Field Sampling of Macro-invertebrates/ Macrophytes, Visual Observation/ Key informant Survey, past literatures for Fishes
• ***Socio-economic and Cultural Environment***	
Demographic, Economic, and social services and facilities	Secondary Information from CBS, District Development Committee (DDC), and Primary information of the projects direct impact area and indirect impact area were collected through structured questionnaire survey
Cultural sites and cultural activities, historical sites, foot trails etc.	Key informant survey, Direct observation of cultural and historical sites.

4.1.4 Impact Prediction and Evaluation

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

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

4.1.5 Report Preparation

Based on the processed data and information, a draft IEE report has been prepared with specific baseline information and alternative analysis. All identified and predicted likely environmental impacts have been included and analyzed in the draft report, which also contain environmental management plan (EMP). EMP has focused on realistic mitigation measures, environmental monitoring including implementation responsibilities/monitoring agencies, staffing, budget and co-ordination aspects.

4.1.6 Project 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 4.3

Table 4.3: 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., Rakam VDC, Surkhet

4.1.7 Study team member

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

Table 4.4: Study Team Members

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

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

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

5.1 Constitution of Nepal

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

5.2 Acts and Regulations

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 Population and Environment (MoPE).

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 Environment Protection Rules, 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.

5.2.3 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.

5.2.4 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.

5.2.5 Public Road Act, 2031 (1974)

Section19 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.

5.2.6 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.

5.2.7 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.

5.2.8 Public Road Act, 2031 (1974)

Section19 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.

5.2.9 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.

5.2.10 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.

5.2.11 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).

5.2.12 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.

5.2.13 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.

5.2.14 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.

*5.2.15 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 Policies and Plans

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

The government has introduced Land Acquisition, Resettlement and Rehabilitation Policy, paving the way for developers of various physical infrastructure projects to acquire land without affecting livelihood of people who have to be relocated from the area where such projects will be built. The policy, which calls for creation of a scientific standard for land valuation and extension of compensation equivalent to minimum market value of land, is expected to facilitate developers to implement projects, like hydro, roads and transmission lines, on time. This will reduce chances of significant cost overrun, which inflates project_

cost. Also, a provision in the policy that allows the government to take action against those who try to disrupt land acquisition process or create hurdles for project developers that have acquired land by following the due process is expected to help project developers in completing the projects on time. The policy has tried to address these complex issues of resettlement and rehabilitation so that the country can achieve its development goals without causing adverse impact on living standard of the people who are displaced or affected by the projects.

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

5.3.2 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.

5.3.3 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 countries development process. The policy focuses on mitigating the environmental impacts

due to urbanization, industrialization and infrastructural development. The policy further states that roads, irrigation, hydroelectric and other infrastructures project have the potential for imposing significant environmental cost if they are not designed and properly implemented. The policy also focuses that the greater involvement of the local people is a prerequisite for improving design and implementation.

5.3.4 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.

5.3.5 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.

5.3.6 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.

5.3.7 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 (ie.,

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

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

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

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

World Bank Operational Policy (OP 4.36): Forest

World Bank Operational Policy 4.36 aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development. Combating deforestation and promoting sustainable forest conservation and management have been high on the international agenda for two decades. However, little has been achieved so far and the world's forests and forest dependent people continue to experience unacceptably high rates of forest loss and degradation. The Bank have proposed revised approach to forestry issues, in recognition of the fact that forests play an

increasingly important role in poverty alleviation, economic development, and for providing local as well as global environmental services. Success in establishing sustainable forest conservation and management practices depends not only on changing the behavior of all critical stakeholders, but also on a wide range of partnerships to accomplish what no country, government agency, donor, or interest group can do alone. Where forest restoration and plantation development are necessary, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services.

Involuntary Resettlement (OP 4.12)

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

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

The policy covered the following impact;

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

(a) The involuntary taking of land resulting in

(i) Relocation or loss of shelter;

(ii) Loss of assets or access to assets; or

(iii) Loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

To address these impacts the burrowers 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.

5.4 Manuals/Guidelines/ Directives

5.4.1 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.

5.4.2 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.

5.4.3 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.

5.4.4 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.

5.4.5 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.

5.4.6 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.

5.5 Standards

5.5.1 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

	Instrument	Maximum threshold limit (dB)
	Water pump	65
	Diesel generator	90
	oudspeaker, other entertainment instrument	70

5.5.2 National Ambient Air Quality Standard 2012 AD

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

National ambient air quality standards for several pollutants

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum
TSP (Total Suspended Particulates)	µg/m^3	Annual	-
		24-hours*	230
PM_{10}	µg/m^3	Annual	-
		24-hours*	120
Sulphur Dioxide	µg/m^3	Annual**	50
		24-hours*	70
Nitrogen Dioxide	µg/m^3	Annual	40
		24-hours*	80
Carbon Monoxide	µg/m^3	8 hours*	10,000

Parameters	**Units**	**Averaging Time**	Concentration in Ambient Air, maximum
Lead	µg/m^3	Annual**	0.5
Benzene	µg/m^3	Annual**	5
PM2.5	µg/m^3	8-hours*	40
Ozone	µg/m^3	8-hours*	157

5.5.2 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.

5.5.3 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.

5.5.4 National Diesel Generator Emission Standard, 2012

The MoPE 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 newe 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.

5.5.5 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.

5.6 International Conventions and Treaties

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

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

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

CHAPTER-6: EXISTING ENVIRONMENTAL CONDITION

This chapter provides the information regarding the existing environmental setting of the project area in terms of physical, cultural environment, biological, socio-economic environment of the project area. The existing environmental condition of the project area was important in determining and analysing the likely environmental impacts resulting from the project implementation.

5.7 Physical and Cultural Environment

5.7.1 Physiography and Topography

Both banks of the proposed bridge area is relatively steeper as the stream flows through the gorge of about 20 m from the first terrace. However, steepness of the area around the proposed bridge site is gentle to moderate. Khahare Khola makes the confluence with Bheri River almost 200 m d/s from the project area. The gradient of stream around the proposed bridge site is around 8%. Watercourse of the Khahare Khola is more or less straight around the proposed bridge location.

5.7.2 Climate

Temperate climate is found around the proposed project site. Average temperature ranges from 37.1^0C maximum to 4.5^0C minimum. The average rainfall of the district is 1603 mm but bulk of the rain (1312mm) falls in the monsoon leaving other months relatively dry.

5.7.3 Hydrology

Khahare Khola is ephemeral with large seasonal variability in its discharge. It is one of the tributaries of Bheri River and make confluence at almost 1.5 km d/s from the proposed bridge location. Several ephemeral gullies are found to be observed around the bridge in the u/s section. The catchment area of Khahare Khola upto the proposed bridge location is 37.8 km^2. The bridge site has moderate bed gradient and has deep gorge so the adjacent land is less vulnerable to flood. The design discharge for the proposed bridge is 29 m^3/s.

5.7.4 Geology

The proposed bridge site belongs to the Ranimatta Formation. The Ranimatta Formation is comprised of phyllite and quartzite but around the bridge area alluvial deposits are seen on both banks. The regional geological map of the project area is given in Figure below;

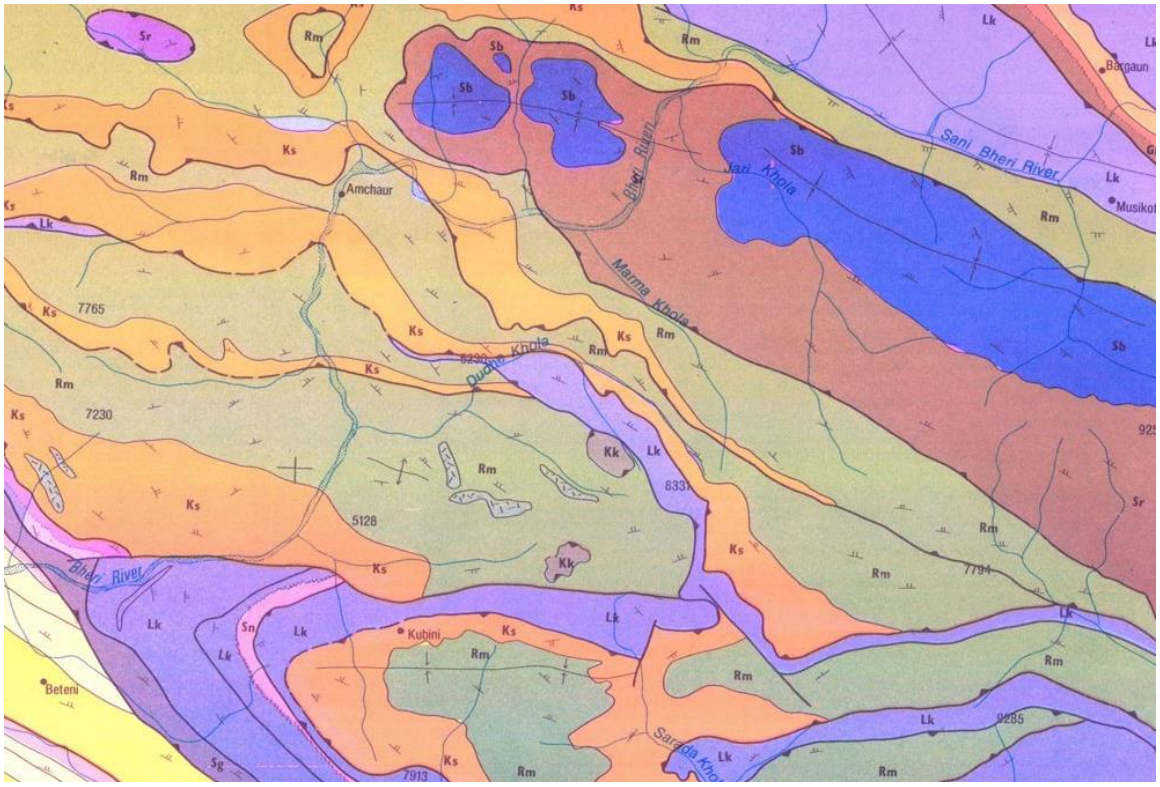
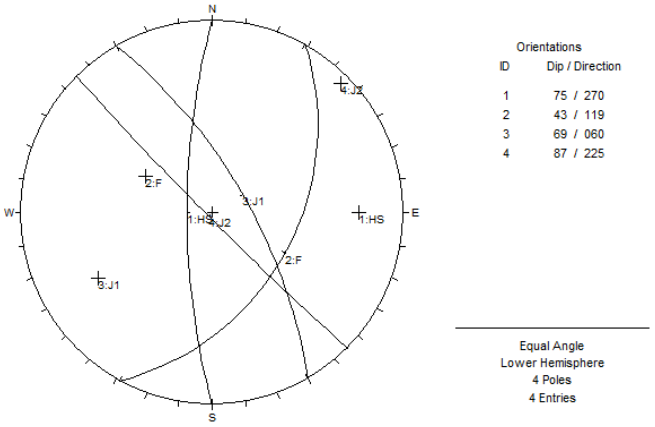


Figure 6.1: Regional Geological Map of the Project Area

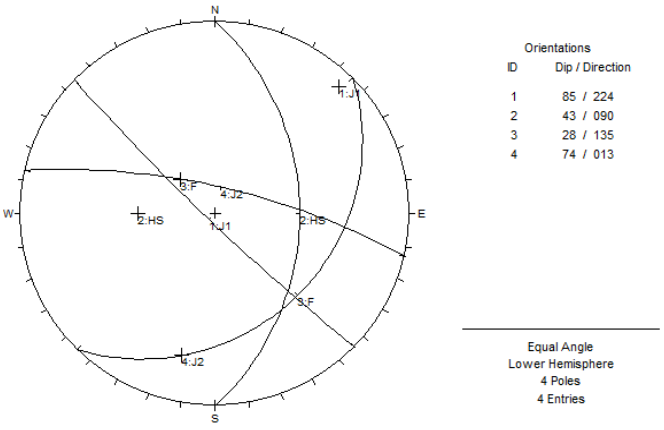
The left bank of the Khahare Khola superficially comprises of thick alluvial deposits (5-8 m thick). Alluvial deposits are composed of boulders (5%) and cobble and pebble with fines (95%). The area on the left bank has steep slope on hill slope. The land use pattern around proposed bridge site is barren land and agricultural land. Right bank is superficially comprised alluvial deposits. Alluvial deposits (more than 8 m thick) are composed of schist and quartzite. The topography is on the right bank has steep slope. Presently, the proposed area is forest and barren land. Bedrocks are not seen on the right bank.

5.7.5 Slope Stability

The slope stability condition is good even there are loose materials along the riverbanks. In general, the slope stability is more or less good on the both banks. The wedges formed by the intersection of the joints and foliation plane seem to be unstable and other wedges are very stable so the project area is found to be relatively stable. Stereographic projection of the proposed bridge location is given in figure below.



Left bank



Right bank

Figure 6.2: Stereographic Projection of Proposed Bridge Site Area

5.7.6 Soil Types

The surface soil of the bridge area consists of mainly alluvial soil deposits at riverbed. The alluvial deposits are mainly found in the riverbeds of the Khahare Khola. The thicknesses of alluvial deposits are more than 5 m. The alluvial deposits are composed of boulders, cobbles, pebble and sands. Boulder, cobbles and pebbles are mainly granite, quartzite from the Lesser Himalaya (0.5 to 1 m in diameter). The nature of the surface soil is characterised by lack of calcareous cementing material so the surface soils are loose in nature.

5.7.7 Land use

Both banks of Khola are dominated with barren land and agricultural land. The other land use pattern in the immediate vicinity of the bridges are, forests, river flood plain with sand and water body, roads. Rakam (1.5 km from the proposed bridge site) and Jamune (2 km from the proposed bridge site) are the small market around the project area, however, they are around 3 km The land use map of the project area is given in Figure 6-4.

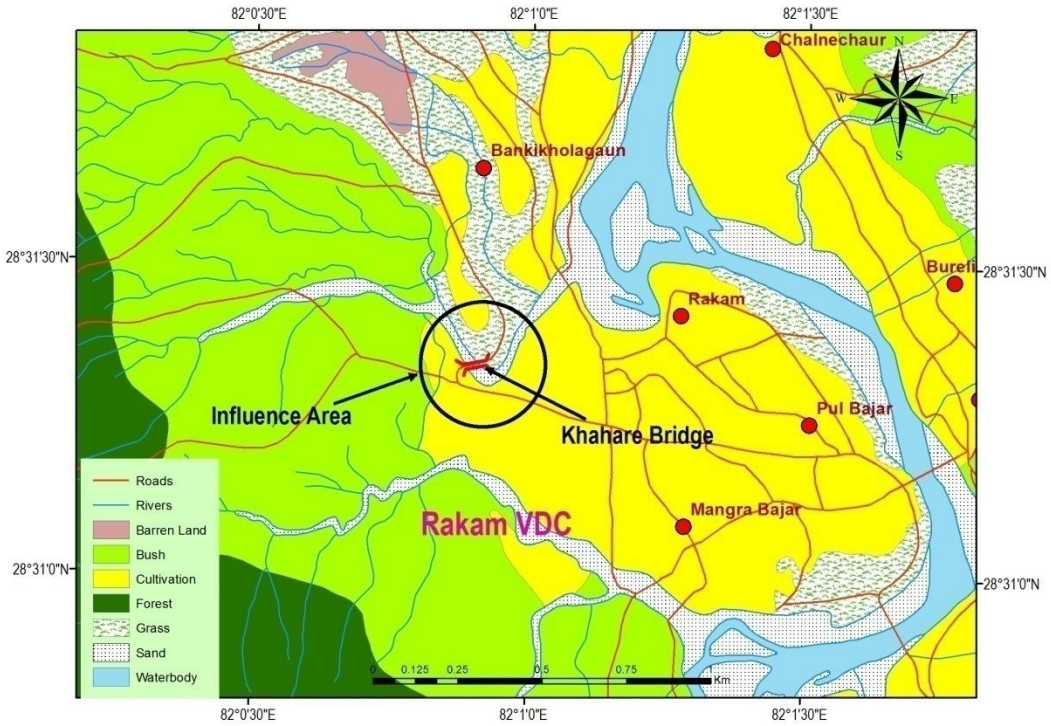


Figure 6.3: Land Use Map of the Project Area

5.7.8 Seismicity

The proposed area located far from remarkable thrust i.e., MBT and MCT. So, the activity of the fault movement is considered minimal. 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.

