



Government of Nepal  
**Ministry of Physical Infrastructure and Transport**  
**Department of Roads**

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**Environmental Impact Assessment (EIA)**  
**Of**  
**Suryabinayak – Dhulikhel Road Improvement**  
**Project**

Submitted to:  
**Ministry of Forests and Environment**  
Singha Durbar, Kathmandu, Nepal

Submitted through:  
**Ministry of Physical Infrastructure and Transport**  
Singha Durbar, Kathmandu, Nepal

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## ABBREVIATION AND ACRONYM

ADB	Asian Development Bank	MU	Municipality
AH	Arniko Highway	NAAQS	National Ambient Air Quality Standard
AP	Affected Persons	NGO	Non-Government Organizations
BOD	Biological Oxygen Demand	NO <sub>2</sub>	Nitrogen Dioxide
BPL	Below Poverty level	NPC	National Planning Commission
CBO	Community Based Organizations	NTFP	Non Timber Forest Products
CDC	Compensation Determination Committee	PAF/P	Project Affected Families/Population
CDO	Chief District Officer	PAP	Project Affected People
CF	Community Forest	PM <sub>10</sub>	Particulate Matter below 10 micron in Aerodynamic size
CFUG	Community Forest Users' Group	PPP	Public Private Partnership
CPR	Community Property Resource	PSA	Poverty and Social Assessment
DBH	Diameter at Breast Height	RAP	Resettlement Action Plan
DCC	District Coordination Committee	RoW	Right-of-Way
DDC	District Development Committee	RP	Resettlement Plan
DFO	District Forest Officer	RR	Resettlement and Rehabilitation
DIA	Direct Impact Area	SD	Scoping Document
DoF	Department of Forests	S-EMAP	Site Specific Environment Management Plan
DoR	Department of Roads	SO <sub>2</sub>	Sulfur Dioxide
DoS	Department of Survey	SPAF/P	Severely Project Affected Families/Population
DPR	Detail Project Report	STD	Sexually Transmitted Disease
EA	Executive Agency	ToR	Terms of Reference
EIA	Environmental Impact Assessment	TRP	Tribhuvan Raj Path, Tribhuvan Highway
EIAG	Environmental Impact Assessment Guidelines	TSP	Total Suspended Particles
EMP	Environment Management Plan	TSS	Total Suspended Solids
EPA	Environment Protection Act	VDC	Village Development Committee
EPR	Environment Protection Rules	VPD	Vehicles per Day
ERT	Electrical Resistivity Survey	WB	World Bank
FGD	Focal Group Discussion	WHH	Women- Headed Households
GESU	Geo-Environment and Social Unit	WHO	World Health Organization
GoN	Government of Nepal	WL	Water Level
GRC	Grievance Redress Committee	ZOI	Zone of Influence
Ha.	Hectares		
IA	Implementing Agency		
IEE	Initial Environmental Examination		
IIA	Indirect Impact Area		
IP	Indigenous Peoples		
IRP	Involuntary Resettlement Plan		
JICA	Japan International Cooperation Agency		
KU	Kathmandu University		
LAA	Land Acquisition Act		
LAR	Land Acquisition and Resettlement		
masl	meters above sea level		
MCT	Main Central Thrust		
MoF	Ministry of Finance		
MoFE	Ministry of Forests and Environment		
MoPIT	Ministry of Physical Infrastructure and Transport		
mt.	Metric Ton		



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## Executive Summary of EIA of Suryabinayak - Dhulikhel Road Improvement Project

### A. Background

Government of Nepal has requested the Japanese Government to carry out Preliminary Survey for the upgrading and widening of Suryabinayak – Dhulikhel Road, as a part of Arniko Highway. The upgrading works include widening of the existing two lanes to four lanes, with provision of new construction of tunnels, bridges, culverts, sidewalks and junction improvements. Service roads are also planned in some sections.

The Suryabinayak - Dhulikhel Section of Arniko Highway passes through the built-up areas of Bhaktapur and Suryabinayak Municipality of Bhaktapur District, and similarly Sanga, Janagal, Banepa Municipality, Dhulikhel Municipality of Kavrepalanchowk district.

Arniko Highway at Dhulikhel is connected with BP Highway, which will lead to increase the number of traffic in this section. The upgrading work will provide better transportation facilities to the road users, enhance the socio-economic activity of number of villages within Bhaktapur and Kavrepalanchowk Districts, enhancement of tourism in the project influenced area, employment generation etc.

At present, after the completion of upgrading of Kathmandu – Suryabinayak road, the travel time from Kathmandu to Suryabinayak is approximately 15 minutes. At present the travel time from Suryabinayak to Dhulikhel is approximately 30 min. After the upgrading of the Highway, the travel time is expected to reduce by half. So, the travel time from Kathmandu to Dhulikhel will be approximately 30 minutes, after completion of upgrading of Suryabinayak to Dhulikhel section.

### B. Objective of the Proposal and the Proponent of the Project

The main objective of the proposal is to identify priority environmental impacts and issues associated with the constructions, widening/upgrading and operation of this proposed Suryabinayak - Dhulikhel Section of Arniko Highway and suggest possible mitigation measures for the associated impacts.

The Proponent of this proposed of Suryabinayak - Dhulikhel Section of Arniko Highway Widening/Upgrading Project is, Government of Nepal, Ministry of Physical Infrastructure and Transport (MoPIT), Department of Roads (DoR).

### C. Project Description

The Salient Features of the proposed Suryabinayak - Dhulikhel Section of Arniko Highway Project for the upgrading and widening of the existing Road and construct new alignment of road in some area of Suryabinayak – Dhulikhel section is as follows.

**Table A: Salient Features of the Suryabinayak - Dhulikhel Section of Arniko Highway**

Project	Suryabinayak - Dhulikhel Road Improvement Project	
Province No.	3	
Districts	Bhaktapur	Kavrepalanchowk
Municipality	Bhaktapur Municipality, Suryabinayak Municipality	Banepa Municipality Dhulikhel Municipality
Total Length	Suryabinayak – Dhulikhel section 14.91 Km (Including approach Road 0.64km and 0.37km and Tunnel length 1.3 km)	
<b>Road Section</b>		
Road Standard	National Highway Standard of DOR, 25m ROW on either side of road	
Number of Lanes of Highway Carriageway	4 lanes (2 lanes for each direction)	
Number of Service Road Carriageway	2 lanes (1 lane for each direction)	
Width of the Central Divider	3.0 m	
Width of Paved Shoulder	2.5 m	
Width of Bus-bays	3.0 m	
Design Speed	Up to 80 km/hour (depends on the sections)	

Surface Type	Asphalt
Type of Work	Upgrading including widening
Improvement of intersections	3 locations (Jagati, Palanse & Banepa) Grade Separated
Pedestrian Crossing Overhead Bridge	Proposed at 6 locations
Total number of Bus Laybys	Proposed at 26 nos.
Bridges, culverts	Number: 7 (Bridges: 3 nos., Span 16 m & 32m; Culverts: 4 nos.)
<b>Tunnel Section</b>	
A) Tunnel Length	1.3 km at Sanga
B) Road lanes inside Tunnel	3.5 m x 2 lanes
C) Nos. of Tunnel Tubes	2 Tubes, one each for each direction
<b>Project Cost</b>	
A) Total Construction Cost	Under review
B) Total Project Cost	Under review
C) Environment Mitigation Cost	NRs. 6,001,170,189 (including Land and House Acquisition Costs)
D) % Environment Mitigation Cost	Under review

Source: Preliminary Report, JICA Study Team, 2017

## D. Major Environmental Impacts Identified and their Mitigation Measures Proposed

### a) Beneficial Impacts Due to Project Activities

During construction stage, beneficial impacts, such as generation of employment opportunities and income increasing of local people may be generated. During operation stage, beneficial impacts like shortening of travel time and saving of vehicle running cost may occur.

