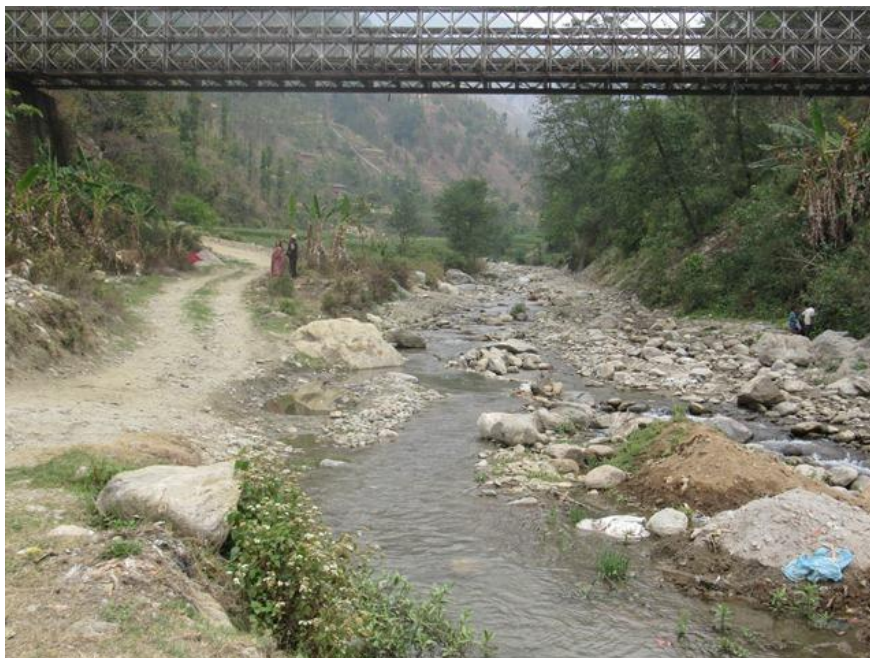


**Initial Environmental Examination
of
Salabang Bridge (Shitalpati- Musikot Road)**



Submitted By:

Geo-Environmental and Social Unit
Department of Roads
Chakupat, Lalitpur
Tel: 01-5005521
Email: gesunit@dor.gov.np

Submitted to:

Ministry of Physical
Infrastructure and Transport
Singha Durbar, Kathmandu

Prepared By:

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

June, 2017

कार्यकारी सारांश

१. प्रस्तावना

प्रस्तावित सलबाङ्ग पुल सितलपाटी-मुसिकोट सडक खण्ड अन्तर्गत रुकुम जिल्लाको भलक्चा गा.वि.स. र खलङ्गा नगरपालिकाको सिमाना हुँदै बग्ने साँख खोलामा पर्दछ। पुल निर्माण स्थलको दाहिने भागमा सलबाङ्ग बजार रहेको छ। प्रस्तावित सलबाङ्ग पुलको निर्माण स्थल समुद्री सतहबाट ९६० मी. माथि पर्दछ। यस उप-आयोजनाले रुकुम जिल्लालाई दाङ्ग जिल्ला सँग जोड्ने मात्र नभई रुकुम भन्दा उत्तरका जिल्लाहरूलाई समेत यातायात सञ्जालले जोड्ने काम गर्दछ। यस सलबाङ्ग पुल निर्माणको प्रस्तावको नाम र ठेगाना निम्न अनुसार रहेको छ।

भू-वातावरण तथा समाजिक शाखा,

सडक विभाग,

चाकुपाट, ललितपुर

फोन: ०१-५००५५२९

ईमेल: 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. प्रस्तावको विवरण

प्रस्तावित सलबाङ्ग पुलको कुल लम्बाई ३६.६ मी.को हुनेछ भने यसको चौडाइ ११ मी. को हुनेछ। पक्की ढलान गरेर निर्माण गरिने उक्त पुलको दूया-बाँया थप १८० मी. पहुँच सडक निर्माण गर्नु पर्ने देखिन्छ। भौगर्भिक रुपमा सो पुल २८°३६'४२.९०" उत्तर अक्षांश र ८२°२६'४२.५४" पूर्व देशान्तरमा अवस्थित छ।

३. प्रस्तावको सान्दर्भिकता

वातावरण संरक्षण नियमावली, २०५४ को अनुसूची १ को नियम ३ अनुसार कुनै पनि मुख्य पुलहरू निर्माण गर्दा प्रारम्भिक वातावरणीय परिक्षण गर्नु पर्ने कानुनी प्रावधान रहेको छ। राष्ट्रिय पुल मापडण्ड २०६७ का अनुसार २५ मी. भन्दा बढी लामो स्पान भएका पुलहरू मुख्य पुल अन्तर्गत पर्दछन्। प्रस्तावित सलबाङ्ग पुलको स्पान ३५ मी. भएकाले उक्त पुल निर्माण गर्नु पूर्व सो पुलको प्रारम्भिक वातावरणीय परिक्षण तयार गरी भैतिक पूर्वाधार तथा यातायात मन्त्रालय मार्फत स्वीकृत गराउनु पर्ने कानुनी व्यवस्था रहेको छ।

४. प्रारम्भिक वातावरणीय परिक्षणको उद्देश्य

यस प्रारम्भिक वातावरणीय परिक्षणको मुख्य उद्देश्य प्रस्तावित आयोजनाको कार्यान्वयनबाट आयोजना क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक, सांस्कृतिक वातावरणमा पर्ने सक्ने सकारात्मक तथा नकारात्मक प्रभावहरूको अध्ययन तथा पहिचान गरी सकारात्मक प्रभावहरूको बढोत्तरी तथा नकारात्मक प्रभावहरूलाई न्यूनीकरण गर्ने उपायहरू पहिल्याउनु हो।

५. कार्यविधि

यसप्रारम्भिक वातावरणीय परिक्षण प्रतिवेदन वातावरण संरक्षण नियमावली २०५४ को दोस्रो संसोधनको प्रावधान अनुसार तथा यसै प्रस्तावको कार्यसूची (Terms of Reference) मा उल्लेख गरिए अनुसार तयार पारिएको हो। यसका लागि सान्दर्भिक ग्रन्थहरूको पुनरावलोकन तथा आयोजना प्रभावित क्षेत्रको निर्धारण गर्ने कार्य गरियो। अध्ययन टोली द्वारा सामूहिक रुपमा २०७२ साल चैत महिनामा स्थलगत सर्वेक्षण गर्ने, आवश्यक सूचनाहरू संकलन गर्ने र स्थानीय समुदाय र सरोकारवालाहरूसँग 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। स्थलगत अध्ययन तथा उपलब्ध इन्जिनियरिङ्ग तथ्याङ्कहरूलाई विश्लेषण गरी आयोजनाले निर्माण स्थल वरपरको वातावरणमा पार्न सक्ने सम्भावित सकारात्मक तथा नकारात्मक प्रभावहरू

पहिचान गर्ने कार्य गरियो । अन्ततः सकारात्मक प्रभावहरु बढोत्तरी गर्ने तथा नकारात्मक प्रभावहरु न्यूनिकरण गर्ने उपायहरु पहिचान गरी प्रारम्भिक वातावरणीय प्रतिवेदन तयार परियो ।

६. विद्यमान वातावरणीय अवस्था

प्रस्तावित पुल निर्माण क्षेत्र मध्यपश्चिमाञ्चल विकास क्षेत्रको पहाडी भेगमा पर्दछ । सो पुल लहु र साँखखोलाको दोभान भन्दा ११३ मी. माथि साँख खोलामा पर्दछ । उक्त पुल निर्माण क्षेत्र वरपर मुख्य गरी खोलाले बगाएर ल्याएको ढुङ्गा, माटो लागयतका थेंग्रानहरु प्रसस्त मात्रामा पाइन्छ । यसै गरी प्रस्ताव कार्यान्वयन गरिने क्षेत्र भौगर्भिक दृष्टिले मजबुत भएका हुनाले कुनै पनि प्रकृतिक प्रकोपको जोखिम क्षेत्रमा पर्दैन । उप-उष्ण जलवायु रहेको उक्त क्षेत्रमा सरदर १८६८ मी.मी. वर्षा हुने गर्दछ । उक्त क्षेत्रमा भूकम्पको दृष्टिले मध्ययम किसिमको जोखिम रहेको पाइन्छ । खेती योग्य जमिनको बाहुल्यता रहेको आयोजना कार्यान्वयन हुने क्षेत्रमा वन तुलनात्मक रूपमा कम छ ।

लप्सी, बकाइनो, रिठ्ठा, खनियु, विडुलो, अम्बा, र तिमिलोजस्तावनस्पतीहरु आयोजना निर्माण गर्ने क्रममा काट्नु पर्ने देखिन्छ । आयोजना कार्यान्वयन गर्नु पूर्व १२ वटा रुखहरु र ३३ वटा केराका बोटहरु काट्नु पर्ने हुन्छ । आयोजना क्षेत्र वस्ती नजिकै भएको हुनाले वन्य जन्तुहरुको वासस्थान आयोजना क्षेत्र भन्दा केही पर रहेको छ । स्थानिय वासिन्दाहरुसँग अन्तर्क्रिया गर्दा बटुलिएको तथ्याङ्क अनुसार आयोजना क्षेत्र वरपर घोरल, स्याल, बँदेल, लंगुर, रातो बाँदर, आदी जस्ता वन्य जन्तुहरु पाइन्छ । चरहरुको सन्दर्भमा आयोजना क्षेत्र वरपर कुथुर्के, मैना, गौथली, चिवे, ढुकुर, काग, भंगेरा, न्याउली, आदी प्रजातिका चराहरु पाइन्छ । साँख खोलामा पाइने माछाहरुमा चुच्चे असला, बुच्चे असला, तिते, धामी, आदी पर्दछन् ।

जतिय हिसाबले क्षेत्री, ब्रमण, ठकुरी, मगर र दलित जातिको बासेबास रहेको उक्त क्षेत्रमा शिक्षा, स्वास्थ्यको राम्रो प्रवन्ध रहेको छ । यद्यपी तुलनात्मक रूपमा हर्ने हो भने पुरुषको तुलनामा महिलाहरु निकै कम साक्षर रहेको पाइन्छ । आयोजना क्षेत्रमा लघु विद्युत गृह छ जसले खलङ्गा नगरपालिकामा विद्युत प्रवाह गर्ने गरेको छ भने भलक्चाका स्थानिय वासिन्दाहरु सौर्य उर्जामा नै निर्भर रहेका पाइन्छ । सडक सञ्जाल राम्रो भएका कारण खलङ्गा नगरपालिकाका केही घरधुरीहरुमा खाना पकाउन ग्यासको समेत प्रायेण हुने गर्दछ । सञ्चारको विषयमा उक्त क्षेत्रमा हाल सञ्चारका सम्पूर्ण सेवाहरु प्रयोगमा आएको पाइन्छ ।

आयोजना निर्माणबाट १२ परिवारका १२ वटा संरचनाहरु असर पर्ने देखिन्छ । आयोजना प्रभावित १२ घरहरु मध्य ७ घर मगर, ४ घर क्षेत्री र १ घर दलित समुदायको रहेको छ । आयोजना प्रभावित घरधुरीहरुमा ६५% वयस्कहरु रहेका छन् । शिक्षका दृष्टिले आयोजना प्रभावित परिवारका सदस्यहरुको अधिकतम शिक्षा प्रमाणपत्र तह रहेको छ । आयोजना प्रभावित परिवारको मुख्य अयश्रोत व्यापार हो र त्यस बापत वार्षिक रु. ३००,००० भन्दा बढी आमदानी हुने गर्दछ । आयोजना प्रभावित घरहरुमा शौचालय प्रयोगको अवस्था निकै कमजोर रहेको छ र हाल समेत खुल्ला शौचको प्रचलन विद्यमान छ । आयोजना निर्माण क्षेत्रमा लैङ्गीक भेदभाव विद्यमान छ र विकासको पहुचका हिसाबले महिलाहरु निकै पछि रहेका छन् ।

७. वातावरणीय प्रभावहरु

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

नकारात्मक प्रभावहरुमा पुल निर्माण तथा सडक सुधारका क्रममा भित्ताहरु काट्दा बढ्न जाने पहिरो लगायतका प्रकोपहरुको जोखिम, खानी सञ्चालन गर्दा निम्त्तने वातावरणीय प्रभावहरु, आयोजनाका औजार तथा सावरी साधन सञ्चालन गर्दा हुने वायु तथा ध्वनी प्रदुषण, पुलको जग खन्दा तथा सडक सुधार गर्दा निस्कने ढुङ्गा माटोको व्यवस्थापन गर्ने चुनौती, कामदारका अस्थायी शिविरबाट निस्कने फोहोरहरुले सृजना गर्ने वातावरणीय प्रभावहरु, अवैध रूपमा 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 ।

आयोजना निर्माण गर्ने क्रममा २ वटा सिचाइका कुलाहरु र एउटा निजी पानी घट्टमा असर गर्ने देखिन्छ । आयोजना निर्माण क्षेत्र वरपर धान उत्पादनका लागि उपयुक्त खेतहरु भएका कारण कुलोको शिध्द पुर्ननिर्माण गर्नु आवश्यक छ ।

८. वातावरणीय प्रभाव न्यूनिकरण तथा वातावरणीय व्यावस्थापन योजना

वातावरणीय प्रभाव न्यूनिकरण गर्नका लागि यस प्रतिवेदनमा विभिन्न उपयहरू पहिचान गरिएको छ । जसमा प्रकृतिक प्रकोपको सम्भावना न्यूनिकरण गर्न इन्जिनियरिङ तथा जैविक इन्जिनियरिङ प्रयोग गर्ने, ढुङ्गा माटोको उचित व्यावस्थापन गर्ने, खानी सञ्चालन गर्दा वातावरणमा प्रतिकूल प्रभाव हुन नदिने, आयोजना प्रभावित परिवारलाई उचित क्षतिपूर्ति प्रदान गर्ने, पेशागत सुरक्षाका उपायहरू प्रयोगमा ल्याउने, धार्मिक तथा साँस्कृतिक संरचनाहरूको जर्गेना गर्ने, लगाएतका उपाहरू यस प्रतिवेदनमा उल्लेख गरिएको छ ।

यसै गरी यस प्रतिवेदनमा वृक्ष रोपणको समेत प्रावधान राखिएको छ । जसमा ३०० वटा विभिन्न जातका स्थानिय विरुवाहरू रोप्ने गरी प्रस्ताव गरिएको छ । आयोजना सँग सम्बन्धित कमदारहरूले स्थानिय जैविक विविधतामा प्रतिकूल प्रभाव नपर्न भनेर प्रतिवेदनमा उनीहरूलाई रुख विरुवा काट्न, माछा मार्न र शिकार गर्न रोक लगाउने कुरा समेत उल्लेख भएको छ । सडक निमार्णका क्रममा हुन सक्ने दुर्घटना कम गर्न संकेतहरू राख्ने, रातको समयमा बत्तीहरू बाल्ने व्यवस्था मिलाउने लगायतका उपायहरू प्रतिवेदनमा समावेश गरिएको छ ।

यसरी प्रस्तवित सलाबाङ्ग पुल निमार्ण गर्दा स्थानिय वातावरणमा पर्न सक्ने प्रतिकूल प्रभावहरू न्यूनिकरण गर्ने, सकारात्मक प्रभावहरूलाई बढोत्तरी गर्ने र प्रतिवेदनमा उल्लेख गरिएका गतिविधिहरू निरिक्षण गर्ने प्रावधान सहित वातावरण व्यवस्थापन योजना समेत प्रतिवेदनमा उल्लेख छ । वातावरण व्यवस्थापन योजना कार्यान्वयन गर्नका लागि रु. १,६३९,९७० विनियोजन गरिएको छ ।

९.० निष्कर्ष

प्रस्तवित सलाबाङ्ग पुललाई रुकुम जिल्लाको वृहत विकासको मुख्य द्वार रुपमा त्यस क्षेत्रका वासिन्दाहरूले लिएका छन् । उक्त पुल निमार्ण गर्दा वातावरणमा कम मात्र नकारात्मक प्रभावहरू पर्ने सो प्रभावहरूलाई प्रतिवेदनमा उल्लेख गरिएको उपायहरू अवलम्बन गरेमा सजिलै समाधान गर्न सकिने हुनाले यस पुल निमार्ण प्रस्ताव यथाशिघ्र अधि बढाउन सुझाव सहितको निष्कर्ष निकालिएको छ । साथै प्रस्तावित अयोजना कार्यान्वयन गर्नका लागि प्रारम्भिक वातावरणीय परिक्षणनै पर्याप्त छ ।

Executive Summary

1. The proposal

The Salabang Bridge is proposed over the Sakh River which is located along the Shitalpati-Musikot Road in the Rukum district connecting Bhalakcha VDC and Khalanga Municipality. The proposed location is 960 m above the mean seal level. The details of the proponent of the proposed project are as follows:

Geo-Environment and Social Social Unit,
Department of Roads,
Chakupat, Lalitpur
Tel:01-5005521
Email:gesunit@dor.gov.np

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

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

2. Details of the Proposal

The length of the proposed Salabang Bridge is 36.6m while its breadth is 11m. The construction of permanent concrete bridge over the Sakh River requires construction of 180m approach road (including both side), which is more upgrading of existing road. The geographical location of the proposed bridge is 28°36'42.90"N and 82°26'42.54"E.