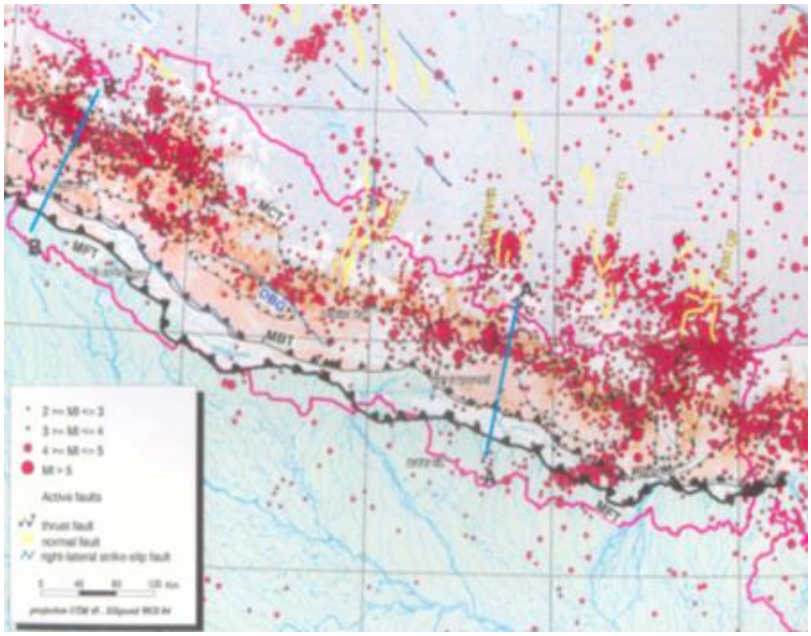


Figure 6.4: Epicentre of Earthquakes in the Nepal Himalaya

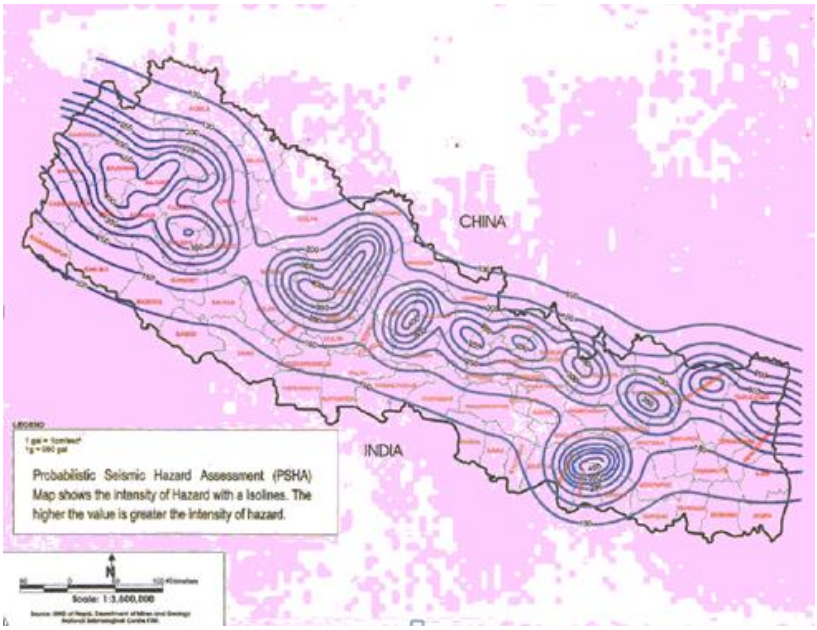


Figure 6.5: Seismic Hazard Map of Nepal

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

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

5.7.9 Air Quality

There are no major sources of air pollution around the vicinity of the project area. Dust (Particulate matter) and vehicular exhaust are the major air pollutant of the area. However ambient air quality of area is found to be within the National Ambient Air Quality Standards.

5.7.10 Water Quality

Water quality of the sources around the proposed bridge location is generally fair. Khahare Khola (Stream) remains dry during most part of the year. Water flows in the stream mostly during rainy condition. Agricultural runoff, soil erosion, generally degrade the quality of water in Khahare Khola. Suspended particulates and organic waste are the major water pollutant released from or nearby the project area.

5.7.11 Noise Quality

The noise level of the project area is generally found to be within the permissible limit. Vehicular movement are the major noise emitting sources around the project area.

5.7.12 Public Structures

None of the public structures are within the project direct impact area.

5.8 Biological Environment

5.8.1 Floral Diversity

The project area donot lie in the forest area. Both sides of the bridge construction area belongs to agricultural land. However, some scattered trees are found nearby the area and they includes, Khayer (*Acacia catechu*) Sisso (Dalbergia sisso), Bakenu (*Melia azederach*), Simal (*Bombax ceiba*), Bel (*Aegel marmelos*), Ipilipil (*Leucaena leucoecphala),* Salla (*Pinus roxburghii*), Kimbu (*Morus sp*.) trees are found around the project area. Shrubs and herbs found around the proposed bridge area includes Kera (*Musa paradisiaca),* Bayar (*Zyziphus mauritiana*) Sisno *(Urtica dioeca),* Banmara *(Lantana camara)* Datkuni *(Casearia tomentosa)* Ajambari *(Kalanchoe pinnata),* Besharam *(Ipomea carnea*), Dubo (*Cynodon dactylon*), Kuro (*Bidens pilosa*), Kans (*Saccharum spontaneum*), Asuro, Gandhe (*Ageratum conyzoides*), Cactus.

5.8.2 Forest Management

There are no any strip of forest around the project's direct impact area. However, community managed forest are found within the project influence area. Siddhakali Community Forest, and Mulpani Community Forest are the community found within the project influence area.

5.8.3 Horitcultural Crops

Nibuwa (*Citrus limonum*), Kera (*Musa paradisiaca),* Kagati (*Citrus aurantifolia*), Mango (*Magnifera indica*), Katahar (*Artocarpus heterophyllus*), etc., are the fruit tree found around the project area and and fodder trees like, Ipilipil (*Leucaena leucoecphala,* Bhimal (*Grewia optiva*), Kutmero (*Litsea monopetala*), etc. Besides, people grow numerous other crops, vegetables, pulses and fruits for household utilization or selling in nearby market.

5.8.4 Faunal Diversity

The forest around the project area is the habitat for many wild animals and birds and herpetofauna.

Mammals:

The project area donot lie nearby the forest area. However, as reported by the local people the commonly found wild animals around the project area are, Jackal (*Canis aureus*), Wild Boar (*Sus scrofa*), and Rhesus Macaque (*Maccaca mulata*), Grey Mongoose (*Herspestes edwardsi) etc.*

Birds:

Birds reported to be found around the project area includes, Bhangera (*Passer domesticus*), Parewa (*Columba palumbus*), Pani Haans (*Anas crecca*), Teetra (*Francolinus fracolinus*), Theuwa (*Coracias benghalensis*), Bakulla (*Egretta garzetta*).

Herpetofauna:

The common herpeto-fauna reported in the project area were Common Rat Snake (*Ptyas mucosus),* Mountain Keel back *(Amphiesma platyceps),* White Lipped Pit Viper *(Trimeresurus albolabris),* large ground skink *(Asymblepharus capitaneus),* Indo pacific gecko *(Hemidactylus garnotii),* Common Garden Lizard *(Calotes versicolor), Hemidactylus spp* (House Gecko), Asian Toad *(Bufo melanonostictus),* Paha (*Paa minica), Syhadra frog (Limnonectes syhadrensis*) are the common.

Fishes:

Khahare Khola is not productive in terms of fish production as it is an ephemeral river. However, during flowing condition some fishes were reported to be found in the stream. The mainly observed fish species includes Buduna (*Garra annandalei), Acrossocheilus hexajgonolepis* (Katle), Fageta (*Barilies scharca).* The people in the area rarely conduct fishing in Khahare Khola, fishing in Bheri (485 m. d/s) from the project implementation site is frequently observed.

5.8.5 Rare, Threatened and Protected Species of Flora and Fauna

Altogether 10 including floral and faunal species reported to be found around the project area are listed in different protection and conservation status. 1 tree species and 2 mammals are under government protection category. The list of plants and animals under GoN protection category, IUCN red list category and CITES Appendices are listed in Table 6-

Table 6.1: List of Flora and Fauna of Protection and Conservation Significance

S. N	Local Name	Scientific Name	Categories		
			GoN	IUCN	CITES
Flora					
	Flora				
2	Khayer	*Aegel marmelos*	P		III
Fauna					
5	Jackal (Syal)	*Canis aureus*		LC	
Flora					
Herpetofauna					
1	Dhaman	*Ptyas mucosus*			II

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

GoN Categories*: P Protected by legislation*

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

5.9 Socio-economic Environment

5.9.1 Project Affected District

The Khahare Khola Bridge is being constructed in Surkhet district of Bheri Zone of Mid-Western Development Region. According to the National population census 2011 projection, the total population of the district is 343,318 with comprises 162,672 males and 180,646 females. According to the National population census 2001(CBS), total population is 342,500 of which the male population is 164,347and female population is 178153. There are 64293 households in the district with an average household size of 6.42 (CBS). The population density per sq. km. is estimated at 189 with an average population growth is recorded at 2.76 % per annum. Different ethnic caste is found in Surkhet district. Majorities are Bramin/Chetri community. Similarly, Dalit and Janajati are found respectively. Actually all the caste is used communicating common Nepali language. In terms of cast, Chetri are 27.72%, Magar are 20.41%, Kami are 18.67%, Bramin are 11.46%, Gurung are 1.19% and others are 3.48%. Major festivals are celebrated Maghi, Dashain, Tihar, Fagupurnima, Sivaratri etc.

The district has 249016 (Ha) total lands out of which 52200 ha is Cultivated Land, 37444 ha is Non-Cultivated Land, 4054 ha is Rivers & Stream, 178361 ha is forest, 14401 ha is Grazing Land & 22690 ha is Irrigated Land. Infrastructural development in the district is steadily increasing. There are altogether 1051 educational institutions with 339 pre-primaries, 496 primary schools, 122 Lower secondary schools, 74 secondary schools, 18 are higher secondary schools, and 2 Campus. Literacy rate of the district is 62.48% whereas female literacy rate is 48.9% and male literacy rate is 70.6%. (*District Education Profile, 2012*)

The district is accessed with road facility. The district is availed through three national and road i.e., Karnali Highway, Ratna highway and Chhinchhu-Jajarkot road section and 2 feeder road i.e., Surkhet-Dailekh Road and Botechaur-Tulsipur Road. Similarly, a total of 424 km of district road network and 1075.5 km of village road. In Surkhet district,there is one District Public Health Center, 1 District Hospital,1 Ayurvedik Ausadhalaya,4 PHC, 9 Health Post(s),38 Sub-Health Post(s) and 2 Privet Hospital. In terms of irrigation facility. In terms of irrigation facility, a total of 12276 ha of land is irrigated. *(Source, DTMP, Surkhet 2012.*

5.9.2 Project influence Area

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., Rakam VDC, Surkhet.

5.9.2.1 Demographic Characteristics

The total population of the project affected VDC i.e., Rakam VDC is 3640 residing in 800 households with household size 4.55. The female population is higher than the male population constituting sex ration 82. 6.

Table 6.2: Demographic characteristics of the project area.

VDC	Households	Population			Household Size	Sex Ratio
		Total	Male	Female		
Rakam	800	3,640	1,647	1,993	4.55	82.6

Source: CBS, 2011

5.9.2.2 Ethnic Composition

Chhetree is the dominant caste/ethnic group comprising 31.9% of the total population followed by Kami (29.1%), Thakuri (11.1%), Magar (8.3%). The other caste/ethnicity of the area includes Lohar, Damai/Dholi, Sarki, Sanyasi/Dasnami, Badi etc. The details of caste/ethnicity of Rakam VDC is given in Table 6.3.

Table 6.3: Ethnic Composition of the Project Influence Area

Caste/Ethnicity	Total	Percentage
Chhetree	1162	31.9
BrahmanHill	74	2.0
Magar	301	8.3
Kami	1059	29.1
Damai/Dholi	128	3.5
Thakuri	403	11.1
Sarki	114	3.1
Sanyasi/Dashnami	132	3.6
Lohar	20	0.5
Badi	226	6.2
Terai	8	0.4
Others	13	0.4
	3640	100

Source: CBS, 2011

5.9.2.3 Literacy Rate

The literacy rate of the project VDC is 63.81% where male literacy rate is 74.98% and female literacy is 55.03%. The literacy rate of the project affected VDC is given in table below:

Table 6.4: Literacy Rate of Project VDC

	Population Above 5 Years	Population Who Are			Literacy Not Stated	Literacy Rate
		Can Read and Write	Can Read Only	Cannot Read and Write		
Both Sex		2,712	108	1,042	5	63.81
Male	1399	1049	46	304	2	74.98
Female	1779	797	62	738	3	55.03

Source: CBS, 2011

5.9.2.4 Sanitation and Drinking Water Facilities

The sanitation status of project affected VDC is poor which can be reflected with the figure that 69% of the households do not have the toilet facility. Out of the total households having toilet facility 19 % have the flush toilet whereas 11.5 % have the ordinary toilet.

Table 6.5: Availability of Toilet Facility in Project VDC

VDC	Total Households	Households without toilet facility	Household with toilet facility of		Total facility not stated
			Flush toilet	Ordinary toilet	
Rakam	800	552	152	92	4
Percentage		*69*	*19*	*11.5*	*0.5*

Source: CBS, 2011

Main source of drinking water in the project VDC is tap/piped where 84.5% of the households use this source. Second main source is river/stream and it accounts for 11.75% followed by spout water (3.125%). Households using well for drinking purpose is very low in number.

Table 6.6: Main Source of Drinking Water in Project VDC

VDC	Total Households	Main Source of Drinking Water				
		Tap/Piped Water	Tube well/ Hand pump	Spout Water	River/ Stream	Not Stated
Rakam	800	676	1	25	94	4
Percentage		*84.5*	*0.125*	*3.125*	*11.75*	*0.5*

Source: CBS, 2011

5.9.2.5 Housing Pattern

Scattered settlements is the characteristics of the project VDC except in few market areas like Jamune and Rakam Bazar. Foundation of most of the houses in project affected VDCs are made up of mud bonded brick stone (94%) followed by cement bonded/brick stone and RCC with pillar 2.1% each. The details of types of foundation of house in project affected VDC is given in table below;

Table 6.7: Types of foundation of house in Project VDC

VDC	Total households	Type of Foundation of House				
		Mud bonded/ Brick Stone	Cement Bonded/ Brick Stone	RCC with Pillar	Wooden Pillar	Not Stated
Rakam	800	752	17	17	10	4
Percentage		*94*	*2.1*	*2.1*	*1.3*	*0.5*

Source: CBS, 2011

5.9.2.6 Household by Ownership

Most of the houses in project VDC is owned which accounts for 96 % and only 3,2% rented. The ownership of housing unit in project VDC is given in following table.

Table 6.8: Ownership of Housing Unit in Project VDC.

		Ownership of House/Housing Unit		
VDC	Total	Owned	Rented	Rented
Rakam	800	768	26	6
Percentage		*96*	*3.25*	*0.75*

Source: CBS, 2011

5.9.2.7 Energy Use

- ***Energy Use for Cooking***

Firewood is the major source of energy for cooking where about 97.1 % of the households are using this source. Households using LPG accounts for only 1.4 %. Other alternative source of energy for cooking includes dung cake, kerosene and biogas. The source of energy used for cooking in the project affected VDC is given in following table.

Table 6.9: Energy Used for Cooking in Project VDC

VDC	Total	Fuel usually used for cooking				
		Wood / firewood	LPG	Santhi/ guitha (cow dung)	Bio gas	Not Stated
Rakam	800	777	11	6	2	4
Percentage		*97.1*	*1.4*	*0.8*	*0*	*0.5*

Source: CBS, 2011

- ***Energy use for lighting Purpose***

Electricity and solar are the main source of lighting in the project VDC. The electricity is being supplied through Badepipal Sub-station (33 kV) at Rakam. Market areas like Rakam and Jamune are supplied with electricity. All villages of Rakam VDC is not supplied with electricity and most of people of the area have to rely on solar and kerosene for lighting purpose.

5.9.2.8 Occupation

Major occupation of the people of Rakam VDC is agriculture (77.8%), followed by business (8.9%), porter, wage labors, foreign employment and service. The occupational status of Rakam VDC is given in table below;

Table 6.10: Occupational Status of Project Influence Area

Occupation	Percentage
Agriculture	77.8
Business	8.9
Porter	4.6
Wage Labor	3.8
Foreign employment	2.1
Service	1.4
Others	1.4

Source: Rakam VDC profile, 2069

5.9.2.9 Education Facility

The project influence area is satisfactory in terms of educational facilities. 1 campus (upto Bachelor Degree), 2 higher secondary schools, 3 secondary school and 8 primary schools are found in the sub-project VDC. Rakam and Jamune Bazar which lie nearby the project area is significant areas for acquiring educational facilities for the people in the area.