### b) Adverse Impacts on Physical Environment

Temporary and permanent change in land use, impact on air quality degradation, impact on surface water quality degradation, impacts due to increasing noise, impact due to wastes, impact upon existing public utilities, etc. may occur.

### c) Adverse Impacts on Biological Environment

Some part of the community forest area at the Sanga pass area with total area 0.25 ha is required with cutting of 163 trees. In addition, the nearly 127 private trees need to be cut in Sanga area. A total of 484 road-side trees will have to cut, which lies on both sides of the existing Suryabinayak – Dhulikhel road.

### d) Adverse Impacts on Social, Economic and Cultural Environment

Conversion of private agriculture land area of 13.34 ha into road section, along with 234 houses structure area likely to be affected with 1280 affected people due to loss of house structures and land.

In Addition to that, there are additional 40 households whose only land will be affected by this Project with housed holds population of 284. Hence, in total there are 1488 family members who are Project affected people, whose land and structure will be used and acquired by the Project to construct its components. Beside these, there are no other impacts which are of serious nature.

Other associated social impacts are : Inaccessible to the properties due to fragmentation of public and private land due to the road alignment; Impacts due to occupational health and safety of workers; Decrease in agriculture production due to loss of agricultural land; Impacts due to physical splits of communities; Effect or pressure on social service facilities; Impacts due to change in social behavior such as crime and Smuggling activities; Possibility of social conflicts due to growth of illegal activities; and Impact due to fire after traffic accident.

## E. Mitigation Measures

The mitigation measures to avoid or reduce above-mentioned adverse impacts are summarized hereunder:

### a) Physical Environment

Preventive mitigation measures, such as selection of equipment and proper maintenance, will be proposed for mitigating the impact due to NO<sub>2</sub> and SO<sub>2</sub>. Preventive mitigation measures, such as

spraying water three time a day at the work areas and washing the vehicles before they leave the construction sites, will be proposed for mitigating the impact due to dust in the work area.

Turbid water discharged from the labor and contractor's camp site will be appropriately treated by septic tank and sedimentation basin before discharge into the river to mitigate the impact on water bodies.

Selection of low-noise type equipment and providing noise barriers at necessary locations and control of work hours and days, i.e. stopping at night and weekends, near the vulnerable facilities and settlements will be proposed for mitigating the impact due to noise.

For mitigating the impact on the existing infrastructure the temporary road trail/passage, water supply and drain mitigation will be provided on the existing district road during construction so that the daily activities in the area will not be affected due to the commencement of the Project.

Alternative facilities will be provided as a part of the Project to any water supply facilities destroyed by the Project. If the planned water intake affects significantly to the existing water use, alternative water source(s) will be provided to minimize the impact to acceptable level.

Crossing passage will be introduced at different locations in order to mitigate the impact due to road blockade during construction phase.

The direct disposal of side surface lead off drains upon private cultivated lands and properties will be avoided. Surface runoff and side lead off drains will be managed properly in order to prevent significant adverse impacts upon public and property. Muck that will be generated from Tunnel excavation work will be dispose on the open space on the side of Punyamata River with construction of toe protection wall has been proposed.

Drainage improvement works will be carried in order to control volume and speed of water flows in water courses in the vicinity of exposed soils and slopes.

Precaution will be taken while using the machines and equipment, especially nearby public and private infrastructures and placing of sound barriers along the settlement area to reduce noise pollution.

Cut spots and embankments will avoid the creation of angle greater than the natural angle of repose for the local soil type. New embankments should be properly compacted and exposed surfaces should be covered with vegetation to avoid slope washout and soil erosion. On cut slopes, landscaping should be carried out with bio-engineering works, prior to rainy season, with the application of top soils.

Use of personal protective equipment will be made compulsory to workers while working. Precaution will be taken while using the machines and equipment, especially nearby public and private infrastructures.

Construction Traffic Management Plan will be developed in S-EMAP stage that will comply by contractor to maintain flow of construction vehicles without hampering good flow of vehicles. Road safety of the highway will be ensured by managing existing traffic properly. Strictly enforce speed limits and traffic rules to all the operators. Conduct Traffic Safety Campaign and Media coverage / informatory announcements to public several times a year. Educate road side people not to allow their children to play on the roads and to allow their cattle to enter in the roads.

## **b) Biological Environment**

Mitigation measures to counter possible adverse impacts on local biological environment are as follows:

Project will carry out compensatory plantation at the rate of 25 saplings for each felled tree in available locations and their management until the age of 5 years. The Project requires to plant 16,175 numbers of tree saplings of local species within the forest area of Suryamod Perunge Community Forest area.

Other measures include, encourage and support local community for controlling illegal harvesting of forest resources and encroachment into the forest area for settlement. Strict rules and regulation will be enforced in and around the forest area to protect from the illegal harvesting of the vegetation and wild life.

### c) Social, Economic and Cultural Environment

Mitigation measures, elaborated in Resettlement Action Plan (RAP), to control possible adverse impacts on socio-economic and cultural aspects are as follows:

- Timely distribution of compensation cash for private lands and other private properties. Required budgets decided by Compensation Determination Committee (CDC) should be allocated for acquisition and compensation during the Project construction.
- At least one family member of affected household will be provided with income generating training and opportunity in the construction and operation of Project.
- The Project will encourage local people in the involvement of agricultural extension services to increase local crop production and adopt better farming techniques.
- Budget for Environmental and Social Enhancement Costs (Rs. 22,575,000) and Other Environmental Mitigation Costs (Rs. 36,500,000) has been allocated. Project will ensure occupational health and safety measures and community involvement. Awareness raising program will be deliver through local organizations to plan proper usage and management of the environment.
- Awareness raising program should be deliver through local organizations to plan proper usage and management of the social service facilities.
- Security systems will be established to avoid various sorts of conflicts between the local and immigrants during the time of construction and operation.
- Project has proposed locals inhabited adjacent to road alignment by providing with passing zones at different locations as appropriate, as safety measure for locals during construction period.

### F. Environmental Management Plan

The baseline, compliance and impact monitoring including environmental audit of the proposed Project have been recommended along with monitoring indicators so as to ensure validity of impact prediction, effectiveness of mitigation measures and in overall, long term sustainability of this Project and environmentally sound rapid socio-economic development of the community adjacent to the Project area. Budget has also been allocated for monitoring during construction period and during the first year of operation and environmental auditing cost also has been allocated.

### G. Tentative Cost Estimation of Mitigation Measures

Cost estimation for the proposed mitigation measures, such as Compensatory Plantation and its management for 5 years, Private Property Compensation for land and house losses, Social Enhancement cost such as skill building trainings and Other Mitigations such as pedestrian/animal/drain crossings, fencings, check posts etc. are illustrated in Table C.