3. 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 Salabang Bridge has span greater than 25 m, an IEE report has to be prepared for it, which has to be approved by Ministry of Physical Infrastructure and Transport (MoPIT).

4. 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. 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. Existing Environmental Condition

The proposed location for the implementation of Salabang Bridge lies in the Hilly region of Mid-western Development Region. The proposed location is about 113m upstream from the confluence of Sakh and Lahu River. Mostly alluvial deposits are available around the proposed bridge location. The hills on either side of the Sakh River are relatively stable and the probability of natural disasters is low. The proposed construction are belongs to sub-

tropical climatic zone which experiences warm summer season and mild winter season. The total precipitation around that area is 1868mm. From the earthquake perspective the area is less vulnerable. Agricultural land dominates the overall land use pattern around the project area with more than 50% of land within Direct Influence Zone belonging to agricultural land. Geologically, the sub-project area lies in Ranimata Formation, where phyllite and quartzite are the dominant rocks.

Lapsi, Bakaino, Rittha, Khaniyo, Beudlo, Amba and Timilo are the tree species that have to be removed during the construction of the Salabang Bridge and its approach road. A total of 12 trees have to be removed prior to the construction of the proposed bridge. Similarly, 33 banana plants also need to be cleared. The location for the construction of the bridge lies near the settlement and thus, the area is not the habitat of the wildlife. Interactions with the local people suggests that Ghoral, Jackal, Langur, Monkey, wild Boar, etc. are the wildlife observed around the forest of project affected VDCs. Similarly, birds like Kuthurke, Maina, Gauthali, Chibe, Dhukur, Crow, Sparrow, Nyaluli, etc. are common in that area. Asla, Dhami and tite are the common fish species observed in the Sakh River.

Chhetri, Brahmin, Thakuri, Magar, Newar and Dliat 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. Although the project area lacks the grid electricity supply, the locally operating micro-hydro provides the electricity only in Khalanga Municipality and the people of Bhalakcha VDC have to rely on solar PV system to light their households. In Khalanga Municipality large fraction population use LPG for cooking purpose, while others are still dependent on fuel wood. People living around the project impact area have access to every kind of communication facilities.

The construction of the proposed bridge will affect 12 structures belonging to 12 households. All of the structures are built in governmental land (i.e. RoW of the existing road). Out of the 12 project affected households 7 belong to Magar, 4 belong to Chhetri, and 1 belongs to Dalit ethnic groups. About 65% of the population in the project affected families belongs to 16-60 years age group. The highest education received by the members of project affected families is the Bachelor level and the population receiving Bachelor level education is only 3%. Business is the main occupation of the project affected families and they earn well above 300,000 per year from their primary 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. Environmental Impacts

There are both positive and negative impacts due to the implementation of the proposed project. Positive impacts include employment to the local people, skill enhancement, improved mobility and the initiation of new avenue for the overall development of Rukum district and districts north to Rukum.

Adverse environmental impact include the risk of disasters due to excavation of hill slope for the construction of the approach road, environmental issues associated with quarry site and spoil disposal site, 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.

Considering the public properties, the construction of the proposed project will affect two irrigation canals and one private water mill. The area around the bridge construction location are extensively used for paddy production and immediate maintenance of irrigation canals are very essential.

8. Environmental Impact Mitigation and Environmental Management Plan

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

Furthermore, the document also has the provision for tree plantation. Altogether 300 saplings of local trees have been proposed for the plantation. 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. Similarly, there is the provision of training and education to the local people in order to discourage the illegal hunting and trade of wildlife and vegetation. In order to avoid accidental risks around the construction site, this report recommends the installation of sign boards and lighting system.

In this way the report includes all possible measures for the enhancement of positive impacts and mitigation of adverse impacts. There is a separate chapter called Environment Management Plan which guides for the implementation of mitigation measures and monitoring provision for those mitigation measures. For the successful implementation of Environmental Management Plan NRs. 1,631,970.00 has been allocated.

9. Conclusion

The project have very minimal environmental impacts that can be mitigated through the mitigation measures proposed in this document and the construction of the Salabang Bridge will open all the possibility for the overall development of Rukum district. 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

amsl:	above mean sea level
CBO:	Community Based organization
CBS:	Central Bureau of Statistics
CDO:	Chief District Officer
CITES:	Convention on International Trade in Endangered Species of Wild Flora and Fauna
DDC:	District Development Committee
DHM:	Department of Hydrology and Meteorology
DHQ:	District Headquarters
DoR:	Department of Roads
EIA:	Environment Impact Analysis
EMAP:	Environment Management Action Plan
EN:	Endangered
EPA:	Environment Protection Act
EPR:	Environment Protection Rules
ERMC:	Environment and Resource Management Consultant
ESMF:	Environmental and Social Management Framework
F:	Foliation
FAR:	Financial Administration Regulation
GESU:	Geo-Environmental and Social Unit
GIS:	Geographic Information System
GoN:	Government of Nepal
HH:	Household
HS:	Hill Slope
IEE:	Initial Environmental Examination
INGO:	International Non-Governmental Organization
IRC:	Indian Road Congress
IUCN:	International Union for Conservation of Nature
J:	Joint
KII:	Key Informant Interview
LC:	Least Concern
LPG:	Liquid Petroleum Gas
MoPIT:	Ministry of Physical Infrastructure and Transportation
MoPE:	Ministry of Population and Environment
NEPAP:	Nepal Environmental Policy and Action Plan
NGO:	Non-Governmental Organization

N-M:	Narayanghat-Muglin
NT:	Near Threatened
PAH:	Polycyclic Aromatic Hydrocarbons
PSC:	Pre-Stressed Concrete
PWD:	Public Works Directive
RCC:	Reinforce Cement Concrete
RSDP:	Road Sector Development Project
SLC:	School Leaving Certificate
SPSS:	Statistical Package for the Social Sciences
SRN:	Strategic Road Network
TMT:	Thermo Mechanically Treated
ToR:	Terms of Reference
VDC:	Village Development Committee
VOC:	Volatile Organic Compounds
EMP:	Environment Management Plan
DFO:	District Forest Office
RAP:	Resettlement Action Plan
IRDST:	Income Restoration and Skill Development Training
LCF:	Local Consultative Forum
PAP:	Project Affected Person
LCLA:	Local Community Liaison Assistant
AP:	Affected Person

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CHAPTER 1: NAME AND ADDRESS OF THE PROPONENT

1.1 Name and Address of the Institution Preparing the Report

The name and address of the institution preparing the Initial Environmental Examination (IEE) Report of Salabang Bridge (Shitalpati-Musikot Road) is as follows:

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

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

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

1.2 Consultant

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

Kunhwa Engineering and Consultancy Co. Ltd.
Korea
and
Environment & Resource Management Consultant (ERMC) Pvt. Ltd.
Mid-Baneshwor, Kathmandu, Nepal
P. O. Box: 12419, Kathmandu
Tel.: 977-01-4483064, 4465863, Fax: 977-01-4479361
Email: safe@ermc.wlink.com.np, Web: www.ermcnepal.com

CHAPTER 2: GENERAL INTRODUCTION OF THE PROPOSAL

2.1 Background

Road Sector Development Project (RSDP), 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.

The scope of the consulting services is feasibility and detail design of the new bridges in Narayanghat-Mugling road and roads under Road Sector Development Project (RSDP) and Inspection and Design of Maintenance/Repair works of all existing bridges in RSDP roads including Narayanghat-Mugling road. Chhinchu-Jajarkot Road, Shitalpati-Musikot Roads, Nepalgunj-Surkhet-Jumla Road, Tallodhungeswor-Dailekh Road, Kalangagad (Bagthala)-Chainpur Road, Satbanjh-Gokuleswor-Darchula Road and Narayanghat-Mugling--Aanbukhaireni Road. For this, RSDP have engaged consultants to provide engineering expert service in Feasibility Study, Conceptual Design with alternatives and Detail Design for suitable alternative for construction of new bridges and Detail Design for suitable maintenance intervention of existing bridges, Environmental Management Action Plan and Resettlement Action Plan.

Salabang Bridge has been proposed to be constructed over the Sakh Khola. The Sakh Khola is a perennial river originating from the Mahabharat Hills. The Sakh Khola is originated from the elevation of 1451m and makes the confluence with Lahu Khola at an elevation of 960m. The proposed bridge is located at the boundary of Bhalakcha VDC (left bank) and Khalanga Municipality (right bank). The proposed bridge is located at the chaingae of 123+460m along the Shitalpati-Musikot Road. The total length of the proposed bridge is 36.6m with its span arrangement 1×35m, while its width is 11m.

2.2 Objectives of IEE

The objectives of IEE are as follows:

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

2.3 Rationality of IEE

As per Environment Protection Rules (EPR) 1997, construction of a major bridge requires an IEE and its subsequent approval from its concerned ministry (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 span of the proposed bridge is about 40m and hence, the proposed construction work requires IEE. Therefore, this IEE Report is prepared in accordance with the Rule-5 and Schedule-3 of EPR'97.

2.4 Relevancy of the Proposal

The Sakh Khola is a perennial river, with its highest flow observed during rainy season (monsoon). Although there is a bailey bridge over the Sakh Khola which is facilitating the movement of vehicles, bailey bridges are not the permanent solution and have several limitations. The life span of Bailey Bridges are shorter compared to the concrete bridge and even the load bearing capacity are also low, so that they could not support the movement of heavy vehicles. Due to this reason it is very essential to switch to the permanent concrete bridge. Besides, the technical advantages of the concrete bridge, the construction of Salabang Bridge over the Sakh Khola have several other advantages that contribute to the socio-economic development of the entire region round Rukum. The newly proposed bridge over the Sakh Khola links the headquarters of Rukum district with several parts of the districts. This facilitates the improvement of trade and economic activities. Apart from this, Rukum is also the gateway to enter the Dolpa district, and Dhorpatan Hunting Reserve. Thus, the improved road system in even facilitates to strengthen the tourism in that area. The design of the Salabang Bridge has been made with seismic analysis. Hence, the bridge is earthquake resistant.

CHAPTER 3: PROJECT DESCRIPTION

3.1 Project Area

The proposed Salabang Bridge over the Sakh Khola is located in the hilly region of Mid-western Development Region. The proposed bridge is located at the boundary of Bhalakcha VDC and Khalanga Municipality in the Rukum district. Salabang village is the nearest village with well-developed market center near the proposed bridge location. The geographical location of the proposed bridge is $28^{\circ}36'42.90''\text{N}$ and $82^{\circ}26'42.54''\text{E}$.

The topography around the proposed bridge is characterized by the presence of gentle slope with relatively stable terrain. The land use pattern is characterized by the presence of agricultural land on the right bank of the river and forested area on the left bank. The growth of thick settlement can be observed on the left side of the river near the proposed location of the construction of Salabang Bridge. The flood plains around upstream area from the proposed construction location are largely used for the cultivation of paddy and the availability of irrigation water contributes the better yield in that area. The location map (figure 3.1), topographical map (figure 3.2) and Google map (figure 3.3) is shown below:

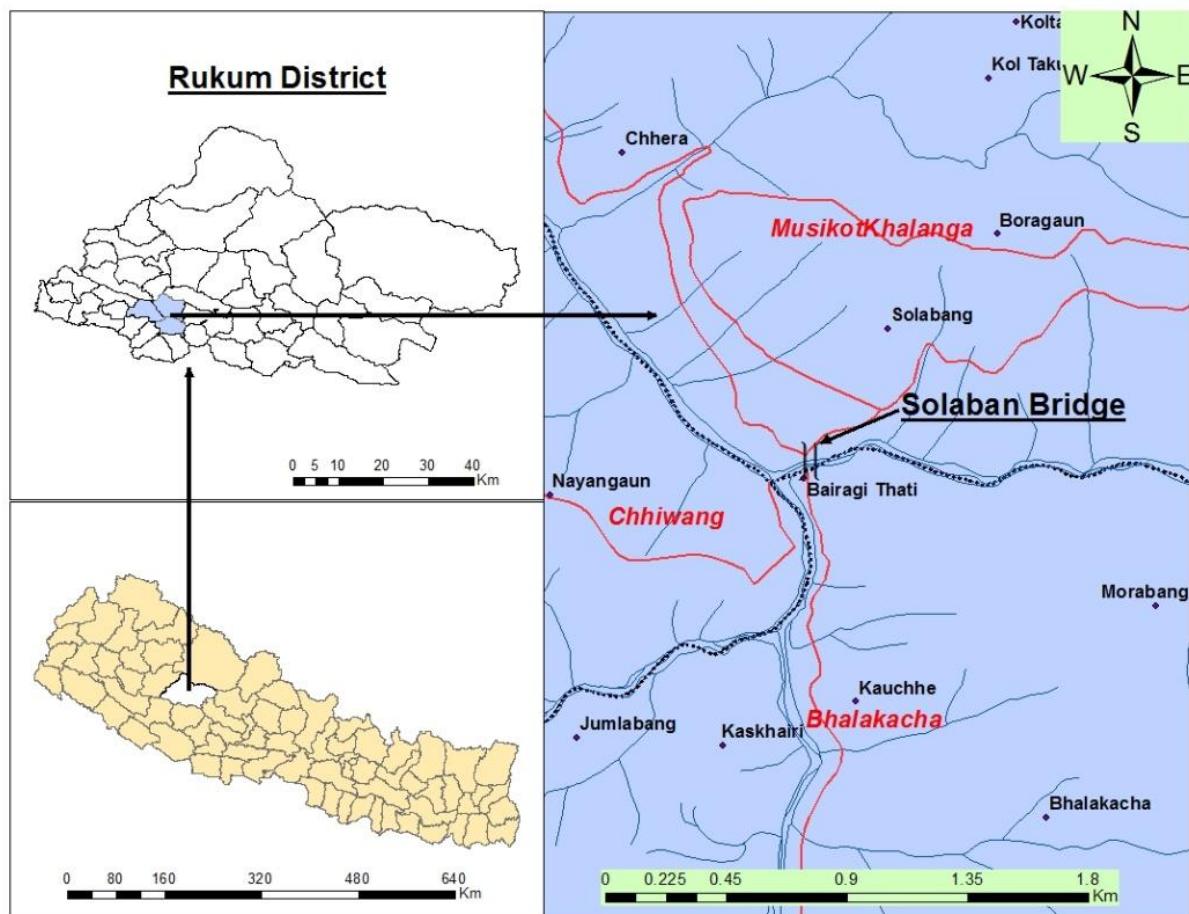


Figure 3.1: Location Map of the Proposed Project.