5.9.2.10 Health Facilities

The area is not satisfactory in terms of providing health facility. One sub-health post and Ayurvedic hospital lies in Rakam. The people in the area generally visit Devasthal for general ailment, and for serious ailment people generally visit hospitals of Surkhet, Nepalgunj and even to Kathmandu.

5.9.2.11 Other Social Service Facilities

Ilaka Police post, Ilaka post office at Badepipal, Ayurvedic hospital, Agriculture service, electricity sub-station (33 kV), VDC office, office of Red cross society are some of the social service facilities found within and nearby the sub-project influence area.

5.9.3 Socioeconomic Condition of Project Affected Households (PAPs)

5.9.3.1 Demographic Composition

The construction of bridge affects 4 households. During field survey, 2 household members were absent. The information provided here belongs to the 2 households likely to be affected. Altogether, 15 family members will be affected in which the number of male is higher than female. The average family household size is 7.50

Table 6.11: Demographic Profile of PAPs

Name of bridge	Affected HHs	Male	Female	Total	HHs size
Khahare Khola	2	8	7	15	7.50

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.2 Ethnicity Composition

All the households those likely to be affected due to bridge construction belongs to Chhetree community.

Table 6.12: Ethnic Composition of PAPs

Caste/Ethnicity	Households	%
Chhetri	1	33.33
Total	3	100.00

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.3 Age Distribution

Among the project affected population, majority (60.00%) are economically active and about 40.00% populations are dependent which indicates that these age group populations are economically inactive and dependent for their livelihood.

Table 6.13: Age Distribution of PAPs

Age Distribution	Population	%
Below 5 Years	2	13.33
6-15	4	26.67
16-60	9	60.00
Total	15	100.00

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.4 Education and Literacy Status

There is well developed educational facilities at Jamune and Rakam located nearby the sub-project area. About 85% of the PAPs member are literate and 15% are illiterate. About 8% populations have received informal education and can read and write only. Majority of the affected population, 30% are in Secondary level which decreased in SLC and no one is found above the Intermediate. The table below shows the education level.

Table 6.14: Educational Status of PAPs

Education	No.	%
Illiterate	2	15.38
Literate	1	7.69
Class 1-5	5	38.46
Class 6-10	4	30.77
SLC	1	7.69
Total	13	100.00

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.5 Occupation of Affected HHs

The affected households are engaged in different occupation. Of the total affected households about 20 percentages are engaged in business operating nearby bridge location. The table below shows the occupational division of affected households

Table 6.15: Occupation of PAPs

Occupation	No.	%
Agriculture	4	36.36
Private Services	2	18.18
Business	1	9.09
Student	2	18.18
Foreign employment	2	18.18
Total	11	100.0

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.6 Sources of income

The major source of income of the PAP are business and foreign employment.

Table 6.16: Source of Income

Major source of Income	Households	%
Business	1	50.00
Foreign Employment	1	50.00
Total	**2**	**100.00**

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.7 Food Sufficiency Level

Among the affected households one HH have food sufficient for whole year and the other have sufficiency for 3-6 months from their own production. The table below shows food sufficiency level of PAPs.

Table 6.17: Food Sufficiency Level of PAPs

Food Sufficiency Level	HHS	%
3-6 Months	1	50.00
9-12 Months	1	50.00
Total	**2**	**100.0**

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.8 Level of Income

The range of income shows that similar of all houses of 100,000- 150000 per year. Table 9: Level of Income

Table 6.18: Income Level of PAPs

Income Range	Households	Percentage
100,001-150,000	2	100.00
Total	2	100.00

Source: Draft Resettlement Plan of Khahare Bridge, 2016

5.9.3.9 Level of Expenditure

There seems similarity between income and expenditure of affected households. Among the affected households, both households' expenses are in 100,001 to 150,000 per year. The table below shows the expenditure pattern of affected households. (*Source: Draft Resettlement Plan of Khahare Bridge, 2016)*

5.9.3.10 Health and Sanitation

The area is not satisfactory in terms of providing health facility. One sub-health post and Ayurvedic hospital lies in Rakam. The people in the area generally visit Devasthal for general ailment, and for serious ailment people generally visit hospitals of Surkhet, Nepalgunj and even to Kathmandu. (*Field Survey, 2016*)

5.9.3.11 Source of Water

The water source is local springs. The springs from Goji Khola have been tapped. The water They have community taped and private tap water from source to their yard. The people in the area have to suffer water scarcity especially during dry periods.

5.9.3.12 Toilet Facility and Defecation Practice

Open defecation practice is highly prevailed in bridge construction site. But 100% of the affected households have toilet facility. Rivers banks and open spaces are the regular locations for defecation those who have not toilet facility. During the group discussion among villagers, they told that even though we have toilet facility but we have not practice of proper defecate system. Those who have toilet also visit open space for defecation.

5.9.3.13 Gender Situation

Gender discrimination is very widespread in project districts. Women are far behind to receive the facilities and access in mainstreaming sector. The girl's enrolment in schools is very poor. The early marriage is prevalence in project districts. Women are mostly engaged in households and unproductive sector. Male partners enjoy outside households and have access to outer world.

5.9.3.14 Perception of PAPs regarding the Project

PAPs of the sub-project are very positive towards the project implementation. They said that construction of bridge will provide the reliable transport facilities to the project implementation. They seek the employment in the project if there is any provision. They are ready to provide their land and structures on permanent or temporary basis if suitable compensation and or rent is provided.

6 ASSESSMENT OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Several impacts are identified, predicted and evaluated considering the project activities on the existing condition on physical, chemical, biological and socio-economic environment condition of the project area. The impacts are both beneficial as well as adverse. The impacts were analysed with quantified information of changes, alternation and losses based on the characteristics of existing condition and sensitivity of environmental aspects. This chapter also includes the mitigation measures proposed for the identified and predicted impact. Mitigation measures are either preventive, corrective, compensatory or benefit augmentation measures. The possible beneficial and adverse impacts from the project during its construction and operation stage are discussed below:

6.4 Beneficial Impacts

Construction Stage

- **Employment Generation**

An estimated 20 people per day including skilled, semi-skilled and unskilled workforce will be directly employed for project construction for around 24 months in contract basis. Among the workforce utilized for the sub-project 30% will be skilled where as 70% will be semiskilled and unskilled. *This impact will be direct, medium magnitude, local in scale and short term in duration.*

Augmentation Measures: The project will prioritize to involve local workforce during project construction. The project will give special priority to the socially deprived and excluded, disadvantaged and marginalized people especially women, indigenous peoples (IPs) and Dalit.

- **Enhancement of 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. Similarly, as per Resettlement Action Plan prepared for this project, the project has planned to provide ***"Income Restoration and Skill Development Training (IRSDT)"*** to the project affected households which will ultimately help in re-establishment of PAP's lost livelihood and creates new income generating activities. *This impact will be direct, of medium magnitude, local in scale and long term in duration and is a significant impact.*

Augmentation Measures:

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. IRSDT training to the family of project affected households will be provided.

- **Enhancement of Local Economy**

Several numbers of construction crew will come into the project area during project construction. In order to meet the increased consumptive demands of local goods and services, the number of groceries, shops, restaurants, and hotels will be increased and agricultural production including diary and other forms of production in and around the project area is likely to be increased. Increase in local market will increase the income level of the local people. *The envisaged impact will be direct of medium impact, local in extent and short term in duration and is a significant impact.*

Augmentation Measures: Priority will be given to the local product and services required for construction activities without putting pressures on local demands.

Operation Stage

- **Improved Mobility**

Crossings through Khahare stream during monsoon period is very difficult due to lack of bridge over it. The construction of new bridge over Khahare stream will ensure all weather mobility within this section of CJ road. *The envisaged impact will be direct, high magnitude, regional in extent and long term in duration.*

Augmentation Measures: During the operation of the bridge, regular and routine maintenance will be conducted so that its operational condition will be maintained.

- **Saves Time and Money**

Along the CJ road, there are several river and stream crossing which are not facilitated with Bridge, one of them is over Khahare Stream at Rakam of Surkhet District. People moving to and back from Jajarkot, various places of eastern Surkhet, Dolpa have to change the vehicles during monsoon period, which is putting unnecessary burden of time and money to the people of the area. Construction of bridge over Khahare Khola will eliminate the extra burden of time and money of the people around the area. *The impact will be direct, moderate magnitude, regional in extent and long term in duration.*

Augmentation Measures: No separate augmentation measures for this impact has been proposed.

- **Reduced Traffic Congestion and Road Safety**

During monsoon period, the stagnation of vehicles on both bank of the stream often happens, which is creating traffic queues. After the construction of bridge this problem will be largely reduced as smooth crossing of vehicles will be ensured. Similarly, standard double lane carriageway width and footpath will ensure the road safety for both pedestrian and passengers. *The impact will be direct, of medium magnitude, local in extent and long term in duration.*

Augmentation Measures: Traffic signs and signals indicating "No parking" will be placed on around the bridge sites. The project will provide the solar lighting system in the bridge axis and around the approach road.

6.5 Adverse Impacts

7.2.1 Physical and Cultural Environment

Construction Stage

- **Change in morphology, longitudinal profile of river bed and hydrological character of regime of river**

The construction of the bridge does not require the diversion of the flow and construction of piers is also not applicable for this sub-project. The construction of the bridge will be carried out during the dry season when the water flow of the river will be minimal. However, excavation works during construction of abutment, and improper management of spoil may affect the natural flow of the stream. Since the construction works of the sub-project is of small nature, and the appropriate drainage will be ensured to maintain natural flow of the stream, the envisaged impact will be of low magnitude, site specific in extent and short term in duration *Hence, this impact will be of low significance, site specific and short term in duration.*

Mitigation Measures: Required flood plain areas be only used; unnecessary disturbances to the flood plain areas will not be done. Sand and gravel will not be quarried from the river bed nearby (at least 500 m u/s and d/s of the bridge axis) the project site. The project have plan to acquire construction materials (River Bed materials) from Bheri River at the location where no natural drainage of Bheri River will be affected. Channel and bank protection activities will be used and allowable materials and potential alternative solutions that allow for natural channel processes will be deployed. Natural flow of the stream will be ensured through proper drainage facility during project construction. Construction activities will be conducted avoiding monsoon season during which flow in Khahare Khola will be very low.

- **Land use Change**

The project requires land for different purposes. Some of the land parcel is required belonging both to private and government property. About 0.85 ha of land is required permanently for the project to construct approach road and bridge. Out of which 0.82 ha belongs to the private land and remaining 0.03 ha belongs to public land. Similarly, 0.13 m^2 is required temporarily for the sub-project. The detail of land requirement for the project is given in table 3.2. 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 short-term.*

Mitigation Measures: Only required land will be acquired for construction purpose. Rehabilitation of the temporary used land will be done. Permanently acquired private land will be compensated. Rental payment will be made for the use of temporary land from private belongings. Agricultural land for temporary use will not be utilized. Written contract will be made between the affected land and asset owner and contractors specifying period of occupancy, market value of crops normally produced on the land (in case of agricultural land), mode of compensation payment, land protection and proper rehabilitation measures for all types of assets. Temporarily used land will be rehabilitated to its previous condition after the work completed.

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

The proposed bridge is not located in fragile hill slopes. The excavation works during construction of bridge abutment including construction of approach road will have very less

impact on the slope stability of the project area. *The impact is insignificant for the proposed project.*

- **Management and operation of quarries and Sand and Gravel extraction**

Locally available construction materials such as sand, stone and gravel can be acquired from the flood plain of Bheri River. The recommended site is 2.5 km from the project location and 0.5 km from Jamaune Bazar. d/s from the proposed bridge location. 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 (commonly 1 km or more) 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. *The envisaged impact will be of high magnitude, site specific in nature and medium in duration.*

Mitigation Measures: Consent from local stakeholders and concerned stakeholders will be taken prior to the use of quarry and river bed extraction site. Unstable sites, erosion prone areas, dense forest, settlements, fertile farm land will be avoided for quarry operation.

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. 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. Floodplain pits will be restored by planting riparian vegetation. Extracted materials will be transported through already available access road.

- **Generation of Construction waste and Spoil**

The excavation of soil for the foundation of the bridge and approach road will generate about some quantity of spoils, however, their quantity will be comparatively low. Out of the generated certain amount will be reused for backfilling and approach road levelling. 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 *Hence, the impact will be of high magnitude, site specific in extent and medium term in nature.*

Mitigation Measures: Whenever possible, surplus spoil will be used to fill eroded gullies, quarries and borrow pits, depressed areas, etc. Remaining spoil will be disposed in the recommended spoil disposal site in a controlled manner. Spoil will be disposed of in land besides the gabion structures constructed for river training works. Disposal of spoil on fragile slopes, farmland, marshy land, forested areas, natural drainage path, canals and other infrastructures will be prohibited. A disposal site will be provided with proper drainage, vegetation and adequate protection against erosion and runoffs. Vegetation plantation will be done over the spoil disposed surface to reclaim the area.

The recommended methods for the disposal of spoil are as follows:

- 3 meter high gabion structures will be built along the bank of river at both sites 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 of 60^0 on the river side.
- As soon as the spoil disposal gets completed the site will be planted with trees. Altogether 50 trees will be planted around the spoil disposal site.

- **Water pollution**

The mishandling of 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 hill slopes for approach road and foundation pit to the river. This would increase the turbidity and contribute the water pollution of Khahare 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 direct, medium in magnitude, local in extent and short term in duration.*

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

- **Road Diversion**

The construction of Khahare Bridge does not involve the use of road diversion as the existing crossing can be utilized for this purpose. The construction of bridge will be almost 10 m d/s of the existing crossing, no separate diversion is required during the construction. *The envisaged impact is insignificant for this 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.*

Mitigation Measures: Storage of chemicals including hazardous materials will be done on safe place and the storage facility will be sealed. Hazardous materials will not be stored near water surface. All used lubricants and oils will be collected and recycled or disposed off site. Plastic sheeting will be placed under hazardous materials storage area to collect and retain leaks and spills. Contaminated runoff from storage areas will be captured in ditches or ponds with an oil trap at the outlet. Contaminated and worn plastic sheeting will be packed into drums and disposed off site. The facility will be well protected from strangers and scavengers. Paints wile 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.

- **Stockpiling of materials/issues related to stockpiling yard**

Construction materials like sand, gravel, rod, cement, chemicals required during construction are to be stockpiled. The leakage, mishandling and misuse of these materials could result in degradation of land and water quality. Improper designation and management of stockpiling area can lead to soil and water pollution, and even to the degradation of aesthetic of the project area. *This impact will be direct, high in magnitude, site specific and short term in duration.*

Mitigation Measures: The stockpiling site has been proposed on barren land away from agricultural land. 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 will be provided to protect the stockpiled materials from scavengers and livestock.

- **Air pollution**

The operation of machineries during the construction period for the excavation of river Vehicular movement, excavation works, bitumen heating and quarry site operation will result in different forms of air pollutants. Since the proposed project is of small nature, the intensity of such works will be low. As most of the construction work will be carried out in dry season, dust emission can be expected to be high. Smoke & Dust will also affect the road/bridge site, vegetation, local people and workers. During windy conditions and can be blown *The envisaged impact will be direct, medium magnitude, site, local in extent and short term in duration.*

Mitigation Measures: 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.

- **Noise Pollution**

The present noise level of the area is fair. During the construction period, operation of machines, excavators, power tiller, movement of transporting vehicles, trucks and construction equipment will increase the existing noise level. The intensity and frequency of use of such vehicles and equipment will be low due to small size of the project. The project area is nearby the settlements however, it is relatively far from the sensitive community areas like schools and hospitals. *The envisaged impact will be direct, low in magnitude, site specific in nature and short term in duration.*

Mitigation Measures: 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. Crusher plant will be kept at area away from settlement.

- **Bridge Safety**

The bridge will be constructed nearby the existing road in which numbers of vehicles ply. 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*

Mitigation Measures: 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. Appropriate passage for drainage will be ensured through properly designed temporary draining structures.

- **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. *Thus, the impact is of medium magnitude, site-specific and short-term in nature.*

Mitigation Measures: 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 (Chlorination) will be continuously spread to avoid contamination. 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 dirking water will be made at the construction camp.