**Table C: Summary of Cost of Environment Mitigation Cost**

SN	Items	Amount (NRs.)
1	Compensatory Plantation Costs	6,228,100
2	Private Property Compensation Costs	5,935,967,089
3	Environmental and Social Enhancement Costs	22,575,000
4	Other Environmental Mitigation Costs	36,500,000
	<b>Total Environmental Mitigation Costs</b>	<b>6,001,170,189</b>

Source: JICA Study Team, 2017

## सूर्यविनायक – धुलिखेल सडक सुधार परियोजनाको

### कार्यकारी सारांश

#### १. पृष्ठभूमि

नेपाल सरकारको अनुरोधमा जापान सरकारले हाल अरनिको राजमार्ग अर्न्तगत सूर्यविनायक धुलिखेल सडक सुधार परियोजनाको लागि प्रारम्भिक सर्वेक्षण कार्य गर्दैछ। सडक स्तरउन्नति अर्न्तगत हाल भएको दुई लेनको सडकलाई चार लेनमा विस्तार गर्ने, नयाँ सुरुङ्ग निर्माण, पुल, कलभट, सडक पेटि, चोकसुधारहरु जस्ता कार्य गरिनेछ। यस सडकको कुनै खण्डमा साहायक मार्गको पनि योजना गरिएको छ।

यस अरनिको राजमार्ग अर्न्तगत सूर्यविनायक धुलिखेल सडकखण्ड भक्तपुर जिल्ला अर्न्तगत भक्तपुर र सूर्यविनायक नगरपालिकाको विकसित वस्तीहरु हुँदै जान्छ। साथै यस सडक काभ्रेपलाञ्चोक जिल्ला अर्न्तगत बनेपा नगरपालिका साँगा तथा जनगलर धुलिखेल नगरपालिकाहरुका विकसित वस्तीहरु हुँदै जान्छ। हाल आएर, यस अरनिको राजमार्ग वि.पि राजमार्ग धुलिखेलमा आएर जोडिएको छ, जसको कारणले यस सडक खण्डमा आगामी दिनमा सवारी साधनको उल्लेखिय बृद्धि हुने देखिन्छ।

यस सडक स्तरउन्नतिले, सडक प्रयोगकर्तालाई, सुलभ यातायातको सेवा प्रधान गर्दैछ। साथै यस कार्यले भक्तपुर तथा काभ्रेपलाञ्चोकका जिल्लाका बासिन्दाको सामाजिक तथा आर्थिक उन्नति गर्छ, रोजगारीको अवसर तथा यस क्षेत्रको पर्यटक विकासमा टेवा पुऱ्याउने छ।

हाल स्तरउन्नतिको सम्पन्न भएको काठमाडौं सूर्यविनायक सडक खण्डले अन्दाजि १५ मिनेटले यात्रा समय घट्न आएको छ। हाल भैरहेको सूर्यविनायकदेखि धुलिखेल सम्म यात्रा गर्नलाई ३० मिनेटको समय लाग्ने गर्दछ, जुन यस सडक स्तरउन्नतिले यात्रा समय आधाले घट्ने अन्दाज गरिएको छ।

#### २. परियोजना प्रस्तावको उद्देश्य र प्रस्तावक

यस प्रस्तावको प्रमुख उद्देश्य भनेको प्रस्तावित सूर्यविनायक – धुलिखेल सडक खण्डको, सडक स्तरउन्नति तथा विस्तार परियोजनाको सञ्चालनबाट वातावरणीय क्षेत्रमा पार्नसक्ने प्रभावको पहिचान गरि अपनाउनु पर्ने प्रभाव न्युनिकरणका उपायहरुको विस्तृत विवरण तयार पार्नु रहेको छ।

यस अरनिको राजमार्ग अर्न्तगत सूर्यविनायक धुलिखेल सडकखण्डको, सडक स्तरउन्नति तथा विस्तार परियोजनाको प्रस्तावक, नेपाल सरकार, भौतिक पूर्वाधार तथा यातायात मन्त्रालय, सडक विभाग रहेको छ।

#### ३. परियोजनाको विवरण

यस परियोजनाका प्रमुख विशेषताहरु तलको तालिका १ मा प्रस्तुत गरिएको छ।

तालिका १: सूर्यविनायक – धुलिखेल सडक स्तरउन्नति तथा विस्तार परियोजनाको केही विशेषताहरु

परियोजनाको नाम:	सूर्यविनायक – धुलिखेल सडक सुधार परियोजना
प्रदेश नं.	३
प्रभावित न. पा.	भक्तपुर जिल्ला : भक्तपुर र सूर्यविनायक नगरपालिकाहरु काभ्रेपलाञ्चोक जिल्ला : बनेपा र धुलिखेल नगरपालिकाहरु
परियोजनाको कुल लम्वाई	१४.९१ कि.मि (सूर्यविनायक - धुलिखेल खण्ड) (पहूँच सडक ०.६४कि.मि र ०.३७ कि.मि र सुरुङ लम्वाई १.३ लम्वाई
<b>सडक खण्ड</b>	
क) सडक स्तर	राष्ट्रिय राजमार्ग (२५ मी. सडक अधिकार क्षेत्र)
ख) जम्मा लेन संख्या	४ लेन (दुवै तर्फ २, २ लेन)
ग) जम्मा सहायक लेन	२ लेन (दुवै तर्फ १, १ लेन )
घ) मध्य विभाजकको चौडाइ	३.० मिटर

ड) सोरडल पेभमेन्टको चौडाई	२.५ मिटर
च) बस विसैनीको चौडाई	३.० मिटर
छ) डिजाइन गती	अधिकतम ८० कि.मि प्रती घण्टा
ज) सतहको किसिक	असफाल्ट कन्क्रीट
झ) कामको किसिक	स्तरान्नी तथा विस्तार
ञ) चौवाटो सुधार	३ स्थान (जगाते, पलाँसे, बनेपा)
ण) बाटो काटने ठाउँ (आकाशे पुल)	६ स्थान
ट) बस विसैनीको संख्या	२६ वटा
ठ) पुल, कलभर्ट	संख्या : ७ (पुल ३ वटा र कलभर्ट ४ वटा)
<b>सुरुङ</b>	
क) सुरुङको लम्वाई	१.३ कि.मि, सांगा
ख) सुरुङ भित्र लेनको संख्या	२ लेन (चौडाई ३.५ मी)
ग) सुरुङ टुब को संख्या	२ वटा, दुवै तर्फ
घ) अन्य सुविधा	सुरुङ कर लिने स्थान (दुवै तर्फ १, १)
<b>लागत अनुमान</b>	
निर्माणको कूल लागत	तय हुने क्रममा रहेको
परियोजनाको कूल अनुमानित लागत	तय हुने क्रममा रहेको
बातावरणीय प्रभाव न्युनिकरणको लागत	रु. ६,००१,१७०,१८९
बातावरणीय प्रभाव न्युनिकरणको लागतको प्रतिसतमा	तय हुने क्रममा रहेको