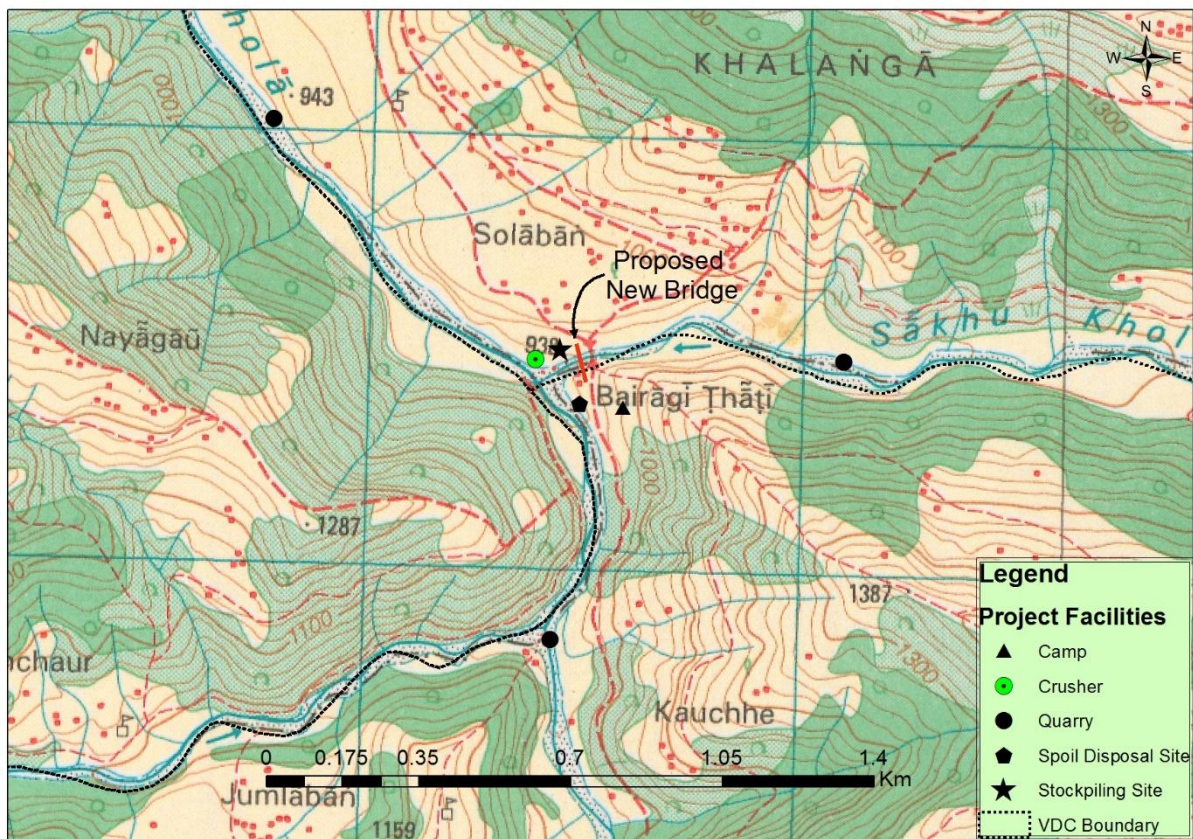


Figure 3.2: Topographical Map Showing Project Facilities.



Figure 3.3: Project Site in Google Map

3.2 Salient Features

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

Table 3.1: Salient Features of the Project

Name of the Project	Initial Environmental Examination of
Bridge Name	Salabang (Sakh Khola) bridge
Location	
Development Region	Mid-Western Development Region
Zone	Rapti
District	Rukum
Village/ Town	Bhalakcha VDC and Khalanga Municipality
Name of the Road	Shitalpati-Musikot Road
Chainage of the Bridge site	123+460
Geographical Location	28°36'42.90"N and 82°26'42.54"E
Classification of Road	Highway
Type of Road Surface	Bituminous
Terrain / Geology	Hilly
Traffic Volume	450 (four wheelers per day)
Structure	
Total length of the Bridge	36.6 m
Span Arrangement	1x 35m
Total width of the bridge	11.0 m
Width of Carriage way	7.50m
Width of Footpath	1.5m
Kerbs	0.35 m
Type of Structure	Simply Supported
Type of Superstructure	Pre-stressed concrete Bridge
Type of Bearing	Pot cum PTFE Bearing
Type of Abutment	RCC (Cantilever)
Type of Foundation	Open/Shallow Foundation
Approach Road	
Left Bank (side)	50 m
Right Bank (side)	113 m

RoW of approach road	15 m on either side
Design Data	
Live Load	IRC Class 'A', IRC class 70R,
Net bearing capacity of soil	500KN/m ²
Design Discharge	381 m ³ /s
Scour Depth	3.82m from minimum river bed level
Highest Flood Level	952.08m
Lowest Bed Level	948.45m
Concrete Grade	M35 – Superstructure, M25 Substructure and Foundation
Reinforcement Bars	Fe 500 (TMT Steel),
Approach Slab	RCC (3.5 m)
Summary of Cost (NRs)	
Total Cost of the Bridge (NRs.)	77,895,145.53

(Source: Project Design Report, 2016)

3.3 Detail of Project Requirements

3.3.1 Land Requirement

The construction of Salabang Bridge and its approach road requires the total of 0.246ha of land permanently belonging to different categories. The general land use category includes existing road, settlement, river channel and river bank, etc. Similarly, another 0.64 ha of land is required temporarily to set contractors and workers camp, stockpiling of construction materials, storing fuels and construction yard. The land area that has to be acquired is tabulated in table below:

Table 3.2: Land requirement for the project.

SN	Project component	Land use	Area (ha)
1	Bridge	River channel and river bank	0.096
2	Approach road	Existing road and hill	0.15
3	Contractors and workers camp	Barren land	0.3
4	Stockpiling yard	Barren land	0.34

3.3.2 Quantity of Construction Materials

The quantity of construction materials required for the completion of the proposed project are mentioned in table 3.3 below:

Table 3.3: Quantity of construction materials required for the Salabang Bridge

Item Description	Unit	Quantity	Remarks
Steel Structure (Without Railing and Anchorage Parts)	kg	105234	
Steel Bars (For Deck Slab, Approach slab)	kg	75231	
Concrete (For Deck Slab, Approach slab)	M ³	986	
Cement	Bags	7800	
Sand	M ³	412	
Aggregate	M ³	1032	
Stones/boulders	M ³	180	
Cable wire	km	8	
Gabion wire	M ²	258 m ²	

(Source: Design Report, 2016)

3.3.3 Source of Construction Materials

The construction materials mainly sands can be available along the riverbed from the Sharda Khola and Lahun Khola as well as Sakh Khola. Boulders, cobbles and pebbles are largely observed to be weathered quartzite. The most reliable sources are the Sakh Khola and Lahun Khola. Materials can be collected from Pata Khola and other quarry side. The distance is less than 1 km distance from the bridge site area.

The materials from the riverbed are required to be tested. During the construction the following test should be done.

Aggregate: a. Los Angeles Abrasion Value b. Aggregate Crushing Value c. Alkali Reactivity Test d. Gradation e. Unit weight f. Sodium Sulphate Soundness Test g. Specific gravity and absorption Test h. Unconfined Compression test.

For sands: a. Grain size b. Compaction test c. Natural Moisture Content Test d. Specific gravity g. Atterberg limit test h. Organic content test

Table 3.4: Proposed quarry site

Location	Distance	Slope stability	Source	Quantity m ³	Materials	Slope stability
Sakh (Salabang) Khola	0.7 km upstream from the bridge site	Stable after extraction of materials due to wide flood plain	Sand and gravel from riverbed Quartzite 60%, phyllite 10%	500x2x2	Quartzite, gneiss, granite	After excavation of the materials from the riverbed, the slope stability condition shall be good to fair in each sources
Lahun Khola	Within 1 km distance	Seems to be stable and stable valley	Sand and gravel from riverbed	500x2x1	Quartzite	
Lahun Khola	Along the road within	Riverbed	Quartzite from road	200x5x2	Quartzite	

	5 km distance		alignment			
Shirbhatu Khola	10 km		Sand and gravel from riverbed	100x2x1		Boulder 40%, cobble and pebble 30% and Sands 20%
Bairagithanti Khola (Pata Khola)	15 km	Riverbed	Sand and gravel from riverbed	100x5x1		

Source: Project Detail Report

Since, the construction of Salabang Bridge requires the considerable quantity of construction materials, the construction materials will be collected by the use of excavators.

3.3.4 Source of Energy during Construction

Sakh Khola-3 Micro Hydropower Project (60KW) is the only source of electricity around the project area. This electricity would not be sufficient to provide the energy requirement during the construction period. Thus, the project has to operate diesel generator during the construction period. The generator will be high efficient emitting low operational sound and low air pollutants. Furthermore, the project will buy fuel wood from the licensed source for bitumen heating. The site for bitumen heating will be at least 200m away from the settlement and bitumen heating will be done as per the project need.



Figure 3.4: Proposed location for labor camp and stockpiling site.

3.3.5 Labor Camp and Material Stockpiling Site

Altogether 0.64ha of land of private land on the right bank of the Sakh Khola (50m d/s from the proposed bridge) has been allocated to set camp site and material stockpiling site. There is a crusher plant within the allocated area, which has been used by the previous contractor who was responsible for upgrading the Shitalpati-Musikot Road. The same crusher plant can be used for this project too.

3.3.6 Spoil Management Site

The construction of Salabang Bridge and its approach road will generate about 15000m³ of spoil. Large part of the generated spoil will be used for backfilling and river training works. Remaining small quantity of spoil will be safely disposed in recommended spoil disposal site. Open space on left bank of Sakh Khola at about 50m d/s from the proposed bridge has been recommended for the disposal of spoil. The total area of recommended spoil disposal site is 1800m² and about 9,000m³ of spoil can be disposed in that area. The method that has to be followed during the spoil disposal without any environmental damage has been given in Chapter 9.

3.3.7 Approach Road and Diversion

The project requires 180m of approach road along with the construction of the Salabang Bridge. Largely the construction of approach road will involve the upgrading of the existing width of Shitalpati-Musikot Road section. While upgrading the approach road, few houses

belonging to the private owners and some private lands have to be acquired. The details of land and properties to be acquired will be included in the Chapter 7.

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

- **Construction scheduling**

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

- **Human Resource Requirements**

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

3.3.9 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 Salabang 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 Shitapati- Musikot Road will handle routine maintenance tasks such as clearing debris, and undertaking repairs that can be handled with basic hand tools. For more extensive maintenance requirements, DOR divisional offices will prepare status report of the bridges to undergo maintenance and the maintenance works will undergo through funding from the Roads Board Nepal, the national budget or funding from international donor agencies.

3.3.12 Possible emission and waste generation during construction

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

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

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

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

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

3.4 Impact Area Delineation

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

Table 3.5: Impact Area Delineation of the Project

Zone of Influence	Bhalakcha VDC and Musikot Khalanga Municipality
Direct Influence Zone	Project implementation site, the adjacent land plots, built up structures, houses and property within 500 m from the project

	site
Indirect Influence Zone	The project implementation ward of the project affected VDCs

Moreover, since 500m downstream incorporates the area across the Lahu Khola and hence the area up to the Sakh-Lahu confluence has been considered as the *Direct Influence Zone* in this report.

CHAPTER 4: PROCEDURES ADOPTED WHILE PREPARING THE REPORT

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

4.1 Desk Study and Literature Review

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

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

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

4.2 Field Survey

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

4.3 Collection of Environmental Baseline Data/ Information

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

Table 4.1: 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
• 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
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	Secondary Information from CBS, District

Data Requirement	Methods/ Tools
social services and facilities	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.

4.4 Data Analysis

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

4.5 Impact Identification/ Prediction and Evaluation

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

The environmental impacts were evaluated as per the National EIA Guidelines (1993), based on the magnitude, extent and duration of the impact. Similarly, experts' judgment and experience from similar projects were used for the quantification of the impacts. For the impact evaluation, the matrix method with numerical ranking was used for the quantitative ranking of the predicted impacts. The numerical scale mentioned in the National EIA Guidelines (1993) was adopted for this study. The numerical scale is presented in Table 4.2.

Table 4.2: Impact Evaluation Matrix

Magnitude		Extent		Duration	
High(H)	60	Regional (R)	60	Long term (LT)	20
Moderate (M)	20	Local (L)	20	Medium Term (MT)	10
Low (L)	10	Site Specific (SS)	10	Short Term (ST)	5

Significance of the identified and predicted impacts was evaluated using the numerical values as proposed in the National EIA Guideline 1993, use of regulated list of species, discussion among the study them members, consultation with experts, and consideration of national policies, laws and local customs. The combined score of magnitude, extent and duration below 40 was termed as insignificant impact; scores ranging between 40 and 79 was termed as significant impact, scores ranging between 80 and 99 was termed as very significant and the scores above 100 was termed as highly significant impact.

4.6 Public Involvement

The local people in project area, concerned government organizations, local NGOs, CBOs, etc.were consulted during IEE study. In accordance with the Rule (7.1) of Environment

Protection Rules, 1997, a 15-day public notice was published in a national daily newspaper, Rajdhani on 16th March, 2016. Furthermore, the copies of public notice were pasted at public places of project area and their evidences (Muchulka) were collected.

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

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

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

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

4.7 Time schedule for project completion

The time schedule for the project is shown in the figure below:

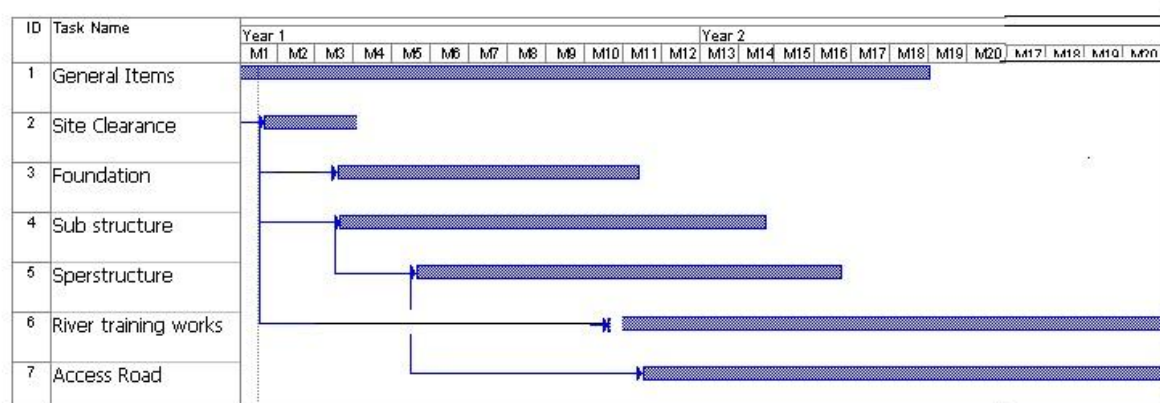


Figure 4.1: Time schedule of the project.

4.8 Study team member

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

Table 4.3: Study team members

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

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

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

5.1 Constitution of Nepal.

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

5.2 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)

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

5.2.6 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 be entitled for permanent employment. The employer could terminate the employee with prior approval of the Department of Labour and prior notice to the employee as defined by the law. The labour act prohibits the employment of the child or under-aged person. The employer could not force the workers to work for long hours other than that defined by the law. The employer has the responsibility to ensure healthy environmental conditions of the workplace as defined by the law.

5.2.7 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)

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

District. The GoN may prohibit, through notification in the *Nepal Rajapatra* (Government Gazette), the construction of any permanent structure (other than walls) within 6m of the road formation edge.

5.2.9 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 be 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 work 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 threat or coercion or any other way against his will”. Under Section 6, in case any Enterprise has to engage a child in works, an approval has to be obtained from the concerned labour office or any authority or official prescribed by that office and from the father, mother or guardian of the child.

5.3 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 intergenerational ally 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 recommends 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 labor 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

SN.	Instrument	Maximum threshold limit (dB)
1	Water pump	65
2	Diesel generator	90
3	Loudspeaker, 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)	$\mu\text{g}/\text{m}^3$	Annual	-
		24-hours*	230
PM ₁₀	$\mu\text{g}/\text{m}^3$	Annual	-
		24-hours*	120
Sulphur Dioxide	$\mu\text{g}/\text{m}^3$	Annual**	50
		24-hours*	70

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum
Nitrogen Dioxide	$\mu\text{g}/\text{m}^3$	Annual	40
		24-hours*	80
Carbon Monoxide	$\mu\text{g}/\text{m}^3$	8 hours*	10,000
Lead	$\mu\text{g}/\text{m}^3$	Annual**	0.5
Benzene	$\mu\text{g}/\text{m}^3$	Annual**	5
PM2.5	$\mu\text{g}/\text{m}^3$	8-hours*	40
Ozone	$\mu\text{g}/\text{m}^3$	8-hours*	157

5.5.3 Nepal Road Standard 2070 BS

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

5.5.4 Nepal Bridge Standard 2067 BS

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

5.5.5 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 new DG set less than 19kW is 0.80 g/kWh; for 19 to <37kW, the emission limit is 0.60 g/kWh; for 37 to <75, it is 0.40 g/kWh; for 75 to 130 kW, it is 0.30 g/kWh; and for 130 to <560 kW, it is 0.20 g/kWh.

5.5.6 Nepal Vehicle Mass Emission Standard 2056 BS

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

5.6 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

6.1 Physical Environment

6.1.1 Physiography and Geomorphology

The proposed site for the construction of Salabang Bridge is located at the boundary Bhalakcha VDC on the left side and Musikot Khalanga Municipality on the right side. The proposed bridge is located at a distance of 113m upstream from the Lahu-.Sakh confluence at the elevation of 960m amsl. The gradient of 16.9% is observed at the proposed location. Furthermore, the longitudinal gradient of the Sakh Khola is not much steep and there is a gentle rise in the river level as we move upstream of the river channel. Figure 6-1 reveals the longitudinal profile of the SakhKhola from the Sakh-Lahu confluence.