- **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 not within the forest area and litters deposition is very low in the area. *The impact is considered moderate in magnitude, Local in extent and short term in duration and is a significant impact.*

Mitigation Measures: 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 soon after their release. 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 8 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.

- **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.*

Mitigation Measures: Safe site for bitumen heating and storage will be identified. 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.

- **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. The construction materials mainly sands can be available along the riverbed from the Bheri. River Boulders and cobble pebbles containing quartzite, dolomite and schist can be found. The riverbed extraction site (Bheri River) can be approached almost 2 km from the project site. The site can be approached nearby Jamune Bazaar. Both excavator and tripper can reach the site. 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.*

Mitigation Measures: 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.

- **Occupational health and Safety of workers**

During the construction stage, different heavy machines and equipment would be operated which can pose the threat to the safety of the workers. Likewise, excavation, slope cutting etc. can cause the physical injury to 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*.

Mitigation Measures: The contractor will maintain occupational health and safety arrangement and strictly enforce the 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. Vehicles and equipment will be maintained in proper condition so that they produce less noise.

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

The construction of Khahare Bridge is not likely to affect any of the cultural, religious and historical sites of the project area. The impact is insignificant for the project implementation.

- **Impact on Common Property Resources**

The construction of Khahare bridge is not likely to affect any of the public infrastructures and common property resources of the area. The impact is insignificant for the project implementation.

Operation and Maintenance Stage

- **Air pollution, Noise and Vibration**

The operation of the bridge would create the easy access to the vehicles and there would be increase in number of vehicles transporting the goods and other materials as well as public vehicles. The increase in number of vehicles would increase the emission of smoke and gas from the vehicles, which would increase the air pollution. The increase in movement of the vehicles would create the noise and vibration. The vibration induced by the resonance of traffic noise can have negative impact on people and structures nearby the bridge location. However, the project location site is not among the busiest section therefore, number of vehicles plying through the bridge will be relatively lower. *The impact is low, local and long term in nature*.

Mitigation Measures: 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.

- **Backwater Effect During Floods**

The operation of the bridge would not block the flow of the water as the bridge is with single span without pier. Erection of abutment will not have any impact on the natural flow of the Khahare Khola. *This impact is not relevant to the proposed project.*

- **Riverbank Erosion**

River bank erosion is prominent around the bridge construction area, as the river flows through steep and deep river channel. The impact will be medium in magnitude, site specific in nature and long term in duration. *This impact will be insignificant during operation phase.*

Mitigation Measures: River training works including bioengineering will be adopted during bridge design which will reduce the impact of river bank erosion.

- **Stockpiling of materials during regular/periodic 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.*

Mitigation Measures: 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.

Mitigation Measures: Warning signs and speed breakers will be provided on both banks of the bridge.

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

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

Mitigation Measures: Different land used temporarily during project construction will be reinstated to the previous condition. For this cost cost for reinstatement of stockpiling yard, labor camp, quarry site and river bed extraction site has been provided.

- **Congestion around the adjoining areas of Bridge Abutment**

There is a possibility of gathering of commercial activities and settlements from vicinity to road alignment. There are some public land around the project area and these land could be encroached by the new comers. There could be the possibility of erecting new and haphazard settlements nearby the bridge location. This practice could disturb the traffic, promote encroachment of the RoW (Right of Way), increase possibility of accidents, decline the aesthetic value, and reduce the overall capacity of road. If such practices are not controlled by enforcing specific legal actions. *The impact will be medium in magnitude, long term in nature and local in extent.*

Mitigation Measures: The project will coordinate with the local authority i.e., VDC, DDC to regulate the activities of roadside encroachment.

6.1.2 Biological Environment

Construction Stage

- **Loss of Vegetation**

The project require the clearance of 4 Ipil-Ipil trees, (Fodder plant), 1 Bakeno tree, and various shurbs and herbs species from private land. The shrubs species likely to be lost during site clearance includes Besharam, Datkune, Bayer, Asuro, Ratanjata. The project will not affect any of the forest land area. *The envisaged impact will be of direct, medium magnitude, site specific in extent and short term in duration and is a significant impact.*

Mitigation Measures: Altogether 4 fodder plant is likely to be due to construction of approach road. Advance agreement will be done with the owner before it is cleared. Net value of tree where will be estimated. Compensation for future production losses, based on 5 years annual net production for fruit/fodder trees and 3 years annual net production for timber/fuel wood trees and other perennial crops will be provided.

- **Impact on Wildlife**

Since the proposed site for the construction of Khahare Khola Bridge is not a wildlife movement corridor and forest areas is not likely to be affected. On the other hand, if the construction crew cut the tress from the nearby forest to meet their cooking energy requirement, it would pose threats on the wildlife and biodiversity of the area. *This impact is direct, of low magnitude, local and medium term in duration.*

Mitigation Measures: Illegal hunting, harassment to wildlife and fishing 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.

- **Impact on aquatic lives**

During dredging, 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, Khahare Khola is ephemeral stream, water in the stream flows only during monsoon periods only within the bridge location, the stream is not significant habitat for wildlife and aquatic habitat. *This impact is envisaged to be low in magnitude, local and short term in duration.*

***Mitigation Measures**:* 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.

Operation and Maintenance Stage

- **Barrier Effects on Aquatic animals**

As the abutment and foundation of the Khahre Khola Bridge will be located at the bank (flood plain) of the Khahare Khola and no piers will be construction within the river channel, there would be insignificant barrier effect on the movement of aquatic animals.

7.2.3 Socio-economic Aspect

Construction Stage

- **Social Conflicts**

For the construction of the Khahare Khola Bridge, local people would be given high priority to work as a workforce. However, some specified workers would be sourced from other areas. Thus, their presence around the project area would cause dispute with local people. the Construction workers may involve in gambling, alcoholism etc and eventually may get into conflict among themselves or with the surrounding people. *This impact is envisaged to be low in magnitude, local in extent and medium term in duration.*

Mitigation Measures: Code of conduct for the workforce will be strictly applied. Conduct regarding respect to local culture and customs and unnecessary relationship with the local people will be enforced.

- **Obstruction to social services and facilities**

During the construction phase, existing diversion is available for river crossing. Hence, the construction of the bridge would not have obstruction in vehicular movement. Likewise, no other social services and facilities like, electric poles, water taps, schools, etc. will be directly or indirectly affected during bridge construction. However, if the construction camp requirements are fulfilled from the local resources like water supply, energy requirement it will pose certain pressure on social service facility. *This impact is envisaged to be low, site-specific and medium term in duration.*

Mitigation Measures: 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, like formation of ditches, will be controlled and rehabilitated.

- **Loss of productive land**

The project will require 0.8173 ha of private land of which most of the land belong to land utilized for dwelling and business purposes. Temporary land requirement for sub-project will not be taken from the private belongings, as government barren land is abundant in the area. The detail about the land affected is presented in the table below. *The envisaged impact will be low in magnitude, site specific in extent and long term in duration*.

Table 6.1: Detail about the affected land.

S.N	Cod No	Structure Owner Name	Address	Distance from bridge(in M)	Description of Structure	No of Storey	Present Use	Area in Sqft	Type of structure	Built Year
1	116	Saiser Budha	Rakam-4	12	Stone and mud motar with dry grass roof	1.00	Shed	168	Kachhi	2062

Source: RAP, 2016

Mitigation Measures: The project will not utilize private agricultural land for temporary use. Stockpiling areas and spoil disposal areas will at least be 50 m away from the agricultural land. The

- **Land and property acquisition**

Altogether 4 households will be affected during bridge construction. About 0.8173 ha of private land will be affected. The details of project affected persons PAPs has been provided in resettlement plan prepared for the sub-project. *The envisaged impact is high in magnitude, local in extent and medium term in duration.*

Mitigation Measures: Compensation to the affected households for their private property will be provided. Furthermore, displacement allowance will be given to those persons who have another house to live and to operate their business and require few months' time period to resettle in a new place. During the time of replacement, the household may lose their income due to disturbance in their business. The affected households those who displaced from the existing place and wants to go to another house either by constructing new house or in an old house, are subject to receive such allowances at lump-sum amount. (*The resettlement plan of the proposed sub-project will address this highly significant issue.)*

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

Out of the 4 households to be affected by the project 4 households belongs to Bramhin and Chhetri, and Thakuri. The sub-project implementation will not affect any of the vulnerable indigenous people and Dalits. *This is the insignificant impact resulting from the project implementation.*

- ***Child Labour Issue***

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

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

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

Mitigation Measures: 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.

7 ALTERNATIVE ANALYSIS

This chapter discuss on various alternatives proposed for implementation of Khahare Khola Bridge. The objective of carrying alternative analysis is to identify and recommend best technical, operational and environment friendly alternatives that ensures the implementation of the sub-project sustainably with minimum environmental and social damage.

7.4 Location Alternatives

Two different alternatives were analysed during the design period of the proposed bridge project. First alternative where the bridge would be constructed at the proposed location and the other option will be to construct bridge at 30 m d/s from the project location. For first option the length of the bridge will be significantly decreased, however approach road has to pass through turning which might have the risk of accident. However, for second option the bridge length will be comparatively larger and will have larger impact on agricultural land due construction of approach road. In terms of cost effectiveness and reducing environmental and social impact, first option was considered for the implementation of the sub-project.

7.5 Design and Construction Alternatives

The proposed bridge have single span without the need of piers. If piers would have to be constructed additional environmental damages including obstruction of river flow, water pollution and spoil generation would have increased. During bridge design, different alternatives have been considered. Following table 8-1 compares major possible bridge design compared for the project.

Table 7.1: Comparison of different bridge types

Simply supported RCC bridge	Steel truss bridge	RC Arch bridge
Most economical up to 25m. May be possible with higher grades of the conc. And steel for span greater than 25m	Economical for span greater than 30m	Cost yet to be finalized – may be economical
Local skill and technology easily available	Limited local skill and technology available	Local skill and technology not easily available
High cost of staging	Low cost of staging	High cost of staging and complicated framework
Lower construction and maintenance cost	Higher construction and maintenance cost	Lower construction and maintenance cost
Longer construction period	Shorter construction period	Longer construction period
Less control on the quality as the most of the work is carried out at site	Better quality ensured as the most of the components can be manufactured in the shop	Less control on the quality as the most of work is carried out at the site
Aesthetically pleasing	-Aesthetically not pleasing	-Aesthetically most pleasing

Considering the river bank, river channel type, bed & bank materials, availability of local skills and technology alignment of the existing road and durability & maintenance cost, RCC simply supported structure have been proposed

The construction of the proposed bridge will involve the environmental friendly approach in which labour and mechanized methods will be optimally applied. 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.

7.6 Time Schedule Alternatives

The construction period have been taken as 24 months considering the climatic and hydrological condition of the project area. Construction of foundation, collection of sand and aggregate from river beds will be constructed only during dry period to minimize the impact on water quality and aquatic ecology.

7.7 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.

7.8 No Project Alternative

Due to lack of motorable bridge over Khahare Khola, all weather vehicular movement is not possible along CJ road. Even though there are several places along CJ road where vehicular crossing during monsoon is not possible. The greater obstacle was at Bheri River where Bridge is almost constructed, otherwise, the vehicles have to cross through Ferry and people generally cross through suspension bridge. Similarly, across Khahare Khola, crossing during dry period is not the concern, but during wet periods it is the bigger problem. No action option will not ensure the all-weather mobility of the people to and from various parts of Surkhet and Jajarkot District. Construction of project will have some impact on environmental and social condition of the project area, however, most of the impact are of less significance and can be mitigated through cost effective mitigation measures. No action option would deprive the people from taking all weather transport facility along CJ road so this option was not considered.

7.9 Other matters

The other matters to be included to minimize the social and environmental impact would be to implement the Environmental Management Plan (EMP). The alternative for the environmental management system could be the establishment of Environmental Monitoring Unit at RSDP/GESU/DoR. The unit will conduct the environmental monitoring works in regular time interval. It will be better if the environmental monitoring unit comprises of the representatives of clients, consultant, contractor and the local authorities as required. Timely meeting shall be conducted where the compliance status and future necessities shall be discussed, and certain agreement could be decided.

8 ENVIRONMENTAL MANAGEMENT PLAN

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

8.4 Roles and Responsibilities of Stakeholders in Executing EMP

The stakeholders that are involved for the environmental and social safeguard during the construction and operation of the proposed Khahare Khola Bridge are presented in table 10-1.

Table 8.1: Institutions and their role in EMP implementation

Institution	Roles	Responsibilities	Remarks
Ministry of Physical Infrastructure and Transport (MoPIT)	It is the concerned ministry and has the role of project execution	✓ Review and approval of Initial Environmental Examination (IEE) document ✓ Coordinate with project implementing bodies during the implementation of environmental safeguard mechanism and their monitoring	
Department of Road (DoR)	It is a department under MoPIT and has the role of project execution	✓ Responsibility for the implementation of the project alongside the environmental safeguard measures	
Road Sector Development Project (RSDP)-Foreign Cooperation Branch (FCB)	Foreign cooperation project under the DoR, which coordinates with donors to invest for the road projects in Nepal	✓ Review of EMP and provide feedbacks ✓ Coordination with the donor agencies to invest for the construction of the road ✓ Execution of the road projects	
Geo-Environment and Social Unit	Unit under the DoR responsible for technical	✓ Review, comment, and forward ToR and IEE for the approval by the	

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

Figure 10-1 shows the hierarchy of agencies responsible for EMP implementation of the proposed sub-project. The MoPIT being the concerned ministry remains at the highest position of the order and the implementing contractor will work at the base level.

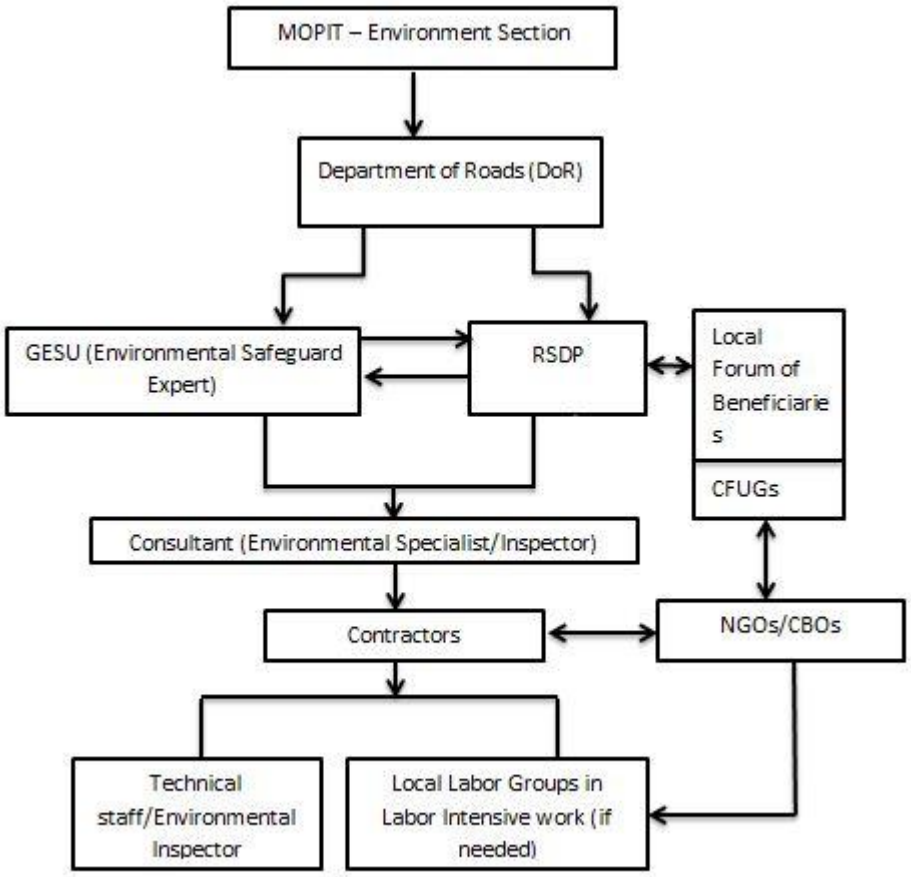


Figure 8.1: Agencies responsible for the implementation of EMP

8.5 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 generally 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 10-2.