स्रोत : Detailed Feasibility Report, जाईका टिम, २०१४

## ४. मुख्य बातावरणीय प्रभाव र तिनको व्यवस्थापन

### ४.१ सकारात्मक प्रभाव

परियोजना निर्माण तथा सञ्चालन अवधिमा सामान्यतया लाभदायी सकारात्मक प्रभावहरु निम्न रूपमा हुनेछन् जस्तै: रोजगारीको अवसर र आयमा वृद्धि, आय आर्जनको क्रियाकलाप मार्फत स्थानिय मानिसहरुको आयमा वृद्धि र प्राविधिक सिपमा अभिवृद्धि, यात्रामा लाग्ने समय र दुरी घटनु, सवारी साधन सञ्चालनमा लाग्ने मुत्यको बचत, सडक दुर्घटनाको न्युनिकरण, वायुप्रदुषणको नियन्त्रण एवं आर्थिक लाभ आदि ।

### ४.२ नकारात्मक प्रभाव

यस सुरुङ मार्ग निर्माण तथा सञ्चालन बाट पर्ने केहि नकारात्मक प्रभावहरु यस प्रकार छन् ।

#### भौतिक वातावरण

भौतिक वातावरणमा पर्ने केहि अन्य असरहरु जस्तै: भू उपयोगमा अस्थायी तथा स्थायी परिवर्तन, वायुको गुणस्तरमा हास, सतहको पानीको गुणस्तरमा हास, ध्वनी प्रदुषणबाट पर्ने नकारात्मक प्रभाव, फोहर मैला उत्सर्जनबाट जल जमिनको अवस्थामा पर्ने प्रभाव, प्रभावित हुन सक्ने मुख्य पूर्वाधारहरु आदि ।

#### जैविक वातावरण

आयोजना निर्माण तथा सञ्चालनबाट जैविक वातावरणमा पर्नसक्ने केहि प्रभावहरु जस्तै: साँगाको सामुदायीक वनको ०.२५ हेक्टरमा १६३ वटा रुखहरु क्षति हुने देखिन्छ । साथै साँगा थेत्रमा जम्मा १२७ निजी रुखहरु पनि काटनु पर्ने देखिन्छ । साथै सडक किनार दाँया, बाँया रहेका ४८४ वटा प्राय काँइयो जातका रुखहरु काटनु पर्ने देखिन्छ ।

#### सामाजिक, आर्थिक र साँस्कृतिक क्षेत्रमा पर्न सक्ने प्रभावहरु

यस सडक विस्तार आयोजना १३.३४ हेक्टर कृषिजन्य जमिनमा र २३४ वटा घर संरचनाहरुमा क्षति पुऱ्याउने देखिन्छ । यस कार्यबाट १२८० जना परियोजना प्रभावित परिवार सख्या छन् जसको जमिन र घर संरचनाहरु यस परियोजनाले लिनुपर्ने देखिन्छ । सो बाहेक अरु ४० वटा घरधुरीहरुको खाली जमिन यस परियोजनाले लिनुपर्ने देखिन्छ जसका जम्मा घरधुरी सख्या २८४ छन् । तथर्स जम्मा १४८८ जना परिवार संख्याहरु परियोजना प्रभावित परिवारमा पर्दछन् जसको घर संरचना र जमिन यस परियोजनाले प्रभाव पाछ । यस बाहेक यो परियोजनाबाट सामाजिक आर्थिक क्षेत्रमा गम्भीर प्रकारको असर पर्ने देखिदैन ।

अन्य सामाजिक प्रभावहरूमा: नीजि तथा सरकारी जग्गाको चक्काबन्दी भई पहुँचमा कठिनाई हुने, निर्माणको क्रममा कामदारको स्वास्थ्य र सुरक्षा सम्बन्धि प्रभाव पर्ने, कृषि उत्पादनको कमीले गर्दा भूमिहिन तथा निम्न वर्गीय किसान परिवारमा पर्ने प्रभाव, कृषियोग्य जमीनको नोक्सानीले कृषि उत्पादनमा पर्ने प्रभाव, गरिव र कमजोर समुदायको विस्थापन हुनसक्ने, भौतिक रूपले समुदायको विभाजनबाट हुने प्रभाव, सामाजिक सेवा सुविधामा असर एवं दबाव, तस्करीका गतिविधि बढ्न सक्ने साथै आर्थिक गतिविधिको वृद्धिले सामाजिक तथा लैङ्गीक अवस्थामा नकारात्मक प्रभाव पर्न सक्ने साथै सुरुङ्ग मार्गमा हुने कतिपय अवाञ्छित क्रियाकलाप जस्तै आगजनी आदिको नकारात्मक प्रभाव।

## ५. प्रभाव न्यूनीकरणका उपायहरू

वातावरणमा पर्ने नकारात्मक प्रभावलाई कम गर्न वा हटाउन तलका न्यूनिकरणका उपायहरू सुझाइएको छ।

### भौतिक वातावरण

वायुमा  $NO_2$  र  $SO_2$  को प्रभाव न्यूनिकरण उपायहरू अवलम्वन गर्नका लागि उचित उपकरण को छनोट र मर्मत संहार गरिने छ।

कार्य क्षेत्रमा धूलोको मात्रा कम गर्नका लागि दिनको तिन पटक पानी छर्किने र साथै निर्माण कार्यमा प्रयोग भएको सवारी साधनलाई धोएर/सफा गरेर मात्र प्रयोग गरिनेछ।

नजिकमा रहेका पानीको मुहान न्यूनीकरण गर्नका लागि कामदार र निर्माण कर्ताक्याम्पबाट निस्काशित हुने धमिलो पानीलाई पहिले सेप्टिक ट्यांक र सेडिमेन्टेसन ट्यांक व्यवस्थापन गरेर मात्र खोलामा प्रवाह गरिनेछ।

ध्वनीको प्रभाव न्यूनीकरण गर्नका लागि कम ध्वनी उत्पादन गर्ने उपकरणहरू प्रयोग ल्याउने र अति नै सम्बेदनशील क्षेत्रहरूमा ध्वनी बेरियर स्थापना गर्ने र रातीको समयमा निर्माण कार्य नगर्ने।

टल सडकमा भैरहेको मुख्य पूर्वाधारका संरचनाहरू पर्ने असरको न्यूनीकरणको लागि र अस्थायी सडक/बाटो, पानी, बिजुली ढलको आपूर्ति गरिने छ। जसको कारणले स्थानिय बासिनदाहरू सो सेवाबाट वंचित हुने छैनन्।

सडक निर्माणको कार्यले बाटो बन्द हुने हुदा र सडकको केहि स्थानमा आवत जावत गर्न समस्या नहोस भन्ने उदेश्यले सोको न्यूनीकरणको लागि सहज आवतजावत गर्नका लागि वैकल्पिक मार्ग उपलब्ध गराउने।

निजी तथा सार्वजनिक सम्पत्तिमाथि प्रवाह हुने सतहको नालालाई व्यवस्थित गरिनेछ। निजी खेतीयोग्य जमीन र निजी सम्पत्तिमा फ्याँकिने फोहरलाई प्रतिबन्ध लगाईनेछ। सुरुङ्गबाट निस्केको उत्पर्जित माटो पण्यमाता खोला छेउको क्षेत्रमा विस्थापन गरिनेछ, यसले आफ्नो प्राकृतिक प्रवाहलाई कुनै अवरोध नपुगोस भनि उचित टोओ वालको (Toe Wall) व्यवस्थाका लागि प्रस्ताव गरिएकोछ।