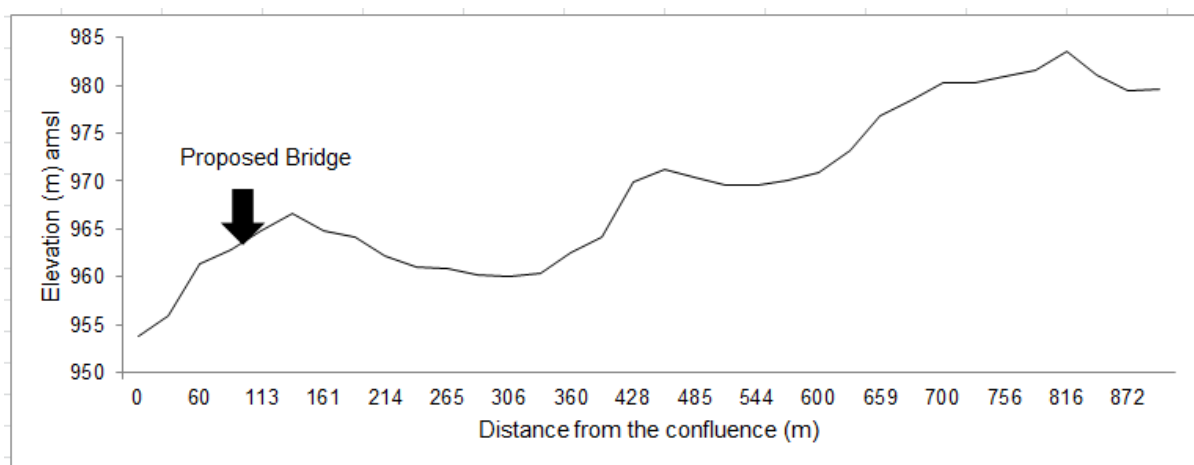


Figure 6.1: Longitudinal Profile of the Sakh River (Source: Project Design Report, 2016)

6.1.2 Geology and Soil

Geologically the project area lies in the Midland Group, Ranimarta Formation of the Western Nepal Himalaya. The Ranimatta Formation is comprised of quartzite and phyllite and even these rocks are exposed in both banks of the Sakh Khola. The superficial materials on both banks of the river include colluvial and alluvial deposits. The alluvial and colluvial deposits are composed of cobble of phyllite and qurtzite. Thickness of alluvial and colluvial deposits are more than 3m on both banks and beds rocks are also exposed at some locations. The bearing of the proposed bridge axis is 065-245 degrees. The flowing direction of Sakh Khola around the proposed bridge site is 000-180 degrees. Major geological structures like faults and the thrust are not observed around the proposed location.

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 Sakh Khola. The thicknesses of alluvial deposits are more than 3m. The alluvial deposits are composed of boulders, cobbles, pebble and sands. Boulder, cobbles and pebbles are mainly granite, quartzite from the Lesser Himalaya (0.5 to 2 m in diameter). The nature of the surface soil is characterised by lack of calcareous cementing material so the surface soils are loose in nature.

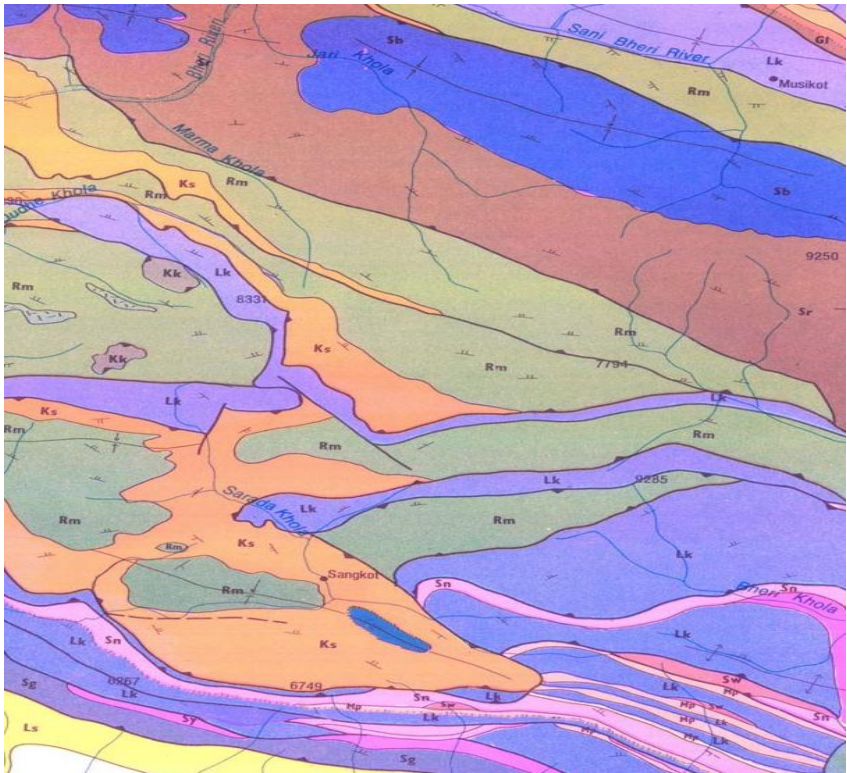
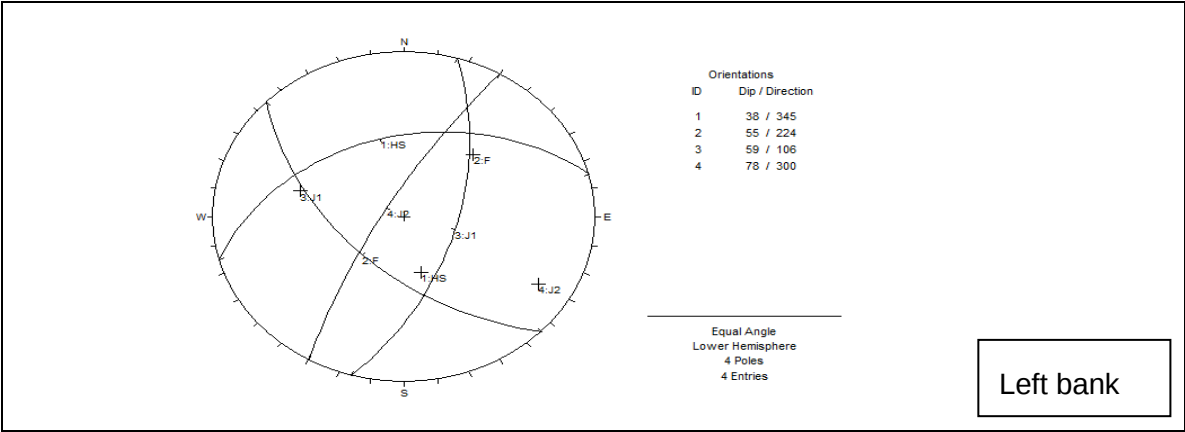


Figure 6.2: Geology around Sakh River Area (Source: DMG)

6.1.3 Slope Stability

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



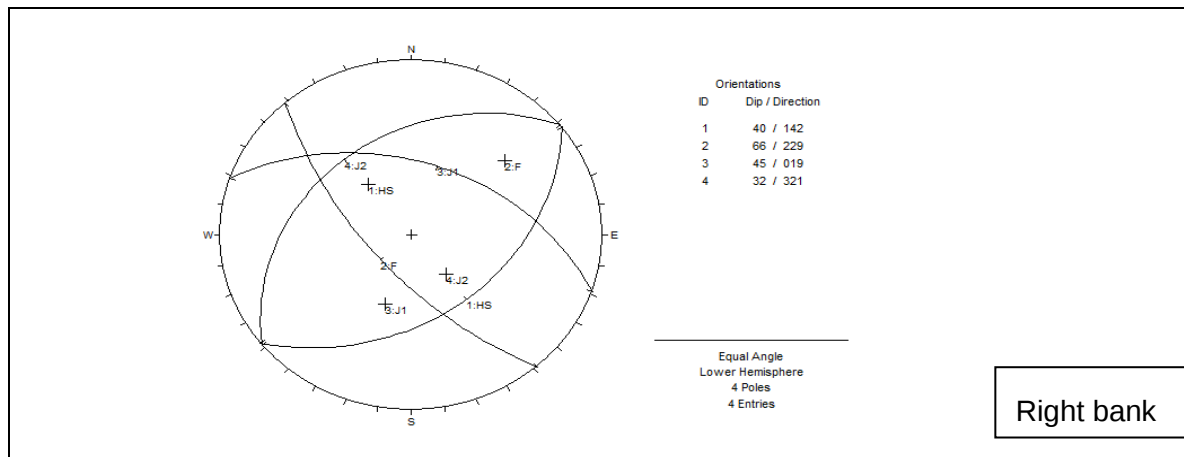


Figure 6.3: Stereographic projection of the proposed bridge site area(Source: Project Design Report, 2016)

Table 6.1: Condition of the slope stability of the rock

Location	HS and F	F and J1	F and J2	J1 and J2
Left Bank	Stable	Stable	Stable	Unstable
Right bank	Stable	Stable	Stable	Stable

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

6.1.4 Seismological Study

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

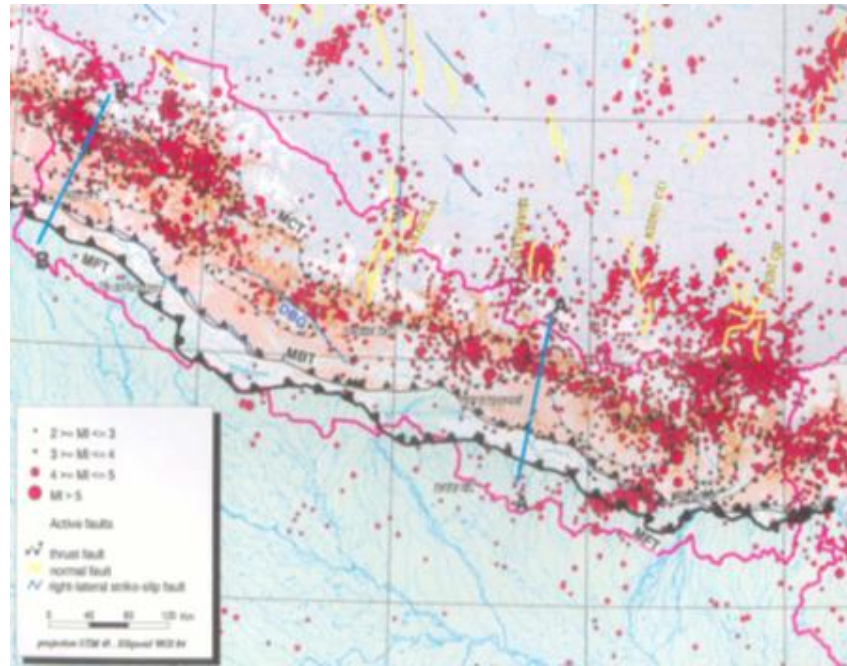


Figure 6.4: Epicenters of earthquakes in the Nepal Himalaya (Source: Project Design Report, 2016)

Similarly, the seismic hazard of the Nepal Himalaya is presented in figure 6-5 below:

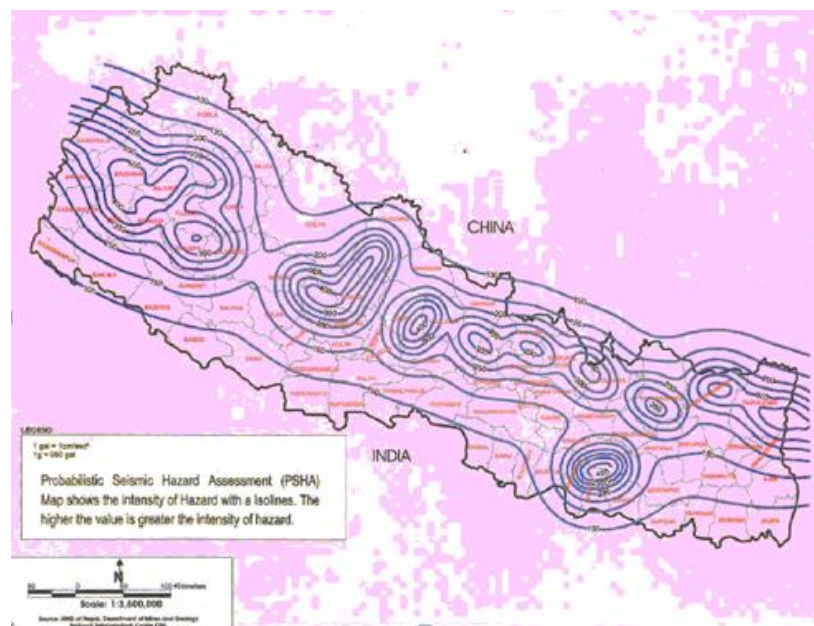


Figure 6.5: Seismic Hazard Map of Nepal (Source: Project Design Report, 2016)

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

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

6.1.5 Climate

Sub-tropical climate is found along proposed project site. The maximum temperature around the project area during summer season exceeds 35°C, while the minimum temperature

during winter season remains not less than 10°C. The average annual precipitation around the project area recorded is about 1868 mm.

6.1.6 Drainage and Hydrology

The proposed bridge has been proposed over the Sakh River which is a Perennial river. The gradient of the river d/s of the bridge is found to be lower than its u/s, which shows constant elevation change. The river shows the complex dendritic pattern comprising of many rivers making the confluence with it. The Sakh River makes the confluence with the Lahu River at 137 m downstream from the proposed bridge location. The drainage characteristic of the Sakh River is presented in figure 6-6.

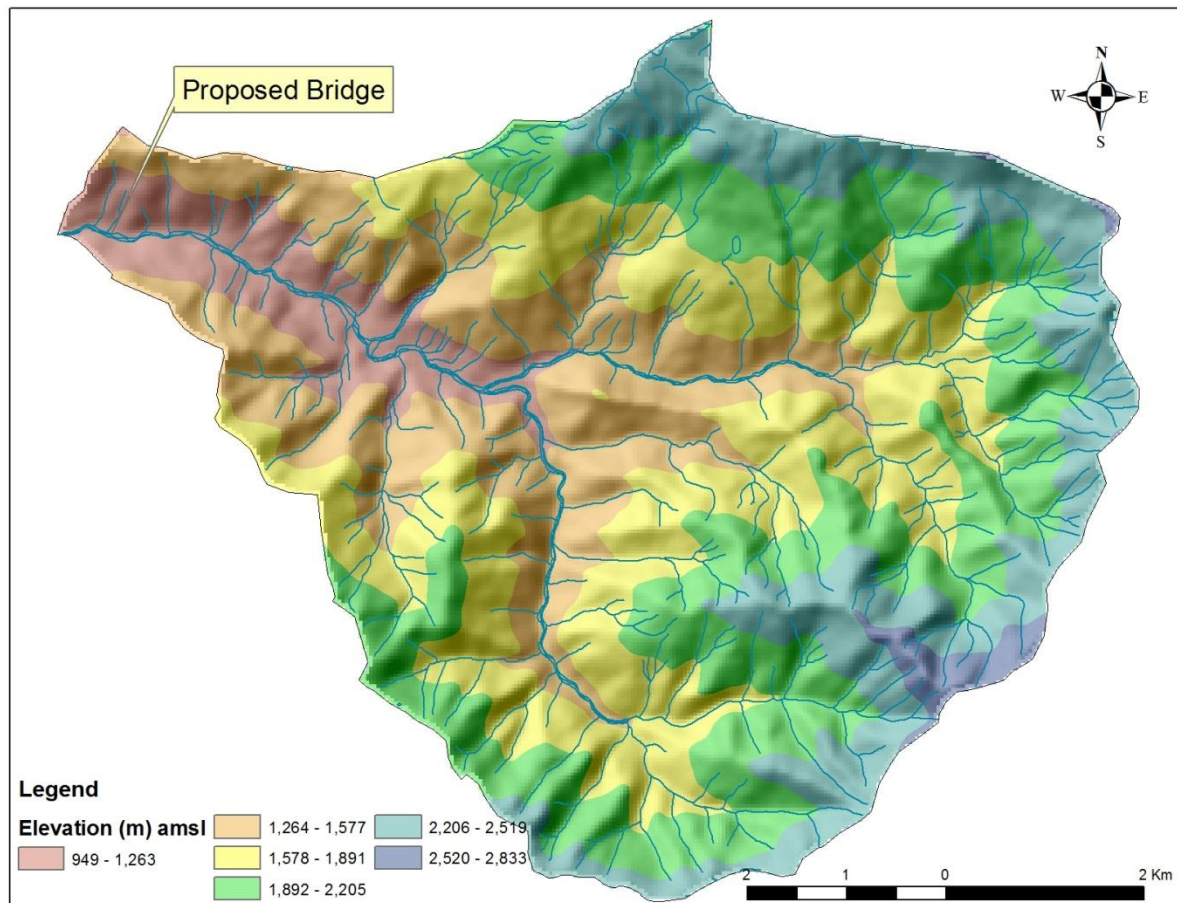


Figure 6.6: Drainage map of Sakh River (Source: Project Design Report, 2016)

The lowest and highest elevations of the Sakh River Catchment are 956 and 2,560 m above mean sea level respectively. Furthermore, the total area of Sakh River Catchment is 56.6 Km² and the total channel length is 11.19 Km. Similarly, the design flood for 100 years return period for the Sakh River at Salabang (near the bridge construction location) is 381m³/s. As identified from the observation of flood marks and the consultations with the local people the maximum depth of water during rainy season is 15m.