Table 8.2: Specific monitoring indicators selected for the IEE document

Monitoring Field	Parameters Selected for the Monitoring
Land use, erosion, landslides and waste management	▪ Area (ha) of land, forested and properties deformed (changed) ▪ Number, location and extent of slope failures ▪ Cause analysis for slope failure (natural or man-made) ▪ Nos and extent of gully erosions and pavement failures ▪ Nos of days and nature of traffic delays due to slides ▪ General condition of waste management site ▪ Drainage and erosion condition of the waste management site
Seismicity	▪ Nos and magnitude of local seismic activities and respective damage to structures
Water use and pollution status for both surface and sub-surface flows	▪ Nos and extent of water-logging around the construction sites ▪ Nos of irrigation canals, drinking water taps, etc. that lie within the project construction site ▪ Incidents and trends of waterborne diseases ▪ Blockage of waterways – extent and secondary impacts ▪ Water pollution incidents due to unsafe disposal of spoil ▪ Trend analysis for local fisheries ▪ Records of seasonal groundwater fluctuations ▪ Laboratory tests for river water quality
Air, noise and vibration in relation to traffic volume	▪ Point measurement of noise near the construction site ▪ Qualitative analysis of wind borne dust particles during the construction stage of the project ▪ Qualitative assessment of vibrations sensed around the nearby households of the project construction site
Bridge/Road safety	▪ Speed measurement at both sides of the bridge ▪ Nos and type of accidents recorded by the Traffic Police Office and local health service centres that occurred around the bridge ▪ Effectiveness of safety signs
Wildlife habitat disturbance and impacts on forest resources and its mitigation	▪ Nos and extent of accidents inflicting wildlife ▪ DFO records on illegal medicinal plant, wildlife exploitation and trade ▪ Nos, extents and causes of forest fires ▪ Observations and handling of invasive species ▪ Success/failure/effectiveness of roadside plantation
Socio-economic development around bridge location	▪ Demographic, economic and educational status ▪ Nos of HHs and extent of market expansion around the bridge ▪ 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.

8.5.1 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.

8.5.2 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.

8.5.3 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.

8.5.4 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 table 10-3 and 10-4.

Table 8.3: Compliance monitoring parameters with respective indicators

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Final location and design as per IEE/EMP recommendation	Incorporation of IEE/EMP recommendations into location and design selection and finalization	Site observation and verification	Preconstruction phase	Consultant	Proponent/RSDP, DoR
Site selection and preparation of construction logistics	Project's arrangement of material storage, and construction activities (e.g.: campsite, material stockpiling site, etc.)	Site inspection, general sketch and photographs	Beginning of construction phase	Technical consultant, contractor	Proponent (RSDP, DoR)
Use of local labour, particularly vulnerable groups and women	Number of local labours employed in project	Records of the local recruitment bodies who facilitate and coordinate the process for local people's employment, interview	Once a month for the entire construction period where labour work is contracted	Contractor	Proponent
Occupational Health and Safety Issues	Health and safety regulation, first aid and medical arrangements, provision of safety equipment and measures, sanitation of labour	Spot checks at camps and work sites, photos, accident records, causes	Once a month throughout the construction phase	Contractor	Proponent
Environmental protection measures, including pollution prevention, water and soil management, slope stabilization, cut and fill, spoil and waste management, environmental and socially critical sites,	Arrangement specified in the code of practice and in manuals relating to environmental protection; records and observations on pollution, waste management, spoil disposal. Training programmes for labourers to prevent impacts on wildlife sensitive habitats, forests and fuel wood use.	Site inspection, discussion with project management, consultants, and local people. Quantifying site-specific impacts, photos, laboratory tests where required. Existing patrol, control and enforcement mechanisms, enforcement records.	Before and during construction period	Consultant (for baseline survey) Contractor	Proponent, consultant

protection of fauna and flora					
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, consultant
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, consultant
Water pollution	Visual inspection, open defecation and waste disposal around water sources near construction sites and labour camp	Site inspection, interview	Regular by the contractor, once a month by the supervision consultant	Contractor	Proponent, consultant
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	Project
Adequate technical and environmental supervision	Adequate number of technicians mobilized regularly at site. Ability to implement labour based bridge construction concept	Check number and type of technicians available at site. Skill of work carried out. Discussion.	During construction by contractor. Once a month by consultant	Consultant	Proponent

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

The parameters selected for the impact monitoring are as follows

Table 8.4: 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,
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, Consultant
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, Consultant

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, Consultant Health Posts
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, Consultant
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, consultant
Air Quality	Atmospheric dust	Visual inspection	At construction sites and at sensitive spots (Schools, hospitals)	During construction and operation	Contractor	Proponent, consultant
Forest and vegetation	Numbers of trees, presence of group vegetation, signs of illicit logging and extraction of NTFPs	Observation, DFO record, photos, stake-holder interviews	In and around the construction sites, markets	During construction and operation	Contractor	Proponent, consultant
Harvest/ trade of Medicinal herbs	Sales of medicinal herbs increased	Observation, interview, photos	Project Areas and markets	During operation	Local stakeholders	DFO, local stakeholders
Wildlife	Wildlife hunting trapping and poaching by work force, Trade of Wildlife, Biological survey on selected biota	Interview with local people/DFO, Photos Observations	Forest areas at roadside	Throughout project	Contractor, LCF, DFO	Proponent, Consultant DOF
Change in Economy	Numbers of people employed by the project during construction Numbers of women in work forces	Records kept by the project management,	Project Area	Twice a year during construction and	Contractor, Consultant,	Proponent

	Changes in land use pattern	discussion with people		operation		
Trade and Commerce	Number of shops increased or decreased, rental of houses and land spaces	Records, interview, observations, photos	Project Area	Throughout project	Consultant	Proponent, VDC
Industries	Establishment of industries in the vicinity of Project Area	Records and interview, photos	Project Areas/Zone of influence	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 centre records interview with laboures	Project Area	During construction	Contractor	Proponent, Consultant Health Authorities

8.6 Environmental Management Plan

The complete sets of environmental enhancement and mitigation measures have been formulated for the sustainable implementation of Khahare Khola Bridge. The environmental management plan ensures the involvement of all the parties that are directly and indirectly associated with the implementation of Khahare Khola Bridge. The framework for the environmental management plan for beneficial impacts and adverse impacts are presented respectively on table 9-5 and 9-6.

Table 8.5: Framework for benefit enhancement measures

Beneficial Environmental Impact	Affected Location	Benefit Augmentation Measure	Enhancement Cost	Responsible Agency	
				Implementing Agency	Supervising Agency
Employment Generation and Increase in income	Entire project area	Involvement of poor, Dalit, women and ethnic minority people in the construction related works and providing life skill training for income generation activities	No additional cost required	Contractor	Supervision consultant/ DoR
Skill Enhancement	-	Capacity Building training will be provided to the construction workforce • Pre-construction orientation to the senior level bridge engineer and mid-level bridge engineer • Training to unskilled work force)	(Nrs 50,000)	Contractor	Supervision consultant/ DoR

Enhancement of local economy	Project area	Priority to local product and services will be given	No additional cost	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, 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 DIA and IIA)	Lump-sum cost 30,000 (@10, 000 per day)	Project Implementation agency (RSDP)	Supervision consultant/ DoR
Reduced Trafffic congestion	Entire project area	Unnecessary stoppage of vehicles will be reduced by placing no parking zone around the bridge axis.	No additional Cost	Contractor	Supervision consultant/ DoR

Table 8.6: 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 and Cultural Environment/Characteristics:							
Bridge Construction	Change in morphology, profile and water regime of river	• 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 for bridge construction	Land Use change	• Only required land will be acquired for construction purpose. • Agricultural land will be avoided for project use	Bridge construction area	Pre-construction	No additional Cost required	Contractor	Supervision consultant/DoR
Operation of quarry site and river bed extraction	Environmental and social damage associated with quarry site operation. Use of Excavator in extracting river bed materials.	• Consent from the local stakeholders and authority will be taken prior to the opening of new quarry. • Unstable sites, erosion prone areas, dense forested areas, settlements, fertile farm land will be avoided for quarry operation • In case of river bank quarry, only the materials deposited during the previous year will	Around the quarry site	During quarrying	Nrs 30,000 (Included in BoQ)	Contractor	Supervising consultant/DoR

		be collected without disturbing the sedimentation cycle of the river. • In case of quarrying over the hill slope, the hill slope will be stabilized by constructing the slope protection structures once the quarrying requirements are meet. • Only required amount of river bed will be extracted. • Sensitive areas such as river course, bank will not be extracted. • Excavator will be used on required area only • Washing of excavator in the river water will not be done.					
Bridge Construction	Generation of construction spoil	• 3 meter high gabion structures have been built along the bank of river at both sites 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 of 60^0 on the river side. • As soon as the spoil disposal gets completed the site should be planted with trees. Altogether 60 trees have to be planted around the spoil disposal site. •	Spoil disposal area	During construction	Cost for construction gabion structures have been included in project design. Nrs. 37350 for rehabilitation of spoil disposal area (Included in BoQ)		

Bridge construction, camp site operation, spoil disposal and quarry site operation	Water pollution	• Spoils generated during the excavation will be disposed-off safely in the designed spoil disposal site. • Oils and chemicals used in construction vehicles and machineries will be handled properly to avoid the contamination with the water bodies. • Separate toilet facilities will be provided to the construction crew with proper septic tank facility. • Liquid waste generated within the camp site will be disposed safely without releasing into the water bodies. • Accidental spillage of the oil, grease and other chemicals substance will be captured immediately without allowing them to get contaminate the water bodies	Bridge construction area, spoil disposal site and quarry site	During construction and quarrying	No additional cost required	Contractor	Supervision consultant/DoR
Chemical Handling during construction	Contamination of soil due to leakage of spent 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 wile applied only where required. Accidental leakage of paints and chemicals will be strictly regulated.	Bridge and approach road construction area, materials stockpiling areas	During construction	No additional cost required	Contractor	Supervision consultant/DoR

		• Contaminated containers, packaging materials and worn plastic will be disposed of in separate spoil disposal areas.					
Materials stockpiling	Air and water pollution, degradation of agricultural land	• 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 will be provided to protect the stockpiled materials from scavengers and livestock.	Materials stockpiling areas	During construction	Nrs 10,000 (Included in BoQ)	Contractor	Supervision constultant/DoR
Camp site operation/ materials stockpiling/spoil disposal	Loss of productive land	• Camp site will be established on recommended barren land to avoid the loss the productive land. Spoils and construction waste will not be released nearby the agricultural land. Spoil disposal site will be at least 50 m away from the agricultural and will be adequately protected.	Around the camp site	During construction	No additional cost	Contractor	Supervising consultant/DoR
Construction works, use of	Air pollution	• Construction equipment and vehicles will be regularly	Construction areas, quarry	During	No additional	Contractor	Supervising

vehicles, machineries and equipment		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.	operation sites, approach road and spoil disposal areas	construction	cost		consultant/DoR
Use of heavy machinery, and vehicles	Noise pollution	• Sound producing equipment will be preferred to use only in daytime. • Earplug will be provided to the worker involved in equipment operations. • Crusher plant will be kept at area away from settlement.	Bridge construction area	During construction	No additional cost required (included in design cost)	Contractor	Supervision consultant/DoR
Bridge construction	Issues associated with bridge construction	• Fencing and lighting of construction and staging areas will be done. • Lane blockages, and vehicles entrance locations will be well signed. Appropriate passage for drainage will be ensured through properly designed temporary draining structures.	Around the construction site, and camp site	During construction period	No additional cost required	Contractor	Supervision consultant/DoR

		• Project will have the provision of fire extinguisher throughout the construction period.					
Work camp operation	Water and soil Pollution due to the release of solid and liquid waste from the work camp	• Bio-degradable waste will be disposed in a separate pit away from the water bodies. • Liquid waste will be disposed in a separate ditch and disinfectant will be continuously spread to avoid contamination. • Separate sanitary toilet will be construction near the construction camp with the facility of septic tank. • Provision of clean dirking water will be made at the construction camp	Labour camp	During construction period	600,000 (Included in BoQ)	Contractor	Supervision consultant/DoR
Construction materials stockpiling	Environmental issues associated with the material stockpiling	• The land allocated for the storing of construction materials will be far from agricultural land and water bodies. • The permission from the local stakeholders will be taken before commencing the stockpiling of the construction material. • Construction material should be covered with tarpaulin during stockpiling to prevent from rain water and dust emission generated from the stockpiling site. • Construction materials will be further encircled with side barriers and covered to avoid	Material stockpiling site	During construction period	No additional cost	Contractor	Supervision consultant/DoR

		mix up with deleterious materials.					
Use of combustible materials	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 soon after their release. 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 8 CAFS will be used during construction.	Materials stockpiling area vehicles parking area and bridge construction area	During construction	NRs. 24,000 for fire extinguisher (Six 4kg, cylinder, at the rate of 4000/cylinder)	Contractor	Supervision consultant/DoR
Bitumen handling and heating	Soil, water and air pollution	• Proper handling of bitumen to avoid soil and water contamination. • Bitumen heating site will be at least 100m away from the settlement. • Unnecessary quantity of bitumen will not be heated. • Occupational health and safety measures will be adopted while heating the bitumen • If bitumen is spread over the land accidentally and in improper place then it will be cleared immediately. • Bitumen related work will not be carried out during rainy season.	Approach road and bridge	During construction period	20,000 (Included in BoQ)	Contractor	Supervision consultant/DoR

		• Bitumen will not be used discharged into the drain structure while overlaying on the sub-base material.					
Transportation of construction materials	Traffic congestion, accidents and air pollution	• 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 impact area	During construction period	No additional cost required	Contractor	Supervision consultant/DoR
Bridge construction works	Occupational health and safety	• The workers will be provided with helmets, masks, muffles depending on the nature of the construction work. • Drinking water facility and temporary pit latrine will be established at construction sites to control open defecation and pollution of water bodies by the workers. • Workers will be provided with first aid and health facilities. There will be provision for group accidental insurance for the workers. • First aid training will be provided to field staffs like observers, social mobilizers and supervisors.	Construction area	Commencement of bridge construction	Nrs. 90,000	Contractor	Supervising consultant/DoR
Operation Phase							
Vehicular movement	Air and noise pollution	• This is a residual impact and can't be avoided. Thus, mitigation measures are not	Approach road and	During operational	No additional cost	-	

		proposed	bridge	period			
Regular maintenance	Environmental issues due to stockpiling of construction materials during regular maintenance	• Selection of safe and appropriate site for material stockpiling	Bridge	During operation period	No additional cost	DoR	DoR
Use of temporary land for bridge construction activities	Issues related to reinstatement of environmental components	• Different land used temporarily during project construction will be reinstated to the previous condition.	Around construction area	After the construction work completes	Already included in various particulars	contractor	Supervision consultant/DoR
Bridge operation	Congestion around the adjoining areas of bridge abutment	• The project will coordinate with the local authority i.e., VDC, DDC to regulate the activities of roadside encroachment • Awareness raising program will be conducted for local people during construction period.	Project impact area	During construction and operation phase	Included in awareness raising program	contractor	Supervision consultant/DoR
Biological Environment:							
Bridge construction	Loss of vegetation	• Construction activity does not require the cutting of tree. • However to develop greenery along the approach road and rehabilitation of spoil disposal area and stream bank plantation will be done.	Bridge construction area	During construction period	Nrs 28,100 (Included in BoQ)	Consultant	Supervision consultant/DoR
Bridge construction	Impact on wildlife	• Illegal hunting, harassment to wildlife and fishing will be strictly controlled. • Construction activities will be confined to day time.	Nearby forest	During construction period	Included in Awareness raising program (No additional Cost	Consultant	Supervision consultant/DoR

		• Construction fuel requirements will be supplemented through alternative sources other than fuel wood. • Awareness raising program will be conducted for the people of sub-project impact area. • A code of conduct will be enforced to construction workers through contractor that prohibit illegal, collection, sale, distribution of wildlife and plant product.			Required)		
Bridge construction	Impact on aquatic life	• Minimum possible disturbance on the river system will be done during the construction stage. • River flow will not be completely blocked during any time of construction. • Spillage of toxic and hazardous chemicals on water bodies will be avoided. • Disposal of solid and liquid waste on water bodies from the construction camp will be completely prohibited. • Critical habitat of fishes and other aquatic life will not be disturbed. • Construction workers will not be allowed to carry any kind of fishing related activities	Around construction site	During construction period	No additional cost	Contractor	Supervision consultant/DoR
Socio-economic Aspect							

Bridge construction	Social conflicts	• The labour should comply with the code of conduct set by the contractor		During construction period	Not applicable	Contractor	Supervision consultant/DoR
Bridge construction	Obstruction of social services and facilities	• Separate facilities of drinking water and other services will be made on camp site. • Construction schedule will be developed to facilitate the smooth movement of vehicles.	Around construction area	During construction period	No additional cost required	Contractor	Supervision consultant/DoR
Bridge construction	Impact on private properties	• The project will not have direct impact on the public structures; four private structures will be directly affected by the project. • Project has prepared a separate resettlement plan and based on the resettlement plan the compensation to the private properties will be made.	Around the construction area	During pre-construction stage	Included in RAP cost	Project	Supervision consultant/DoR
Bridge construction	Land and property acquisition, compensation, resettlement and rehabilitation	• Project has prepared a separate resettlement plan (RP) which address the issues related to the land and property acquisition, compensation, resettlement and rehabilitation	Around project area	During pre-construction stage	Cost included in resettlement plan (RP)	Project	Project/local stakeholders/local government authority
Operation of bridge	Road accident	• Project will install required delineators, safety signs, etc. as per the requirement. • Installation of sign boards at accident-prone spots and busy spots.	Around the project area	During operation stage	Included in detail design	Contractor	Supervision consultant/DoR

8.7 Cost for Execution of EMP

8.7.1 Details of specific cost

a) Land, properties acquisition, resettlement and rehabilitation cost

Resettlement plan for the sub-project have been prepared. A total of 4 households including 8173 m^2 of private land will be affected. For this RP has allocated Nrs. 900,000. Similarly, RP has proposed Nrs 450,000 for Income restoration and Skill development trainings. ***These cost has already been included in RP prepared for the sub-project.***

b) Environmental Cost to be Included in BoQ

Items to be included as a safeguard to local environment-in bid document for the likely adverse impact associated with the proposed bridge construction and other as outlined in EMP require to be addressed and also ensure to being incorporated in BOQ.