खाली रहेको जमिन र भिरालो स्थलको संरक्षणको लागि पानीको प्रभावको गती र परिमाण उचित व्यवस्थापन गरि कुलोको विकास र सुधार गरिने छ।

बाटोको नयाँ निर्माण भएको embankment हरु उचित तरिकाले निर्माण गरिनुपर्ने र नांगीएर रहेको सतहको माटो वग्न बाट रोक्न वृक्षारोपण गरिने छ, साथसाथै नयाँ काटिएको भिरालो सतहको व्यवस्थापनको लागि bio-engineering को प्रयोग गरिने छ।

कार्यक्षेत्रमा कामदारलाई काम गर्दा अनिवार्य रूपमा व्यक्तिगत सुरक्षा उपकरण लगाउनु पर्ने छ।

सार्वजनिक र निजी क्षेत्रहरूमा मेसिन र उपकरणहरूको प्रयोग गर्दा विशेष ध्यान र साधानी अपनाइने छ। सै गरी मानव वस्ती नजिकको क्षेत्रमा ध्वनी प्रदुषण कम गर्न ध्वनी अवरोध गर्ने प्रणालीको व्यवस्था गरिनेछ।

निर्माण कर्ताले कार्यक्षेत्रमा काम गर्नको लागि ट्राफिक व्यवस्थापन प्रतिवेदन बनाई सोको आधारमा रही काममा प्रयोग भएको गाडीहरूको ट्राफिक प्राह सुचारु गर्ने र अन्य सवारी साधनलाई असर नपुग्याउने। गाडी चालकहरूले नियमित रूपमा ट्राफिक नियमको पालना गर्ने र गाडीको गति सिमित गर्ने। समय समयमा जनचेतना मूलक कार्यक्रमहरू संचालन गरि सडक प्रयोगकर्ता र स्थानिय बासिन्दालाई अवगत गराउने।

### जैविक वातावरण

जैविक वातावरणमा पर्ने प्रभावहरूलाई कम गर्न निम्न उपायहरू अपनाइने छ । सुरुङको पश्चिममा पर्ने मुखको जंगलमा करीव ६४ वटा रुखहरू काट्नु पर्ने देखिन्छ । यस प्रभावलाई कम गर्न नियमानुसार १ रुख बराबर २५ विरुवाका दरले उपयुक्त स्थानमा १६,१७५ वटा स्थानिय जातका विरुवाहरू क्षतिपूर्ती स्वरुप वृक्षारोपण सूर्यमोड पेरुङ्गा सामुदायीक वनमा गरिनेछ । यसलाई ५ वर्ष सम्म संरक्षण व्यवस्थापन समेत गरिनेछ ।

अन्य प्रभाव न्युनीकरणका उपायहरूमा अवैध रुपमा हुने वन पैदावरको नोक्सानी रोक्न र बस्तीमा हुने अवैध अतिक्रमण रोक्न कडा नियम लागु गर्न सुझाव दिइएको छ ।

### सामाजिक, आर्थिक र साँस्कृतिक वातावरण

सामाजिक, आर्थिक र साँस्कृतिक वातावरणमा पर्ने प्रभावलाई कम गर्न निम्न उपायहरू अवलम्बन गरिने छ । निजी जमीन र सम्पत्तिको क्षती हुने जग्गा धनीलाई समयमा उचित मुआब्जाको व्यवस्था गरिनुपर्ने देखिन्छ । परियोजना निर्माणका बेला मुआब्जा वितरण गर्नका लागि मुआब्जा निर्धारण समितिको निर्णय अनुसार आवश्यक बजेटको व्यवस्था गर्न सुझाइएको छ । मुआब्जा सम्बन्धि विस्तृत जानकारी अर्को प्रतिवेदन पुर्नवास कार्यान्वयन योजनामा व्यवस्था गरिएको छ ।

परियोजनाबाट प्रभावित परिवार र गम्भिर रुपमा परियोजना प्रभावित परिवारको एक जना सदस्यलाई आयआर्जनको तालिम र आयोजना निर्माण गरीदा दक्षताको हिसावले काम दिइने छ । परियोजनाको कारण खाद्यान्न सङ्कट हुने अवस्था भएमा सोको संबोधन गरिनेछ ।

वालीको उत्पादन वृद्धि गर्नका लागि यस परियोजनाले यहाँका स्थानीय बासिन्दालाई उन्नत कृषि विकास प्रविधिमा संलग्न हुन प्रोत्साहन पनि गर्नेछ ।

सामाजिक र वातावरणीय सुधारको लागि भनेर रु. २२,५७५,००० र रु. ३६,५००,००० बजेट प्रस्तावित गरिएको छ ।

सामाजिक सेवा सुविधाको उचित उपयोग र व्यवस्था गर्नको लागि स्थानीय संघ-सस्था मार्फत जनचेतनामुलक कार्यक्रम हुनु पर्ने देखिन्छ ।

आयोजना निर्माण र सञ्चालन गरिदा कामदारहरू र स्थानीय बासिन्दाबिच हुन सक्ने भैँ-भगडा रोक्नका लागि सुरक्षा व्यवस्था स्थापना गरिने छ ।

आयोजना निर्माण अवधिमा स्थानिय बासिन्दाहरूको आवागमनलाई उचित व्यवस्था गरिनेछ ।

### ६. वातावरणीय ब्यबस्थापन योजना

वातावरण संरक्षणका उपायहरू लागु गर्नका निम्ति वातावरण ब्यबस्थापन कार्य योजना निर्माण गरिएको छ, जसमा संरक्षणका उपायहरू कार्यान्वयन गर्नका लागि वातावरणीय अनुगमन र वातावरणीय लेखापरिक्षणका लागि प्रस्ताव रहेका छन् । वातावरणीय ब्यबस्थापन कार्ययोजना विवादित पक्षका मुद्दाहरूलाई संरचित रुपमा गरिने काम हो, विशेष गरी जुन प्रभावलाई महत्वपूर्ण रुपमा मुल्याङ्कन गरिएको छ । यस वातावरणीय ब्यबस्थापन योजनाले प्राविधिक कार्य प्रस्ताव गरेकोछ, जसका साथै आवश्यक कार्यको विवरण, प्रतिवेदन र आवश्यक कर्मचारीको कार्य दक्षता र आवश्यक उपकरण, कार्ययोजना लागु गर्नका निम्ति अनुमानित लागतका बिषयमा परिभाषित गरिएको छ ।

#### वातावरणीय प्रभाव न्युनीकरण गर्नका लागि अनुमानित लागत

वातावरणीय प्रभावलाई न्युनीकरण गर्नका लागि अनुमानित लागत शिर्षक जस्तै क्षतीपूर्ती वृक्षारोपण र ५ वर्ष सम्म व्यवस्थापन, जग्गा र घरको क्षतिको उचित मुआब्जा, सामाजिक संबर्द्धनका लागि क्षमता अभिवृद्धि तालिम र अरु प्रभाव न्युनीकरणका उपायहरू जुन तलको तालिकामा दिइएको छ ।



## तालिका ३: वातावरणीय प्रभाव न्यूनीकरणका लागि लागतको सारांश

क्र. स.	विवरण	जम्मा
१	क्षतीपुर्ती वृक्षारोपण लागत	रु. ६,२२८,१००
२	निज सम्पत्तिको क्षतीपुर्ती लागत	रु. ५,९३५,९६७,०८९
३	सामाजिक संवर्द्धनको लागत	रु. २२,५७५,०००
४	वातावरणीय र अन्य संवर्द्धनको लागत	रु. ३६,५००,०००
	<b>जम्मा</b>	<b>रु. ६,००९,९७०,९८९</b>

स्रोत : जाईका अध्ययन टोली, २०१७

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## Chapter 1 NAME AND ADDRESS OF THE INSTITUTION PREPARING THE REPORT

### 1.1 Name of the Proposal and Brief Introduction

The name of this Proposal is:

"Environmental Impact Assessment (EIA) of Suryabinayak - Dhulikhel Road Improvement Project in Bhaktapur and Kavrepalanchowk Districts (including Tunnel Road in Sanga)".