6.1.7 Landuse

The land use around the direct impact zone (DIZ) is largely dominated by the agricultural land. Similarly, forested area is the second largest land use pattern around the proposed sub-project area. Other land use comprises bushes, grass land and flood plain. The land use around the sub-project area is presented in table.

Table 6.2: Land use categories around the sub-project area

Land Use	Percentage
Bush	8
Cultivation	57
Forest	24
Grass	7
Flood Plain	5

6.1.8 Public Structures

About 25m stretch of two irrigation canals on both bank of the Sakh Khola will be affected due to the project construction. The total command area of those irrigation canals is 35 ropani (1.75ha). Besides, a water mill belonging to private owner will be affected by the project. Although the water mill provides the public services, due to the private ownership it will be dealt separately under private properties and will be compensated according to that.

6.1.9 Air Quality, Water Quality and Noise levels

There are no stationary sources of air, water and noise pollutants, and the vehicles moving through the Shitalpati-Musikot Road are only responsible for the deterioration of ambient air and noise quality.

6.2 Biological Environment

There is a community forest on the left bank of the Sakh Khola. The name of the community forest is Jumlaban Pahi Pakho Community Forest. The dominant species observed in that community forest are Sal (*Shorea robusta*) and Salla (*Pinus roxburghii*). However, the vegetation that has to be removed for the construction of the approach road are different and mainly the one planted by the local people.

6.2.1 Project Affected Vegetation

The project will directly affect the following vegetation:

Table 6.3: Vegetation to be removed during the construction of the bridge

S.N.	Name	Scientific Name	Number
1	Lapsi	<i>Choerospondias axillaris</i>	1
2	Bakaino	<i>Melia azederach</i>	3
5	Rittha	<i>Sapindus mukorossi</i>	1
6	Khaniyo	<i>Ficus semicodata</i>	3
9	Bedulo	<i>Ficus sarmentosa</i>	2
11	Amba	<i>Psidium guajava</i>	1
12	Timilo	<i>Ficus auriculata</i>	1

Similarly 30 banana plants have to be removed during the construction of the proposed bridge and its approach road.

6.2.2 Faunal Diversity

The temperate forest around the project area is the habitat for many wild animals and birds. Some of the commonly found wild animals around the project area are Goral (*Naemorhedus goral*), Jackal (*Canis aureus*), Wild Boar (*Sus scrofa*), Langur (*Colobinae ajax*) and Rhesus Macaque (*Maccaca mulata*). Likewise, the birds include Kuthurke (*Magalaima asiatica*), Maina (*Acridotheres tristis*), Gauthali (*Hirundo rustica*), Chibe (*Dicrurus spp.*), Dhukur (*Streptopelia chinensis*), Crow (*Corvus splendens*), Bhanger (Passer domesticus), Nyauli (*Megalaima virens*), etc.

6.2.3 Fish Diversity

The Sakh Khola serves a potential habitat for many aquatic lives. The major fish species found in the Sakh khola are Bucche Asala (*Schizothorax plagiostomus*), Chucche Asala (*Schizothoracichthys spp.*), Tite (*Psilorhynchus pseudecheneis*), and Dhami.

6.3 Socio-economic and Cultural Environment

6.3.1 Project Affected VDCs

The proposed Salabang Bridge is located at the boundary of two VDCs, i.e. Bhalakcha VDC and Khalanga Municipality. The socio-economic status of project affected VDCs are presented below:

a. Demography

According to the National Population of Census of 2011 the total population of Bhalakcha VDC and Khalanga Municipality are 3,713 and 13,203 respectively. In both the project affected VDC/Municipality the total population of female is greater than the total population of male. The demographic characteristics of the project affected VDC/Municipality is presented in table 6-2.

Table 6.4: Demographic Characteristics of the Project affected VDCs

VDC	Household	Population			Average Household Size	Sex Ratio
		Total	Male	Female		
Bhalakcha	748	3,713	1,683	2,030	4.96	82.91
Khalanga	3,279	13,203	6,394	6,809	4.03	93.91

Source: CBS, 2011

b. Caste and Ethnicity

According to the National Population Census of 2011, Chhetri is the dominant ethnic group in terms of population in the project affected VDC/Municipality. Similarly, other ethnic groups observed around the project area are Brahmin, Thakuri, Magar, Newar, Dalits, etc. Largely Nepali is the mother tongue for large fraction of population.

c. Sanitation and Drinking water facilities

According to the National Population Census of 2011, the sanitary status of the project affected VDC/Municipality is not satisfactory. In Bhalakcha VDC less than 50% of the total households had toilet facilities. However, in Khalanga Municipality considerable household (4/5th) have toilet facility. Among the households having toilet in Khalanga Municipality 2/3rd of the households had flush toilet.

Table 6.5: Household proportion with and without toilet facility around project VDCs.

VDC	Total Households	Households without toilet facility	Household with toilet facility of		Total facility not stated
			Flush toilet	Ordinary toilet	
Bhalakcha	748	417	125	205	1
Khalanga	3,279	605	1,675	999	0

Source: CBS, 2011

Large fraction of households in both the project affected VDC/Municipality have tap water facilities. The households that are deprived from tap water facilities rely on Kuwa and Spout water for drinking water supply. Other general sources around the project affected VDC/Municipality include tube well, river/streams, etc. The details of the source of drinking water in project affected VDC are given in the table below.

Table 6.6: Drinking water facilities in project VDCs

VDC	Total Household	Main Source of Drinking Water					
		Tap/piped Water	Tubewell/handpump	Covered Well/Kuwa	Uncovered Well/Kuwa	Spout Water	River/stream
Bhalakcha	748	625	0	2	39	80	1
Khalanga	3,279	3,150	3	2	10	110	4

Source: CBS, 2011

d. Energy usage

The project VDC/Municipality has majority of households that use firewood as the main source of fuel for cooking while other sources do not contribute to any. The use of LP Gas for cooking purpose is only prevalent in Khalanga Municipality. The details of the source of fuel for cooking in project affected VDCs are given in table below.

Table 6.7: Fuel used for cooking purpose

VDC	Total Household	Fuel usually used for cooking							
		Wood /firewood	Kerosene	LP gas	Santhi/guitha(cow dung)	Bio gas	Electricity	Others	Not Stated
Bhalakcha	748	746	0	0	1	0	0	0	1
Khalanga	3,279	2,704	12	545	6	3	1	8	0

Source: CBS, 2011

Electricity is mostly used for lighting purpose in Khalanga Municipality, but a very few households in Bhalakcha VDC have excess to electricity. The source of electricity for Khalanga Municipality is the locally developed micro-hydropower projects. In case of Bhalakcha VDC more than 80% of the total households rely on solar PV system to light their dwellings. Only six households in Khalanga Municipality have been using biogas as a source of lighting energy.

Table 6.8: Fuels used for lighting purpose

VDC/Municipality	Total Household	Fuel usually used for lighting					
		Electricity	Kerosene	Bio gas	Solar	Others	Not stated
Bhalakcha	748	65	41	0	479	162	1
Khalanga	3,279	2,392	125	6	494	262	0

Source: CBS, 2011

e. Education and health facilities

As per the National Population Census of 2011, the literacy rate of Phoi Mahadev VDC is 66%. However, the male literacy rate (77.19%) is higher than that of the female literacy rate (54.73%). The details of the literacy status of the project VDC are given in the table below:

Table 6.9: Literacy Status of the Project VDC

VDC and sex	Population aged 5 years & above	Population Who are			Literacy not stated	Literacy rate
		Can read & write	Can read only	can't read & write		
Bhalakcha						
Both Sex	3,321	2,218	144	958	1	66.79
Male	1,483	1,114	68	301	0	75.12
Female	1,838	1,104	76	657	1	60.07
Khalanga						
Both Sex	12,020	9,522	102	2,390	6	79.22
Male	5,790	5,062	34	691	3	87.43
Female	6,230	4,460	68	1,699	3	71.59

Source: CBS, 2011

The project area has better health access available as the district hospital and several other private and public health institutions are available in the Khalanga Municipality. The common diseases that are frequently observed around the project area are common cold, diarrhea, dysentery, typhoid, etc.

f. Communication facilities

The project area has all kind of communication facilities available. Local people are widely observed to be using mobile phone as the primary means of communication facilities. Both Nepal Telecom and other private mobile service providers are providing communication facilities. Furthermore, internet, email and cable television are also available around the sub-project area.

6.3.2 Project Affected Families

6.3.2.1 Demographic Composition

The construction of bridge affects twelve household. Altogether, 72 family members will be affected in which the number of male is higher than female. The average family household size is 6.0.

Table 6.10: Population of affected households

Name of bridge	Affected HHs	Male	Female	Total	HHs size
Salabang Bridge	12	41	31	72	6.0

Source: Project RAP, 2016

6.3.2.2 Ethnicity Composition

The bridge construction site is located in Mid-western development region of Nepal. Altogether twelve households will be affected by the construction of bridge. Among the affected, 58.33% are Magar, 33.33% Chhetri and 8.33% Dalit ethnic group. The table below shows the ethnic composition.

Table 6.11: Ethnic composition of project affected families

Caste/Ethnicity	Households	%
Magar	7	58.33
Chhetri	4	33.33
Dalit	1	8.33
Total	12	100.00

Source: Project RAP, 2016

6.3.2.3 Age Distribution

Among the project affected population, majority (65%) are economically active and about 35% populations are dependent which indicates that these age group populations are economically inactive and dependent for their livelihood.

Table 6.12: Age distribution of project affected people

Age Distribution	Population	%
Below 5 Years	3	4.17
6-15	18	25.00
16-60	47	65.28
Above 60 Years	4	5.56
Total	72	100.00

Source: Project RAP, 2016

6.3.2.4 Education and Literacy Status

The primary schools are nearby location of each settlement but for secondary and higher education, the students have to travel either district headquarter or Dang or Kathmandu. While calculating the literacy status the population belongs below 5 years age group is not calculated. About 90% are literate and 10% are illiterate. About 13% populations are in primary, 36% secondary, 16% SLC, 8.70% PCL and about 3% Bachelor level education. The table below shows the education level.

Table 6.13: Literacy status of project affected people

Education	No.	%
Illiterate	7	10.14
Literate	9	13.04
Class 1-5	9	13.04
Class 6-10	25	36.23
SLC	11	15.94
Intermediate	6	8.70
Bachelor	2	2.90
Total	69	100.00

Source: Project RAP, 2016

6.3.2.5 Occupation of Affected HHs

The affected households are engaged in different occupation. Majority of them are school going students and dependent on agriculture. Of the total affected households 58.0 percentage are engaged in local small scale business, 16.67% household head are engaged in foreign employment and service sector and 8.3% are in agriculture. The table below shows the occupational division of affected households.

Table 6.14: Occupation of project affected population

Occupation	No.	%
Agriculture	1	8.33
Business	7	58.33
Service	2	16.67
Foreign employment	2	16.67
Total	12	100.0

Source: Project RAP, 2016

6.3.2.6 Sources of income

The household was asked the major sources of income of the affected household. They depend in multiple source of income. Among them, business foreign employment is the main source of income.

Table 6.15: Major sources income of project affected population

Major source of Income	Households	%
Wages (Local)	1	8.33
Services	2	16.67
Business	7	58.33
Foreign Employment	2	16.67
Total	1	100.0

Source: Project RAP, 2016

6.3.2.7 Food Sufficiency Level

The project affected household was asked level of food sufficiency. Among them 25% have no agriculture, 58.77% have food sufficiency 3 to 6 months, and 8.33% have below 3 months and 6 to 9 months food sufficiency level. The table below shows food sufficiency level among affected households.

Table 6.16: Food sufficiency level of project affected families

Food Sufficiency Level	HHS	%
No agriculture	3	25.00
Below 3 Months	1	8.33
3-6 Months	7	58.33
6-9 Months	1	8.33
Total	12	100.0

Source: Project RAP, 2016

6.3.2.8 Measures to Meet Food Deficit

The survey reports that affected households do not food sufficient for whole year. While asking about the ways to meet food requirements they reported that business, services and foreign employment are sources of income which supplement income for food grain.

6.3.2.9 Level of Income

Local business is the major sources of income of the affected HHs. The range of income shows that the household has not sufficient income level. All the affected households earn NRs above 300,000 per year. The table below shows the income level of affected households.

Table 6.17: Income level of project affected families

Income Range	Households	Percentage
Above 300,000	12	100.00
Total	12	100.0

6.3.2.10 Level of Expenditure

There seems similarity between income and expenditure of affected household. About 42% affected household, expenses are in 200,001 to 300,000 and 58% expenses is above 300,000 per year in a year. The table below shows the expenditure pattern of affected household.

Table 6.18: Level of expenditure of project affected households

Expenditure Level	Households	Percentage
200,001-300,000	5	41.66
Above 300,000	7	58.33
Total	12	100.0

6.3.2.11 Health and Sanitation

People visit nearest health service center for medical treatment but the services provided from those institutions are poor and not satisfactory. Mostly people visit Dang and Nepalgunj for better treatment but minor cases are treated in village based service centers. Sub-health post located in one to two-hour travel is the nearest health facility received by the affected households.

6.3.2.12 Source of Water

The water source is local springs. But the water source is not available for year round. In dry season people have to about 15 to 30 minute walk for water supply.

6.3.2.13 Toilet Facility and Defecation Practice

Open defecation practice is highly prevailed in bridge construction site. Among the affected household 70% have toilet facilities. Rivers banks and open spaces are the regular locations for defecation those who have not toilet facility. During the group discussion among villagers, they told that even though we have toilet facility but we have not practice of proper defecate system. Those who have toilet also visit open space for defecation.

6.3.2.14 Gender Situation

Gender relation primarily depends upon the existing socio cultural phenomena of society. Gender discrimination is very widespread in project districts. Women are far behind to receive the facilities and access in mainstreaming sector. The 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.