Table 8.7: Cost for Environmental Impacts Mitigation Measures and Augmentation measures

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
Camp site • Contractor Office/ Workshop • Labor camp	Lump Sum	600,000	600,000	Contractor will bear the cost of labor force site including land/house hire, fuel, drinking water supply, electricity etc.
Capacity Building • Pre-construction orientation to the senior level bridge engineer and mid-level bridge engineer • Training (work force)	• Lump sum ump Sum	30,000 20,000	30,000 20,000	Senior level bridge engineer, mid-level bridge engineer, site supervisor and labor force
Safety gadget	18 months	5000	90,000	Project is planned to be completed in 24 months however, working period will be 18 months avoiding 3 monsoon months. Safety gadget will be provide to work force, visitors, supervision consultant.
Awareness Raising Program to the local	3 day	10,000	30,000	Training related to health and

(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 (i.e., protection of river and banks), health and sanitation, biodiversity conservation, demerits of encroachment of RoW etc.				sanitation, biodiversity conservation will be provided to the people of Project DIA and IIA
Quarry, Rock break, river bed and reinstatement of site	PS	30,000	30,000	Reinstatement of quarry and river bed extraction site
Safe disposal of spoil including transportation and reinstatement of site of site		PS	37350	The cost includes transportation of spoil to the designated site, and rehabilitation of the site
Relocation of Public Structures	NA	-	-	None of the public structures needs to be relocated by the project
Bitumen Heating (Safe storage, heating and handling and closure)	PS	20,000	20,000	
Construction of Berms and fencing of stockpiling materials	PS	10,000	10,000	Contractor will bear the cost for protecting the stockpiling materials
Plantation of Vegetation	120	Planting 120 @100 per saplings, replacement of 40 (assuming 30% mortality) @ 70 and lump sum cost of 2000 for tools and lump sum cost of 12000 for tending and maintenance for 5 years	28,100	Planting will be done around the approach road and spoil disposal site. Trees from forest areas will not be lost so compensatory plantation has not to be made.
Fire Safety Gadget	6	4,000	24,000	
Sub-Total			***919,450***	

c) Cost of environmental monitoring

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

Table 8.8: 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

8.7.2 Total Cost for EMP Implementation

The breakdown of cost for the implementation of Environmental Management Plan is presented in table 10-11.

Table 8.9: Total cost of implementation of EMP

S.N.	Activities	Cost	Remarks
1	Mitigation measure under physical environment	861350.00	
2	Tree Plantation	28,100	
3	Mitigation measure under socio-economic aspect environment (Awareness raising program)	30,000.00	
4	Environmental Monitoring	680,000.00	
Total Cost of EMP implementation		1,899,459.00	

8.8 Grievance Redress Mechanism

At project level a grievance redress mechanism will be established allow project affected persons (PAPs) to appeal any disagreeable decisions, practices and activities arising compensation for assets, and technical and general project-related disputes. As specified in ESMF the PAPs will be made fully aware of their rights and the procedures for doing so verbally and in writing during compensation, survey, and time of compensation.

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

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

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

Box: 1 Stage of Grievance Mechanism

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

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

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

8.9 Contractors Mitigation Plan

Contractors should carry Environmental Management Plan provided during the tender document. The Contractor shall follow the guidelines identified in the document. Environmental issues in general and contractor activities include. The contractor should submit the concise site specific EMP, for contract related aspects, adhering with the one with this EMP which will be submitted before commencement of project construction work. Contractor should submit a construction site for its job environmental program for environmental supervision engineers, management consultants and owners of the external environment review before the construction commences. In general, Environmental protection measures includes

8.9.1 Onsite Facilities

- **Hiring of Workforce**
  - Priority should be given to local workforce for sub-project construction
  - If possible, at least 33% women are to be employed
  - Use of child labour should be strictly regulated
  - Priority should be provided to Dalits, Janajatis and minorities
  - The Contractor should publish notice informing the requirements of workforce (different job position) for construction purposes in VDC
  - Construction staff should have employment contracts.
  - The Contractor should provide the education and training of construction workers regarding construction technology, environmental protection and occupational health and safety.
- **Establishment of Construction Camp**
  - Take prior consent from the concerned from the concerned authority i.e., VDC;
  - Contractor should provide safe accommodation facilities;
  - Men and women workers should be independent of having facilities such as toilet; bathrooms. Toilet should be marked indicating man and woman;
  - At least 1 toilet for 10 workers should be provided;
  - Sustained supply of water should be provided;
  - Lighting facility should be established;
  - The hygiene condition of kitchen should be well managed;
  - Camp site should be established at least 10 m away from the drainage line;
  - Construction camp should be providing with first aid treatment facilities;
  - Provision of fire safety should be made within the labour camp.

8.9.2 Code of Conduct

Code of conduct emphasizing appropriate behaviour, respect to local culture and norms, drug and alcohol abuse, gender respect etc., to be followed by workforce should be strictly implemented. Code of conduct includes but is not limited to the following actions.

- All workforce should abide by the existing national laws and regulation
- Gambling activities is prohibited
- Use of pornography materials is strictly prohibited
- Do not carry or bring dangerous goods and weapons

- Do not quarrel with co-workers
- Unnecessary connection to the locals is regulated
- Respect the local culture and traditions
- Do not act creating obstruction to regular activities of local people.

Notice board advising about the prohibited act as follows should be established within the project area.

Prohibited acts
• Harm wildlife and livestock villager's adjacent areas; • Hunting and harassment of wildlife • Unnecessary picking and harm to plant • Fishing in the rivers • Buy meat of wildlife • Collection of wildlife body parts and plants • Affect or destroy objects of historic or architectural value; • Outdoor lighting of fire; • Working hours drinking; • Mechanical maintenance (oil and lubricant supply) outside the designated area; • Dumping outside the designated area; • Dangerous driving on local roads; • Impact on nearby residents; • Leakage of pollutants, such as: Oil, paints, lubricant • Littering of waste; • Incineration; • Involving in prostitution, gambling and other social violation • Go outside without permission ***Any contractor, office staff or other staff, if found in violation of the above rules, depending on its severity should be released verbal criticism to disciplinary labor contracts***.

8.9.3 Health and Safety

Contractor should ensure all the health and safety complying with national and local safety regulations and other measures to avoid damage;

- Training on occupational health and safety measures should be provided to the workforce before the construction commences

- Fencing should be done on critical construction areas
- Unauthorized entry on construction site should be prohibited
- Construction camps should be equipped with fire extinguishers and other firefighting equipment;
- Adequate provision of personal protection equipment (for example: goggles, protective gloves, protective masks, dust cover, helmet, ear protectors, helmets, etc.), should be provided to the workforce
- Safety procedures, emergency plans and emergency contact information, etc. should express at the construction site Notice board;
- Warning signs on dangerous places should be placed.
- Contractor should take all reasonable measures to prevent risks and ensure that all construction sites and camps have been providing fire protection equipment;
- The Contractor should provide basic first aid services and emergency measures for the construction workers.

8.9.4 Storage of Fuel, Oil and Hazardous Substances

- Separate storage facility for paints, fuel, oil and hazardous substances should be established;
- Unauthorized entry to the site should be prohibited;
- Machineries and equipment should be maintained in the designated site;
- The maintenance site should be at least 100 m away from the water sources;
- The leakage of oil, paints, lubricants should be immediately recovered and safely disposed of;
- Provision of fire extinguisher and fire safety should be made on the storage facility.

8.9.5 Waste Water Management

- The liquid and semi liquid waste should be collected and safely disposed of in designated site by constructing septic tanks;
- Runoff from construction site should be trapped through appropriate temporary drainage and guide it to the disposal areas;
- The disposal areas should be covered after the work completed;
- Do not perform the construction activities on monsoon season and heavy rain condition.

8.9.6 Solid waste Management

- Construction camp and construction sites should be facilitated with litter bins and haphazard littering should be regulated;
- Designate separate waste disposal site for waste disposal-and disposed based on bio degradable and non-degradable;
- Facilitate recycling of waste for its safe disposal;
- Reclaim the waste disposal site after the work ceases.

8.9.7 Noise Management

- Construction works should be done during the day time;
- Site staff, visitors and construction workers must be equipped with proper hearing measures to avoid the effect of noise;

- Supervision engineer must carry out regular site inspections to ensure compliance with occupational health and safety.

8.9.8 Air Pollution Abatement

- Regular spraying of water nearby the construction activities during dusty condition should be done;
- Bitumen heating facility should be established at least 100 m away from the settlements;
- Regular maintenance of vehicles and equipment should be done;
- Face mask and other protective equipment should be provided to the work force to comply with occupational health and safety

8.9.9 Material Stockpiling

- Material stockpiling should be done on designated site at least 10 m away from the drainage lines and on the surface having less than 10^0 slopes.
- Stockpiling sites should be devoid of vegetation, shrubs;
- Materials should be covered with tarpaulin to avoid dispersion and scattering of materials;
- Unauthorized entry to the stockpiling site should be regulated.
- Stockpiling site should be rehabilitated after the work completed.

8.9.10 Spoil Disposal

- Spoil should be disposed of in designated spoil disposal sites;
- Take prior consent from the concerned authority before using the land;
- Spoil should be minimized through its use as backfilling materials and grading of approach road;
- Spoil disposal sites should have rehabilitated and planted after the work completed.

8.9.11 Quarry Site and River Bed Extraction

- Agreement should be done with the concerned body (VDC/DDC), local stakeholders and CFUGs before the using it;
- Restrict it to small area;
- Avoid cutting of trees and removal of vegetation;
- Acquire the materials only in required quantity;
- Located away from 200 m away from the settlement;
- No rock materials should be littered nearby agricultural land;
- No rock materials causing disturbance to public services and utilities.

9 CONCLUSION AND RECOMMENDATION

There are 13 different river and stream crossings where bridge construction is essential for ensuring all weather mobility along Chinchhu-Jakarkot road, among them construction of Khahare Bridge is one proposed for construction. Proposed Khahare bridge is RCC simply supported type. The bridge will be constructed at Rakam-5 of Surkhet District. Construction of bridge will facilitate in achieving various social services for the people of Salyan, Surkhet, Jajarkot and Dolpa district districts. Construction of the bridge will have positive impact on the overall development of the area. The implementation of the proposal is also expected to bridge several immediate short term benefit like employment generation, awareness raising, skill enhancement, increase in local economy.

The implementation of the sub-project will also have some environmental impacts on physical, biological, socio-economic and cultural domains of the area. The sub-project area does not fall on any of the environmentally, historically, and culturally sensitive areas. The implementation of the proposal will not cause removal of trees from forest area, however 4 fodder trees will be lost during construction of approach road. The implementation of the project will not affect any of the common property resources including public structures. 4 households and 1 private structure is likely to be affected by the implementation of sub-project About 8489.6 m^2 of land is required permanently for the project to construct approach road and bridge. Out of which 8173 m^2 belongs to the private land and remaining 316.8 m^2 belongs to public land. Similarly, 1271 m^2 is required temporarily for the sub-project. Impact on private land and property, spoil generation, impact due to river bed materials extraction, camp site operation, air pollution and water pollution are some of the anticipated significant impacts resulting from the project implementation. Most of the identified impacts are of temporary in nature and limited to project specific area and are reversible in nature. The IEE study of the proposal have 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. 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.

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.

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Annexes:

Approved TOR

Annex 2: Public Notice

नेपाल सरकार
भैतिक पूर्वाधार तथा यातायात मन्त्रालय
सडक विभाग
योजना तथा डिजाईन माहाशाखा
भू-वातावरण तथा सामाजिक शाखा

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सार्वजनिक सूचना

(प्रथम पटक प्रकाशित मितिः २०७२/१२/१८)

प्रस्तावकको नामः भू-वातावरण तथा सामाजिक शाखा, सडक विभाग

प्रस्तावको नामः खहरे खोला पुल

विश्व बैंकको सहयोगमा नेपाल सरकार, भैतिक पूर्वाधार तथा यातायात मन्त्रालय, सडक विभाग अर्न्तगत सडक क्षेत्र विकास आयोजनाले छिन्चु-जाजरकोट सडक खण्डमा पर्ने खहरे खोला माथि निर्माण गर्न प्रस्ताव गरेको ३१.२ मी. लम्बाई (१X३० मी. स्पान) तथा ११ मी. चौडाई भएको पक्की पुल, वातावरण संरक्षण नियमावली, २०५४ को अनुसूची १ मा परेको हुनाले उक्त प्रस्ताव कार्यान्वयन गर्नु अघि वातावरण संरक्षण ऐन, २०५३ र वातावरण संरक्षण नियमावली, २०५४ अनुसार प्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन तयार गरी स्विकृत गराउनु पर्ने नियममा व्यवस्था भएको छ। उक्त प्रतिवेदन तयारीको क्रममा हेर्नु पर्ने निम्न क्षेत्र सँग सम्बन्धित वातावरणीय सवालहरु बारेमा प्रस्ताव कार्यान्वयन हुने क्षेत्रको गाँऊ विकास समिति, जिल्ला विकास समिति तथा त्यस क्षेत्रका विद्यालय, अस्पताल, स्वास्थ्य चौकी तथा सरोकारवाला व्यक्ति वा संघ संस्थाले आ-आफ्ने राय सुझाव दिन हुनको लागि सोहि नियमावलीको नियम ७ (२) अनुसार यो सार्वजनिक सूचना प्रकाशन गरिएको छ।

जिल्लाको नामः सुर्खेत

प्रभाव पर्न सक्ने गा.वि.स.को नामः राकम गा.वि.स.