The agreement for conducting Environmental Impact Assessment of Suryabinayak - Dhulikhel Road Improvement Project (including Tunnel Road in Sanga) (hereinafter referred to as "the Project") was issued to the Proponent Company by the Ministry of Physical Infrastructure and Transport on **April 17, 2014**.

A Scoping Document (SD) and Terms of Reference (TOR) for EIA were prepared for the proposed Project and the Ministry of Forests and Environment (MoFE) had approved the SD and TOR on **6th December 2015**. This EIA Report is based on this approved TOR for EIA and the field data collected during field surveys conducted during September 2017 to January 2018 with the addition of tunnel road on Sanga pass area.

JICA Study Team has prepared the Preparatory Survey Report of the Project in December 2016, and the EIA is based on the information available from the report and additional survey started in 2017.

### 1.2 Name and Address of the Proponent

The Proponent of the "Environmental Impact Assessment of "Suryabinayak - Dhulikhel Road Improvement Project" in Bhaktapur and Kavrepalanchowk Districts is Government of Nepal (GoN), Ministry of Physical Infrastructure and Transport (MoPIT), Department of Roads (DoR), Geo-Environment and Social Unit (GESU), on behalf of Foreign Cooperation Branch of the Department of Roads, who is the Project's implementing agency.

Name and address of the proponent is as follows:

Government of Nepal  
 Ministry of Physical Infrastructure and Transport  
 Department of Roads  
 Geo-Environment and Social Unit  
 Babar Mahal, Kathmandu, Nepal  
 Tel. 01 4262996, 426 2675 Fax: 01 426 2993  
 Email: gesunit@dor.gov.np

On Behalf of:  
 Foreign Cooperation Branch  
 Department of Roads  
 Babar Mahal, Kathmandu

### 1.3 Name and Address of Institute Preparing the Report

The present EIA Report has been prepared for the Project Proponent by the following Firm.

Full Bright Consultancy (Pvt.) Ltd.  
 P.O. Box 4970, Sinamangal, Kathmandu  
 Tel: 01 4468149, 4468118 Fax: 01 4465604  
 Email: fbc@mos.com.np

#### **1.4 EIA Study Team and Declaration**

The overall responsibility of the contents of this EIA Report will lie with the report preparing institution, namely, Full Bright Consultancy (Pvt.) Ltd.

All the team members have duly declared their involvement and have taken due responsibility in preparation of this Scoping Document. The declaration forms from the Study Team members and the Project Proponent are attached in ANNEX VII.

#### **1.5 Organization of the EIA Study Report**

This EIA Report has been organized by following the format and Table of Contents prescribed in the Schedule 6, Rule 7 of Section 2 of the Environment Protection Rule, 1997 (first amendment 1999). The Report contains twelve Chapters. The Report also includes an Executive Summary in English as well as in Nepali.

## Chapter 2 SUMMARY OF THE PROPOSAL

### 2.1 Introduction

#### 2.1.1 General Project Background: Arniko Highway

Arniko Highway is an important road linking Kathmandu valley, the capital city, with the Chinese Border at Kodari, at about 114 km and is a part of Nepal's Strategic Road Network connecting Central and Eastern Nepal. Arniko Highway was constructed under Nepal-China Cooperation which was started in 1969, completed on 1971 and came into service from January 1972. Arniko Highway has political and economic significance in the national perspective. This Highway has played an important role in raising the economic level of the populations of Kavrepalanchowk, Sindhupalchowk and Dolakha districts via Lamosangu - Jiri Road, Dolalghat - Chautara and others. Besides this, the Highway at Dhulikhel is connected with Terai region through B.P. Highway.

Arniko Highway connects the urban area of Kathmandu with those in Thimi, Banepa and Dhulikhel. The resulting highway and interurban traffic is already beyond the carrying capacity at certain sections during peak hours. After the operation of this Highway, it has undergone improvement several times because of alignment located in fragile hills.

With the increasing trade volume between neighboring India and China, the international traffic on Arniko Highway is going to be increased in the coming years. The construction of the dry-ports at the Indian and Chinese borders as well as the forthcoming Kathmandu-Terai Fast Track will add up additional traffic on this highway. Hence it is necessary to widen the highway to cater the increasing traffic and to attract further economic activities along the corridor.

Government of Japan had supported to widen the Tinkune (of Kathmandu) – Suryabinayak (of Bhaktapur) section (10 km) of the Arniko Highway. The work had been completed and the road is now functional. The road was widened from double lane carriageways to 4 lanes standard, separated with two service lanes on both.

Now, GoN has planned to extend the widening of this Highway from Suryabinayak to Dhulikhel focusing to reduce sharp curves and bends in places like Sanga pass area and KU Chowk at Dhulikhel. This activity requires acquiring addition land area than that demarcated as RoW. Total length of the road to be upgraded is 14.91 km. Initially, there has been lots of public disagreement and protest for the RoW set by the government, and regarding the compensation policy forward by the Government for this project. The design team has proposed 4 lanes standard with provision of service track at major urban areas. Project has also proposed Pedestrian overhead crossing at 6 locations.

#### 2.1.2 Suryabinayak - Dhulikhel Section of Arniko Highway

The GoN has planned to widen this Highway from Suryabinayak to Dhulikhel (total length 14.91m). The cross-section of existing road is double-lane standard and the present paved carriageway width of the road is 6 to 6.5m. The Right-of-Way (RoW) of the road is 25m from the road's center line.

The proposed section will be the continuation of Tinkune (Kathmandu) – Suryabinayak (Bhaktapur) road upgrading project. The upgrading works include widening of the existing two lanes to four lanes as fast lanes, with provision of new construction of bridges and culverts, sidewalks and junction improvements as necessary. The two lanes on either side of fast lanes are also proposed as a service road.

The Suryabinayak - Dhulikhel Section of Arniko Highway passes through the built-up areas of Bhaktapur Municipality and Suryabinayak municipality of Bhaktapur District and Sanga, Janagal, Banepa and Dhulikhel Municipality of Kavrepalanchowk district.

Arniko Highway at Dhulikhel is connected with BP Highway which has increased the traffic volume in this section. The upgrading work will provide better transportation facilities to the road users, enhance the socio-economic activity of number of villages within Bhaktapur and Kavrepalanchowk districts, enhance tourism in the project influenced area and generate employment opportunities.

The general environmental setting of this road is that it passes through some urban areas such as Jagati, Sanga, Banepa and Dhulikhel. Other than these, most of the road passes through agricultural land and sparse settlements. Small section of the road passes through forest area which has less significant effect. There are trees on both sides of the proposed road project which needs to be cleared. Few private houses are out of RoW and need not be disturbed, except at Jagati where old settlement is next to the existing road and need to be cleared. Other major environmental issues are not observed at present.