CHAPTER 7: ENVIRONMENTAL IMPACTS

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

7.1 Beneficial Impacts

Construction Stage

▪ Employment Generation

The construction of bridge over the Sakh Khola requires a number of skilled, semi-skilled and unskilled manpower. The project shall generate the employment opportunity to 50 workers, among them 30% will be skilled and unskilled whereas 70% will be unskilled. This will create employment opportunities to the people of affected villages which will result in enhanced income generation. *This impact will be of high magnitude, local in scale and short term in duration.*

▪ Enhancement of skills

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

▪ Increased environmental awareness in the local people

The project will organize environmental awareness program to aware the local people regarding the maintenance of good and harmonious environment around the bridge area. The awareness program will mainly highlight the following issues:

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

Operation Stage

▪ Improved Mobility

The existing bridge over the Sakh Khola is a bailey bridge which is single lane. The load bearing capacity of the existing bridge is very low, due to which the heavy vehicles like Bull Dozers could not be transported through the bridge. Furthermore, construction of new permanent concrete bridge will facilitate the movement of relatively heavier vehicles directly to Khalanga, which will even contribute to the development of new avenue around the northern part of Rukum District. *The impact will be high magnitude, regional in scale and long term in duration.*

- **Saves Time**

Although the present number of vehicles running towards Khalanga is very low, the construction of road network towards the neighboring districts from Rukum will obviously increase the number of vehicles, imposing pressure on existing infrastructure. At this situation construction of double lane bridge will be very useful as it will facilitate the dual movement of vehicles without any traffic congestion. Furthermore, current practices unloading the heavy vehicles (Bull Dozers) from the carrier, and crossing the river riskily by taking them through the river channel will come to the end. This will save the time of those carriers by at least 3 hours. *The impact will be of high magnitude, regional in scale and long term in duration.*

- **Reduced Traffic Congestion**

The bridge links the people of Rukum District with Dang, salyan and various parts of Mid-Western Development Region. Hence, numerous vehicles carrying the passengers as well as goods run over the bridge and the Shitalpati-Musikot Highway. The movement of the numerous vehicles over the single lane Bailey bridge would create the problem of traffic congestion. Hence, the operation of 11 m PSC Girder Bridge would reduce the traffic congestion and enhance the smooth operation of the vehicles. *The impact will be of high magnitude, regional in scale and long term in duration.*

7.2 Adverse Impacts

7.2.1 Physical Environment

Construction Stage

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

The construction of the bridge does not require the diversion of the river and the construction of the bridge will be carried out during the dry season when the water flow of the river will be minimal. *Hence, this impact will be of low significance, site specific and short term in duration.*

- **Change in land use and loss of productive soil**

The construction of proposed Salabang Bridge and its approach road requires the total of 0.246 ha of land permanently. This land area is the right of way of the Shitalpati-Musikot Road alignment and belongs to the Government Ownership. However, encroachment of RoW and establishment of settlement is clearly visible along the alignment. There is no any agricultural land that has to be acquired for the implementation of the proposed sub-project. Moreover, the temporary land requirement (0.64 ha) belongs to the private owner and the land area is barren in itself. While acquiring the private land mutually fixed rent will be paid to the owner. *The impact due to change in land use is of low magnitude, site-specific and short-term.*

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

The hill slope on both bank of the Sakh Khola is gentle and mechanical activities like excavation of hill slope for the widening of approach road is not highly likely to bring large scale landslides. Adoption of basic engineering and bioengineering approaches can stabilize the excavated slope. *This impact is envisaged to be medium significance, site specific and medium term in nature.*

▪ **Management and operation of quarries and burrow pits**

There are five different locations recommended as quarry sites for the extraction of construction materials. All of them are flood plain of Palta Khola, Shibhatu Khola, Lahu Khola and Sakh Khola where annual river deposits are collected and used as construction materials, while the remaining one is the hill slope which is an old alluvial deposit. The extraction of construction materials from the river flood plain is only sustainable when the materials deposited during the preceded year are used in the following year. Over extraction of the construction materials could result in bank cutting, river bank erosion and even landslides. Furthermore quarrying over the hill slope is particularly vulnerable as it could trigger into large scale landslides. *This impact will be of medium magnitude, site-specific in nature and medium term in duration.*

▪ **Spoil and construction waste disposal**

The excavation of soil for the foundation of the bridge and approach road will generate about 1,5000 m³ of spoil. Out of the total spoil generated about 8,000 m³ will be used for backfilling. Similarly, some amount of excavated materials is even used for river training works and just about 7,000 m³ of spoil have to be disposed. The random and improper disposal spoil can be very hazardous as the runoff during rainy season would wash the materials causing water pollution in the nearby water bodies and even resulting in several water borne diseases. *Hence, the impact will be medium, local and medium term in nature.*

▪ **Pollution of water resource**

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. *This impact is envisaged to be medium in magnitude, local in extent and medium term in duration.*

▪ **Approach road and related issues**

The construction of Salabang Bridge requires the construction of 180m alongside. During the construction of approach road, several private and public properties have to be removed. Similarly, hill slope excavation on left bank of Sakh Khola has to be done. Excavation of hill slope could result landslides and slope failures. *This impact is envisaged to be highly significant, site-specific and short term in duration.*

▪ **Road diversion and related issues**

The construction of Sakh Khola Bridge does not involve the use of road diversion as the existing Bailey bridge serves as the diversion. *Thus, this issue is irrelevant for this project.*

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

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

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

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

- **Air and noise pollution**

The operation of machineries during the construction period for the excavation of river terraces in order to construct the foundation of the bridge will be the main source of air pollution, noise and vibration around the surrounding area. Similarly, the operation of crushers around the quarry areas also contribute to the problems associated with noise and vibration. Furthermore the project vehicles carrying construction materials will cause air, noise pollution and even vibration problems to the roadside houses. Generators are the only source of electricity around the project area and the operation of generators even contribute to the air and noise pollution. However, since the area is not over crowded and natural settings can easily disperse the air pollutants and absorb noise reducing the magnitude of their impact. *The impact is of low significance, site specific and short term in nature.*

- **Combustible and toxic material management**

Various combustible and toxic materials like petroleum products, oil, grease, etc. will be used during the construction period of the project. Mishandling of these materials can result in several environmental and health related threats like fire, air, soil and water pollution, etc. However, the use of such materials is very low and the chances of accidental release are very low. *Thus, this impact is considered low in magnitude, site specific in extent and short term in duration.*

- **Use of bitumen**

Bitumen is used to make the black top surface of the road. 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 envisaged to be direct, moderate magnitude, local in extent and short term in duration.*

- **Environmental issues associated with work camp**

The construction camps near the proposed bridge location will generate the domestic wastes such as food waste and other inorganic wastes. These solid wastes if dumped improperly can cause bad odor from the deterioration which increases the flies causing health hazards to the local people. But the solid waste generated will be minimal and these wastes will be dumped in environment friendly manner. *Thus, the impact is of low magnitude, site-specific and short-term in nature.*

Operation and Maintenance Stage

- **Air pollution**

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

- **Noise and Vibration**

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

- **Backwater Effect During Floods**

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

- **Riverbank Erosion**

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

- **River Channel Shifting**

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

- **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.*

- **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 occupational health impact to the workers. *The envisaged impact is moderate, site specific and medium in duration.*

- **Accidental risks**

The construction of Salabang Bridge will involve the extensive use of various mechanical instruments designed for different kind of activities, involving breaking rocks, digging for the foundation, earth removing, etc. There is always some degree of risks associated with the handling of those machineries. Besides, the pit that are dug for the erection of abutments are particularly risky during night time as people might fall down there, which could cause the death as well. *This impact will be medium in magnitude, site-specific in extent and medium term in duration.*

7.2.2 Biological Environment

Construction Stage

- **Clearing of vegetation**

The project requires the clearance of 12 trees belonging to different species. The details of trees that have to be removed during the construction of the proposed bridge and its approach road are presented in table 6-3. Similarly, about 30 banana plants have to be removed during the construction of the proposed bridge. *This impact is envisaged to be medium significance, site specific in extent and medium term in duration.*

- **Impact on Aquatic Life**

There will be various mechanical activities along the bank of Sakh River during the erection of abutments. During this period river channel has to be narrowed. The involvement of heavy machineries and intensive construction activities along the river channel hinder the activities of aquatic organisms, alongside the destruction of their natural habitat. Similarly, some members of construction crew would involve themselves in fishing activities in their spare

time and this would enhance the intensity of fishing activities (as additional people are involved in fishing), causing the population of some fish species to decline. *This impact is envisaged to be medium magnitude, local and medium term in duration.*

- **Disturbance to wildlife and biodiversity**

Since the proposed site for the construction of Salabang Bridge is not a wildlife movement corridor and trees are not necessary to be felled, there is no direct primary impact of bridge construction on wildlife and biodiversity. 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 envisaged to be low magnitude, local and medium term in duration.*

- **Damage to aquatic habitat, and barriers to fish/aquatic movement**

During the construction period of the proposed Salabang Bridge, several mechanical works will be carried within and around the river channel. This would disturb the movement of fishes and other aquatic species. Similarly, construction of abutments will destroy all the aquatic plants around the construction site that grows along the bank of Sakh River and aquatic organisms relying on those plants for food will get directly affected by such activities. *This impact is envisaged to be medium magnitude, local and medium term in duration.*

Operation and Maintenance Stage

- **Barrier Effects on Aquatic animals**

As the abutment and foundation of the Salabang Bridge will be located at the bank of the Sakh Khola and no pillars will be construction within the river channel, there would be insignificant barrier effect on the movement of aquatic animals.

7.2.3 Socio-economic and cultural Environment

Construction Stage

- **Social Conflicts**

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

- **Obstruction to social services and facilities**

During the construction phase, the existing Bailey bridge would be used as the diversion bridge. Hence, the construction of the bridge would not have obstruction in vehicular movement. Likewise, no other social services and facilities like, electric poles, drinking water supply, schools, etc. need to be displaced for the bridge construction. Besides, the area around the location of proposed bridge lacks the adequate supply of drinking water, and thus addition of workforce would pose stress on available water resources and even would result in conflict with the local people for drinking water. *This impact is envisaged to be low, site-specific and medium term in duration.*

- **Impact on private and public properties**

The construction of Salabang Bridge and its approach road requires about 0.246 ha of land permanently. During the construction, the sub-project will affect about 25m stretch of two irrigation canals on either side of the bridge. Similarly, a water mill will also get affected by the sub-project. Furthermore, although the land for the construction of approach road is the RoW of the existing Shitalpati-Musikot road section, thick roadside settlements have already been developed by the encroachment RoW. Thus, the households of that settlement have to

be relocated prior to the construction of the road. *This impact is considered medium in magnitude, site-specific in nature and medium term in duration.*

- **Public grievance related to project construction**

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

- **Loss of productive land**

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

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

The construction of the Salabang Bridge requires the removal of 12 different structures on government land. The details of structure that are directly affected by the project are presented in table below:

Table 7.1: Detail of owners and type of structure affected by the project

Land Owner Name	Household Head Name	Use of structure	Type Structure	Area (ft ²)	Construction type
Government Land	Bir Bdr. Buda	Residential cum business	Building	375	Kachhi
Government Land	Pramod Oli	Shed	Shed	450	Kachhi
Government Land	Bir Bdr. Pun	Toilet	Toilet	225	Kachhi
Government Land	Lal Muni Pun	Residential cum business	Building	270	Kachhi
Government Land	Prabin Pariyar	Toilet	Toilet	225	Kachhi
Government Land	Aan Bdr. Budamagar	Residential cum business	Building	396	Kachhi
Government Land	Bhim Bdr. Khadga	Residential cum business	Building	455	Kachhi
Government Land	Man Bdr. Oli	Residential cum business	Building	1225	Pakki
Government Land	Moti Ram Dharti	Toilet	Toilet	225	Kachhi
Government Land	Deepak Pun	Toilet	Toilet	225	Kachhi
Government Land	Dhan Singh	Toilet	Toilet	225	Kachhi
Government Land	Khamba Bdr. Ban	Temporary Kiosk	Ghumti	225	Kachhi

(Source: Draft Resettlement Action Plan)

This impact is envisaged to be direct, high significant, site specific and medium term in nature.

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

There is no association of project construction and vulnerable indigenous people and dalits, so this issue is not relevant.

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

The project will not pose any impact on cultural, religious and historical sites and hence this impact is not applicable.

- **Impact on landscape aesthetics**

During the construction stage of the proposed project the aesthetics of the landscape around the proposed project location would be hindered. *This impact will be medium significance, site-specific and medium term in duration.*

Operation and Maintenance Stage

- **Traffic accidents**

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

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

Experience from the study of project area suggests that the connection of Bhalakcha VDC and Khalanga Municipality by the existing Bailey bridge has indirectly facilitated the development of thick market on both sides of the bridge. Thus, it is highly likely that the construction of permanent concrete bridge over the Sakh River connecting Bhalakcha VDC and Khalanga Municipality will increase the extent of current market area. This impact is envisaged to be of medium significance.

CHAPTER 8: ALTERNATIVE ANALYSIS

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

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

8.1 Location Alternatives

Basically two alternatives are available for the construction of the proposed bridge. These two alternatives include, (I) proposed location and (II) existing Bailey bridge. These two alternatives are feasible from both technical and socio-environmental perspectives. If new bridge is constructed by replacing the existing Bailey bridge, diversion needs to be constructed which has its own socio-environmental impacts and technical challenges. Thus, the proposed location is very suitable as the selection of this alternative does not require the construction of diversion and is technical and economically feasible to undertake the construction activities. Furthermore, the environmental and social damage upon the approval of this alternative is not severe and can be mitigated by the implementation of mitigation measures proposed in the subsequent chapters.

8.2 Design and Construction Alternatives

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

8.3 Time Schedule Alternatives

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

8.4 Resource Alternatives

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

8.5 No Project Alternative

The existing Bailey bridge over the SakhKhola has been under operation for about a decade. The load bearing capacity of that bridge is not enough for the movement of heavy vehicles. Furthermore, Bailey bridges are not the long term crossing solution and thus there is no alternative to the construction of concrete bridge over the Sakh River.

CHAPTER 9: IMPACT MITIGATION MEASURES

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

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

9.1 Beneficial Impact Augmentation Measures

9.1.1 Construction Stage

▪ Employment Generation

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

▪ Enhancement of skills

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

▪ Awareness raising program

Several awareness raising programs regarding the environment, health and sanitation, solid waste management, biodiversity conservation, etc. will be organized by the project. The awareness raising programs will be beneficial for the local people to set up the clean and green environment of the project area.

9.1.2 Construction Stage

▪ Improve mobility and reduce traffic congestion

The construction of 11m wide concrete bridge will completely eradicate the traffic problems that occurred with the existing Bailey bridge. The project as a part of benefit enhancement measure will make a provision of plantation around the bridge location, and this will not only enhance the aesthetics of the area but also helps to prevent natural disasters. Furthermore, the project will install solar lamp along the approach road and the bridge and this will facilitate the local people to cross the bridge during night time also and even reduces the probability of accidents.

9.2 Adverse Impact Mitigation Measures

9.2.1 Construction Stage

1. Physical Environment

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

During the construction of the proposed project, unnecessary scouring of the river bed will be avoided. As the proposed bridge is a single span bridge, river diversion will not be done and a very minimum disturbance on river channel will be made. Furthermore, the spoil generated during the excavation for the abutments will be disposed on a designated spoil disposal site and contamination with the river water will not be made. Since, the gradient of the Sakh Khola is very high, the inundation of the upstream region is not possible. However, narrowing the channel during the construction period will have some effect on the upstream velocity of water and could even enhance the bank erosion. Thus, to mitigate this impact, river training work will be carried parallel to the bridge construction. The provision of river training work has been included in the project design.

- **Pollution of water resources**

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

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

- **Prevention of landslides, instabilities, and soil erosion**

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

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

- **Change in land use and loss of productive land**

The construction of the proposed Sakh Khola Bridge and approach road will require only 0.198 ha of land belonging to various land use categories. The land use categories are existing road; river bank, river channel and barren hill slope. Thus, no significant land use change and loss of productive land will occur. However, the location of camp site and construction material stockpiling site could lead towards the loss of productive land temporarily. Thus, selection of such site will be located over the barren land which would not lead towards serious social and environmental impacts.

- **Mitigation of environmental and social damage associated with quarry site operation**

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

- ✓ Authority from the local stakeholders and authority office will be taken prior to the opening of quarry 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.
- ✓ In case of quarrying over the hill slope, the hill slope will be stabilized by constructing slope protection structures once the quarrying requirements are fulfilled.

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

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

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

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

- ✓ Five meter tall 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° on the river side.
- ✓ As soon as the spoil disposal gets completed the site should be planted with trees. Altogether 50 trees have to be planted around the spoil disposal site.

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

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

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

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

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

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

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

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

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

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

▪ **Mitigation for environmental pollution due to the release of solid and liquid waste from the work camp**

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

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

2. Biological Environment

▪ **Mitigation measures for clearing of vegetation**

Compensation plantation will be done in the ratio 1:25 for the cleared trees.

▪ **Mitigation for disturbance to wildlife and biodiversity**

The mitigation measures proposed for the disturbance to wildlife and biodiversity are discussed below:

- ✓ Construction activity does not require the cutting of tree.
- ✓ Illegal hunting and fishing during construction period by the construction workforce will be strictly controlled.

- ✓ Construction camp will be supplied with LPG and the use of fuel wood will be discouraged.
- ✓ Depending on the local conditions and logistic constraints, meat and fish for contractor's workforce should be supplied by the contractor by purchasing them from market in the area.
- ✓ Trading of animal skin, horns, bones, feathers, etc. will be fully controlled and supervised, and if anybody is found guilty, he/she will be informed to the authority.
- ✓ Contractor will arrange/buy energy resource for bitumen heating from the authorized source.

▪ **Mitigation of impact on aquatic life**

The mitigation of impact on aquatic life due to bridge construction are as follows:

- ✓ 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.

3. Socio-economic and Cultural Environment

▪ **Occupational health and safety of workers**

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

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

▪ **Social Conflicts**

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

▪ **Obstruction of social services and facilities**

As the existing Bailey bridge will serve as the diversion for the movement of vehicles, the existing vehicular movement will not be halted due to the construction of new bridge. Similarly, the project will make the provision of separate drinking water facilities to the camp site. Toilets will be constructed near the camp site so that there would not be pressure on public toilet due to the involvement of construction workers.

▪ **Accidental risk**

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

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

- **Impact on public and private properties**

The 12 private structures will be directly affected by the project. In order to compensate, and rehabilitate the project affected families project have prepared separate resettlement plan. Likewise, the privately owned water mill will also be compensated by the project.

Similarly, the affected two irrigation canals will be repaired and relocated as per the requirement.