क्षेत्रहरुः (१) भौतिक वातावरण (२) जैविक वातावरण
(३) सामाजिक तथा आर्थिक क्रियाकलापहरु (४) साँस्कृतिक वातावरण

उक्त प्रस्ताव कार्यान्वयन बाट प्रभाव पर्न सक्ने गा.वि.स., नगरपालिका, जिल्ला विकास समिति तथा त्यस क्षेत्रका विद्यालय, अस्पताल, स्वास्थ्य चौकी तथा सरोकारवाला व्यक्ति वा संघ संस्थाले यो सूचना राजधानी दैनिकमा पहिलो पटक प्रकाशन भएको मितिले पन्ध्र (१५) दिन भित्र निम्न ठेगानामा आई पुग्ने गरी राय सुझाव उपलब्ध गराई दिनु हुन हार्दिक अनुरोध गरिन्छ। सो राय सुझावको प्रतिलिपि सम्बन्धित मन्त्रालयलाई समेत दिन सकिने छ।

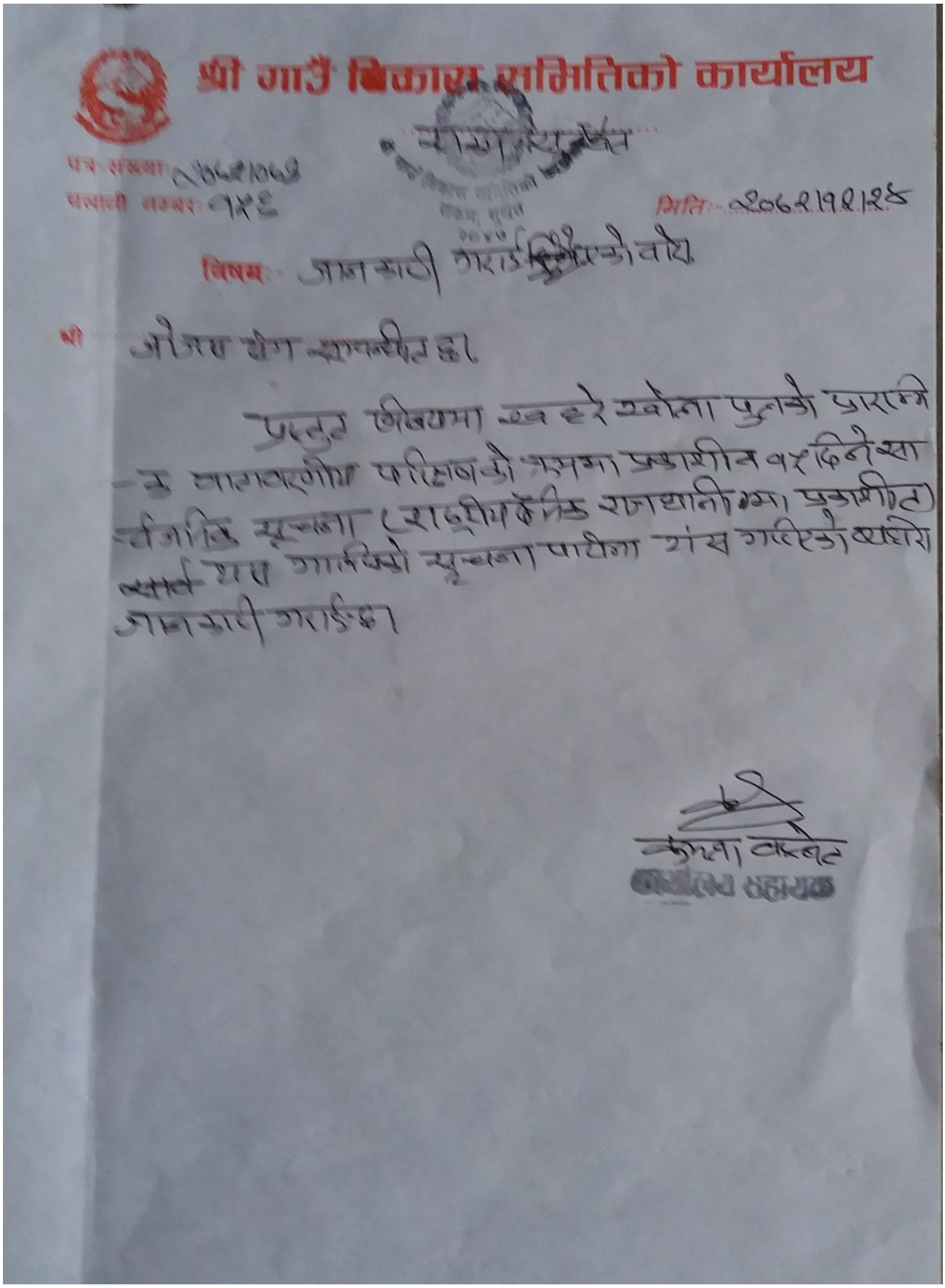
राय सुझाव पठाउने ठेगानाः	परामर्शदाताः
सडक विभाग, भू-वातावरण तथा सामाजिक शाखा पाटन, ललितपुर, नेपाल टेलिफोन नं.: ९७७-०१-५२६०६९६ फ्याक्स नं.: ९७७-०१-५५२९१०६ इमेलः gesunit@dor.gov.np	**Kunhwa Engineering and Consultancy Co., Ltd, Korea** In association in the form of sub consultancy with **ERMC (P) Ltd., Nepal** १२६/२३, पुजा प्रतिष्ठान मार्ग, मध्य-बानेश्वर, काठमाडौं फोन नं: ०१-४४७१८८४, फ्याक्स नं: ०१-४४७९३६१ पोष्ट बक्स नं: १२४१९, काठमाडौं इमेलः safe@ermc.wlink.com.np

Annex 3: Deeds of Enquiry

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सूचना टाँसको मुचुल्का

आज मिति २०७२/१२/२४ गते ~~मितिवारको~~ दिन बुध वडा नं २ गा.वि.स./न.पा. स्थित जामुन बजार भन्ने ठाँउमा खहरे खोला पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा सम्पूर्ण सरोकारवालाहरुलाई प्रस्तावित पुल निमार्ण गर्दा त्यस क्षेत्रको भौतिक, जैविक, आर्थिक सामाजिक तथा साँस्कृतिक वातावरणमा पर्न सक्ने असर तथा ति असरहरु न्यूनिकरण गर्न अवलम्बन गर्न सकिने सम्भावित उपयहरु बारे आफ्ना राय सुझावहरु पठाउन आवहान गर्दै मिति २०७२/१२/१८ को राष्ट्रिय दैनिक राजधानिमा प्रकाशित १५ दिने सार्वजनिक सूचनाको छाँया प्रति हामी निम्न सरोकारवालाहरुको उपस्थितीमा टाँस गरिएको व्यहोरा सही हो भनि यो मुचुल्कामा हस्ताक्षर गर्दछौं ।

क्र.स.	नाम/थर	ठेगाना	पेशा	हस्ताक्षर
१	नारायण सापकोटा	वडानं-२.	कृषि	
२	मोहन रोकाया	वडानं- २	शिक्षक	
३	~~सन्त~~ चन्द्र प्रकाश थापा	वडानं-२	व्यापार	
४	चन्द्र बहादुर	वडानं-२	व्यापार	
५	सन्त प्रकाश थापा	काफ्लेचौर-४	शिक्षक	
६	विनोद खत्री	आप्पुगाउँ-३	व्यापार	
७	नेत्र प्र. सापकोटा	वडानं-२	शिक्षक.	
८	अमिता रावत	वडानं-२	व्यापार.	
९				
१०				



श्री गाउँ विकास समितिको कार्यालय

पत्र संख्या: २०६२/०६३
चलानी नम्बर: १४६

मिति: २०६२।१२।२६

विषय: जानकारी गराईएको बारे

श्री औजस योग खाम्बीत ज्यू

प्रस्तुत विषयमा यस क्षेत्रमा पुलको प्रारम्भिक वातावरणीय परिक्षणको क्रममा प्रकाशीत गरिनेका निर्णयहरु सूचना (राष्ट्रीय दैनिक पत्रिकामा प्रकाशीत) सम्बन्धमा यस गाविसको सूचना पाटीमा यस सम्बन्धी जानकारी गराईएको।

कृष्ण बस्नेत
सचिव सहायक

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सूचना टाँसको मुचुल्का

आज मिति २०७२/१२/२४ गते ~~बिहिवार~~ बुधवार दिन यस ..... गा वि स /न.पा. वडा नं .....
स्थित मिल चोक ..... भन्ने ठाँउमा मिल चोक खहरे खोला पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा सम्पूर्ण सरोकारवालाहरुलाई प्रस्तावित पुल निर्माण गर्दा त्यस क्षेत्रको भौतिक, जैविक, आर्थिक सामाजिक तथा सांस्कृतिक वातावरणमा पर्न सक्ने असर तथा ति असरहरु न्यूनिकरण गर्न अवलम्बन गर्न सकिने सम्भावित उपायहरु बारे आफ्ना राय सुझावहरु पठाउन आवहान गर्दै मिति २०७२ १२ १८ को राष्ट्रिय दैनिक राजधानिमा प्रकाशित १५ दिने सार्वजनिक सूचनाको छाँया प्रति हामी निम्न सरोकारवालाहरुको उपस्थितीमा टांस गरिएको व्यहोरा सही हो भनि यो मुचुल्कामा हस्ताक्षर गर्दछौं ।

क.स.	नाम/थर	ठेगाना	पेशा	हस्ताक्षर
१	स्वामेहु सिंह	वडा -६, मिलचौक	व्यापार	
२	चित्र बहादुर सिंह	वडा -6, मिलचौक	कृषि	
३	प्रहत कुमार सिंह	नगरपा - ६, वार्ड	कृषि	
४	गोविन्द प्रताप उपाध्याय	वडा -५, बाहुनटोल	कृषि	
५	भुमी कुमारी सिंह	वडा -६, मिलचौक	व्यापार	
६	भुपाल खत्री	वडा -6, खहरेखोला	कृषि	
७				
८				
९				
१०				

Annex 4: Recommendation Letters

श्री गाउँ विकास समितिको कार्यालय

राकम, उत्तरपे

पत्र-संख्या:- ०७२/०७३

चलानी नम्बर:- १९९

मितिः- २०७२/१२/१६

विषयः- सिफारिस गरिएको ।

श्री सडक विभाग
वातावरण तथा सामाजिक शाखा

प्रस्तुत विषयमा सडक विभाग वैदेशिक सहायता को प.सं. ०७२/०७३ च.नं. ६६६ मिति २०७२/१२/१८ को पत्रानुसार दिन्चु जाजरकोट सडक खण्ड अन्तर्गत राकम श्री.वि.सं.को खहरे खोला मथी पुल निर्माण गर्दा महत्को भौतिक, आर्थिक, सांस्कृतिक वातावरण तथा सामाजिक क्रियाकलाप का साथ जैविक वातावरण मा असर नपर्ने गरी आयोजना कार्यान्वयन गर्न र यदि त्यस्ता असरहरु पर्न गएमा न्युनिकरण का उपायहरु अवलम्बन गर्दै आयोजना कार्यान्वयन का लागी सिफारिस गरि अनुरोध छ ।

०७२/१२/१६

श्यामलाल खराल
अध्यक्ष
गाविस कार्य सञ्चालन समिति

Annex 5: Minutes of Public Interaction

आज मिति 2062-12-26 गते यस राकम गा.वि.स को
आयुमा प्रस्तावित खवटरे खोला पुलको प्रारम्भिक
वातावरणीय परिक्षणको क्रममा आयोजित छलफल तथा
सार्वजनिक अन्तर्वार्ताको क्रममा निम्न लिखित अहानु-
भावहरुको उपस्थितिमा रहेर। उक्त अन्तर्वार्ताका आयोजना
कार्यान्वयनले पार्ने सकल वातावरणीय तथा
सामाजिक ~~अवस्थामा~~ असरहरु तथा तिनका प्रभावहरुका
को उपायहरु बारे छलफल गरियो।

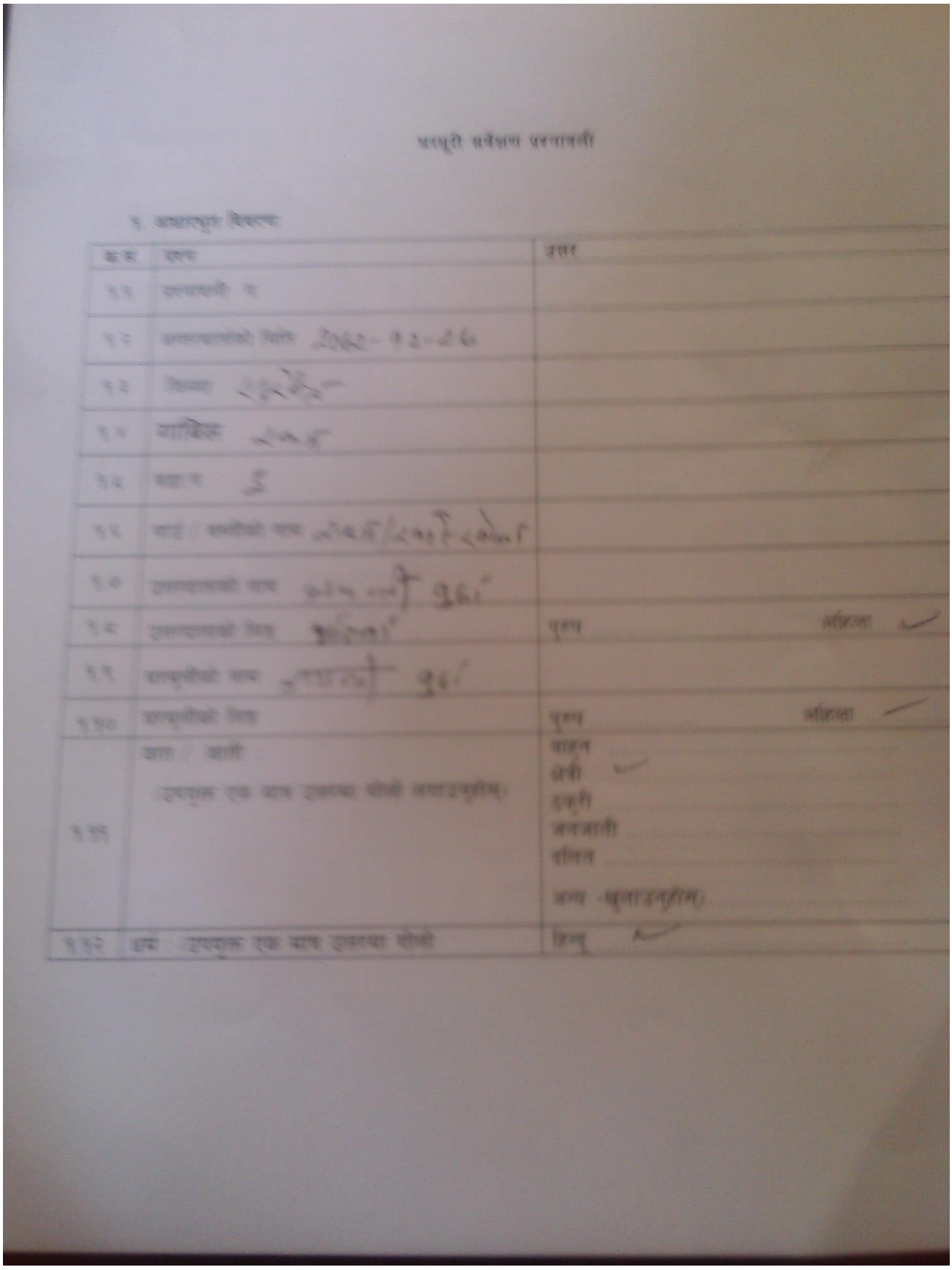
क्र.सं.	नाम	ठेगाना	पेशा	हस्ताक्षर
१.	अमृता रावत	राकम-२	व्यापार	अमृता
२.	चन्द्र बस्नेत	राकम-२	व्यापार	~~[illegible]~~
३.	नारायण सापकोटा	राकम-५	कृषि	[illegible]
४.	गोविन्द प्रसाद उपाध्याय	राकम-५	कृषि	[illegible]
५.	मुपल ~~[illegible]~~ शाही	राकम-६	कृषि	[illegible]
६.	मुना सिंह	राकम-६	"	[illegible]
६	धन सिं बुढा	राकम-५	कृषि	[illegible]
७.	चित्र ब. सिंह	राकम-६.	"	चित्रबं
१०.	नेप ब. सापकोट	राकम-२.	व्यापार	[illegible]
११.	हरिकला हमाल	राकम-५	कृषि.	[illegible]
१२.	सूर्यकला शाही	राकम-५	"	[illegible]

छलफलका क्रममा उठेका मुख्य मुद्दाहरु

१. आयोजना ~~[illegible]~~ दिने तथा दिने कार्यान्वयन हुनपर्ने।
२. आयोजनाले ओगट्ने निजी जमिन तथा सम्पत्तिको उचित क्षतिपूर्ती दिनु पर्ने।
३. आयोजनामा स्थानीयलाई रोजगारीको व्यवस्था हुन पर्ने।
४. पुल बनाउँदा अघिलेको झुम्राउने ठाउँमा नयाँ सिधा बनाउँदा राम्रो हुने।
५. यस आयोजनाले पार्ने क्षतिमा कुनै पनि नकारात्मक असर नपर्ने।

चित्रबं [illegible] अमृता [illegible]

Annex 6: Questionnaire used during Survey



घरपुरी सर्वेक्षण प्रश्नावली

१. आधारभूत विवरण:

क्र.सं.	प्रश्न	उत्तर
१.१	प्रश्नावली नं.	
१.२	अन्तर्वार्ताको मिति: २०६२-१२-२६	
१.३	जिल्ला: [illegible]	
१.४	गाविस: [illegible]	
१.५	वडा नं: ३	
१.६	घर / घरधनीको नाम: [illegible]	
१.७	उत्तरदाताको नाम: [illegible]	
१.८	उत्तरदाताको लिङ्ग:	पुरुष ✓ महिला
१.९	घरधनीको नाम: [illegible]	
१.१०	घरधनीको लिङ्ग:	पुरुष महिला ✓
१.११	जात / जाती (एकभन्दा एक बढ़ा उत्तरमा घेरो लगाउनुहोस्)	बाहुन क्षेत्री ✓ दनुवार जनजाती दलित अन्य (खुलाउनुहोस्)
१.१२	धर्म (एकभन्दा एक बढ़ा उत्तरमा घेरो	हिन्दु ✓