After the completion of upgrading of Kathmandu – Suryabinayak road, the travel time from Kathmandu to Suryabinayak is approximately 15 minutes. The travel time from Suryabinayak to Dhulikhel is approximately 30 min. After the upgrading of the Highway, the travel time is expected to reduce by half. Importantly, the journey will be comfortable, wear and tear of the vehicles will be less with less fuel consumption and maintenance cost of the vehicles will also be less.

### 2.1.3 Salient Features of the Project

The Project is improvement of the existing Road and construct new alignment of road in some area of Suryabinayak – Dhulikhel section of Arniko Highway.

Table 2.1-1 Salient Features of the Suryabinayak - Dhulikhel Section of Arniko Highway

Project	Suryabinayak - Dhulikhel Road Improvement Project	
Province No.	3	
Districts	Bhaktapur	Kavrepalanchowk
Municipality	Bhaktapur Municipality, Suryabinayak Municipality	Banepa Municipality Dhulikhel Municipality
Total Length	Suryabinayak – Dhulikhel section 14.91 Km (Including approach Road 0.64km and 0.37km and Tunnel length 1.3 km)	
<b>Road Section</b>		
Road Standard	National Highway Standard of DOR, 25m ROW on either side of road	
Number of Lanes of Highway Carriageway	4 lanes (2 lanes for each direction)	
Number of Service Road Carriageway	2 lanes (1 lane for each direction)	
Width of the Central Divider	3.0 m	
Width of Paved Shoulder	2.5 m	
Width of Bus-bays	3.0 m	
Design Speed	Up to 80 km/hour (depends on the sections)	
Surface Type	Asphalt	
Type of Work	Upgrading including widening	
Improvement of intersections	3 locations (Jagati, Palanse & Banepa) Grade Separated	
Pedestrian Crossing Overhead Bridge	Proposed at 6 locations	
Total number of Bus Laybys	Proposed at 26 nos.	
Bridges, culverts	Number: 7 (Bridges: 3 nos., Span 16 m & 32m; Culverts: 4 nos.)	
<b>Tunnel Section</b>		
D) Tunnel Length	1.3 km at Sanga	
E) Road lanes inside Tunnel	3.5 m x 2 lanes	
F) Nos. of Tunnel Tubes	2 Tubes, one each for each direction	
<b>Project Cost</b>		
E) Total Construction Cost	Under review	
F) Total Project Cost	Under review	
G) Environment Mitigation Cost	NRs. 6,001,170,189 (including Land and House Acquisition Costs)	
H) % Environment Mitigation Cost	Under review	

Source: Preliminary Report, JICA Study Team, 2017

## 2.2 Project Location

The proposed project Suryabinayak–Dhulikhel Road lies in Bhaktapur and Kavrepalanchowk Districts. The Alignment passes through Suryabinayak (Start Point), Jagati, Bhatedhikuro, Nalinchowk, Palanse, Saga, Bhaisepati, Pul Bazar, Banepa, Dhulikhel (End Point).

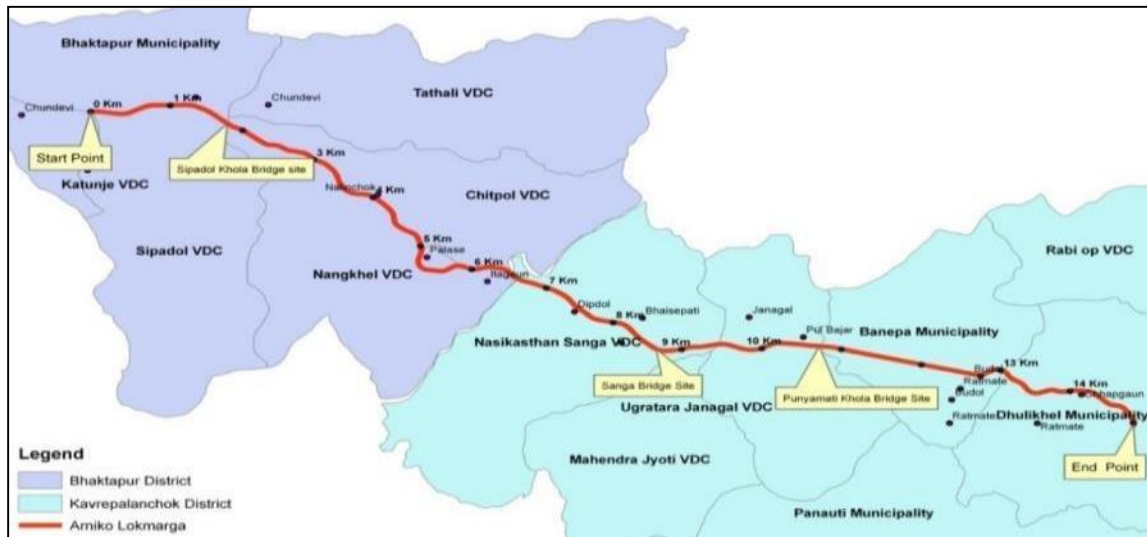
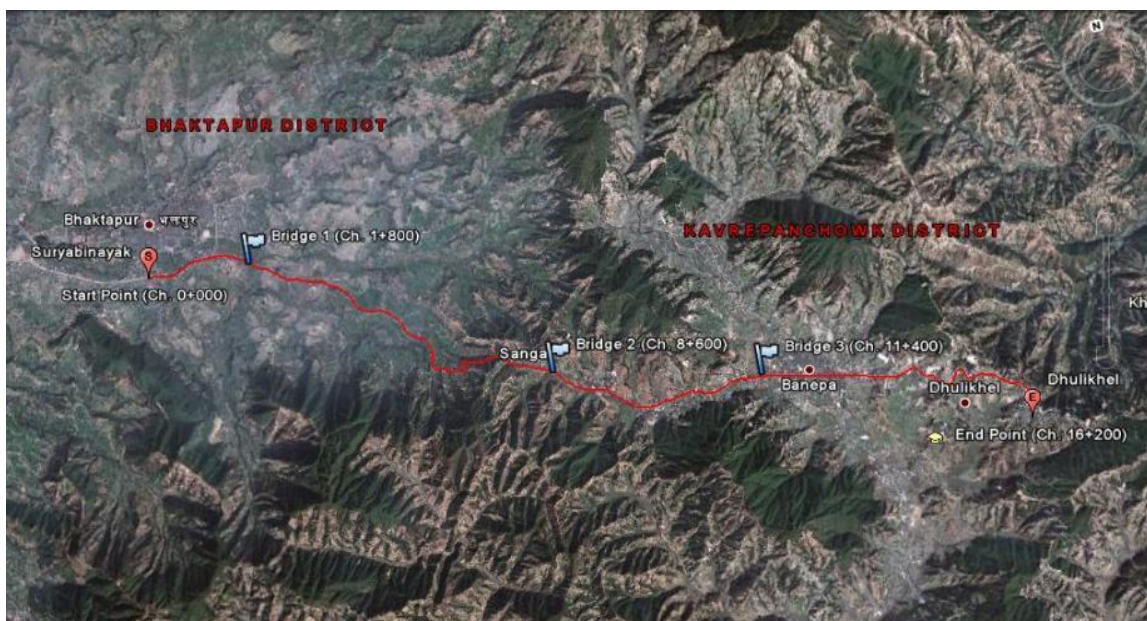