- **Public grievance related to bridge construction**

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

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

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

Project has prepared separate resettlement action plan (RAP) which will address the issue related to the land and property acquisition, compensation, resettlement and rehabilitation. The breakdown of cost for this issue sourced from draft RAP document is presented in the section 10.3.

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

The project will formulate and implement strict code of conduct to the work force so that they will not be allowed to hinder the cultural and religious environment of the local area. Similarly, the project will also support for the improvement and betterment of existing Shiva Temple.

9.2.2 Operation Stage

- **Air and noise pollution due to vehicular movement**

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

- **Mitigation of environmental issues due to stockpiling of construction materials during regular maintenance**

During the maintenance safe and appropriate site for the stockpiling of construction materials will be selected. The stockpiling will follow all the norms mentioned in the construction stage.

- **Mitigation of road accidents**

Project will install required delineators, safety signs, etc. as per the requirement. Similarly, sign boards at accident-prone spots and busy spots will be installed.

CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN

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

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

Table 10.1: Institutions and their role in EMP implementation

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

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

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

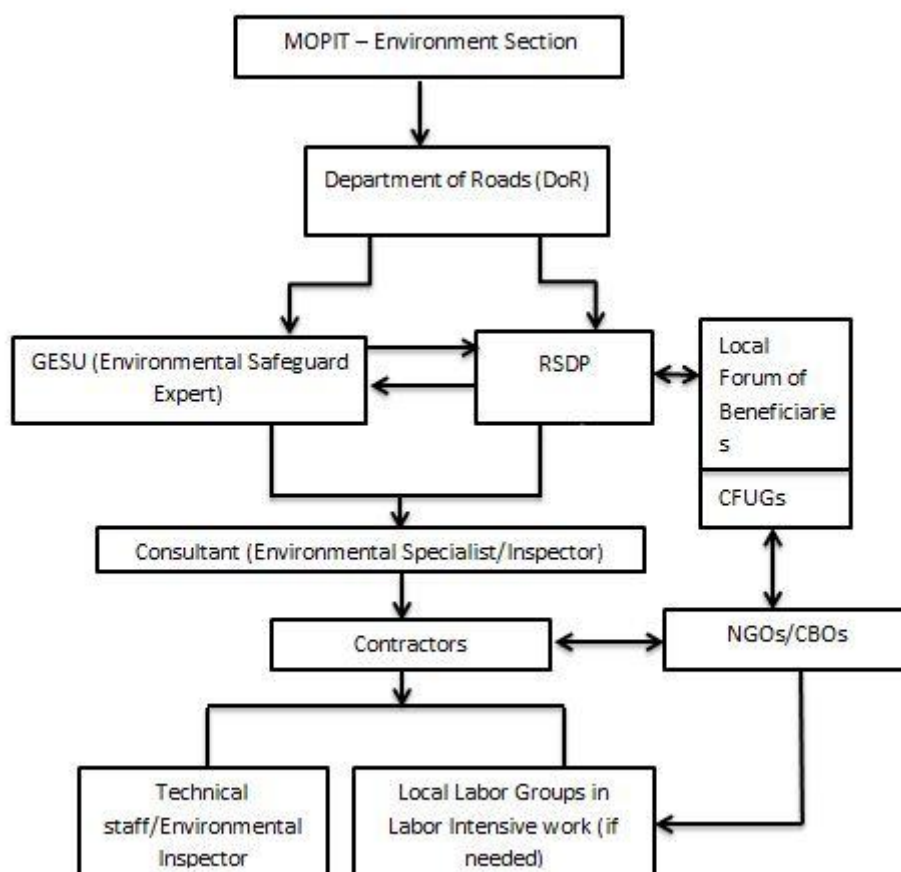


Figure 10.1: Agencies responsible for the implementation of EMP

10.1 Environmental Monitoring and Reporting

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

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

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

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

The specific monitoring indicators selected for this IEE document are presented in table 10-2.

Table 10.2: Specific monitoring indicators selected for the IEE document

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

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

10.1.1 Pre-construction Phase Monitoring

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

10.1.2 Construction Phase Monitoring

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

a. Daily Supervision

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

b. Weekly Supervision

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

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

c. Monthly Supervision

The monthly inspection will include the field based review of work progress, their compliance with the measures mentioned in the EMP section of the IEE document. The deviation from the mandate of the EMP during construction will be immediately reported and the correction measures will be recommended. The supervising consultant shall prepare a monthly progress report and mention clearly the extent to which the mitigation measures are adopted the construction activities. The supervising consultant shall provide a copy of the monthly report to the project and the contractor within 4 days of the inspection of action.

10.1.3 Post-construction Phase

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

10.1.4 Operation Phase

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

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

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

The details of guideline for compliance and impact monitoring are presented in table 10-3 and 10-4.

Table 10.3: Compliance monitoring parameters with respective indicators

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Final location and design as per IEE/EMP recommendation	Incorporation of IEE/EMP recommendations into location and design selection and finalization	Site observation and verification	Preconstruction phase	Consultant	Proponent/RSD P, 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,	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	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,	Before and during construction period	Consultant (for baseline survey) Contractor	Proponent, consultant

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
environmental and socially critical sites, protection of fauna and flora	wildlife sensitive habitats, forests and fuel wood use.	enforcement records.			
Pressure on forest and wildlife	Use of firewood or fossil fuel by construction crew, events of hunting and poaching of wildlife	Inspection and interview	Regular by contractor, once a month by consultant	Contractor	Proponent, 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

Parameters	Verifiable Indicators	Verification Methods	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
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 10.4: Parameters selected for the impact monitoring

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

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
	Establishment of nursery	measurements				
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

Parameter	Verifiable Indicators	Verification Methods	Location	Schedule	Responsible Implementing Agency	Responsible Monitoring Agency
Forest and vegetation	Numbers of trees, presence of group vegetation, signs of illicit logging and extraction of NTFPs	Observation, DFO record, photos, stakeholder interviews	In and around the construction sites, markets	During construction and operation	Contractor	Proponent, 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 Changes in land use pattern	Records kept by the project management, discussion with people	Project Area	Twice a year during construction and operation	Contractor, Consultant,	Proponent
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

10.2 Environmental Management Plan

The complete sets of environmental enhancement and mitigation measures have been formulated for the sustainable implementation of Sakh Khola Bridge. The environmental management plan ensures the involvement of all the parties that are directly and indirectly associated with the construction of Sakh Khola Bridge. The framework for the environmental management plan for beneficial impacts and adverse impacts are presented respectively on table 10-5 and 10-6.

Table 10.5: Framework for benefit enhancement measures

Beneficial Environmental Impact	Affected Location	Benefit Augmentation Measure	Enhancement Cost	Responsible Agency	
				Implementing Agency	Supervising Agency
Employment 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	Construction contract	Contractor	Supervision consultant/ DoR
Skill Enhancement	-	Involvement of the local people in the project construction activities will serve to enhance the level of skills so that they can involve themselves in similar kind of activities in near future. Those involved as labour can learn the skill of Mason, painters, etc. Similarly, there is a provision of training for the project affected family	Cost for the skill based training for the project affected families is included in Resettlement Action Plan	Contractor	Supervision consultant/ DoR
Improved mobility, saving of transportation time	Entire project area	Construction of permanent bridge will ultimately serve as the benefit augmentation measure.	No addition cost	Contractor	Road Division Office

Table 10.6: Framework for adverse impact mitigation measures

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
Physical 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
Bridge construction, camp site operation, spoil disposal and quarry site operation	Pollution of water resources	- Spoils generated during the excavation will be disposed-off safely in the designed spoil disposal site. - Oils and chemicals used in construction vehicles and machineries will be handled properly to avoid the contamination with the water bodies. - Separate toilet facilities will be provided to the construction crew with proper septic tank facility. - Liquid waste generated within the camp site will be disposed safely without	Bridge construction area, spoil disposal site and quarry site	During construction and quarrying	No additional cost required	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		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					
Approach road construction	Landslides, slope destabilization and soil erosion	- The retaining structures proposed in the DPR will be constructed. - Approach road will be supplemented with the construction of properly designed side drain. - Check dams and gabions structures will be constructed to check landslides and erosion	Around the approach road	During construction	Included in project detail design	Contractor	Supervising consultant/DoR
Camp site operation	Loss of productive land	Camp site will be established on recommended barren land to avoid the loss the productive land	Around the camp site	During construction phase	Cost included in table 10.9	Contractor	Supervising consultant/DoR
Operation of quarry site	Environmental and social damage associated with quarry operation	- Authority from the local stakeholders and authority office will be taken prior to the opening of new quarry. - Unstable sites, erosion prone areas, dense forested areas, settlements,	Around the quarry site	During quarrying	Cost included in table 10.9	Contractor	Supervising consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		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. - 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.					
Chemical handling	Environmental issues associated with the mishandling of chemical substances	- Proper safety measures will be adopted while handling the hazardous chemicals like oil, grease, etc. - Combustible chemicals like petrol, diesel, etc. will be stored separately in a safe container. - Project will have the provision of fire extinguisher throughout the construction period.	Around the construction site, and camp site	During construction period	Cost included in table 10.9	Contractor/project	Supervision consultant/DoR
Construction materials stockpiling	Environmental issues associated with	The land allocated for the storing of construction materials will be far from agricultural land and water	Material stockpiling site	During construction period	Cost included in table 10.9	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
	the material stockpiling	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 mix up with deleterious materials.					
Spoil disposal	Environmental issues associated with spoil disposal	- Whenever possible, surplus spoil will be used to fill eroded gullies, quarries and borrow pits, depressed areas, etc. - Remaining spoil will be disposed in the recommended spoil disposal site in a controlled manner. - Disposal of spoil on fragile slopes, farmland, marshy land, forested areas, natural drainage path, canals and other infrastructures will be	Spoil disposal area	During construction period	Cost given in table 10.9	Contractor/CBOs/Project	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		prohibited. - A disposal site will be provided with proper drainage, vegetation and adequate protection against erosion. - Vegetation plantation will be done over the spoil disposed surface to reclaim the area.					
Operation of project vehicles and machineries	Air and noise pollution	- Contractor will use the conditioned vehicles and machineries. - Alternative schedule will be adopted during the operation of the vehicles and machineries so that there will not be disturbance on the livelihood of the local people	Construction site and quarry site	During construction period	No additional cost	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 200m away from the settlement. - Unnecessary quantity of bitumen will not be heated. - Occupational health and safety measures will be adopted while heating the bitumen	Approach road and bridge	During construction period	Included in project detail design	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		• If bitumen is spread over the land accidentally and in improper place then it will be cleared immediately. • Bitumen related work will not be carried out during rainy season. • Bitumen will not be used discharged into the drain structure while overlaying on the sub-base material.					
Work camp operation	Environmental pollution due to the release of solid and liquid waste from the work camp	• Solid waste will be managed following 3 R principle. • Bio-degradable waste will be disposed in a separate pit away from the water bodies. • Liquid waste will be disposed in a separate ditch and disinfectant will be continuously spread to avoid contamination. • Separate sanitary toilet will be construction near the construction camp with the facility of septic tank. • Provision of clean drinking water will be made at the construction camp	Labour camp	During construction period	Cost included in table 10.9	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
Vehicular movement	Air and noise pollution	This is a residual impact and can't be avoided. Thus, mitigation measures are not proposed	Approach road and bridge	During operational period	No additional cost	-	-
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
Bridge construction	Occupation health and safety of workers	- 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	Construction area	During Construction period	Included in project design	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		and supervisors.					
Bridge construction	Accidental Risk	- Various warning sign post will be installed around the construction area. - Local people and visitors will not be allowed to enter the working area. - Emergency siren will be installed around the construction area. - Provision of lighting facilities will be made during night time throughout the construction period.	Around construction area	During construction period	Included in project design	Project/contractor	Supervision consultant/DoR
Biological Environment:							
Bridge construction	Disturbance to wildlife and biodiversity	- Construction activity does not require the cutting of tree. - Illegal hunting and fishing during construction period by the construction workforce will be strictly controlled. - Construction camp will be supplied with LPG and the use of fuel wood will be discouraged. - Depending on the local conditions and logistic constraints, meat and fish for contractor's workforce	Construction camp	During construction period	No additional cost	Consultant	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		should be supplied by the contractor by purchasing them from market in the area. - Trading of animal skin, horns, bones, feathers, etc. will be fully controlled and supervised, and if anybody is found guilty, he/she will be informed to the authority. - Contractor will arrange/buy energy resource for bitumen heating from the authorized source					
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.	Around construction site	During construction period	No additional cost	Contractor	Supervision consultant/DoR

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
		Construction workers will not be allowed to carry any kind of fishing related activities					
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 and public properties	- The irrigation canals will be relocated. - The private water mill will be compensated. - 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	Cost included in table 10.9 Included in resettlement cost	Project	Supervision consultant/DoR
Bridge construction	Public grievance related to bridge	Project will form, activate, and maintain Grievance Redress Mechanism around the project area.	Around the construction	During pre-construction and construction	No additional cost	Project/Contractor	Supervision consultant/project

Activity/Issues	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Timing of Action	Mitigation Cost	Institutional Responsibility	
						Implementing Agency	Supporting Agency/Supervision
	construction	• Activate and maintain Grievance Redress Mechanism in concerned Manager's Office, Resident Engineer's Office, and Contractor's Office. • Inform local stakeholders of Grievance Redress Mechanism's existence. • Inform local stakeholders about how they can lodge grievance against contractor's fault work for his ratification.	tion area	n stage			
Bridge construction	Land and property acquisition, compensation, resettlement and rehabilitation	• Project has prepared a separate resettlement plan 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	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

10.3 Cost for Execution of EMP

10.3.1 Details of specific cost

a) Land, properties acquisition, resettlement and rehabilitation cost

The project has already prepared Resettlement Action Plan (RAP) and has identified four households to be directly affected by the project. The specific cost estimated as mentioned in draft RAP is presented here. ***This cost will not be added in this report.***

Table 10.7: Cost associated with resettlement and rehabilitation

A. Compensation & Rehabilitation			
I. Estimated compensation for private structures	Number	12	1,457,650
II. House displacement allowance	Number	5	100,000
III. Transportation allowance	Number	5	50,000
IV. Business displacement	Number	5	100,000
VI. Support Allowance	Number	5	50,000
Total			1,757,650

(Source: Draft RAP)

b) Income Restoration and Skill Development Training for Affected HHs

One member of each affected households will be provided income restoration measures under the **Income Restoration and Skill Development Training (IRSDT)** program according to the requirements of the ESMF. RSTD include trainings on income generating activities which will be delivered through trainings and others supplementary investments. These programs are expected to re-establish PAPs' lost livelihood options and uplift of new income generating opportunities. Regarding the information from the consultations some list of training is listed below and this training will deliver as per their need basis during construction phase. ***This cost will not be included in this report.***

Table 10.8: Proposed training and cost estimate

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

(Source: Draft RAP)

c) Cost for Mitigation measures

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 10.9: Cost for mitigation 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	30,000	30,000	Senior level bridge engineer, mid-level bridge engineer, site supervisor and labor force
	Lump Sum	20,000	20,000	
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 sanitation, biodiversity conservation will be provided to

Environmental Issues	Unit	Rate (Rs)	Amount (Rs)	Remarks
				the people of Project DIA and IIA
Quarry, Rock break, river bed extraction site rehabilitation	Lump Sum	30,000	30,000	Reinstatement of quarry and river bed extraction site
Safe disposal of spoil including transportation and rehabilitation of site	1245	30	37350	The cost includes transportation of spoil to the designated site, and rehabilitation of the site
Relocation of Irrigation Canals	Lump Sum	-	150000	
Bitumen Heating (Safe storage, heating and handling and closure)	Lump Sum	20,000	20,000	
Construction of Berms and fencing of stockpiling materials	Lump Sum	10,000	10,000	Contractor will bear the cost for protecting the stockpiling materials
Fire Safety Gadget	6	4,000	24,000	
Compensation for the removal of private bananas	30	1,000	30,000	
Sub-Total			1,071,350	

d) Cost of tree plantation

Tree plantation will be mainly done for the restoration of spoil disposal site, road side plantation and plantation to enhance the aesthetics of the project area. Altogether the plantation of 120 trees has been proposed in this report. Out of 120 trees 60 of them will be planted around spoil management site, 40 along the approach road and 20 around the bridge axis. The cost estimate for the plantation of trees is presented in table 10.10.