क.सं.	प्रश्न	उत्तर
	लगाउनुहोस्।	बौद्ध मुस्लिम क्रिश्चियन अन्य -खुलाउनुहोस्।
१.१३	परिवारको प्रकार (उपयुक्त एक वा उभन्दा धेरै लगाउनुहोस्)	एकात्मक परिवार संयुक्त परिवार विस्तारित परिवार

२. घरधुरी विवरण

२.१ पारिवारिक विवरण

क.सं.	घरपरिवारका सदस्यहरुको घरधुरीसंगको नाता	लिङ्ग		उमेर (पूरा भएको उमेर)	शिक्षा (५वर्ष माथि)	पेशा (१४ वर्ष भन्दा माथि)	हाल घरमा भएको /नभएको	
		पु	म				भएको	नभएको
१	[illegible]	१	२	१८	१०	विद्यार्थी	१	२
२	[illegible]	१	२	२८	[illegible]	[illegible]	१	२
३	[illegible]	१	२	१६	८	विद्यार्थी	१	२
४	[illegible]	१	२	६	४	विद्यार्थी	१	२
५		१	२				१	२
६		१	२				१	२
७		१	२				१	२
८		१	२				१	२
९		१	२				१	२
१०		१	२				१	२
११		१	२				१	२
१२		१	२				१	२
१३		१	२				१	२
१४		१	२				१	२
१५		१	२				१	२
१६		१	२				१	२
१७		१	२				१	२
१८		१	२				१	२
१९		१	२				१	२
२०		१	२				१	२

संकेतहरु :

१. घरमूलिसंगको नाता: घरमूलि -१, श्रीमती -२, श्रीमान- ३, छोरी- ४ छोरा -५, बुहारी -६, बुवा -७, आमा- ८, सासू - ९, सासैनी -१०,जेठानी- ११, दाई- १२, भाइजु -१३, भाई -१४, भाई बुहारी -१५, नातेदार (पुरुष)- १६, नातेदार (महिला)- १७, अन्य -१८

२. वैवाहिक अवस्था: अविवाहित -१, विवाहित -२, सामाजिक विच्छेद/छुट्टै बसेको -३, विधवा/विदुर -४

३. शिक्षा : निरक्षर -१, साक्षर - २, प्राथमिक -३, निम्न माध्यमिक -४, माध्यमिक- ५, प्रवेशिका/ उच्च माध्यमिक -६, उच्च माध्यमिक भन्दा माथि- ७

४.पेशा: कृषक- १, नोकरी/पेन्सन -२, व्यापार -३, ज्यालदारी (कृषि/ गैर कृषि) -४, वैदेशिक रोजगार- ५, विद्यार्थी - ६, गृहिणी- ७, अपाङ्ग -८, अन्य -९

३ कमाई मगाई

क.सं	प्रश्न	उत्तर
३.१	तपाईंका परिवार (पुर्खा) लाई के हेर्दा यस ठाईमा बस्दै आउनुभएको हो ?	दुई पुस्ता भन्दा अघिदेखि (५० वर्ष)
		एक पुस्ता भन्दा अघिदेखि २५ वर्ष)
		हालसालै (१० वर्ष भन्दा कम)
३.२	यदि तपाई बसाई सरेर आउनुभएको हो भने कृपया तपाईंको पुर्खाको ठाउँ सोध्नुहोस् ।	जिल्लाको अर्को गा.वि.स/नगर
		छिमेकी जिल्ला
		अन्य जिल्ला
३.३	के तपाईंको परिवारका कुनै सदस्य कामको सिलसिलामा बसाई सर्नु भएको छ?	छ
		छैन ✓

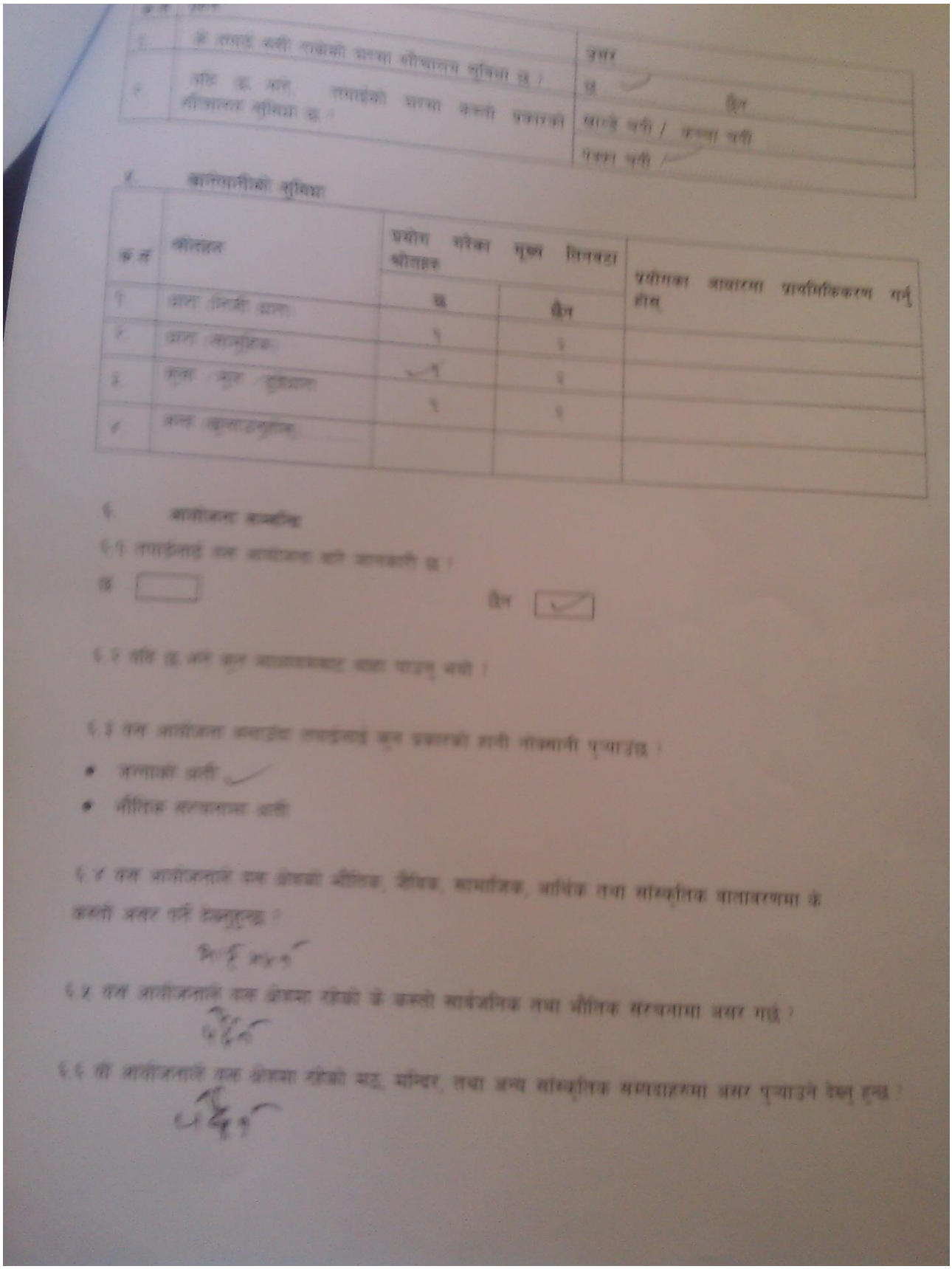
३.४	यदि छ भने बताउनुहोस्।	कामको प्रकृति स्थान/ठाउँ							के बसाई मगाई दोहोरिक चलन हो?	
	क्रम संख्या	जानेको संख्या लिइ		जिल्ला भित्र	जोडिएको जिल्ला	अर्को जिल्ला	भारत	विदेश	हो	होईन
		पुरुष	महिला							

४. परिवारमा बिरामी

क.सं	प्रश्न	उत्तर
३.७१	गएका १२ महिनामा तपाईको कुनै सदस्य बिरामी हुनु भएको थियो?	थियो ✓ ..... १ थिएन् २

४.१ यदि थियो भने, परिवारका सदस्य कस्ता रोगबाट बिरामी भएका थिए र कुन समयमा ? कृपया खुलाउनुहोस्।

क.सं	रोगको नाम	बिरामी सदस्य संख्या		मौसम (कृपया टिक लगाउनुहोस)		
		पुरुष	महिला	वर्षा (आषाढ-असोज)	हिउँद (कार्तिक-फागुन)	गर्मी(चैत-जेठ)
१.	ज्वरो					
२.	सामान्य रुघा /खोकी	✓				
३.	मलेरिया					
४.	झाडापखला		✓	✓		
५.	जन्डीस					
६.	टाइफाईड					
७.	निमोनिया					
८.	मुटु सम्बन्धि					
९.	अन्य(खुलाउनुहोस्)					
१०.	अन्य(खुलाउनुहोस्)					
११.	अन्य(खुलाउनुहोस्)					
१२	अन्य(खुलाउनुहोस्)					



क.सं.		उत्तर
१	के तपाईं यसै गाउँको स्थायी बासिन्दा हुनुहुन्छ ?	हो ✓ होइन
२	यदि हो भने, तपाईंको बसाइ कस्तो प्रकारको बसाइ हो ?	स्थायी बसी / बसाइ बसी
		पेशा बसी ✓

४ खानेपानीको सुविधा

क.सं.	श्रोतहरु	प्रयोग गरेका मुख्य तिनवटा श्रोतहरु		प्रयोगका आधारमा प्राथमिकिकरण गर्नु होस्
		हो	होइन	
१	धारा (निजी धारा)	१	१	
२	धारा (सामुहिक)			
३	कुवा (मुल / पुईयाल)	१	१	
४	अन्य (खुलाटयाङ्कर)			

५ सामाजिक सम्बन्ध

५.१ तपाईंलाई यस आयोजना बारे जानकारी छ ?

हो ☐ होइन ☑

५.२ यदि छ भने कुन माध्यमबाट थाहा पाउनु भयो ?

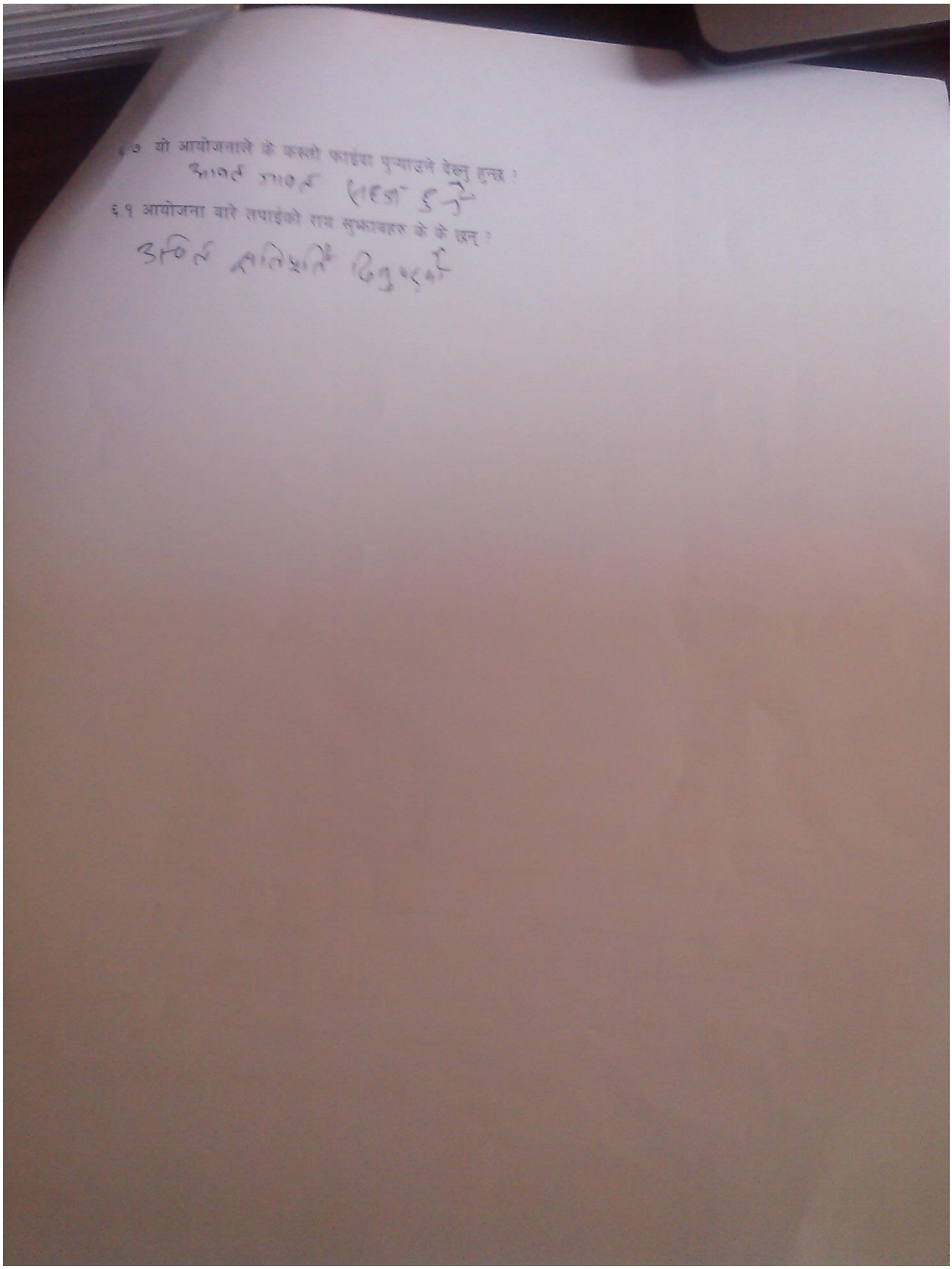
५.३ यस आयोजना सम्बन्धित तपाईंलाई कुन प्रकारको हानी नोक्सानी पुग्दछ ?

- जग्गाको क्षती ✓
- भौतिक संरचनामा क्षती

५.४ यस आयोजनाले यस क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक तथा सांस्कृतिक वातावरणमा के कस्तो असर पर्ने देख्नुहुन्छ ?

५.५ यस आयोजनाले यस क्षेत्रमा रहेको के कस्तो सार्वजनिक तथा भौतिक संरचनामा असर गर्छ ?

५.६ यो आयोजनाले यस क्षेत्रमा रहेको मठ, मन्दिर, तथा अन्य सांस्कृतिक सम्पदाहरुमा असर पुग्ने देख्नु हुन्छ ?



Annex 7: Photographs

	
Proposed Bridge Location	**Khahare River**
	
Consultation with local people.	**Vegetation in the project area.**
	
Public Consultation	**Proposed Material Stockpiling Site**

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 4.1.8 (pg. 14)	
2.	Submit the clear Topo Map including delineation area if possible color Map	Topomap included in Figure 3-1, (pg. 4)	
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.	Section 3.2 (pg. 5), section 6.1.3 (pg. 28) and section 7.2.1 pg. 46-53)	
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 Guidelines, GESU/DoR, July 1999.	Included in Chapter 5	All suggested legal provisions are reviewed
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 • Sand and gravel extraction • Degradation of water quality • Bridge safety • Transportation of construction materials	All the suggested issues are incorporated in chapter 7, section 7.2.1 (pg. 46-53)	

	• Approach road for bridge construction areas • River flooding and bank erosion at both banks of river • Occupational Health safety Operation Phase • 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.	Add the bridge related Act, Rules, Policies and Manuals: • The Aquatic Animal protection Act, 1961, • Bridge policy , 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.	Training/Awareness • River training • Protection of river • Protection of embankment(bioengineering), etc.	Section 9-7 (Pg. 84 and 85)	
Social Aspects			
9.	Include Muchulkas & Recommendation letter of affected VDCs published notice	Incorporated in annex 2, 3 and 4	
10.	Table of content should as per EPR – 1997	Table of content as per EPR 1997	
11.	Include filled sample checklist	Filled checklist/Questio	

		nnaire attached in annex 6	
12.	Include approved letter of ToR	Approved letter of ToR attached in annex 1	
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		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 not included in report.