Table 10.10: cost of tree plantation

Activities	Cost in Rs.	Remarks
Plantation of 300 saplings, including site preparation, pitting and mulching (plantation at the ratio 1:25 for	30,000	Lump sum cost of NRs. 100/sapling (including cost for site preparation, pitting and mulching)

12 trees that needs to be cut)		
Replacement of 90 dead saplings at the rate of Rs. 70	6,300	Assuming 30% mortality
Tools	2,000	Lump sum
Tending and maintenance for 5 years	10,000	Lump sum
Sub-total	48,300	

e) Cost of environmental monitoring

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

Table 10.11: Cost of environmental and social monitoring

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

10.3.2 Total Cost for EMP Implementation

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

Table 10.12: Total cost of implementation of EMP

S.N.	Activities	Cost	Remarks
1	Mitigation measure under physical environment	1,071,350.00	

2	Tree Plantation	48,300.00	
3	Environmental Monitoring	980,000.00	
Total Cost of EMP implementation		2,099,650.00	

10.4 Grievance Redress Mechanism

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

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

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

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

Box: 1 Stage of Grievance Mechanism**Stage1:**

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 and 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.

Stage2:

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.

Stage3:

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.

10.5 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

10.5.1 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 provide with first aid treatment facilities;
- Provision of fire safety should be made within the labour camp.

10.5.2 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 villagers 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.

10.5.3 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 equipments (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 ;

10.5.4 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.

10.5.5 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.

10.5.6 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.

10.5.7 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 .

10.5.8 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

10.5.9 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° 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.

10.5.10 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 rehabilitated and planted after the work completed.

10.5.11 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.

CHAPTER 11: CONCLUSION AND RECOMMENDATION

The construction of Sakh Khola Bridge results in a substantial beneficial impacts. Lacking of permanent concrete bridge has caused several problems in the smooth operation of vehicles. In case of Sakh Khola Bridge the environmental impact of bridge construction is very low and can be easily mitigated through the mitigation measures proposed in chapter 9. Removal of trees is not required during the construction of the proposed bridge and no any public structures fall within the construction area. Once of the significant environmental issue during the construction of the approach road is the excavation of stable hill slope which would require immediate mitigation measures to prevent the future hazards associated with the excavation.

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

Give the above conclusion; the Initial Environmental Examination (IEE) document recommends for the implementation of Environmental Management Plan included herewith the IEE document for the mitigation of adverse environmental impacts, enhancement of beneficial impact and sustainable operation of the proposed bridge.

Annexes

Annex A: Approved Terms of Reference (ToR)

Annex B: Public Notice



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

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सार्वजनिक सूचना

(प्रथम पटक प्रकाशित मिति: २०७२/१२/१८)

प्रस्तावकको नाम: भू-वातावरण तथा सामाजिक शाखा, सडक विभाग

प्रस्तावको नाम: सलवाड पुल

विश्व बैंकको सहयोगमा नेपाल सरकार, भैतिक पूर्वाधार तथा यातायात मन्त्रालय, सडक विभाग अर्न्तगत सडक क्षेत्र विकास आयोजनाले सितलपाटी-मुसिकोट सडक खण्डमा पर्ने साँखु खोला माथि निर्माण गर्न प्रस्ताव गरेको ३६.२ मी. लम्बाई (१X३५ 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-आफ्नै राय सुझाव दिन हुनको लागि सोहि नियमावलीको नियम ७ (२) अनुसार यो सार्वजनिक सूचना प्रकाशन गरिएको छ।

जिल्लाको नाम: रुकुम

प्रभाव पर्न सक्ने नगरपालिका/गा.वि.स.को नाम: मुसिकोट खलङ्गा न.पा. र भलक्वा गा.वि.स.

क्षेत्रहरु: (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 ठेगाना:

भू-वातावरण तथा सामाजिक
शाखा, सडक विभाग
पाटन, ललितपुर, नेपाल
टेलिफोन नं.: ९७७-०१-५२६०६९६
फ्याक्स नं.: ९७७-०१-५५२९१०६
इमेल: gesunit@dor.gov.np

परामर्शदाता:

**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: ०१-४४७९८८४

फ्याक्स नं: ०१-४४७९३६१

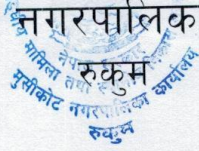
पोष्ट बक्स नं: १२४१९, काठमाडौं

इमेल: safe@ermc.wlink.com.np

Annex C: Deeds of Inquiry (Muchulka)



नेपाल सरकार
संघीय मामिला तथा स्थानीय विकास मन्त्रालय
मुसिकोट नगरपालिका कार्यालय



पत्र संख्या ०७३/०७४
च.नं. २१६४

मिति २०७३/११/०८

विषय : सूचना टाँस गरीएको बारे ।

श्री सडक सुधार विकास आयोजना
वैदेशिक महाशाखा,
सडक विभाग काठमाण्डौ ।

प्रस्तुत विषयमा रुकुम जिल्लाको मुसिकोट नगरपालिका र भलाक्चा गाविस भएर बग्ने साख खोलामा (सोलावाड बजार नजिकै) निर्माण गर्न प्रस्ताव गरीएको सोलावाड पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा राय सुभाष पेश गर्नका निमित्त आव्हान गर्दै २०७२/१२/१८ गतेको राजधानी राष्ट्रिय दैनिका प्रकाशित सार्वजनिक सूचनाको छायाप्रति यस कार्यालयको सूचना पाटिमा टाँस गरीएको व्यहोरा जानकारीका लागि अनुरोध गरीन्छ ।

कार्यकारी अधिकृत
०८२/११/२०७३



गाउँ विकास समितिको कार्यालय



पत्र संख्या: २०६३/०६४
चलानी नम्बर: ४३२

मिति २०६३/११/०८

विषय: सूचना राख्न गरिएको वारे ।

श्री: राइक सुधार विकास आयोजना
वैदेशिक महाश्वारता
राइक विमण कामाण्ड नेपाल ।

प्रस्तुत विषयमा रुकुम जिल्लाको मुसिकोट नगरपालिका र भुलाक्छा गाउँ विकास समिति भन्ने बन्ने सौरवखोलाभा (सोलुखुम्बा) बजार र वैराणीठरी बजार (विच) निर्माण गर्न प्रस्ताव गरिएको वरिष्ठ ठोरो पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा राख्न सुझाव पेश गर्नका लागि आह्वान गर्दै २०६२/११/१८ गतेको राजधानी — राष्ट्रिय दैनिक प्रकाशित सार्वजनिक सूचनाको ह्यापारि यस कार्यालयको सूचना पारिमा राख्न गरिएको व्यहोरा जानकारीका लागि अनुरोध छ ।

(Signature)

गा वि स सचिव

प्रारम्भिक वातावरणीय परिक्षण सम्बन्धि सूचना टाँसको मुचुल्का

आज मिति २०७२-१२-२२ गते सोमवार बिहिवारको दिन यस अलकचा-४, वैराजीगढी गा.वि.स./न.पा. वडा नं. ४ स्थित र.प.ग.डी भन्ने ठाउँमा २०७२/८० पुलको प्रारम्भिक वातावरणीय परिक्षण गर्ने क्रममा सम्पूर्ण सरोकारवालाहरुलाई प्रस्तावित पुल निर्माण गर्दा त्यस क्षेत्रको भौतिक, जैविक, आर्थिक सामाजिक तथा सांस्कृतिक वातावरणमा पर्ने 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 राजधानीमा 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	दिल्ली व. ओली	अलकचा-४, वैराजीगढी	वि.स.क.	
२	मोहन ओली	अलकचा-४, वैराजीगढी	अध्यक्ष	
३	गुना ओली	अलकचा-४, वैराजीगढी	अध्यक्ष	
४	विष्णु ओली	अलकचा-४, वैराजीगढी	अध्यक्ष	
५	चनसि कुँडा	अलकचा-४, वैराजीगढी	अध्यक्ष	
६	राज वहादुर ओली	अलकचा-४, वैराजीगढी	अध्यक्ष	
७	रेमा पुन	अलकचा-४, वैराजीगढी	अध्यक्ष	
८				
९				
१०				

Annex D: Recommendation Letter



नेपाल सरकार
संघीय मामिला तथा स्थानीय विकास मन्त्रालय
मुसिकोट नगरपालिका कार्यालय
रुकुम

पत्र संख्या ०७३/०७४
च.नं. २१६२

मिति २०७३।११।०८

विषय : सिफारीस गरीएको बारे ।

श्री सडक सुधार विकास आयोजना
वैदेशिक महाशाखा,
सडक विभाग काठमाण्डौ ।

प्रस्तुत विषयमा रुकुम जिल्लाको मुसिकोट नगरपालिका र भलाक्चा गाविस भएर बग्ने साख खोलामा (सोलावाड वजार नजिकै) निर्माण गर्न प्रस्ताव गरीएको सोलावाड पुलको कार्यन्वयन गर्दा स्थानीय वातावरणमा न्युन प्रभाव परी समग्र रुकुम जिल्लामा फाईदा हुने देखिन्छ । उक्त पुल निर्माण गर्ने क्रममा कुनैपनि वातावरणिय प्रभावहरु पर्ने गएमा सो प्रभावहरु न्युनिकरण उपायहरु अवलम्बन गरी कार्य अघि बढाउन हुन सिफारीस साथ अनुरोध गरीन्छ ।

०७३।११।०८
मुसिकोट नगरपालिका



गाउँ विकास समितिको कार्यालय



पत्र संख्या: २०६३/०५४
चलानी नम्बर: ४३३

मिति: २०६३/११/०८

विषय: रिफारिस सम्बन्धमा।

श्री. सङ्क सुधार विकास योजना
वैदेशिक महशारवा
सङ्क विभाग काठमाडौं, नेपाल।

प्रस्तुत विषयमा सुकुम जिल्लाको मुखौट नगरपालिका
भलाक्या गा.वि.स. भएर गर्ने सौख खोलामा (खोलावट वजार र
वैरागीठाँडे वजार बीचमा) निर्माण गर्ने प्रस्ताव गरिएको वैरागीठाँडे
पुलको कार्यन्वयन गर्दा स्थानीय वातावरणमा न्यून प्रभाव परेसम्म
सुकुम जिल्लामा फाइदा हुने देखिन्छ। उक्त पुल निर्माण गर्ने क्रममा
कुनै पनि वातावरणीय प्रभावहरू पर्ने जसमा यो प्रभावहरू —
न्युनिकरण उपायहरू अवलम्बन गरी कार्य अघि बढाउन हुन
रिफारिस साथ अनुरोध गरिन्छ।

[Signature]

गा.वि.स. सचिव

Annex E: Minutes of Public Consultation

आज मिति २०६२-१२-२२ गते यस मुलिकोत नगर-५ सोलावाडो कमारमा प्रस्तावित सोलावाडो पुनर्को प्रारम्भिक वातावरणीय परिक्षणको क्रममा आयोजना कार्यलयमार्फत यस क्षेत्रमा पर्ने सबै भौतिक, जैविक, सामाजिक आर्थिक तथा सांस्कृतिक वातावरणीय असरहरूवारे निम्न लिखित स्थानियको उपस्थितिमा दलफल गरियो ।

क्र.सं.	नाम	ठेगाना	पेशा	हस्ताक्षर
१.	गुला ओली	भलकचा-५.	छापा	
२.	विष्णु ओली	"	"	
३.	शान व. ओली	"	"	
४.	धन सि. पुडा	भलकचा-५.	"	
५.	हेमा पुन	भलकचा-५.	"	
६.	शानि व. ओली	भलकचा-५.	टुपि	
७.	विष्णु ओली	भलकचा-५.	छापा	
८.	डिल्ली व. ओली	भलकचा-५.	छापा	
९.	गगन हिं. वि.	मु. न. पा. ५.	टुपि	
१०.	शंकर कुमा. (सर्वा)	मु. न. पा. ५.	छापा	
११.	दाम. व. शंकर	मु. न. पा. ५.	छापा	
१२.	राजन ओली	मु. न. पा. ५.	छापा	

दलफलको क्रममा उल्लेख भइरहेको तथा सम्बन्धित रहेको ।

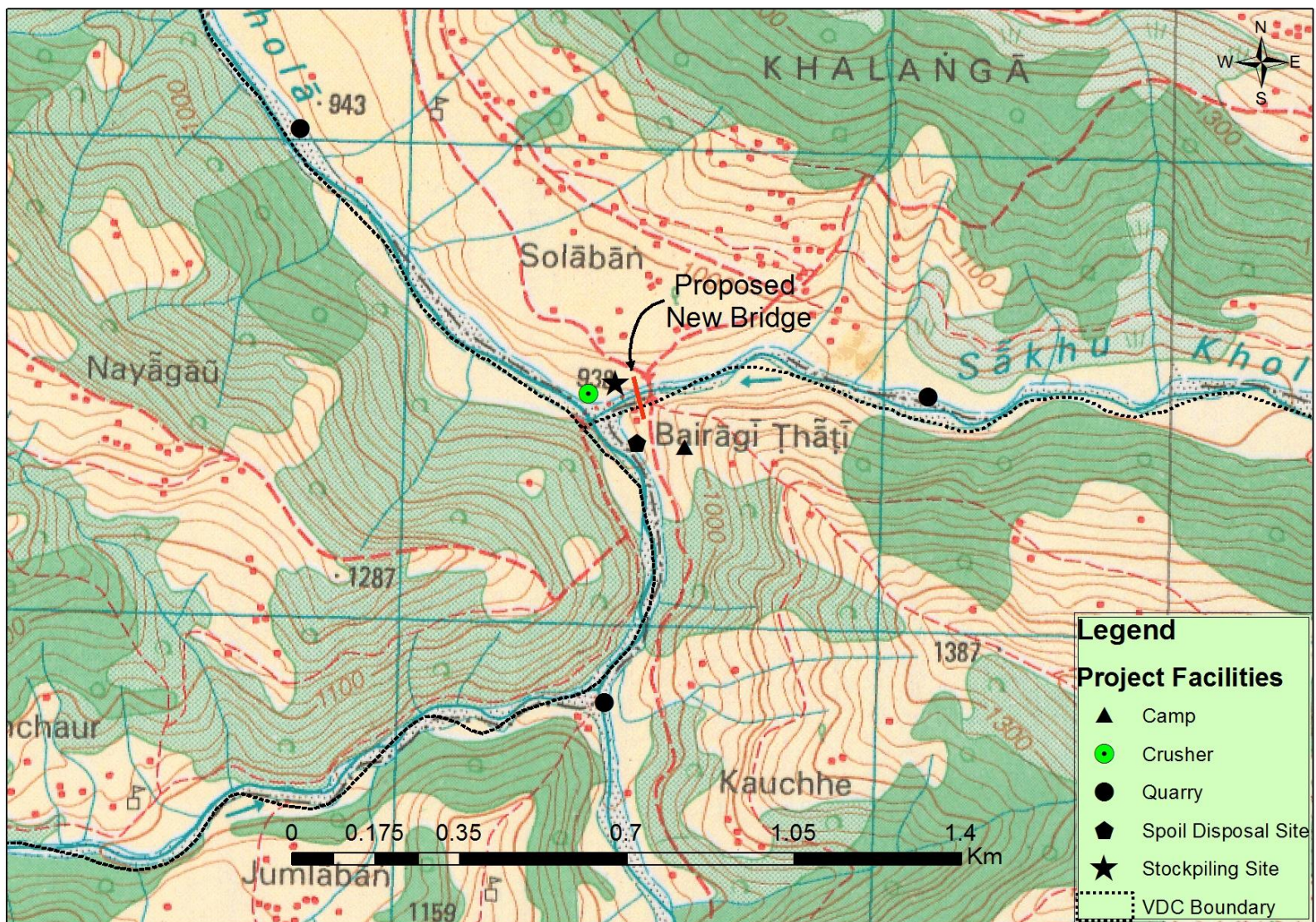
१. अभियान र भण्डारको उचित शक्तिपूर्व तालिम गर्ने !
२. पुल चारो भण्डार चारो वल्लु गर्ने ।
३. अहिले वल्लु राखेको पुल कम्ती गर्ने वरिजोकोली खालेको ।
४. यसै असा गर्ने लासकारको अलि सज्जो पुल बनाउने ।
५. पुलको लागि अस्थायी भण्डार चारो वल्लु उपयोज्य गरेका ।
६. भण्डार भण्डारको उपयोज्य गर्दा राम्रो हुने ।
७. सिचाईको कलाकोलाई असा गर्ने भए तोकल्लिउ ठोक्को ।
८. भण्डार गर्ने गर्ने ।
९. रोजगारीको अवस्था भएमा विदेश जानु नपर्ने !

Annex F: Approval Letter of ToR

Annex G: Maps and Layouts

Annex G1: Topographic Maps and General Layout

Annex G2: Map with the project components



Annex H: Photographs



Existing Bridge



Crusher plant



Vegetation around the bridge location



Public consultation



Public notice pasted on the nearby shop



Interaction with local people.