Figure 2.2-1 Location Map of Project Road



Source: JICA Study Team

Figure 2.2-2 Satellite Imagery of Project Location

### 2.3 Project Area Delineation

For the study of EIA, the possible areas where the impacts can be expected are delineated as Direct Impact Area (DIA) and Indirect Impact Area (IIA). The description of the delineated areas, along the alignment is described as follows:

#### 2.3.1 Direct Impact Area (DIA)

The following are the immediate influence area of the road, along which the road alignment passes:

Table 2.3-1 Project Affected Areas

District	Municipality	Direct Impact Area (DIA)	Indirect Impact Area (IIA)	Including New Road Alignment	Tunnel Section
		Ward No.	Ward No.		
Bhaktapur	Bhaktapur Municipality	4,5,6,7 & 8		No	
	Suryabinayak Municipality	6,8,9,10,11& 12	5 & 13	Yes	Yes
Kavrepalanchok	Banepa Municipality	5,6,8, 10, 11,13 &14	1, 2, 3, 4, 7, 9 & 12	Yes	Yes
	Dhulikhel Municipality	3,4,6 & 7	1, 2, & 5	Yes	

DIA: 50 m RoW for surface road, and alignment. Defined as ‘directly affected area.’

IIA: Within 500 m from the boundary of the RoW. Defined as ‘indirectly affected area.’

Source: JICA Study Team, 2017

### 2.3.2 Indirect Impact Area (IIA)

The following are the adjacent municipalities that are considered to be within wider influence areas:  
Suryabinayak Municipality: Katunje Banepa Municipality: Tathali, Tukucha Nala, Ugrachandi, Mahendra Jyoti, Kavre Nilya Chandeswori etc.

### 2.3.3 Zone of Influence (ZoI)

The areas other than DIA and IIA may also come into impact during construction stage and operational stage with cumulative combine impacts of it and other project activities in the surrounding area which is ZoI. ZoI of this project consists of municipalities falling within its alignment where the project activities will not have its direct effects and the impacts will be low.

## 2.4 Objectives of EIA

The prime objective of an EIA study is to inform decision makers and stakeholders about the potential impacts of the Project and to propose mitigation measures for avoiding and minimizing adverse impacts to acceptable level, so that the Project is implemented in socially acceptable and environmentally sound manner.

In specific terms, the objectives of the EIA of this Project are as follows:

- A. To identify and document the existing physical, biological, socio-economic and cultural baseline conditions in the Project Affected Areas.
- B. To analyze and determine the potential positive and adverse impacts of the Project in terms of both direct and indirect impacts, including definition of their extent in the context of areas affected, and whether the impacts are temporary or permanent.
- C. To formulate and propose practical mitigation measures for adverse impacts, enhancement measures for positive impacts, and to incorporate necessary safeguards measures in the Project design, the Construction Plan, and the Operation Plan.
- D. To outline requirements to minimize risks of environmental damage to the Project or other resource management entities operating in the area.
- E. To determine the potentials for improvements to natural resources and environmental management and socio-economic benefits to communities in the Project Area and its surroundings.
- F. To prepare Environmental Impact Assessment Report according to the Environmental Protection Rules (EPR), 1997 and JICA Guidelines for Environmental and Social Considerations, 2010, so that the Project could be implemented.
- G. To identify the potential environmental consequences.
- H. To inform decision makers and concerned parties about environmental implications of proposed Projects.

## 2.5 Rationality for Conducting EIA

The rationality for conducting EIA is to determine whether the implementation of project may result adverse environmental impacts to the local people and its surroundings.

In the past, an IEE survey was conducted and approved for the Suryabinayak - Dhulikhel Road Improvement Project. But at present, the same Suryabinayak - Dhulikhel Road Improvement scope has been change by including new road alignment with tunnel road option. Due to this added scope of work, which requires government to acquire additional private land and property. Hence, these acquiring new public land area and property have made this Project to carry out the EIA study.

## **2.5.1 Legal Rationality of Conducting EIA**

### **2.5.1.1 Provision under Highway**

The Project is upgrading, widening and improvement of the existing road with construction of new alignment for National Highway. According to the Schedule 2 (pertaining to Rule 3) Clause D Road Sector – No. 1 (a) of the Environmental Protection Rules, 1997 (last amendment 2007/08/02), the Project is required full-scale EIA that require approval of Ministry of Forests and Environment (MoFE), including identification of the impacts and their significance, and the proponent's proposal for mitigation and monitoring measures and plans.

In this context, this Proposal is considered to require a full-scale EIA Study to be conducted and receive approval from, MoFE, which is the competent agency for the approval of EIA studies and ensure the integration of mitigation measures with project activities. EIA Report of the Proposal will be prepared after the approval of Scoping Document and Terms of Reference.

The GoN has made it mandatory and requires proof of people's participation in the very beginning of the project. It is required by the Act that an early scoping report is presented to the decision makers before a detailed EIA is carried. The very early stage of EIA, in the scoping phase itself, if issues existed, discussion forums are availed legally to overcome those before a proposal is enacted on. Issue identified during scoping, provides guidance to EIA and Environmental Management Plan (EMP). Public consultation is the key process for conducting scoping to identify the issues; which upon analysis can be ascertained as significant issue.

### **2.5.1.2 Provision under Highway Construction**

The Project has proposed construction of new road section of 2.87 km of National Highway Category (which includes 1.3 km of double-tube Tunnel).

According to the Schedule 2 (pertaining to Rule 3) Clause D Road Sector – No. 1 (a) of the Environmental Protection Rules, 1997 (last amendment 2007/08/02), the Project is required full-scale EIA that require approval of MoFE, including identification of the impacts and their significance, and the proponent's proposal for mitigation and monitoring measures and plans. Thus, because of this legal rationality, the EIA of this Project is conducted.

Other associated rationalities are discussed hereunder:

### **2.5.1.3 Provision under Forest Clearance**

The proposed Project does not require clearance of large areas of forest. However, it requires felling of some road-side trees and some trees belonging to a Community Forest, of about 0.25 hectares which does not fall under any National Park or Conservation Areas.

From the criteria of forest clearance, Schedule 1 (pertaining to Rule 3) Clause A Forest Sector of the Environmental Protection Rules, 1997 (last amendment 2007/08/02), "any proposal requiring clearance of not more than 5 hectares of forest area" would require an IEE study.

### **2.5.1.4 Provision under Tunnel Construction**

The Environmental Protection Rules, 1997 (last amendment 2007/08/02), does not contain any provision for requirements of conducting EIA for Tunnel construction. However, there is provision of conducting IEE for the construction of Tunnel according to the Schedule 1 (pertaining to Rule 3) Clause D No. 5, of EPR, 1997.

### **2.5.1.5 Provision under Project Costs Consideration**

The Environmental Protection Rules, 1997 (last amendment 2007/08/02), according to the Schedule 1 (pertaining to Rule 3) Clause L No. 5, of EPR, 1997, large Projects of estimated Project Cost exceeding Rs. 250 million requires an EIA study. This Project exceeds this threshold and thus an EIA level study is required.



## Chapter 3 METHODOLOGY ADOPTED

In this Chapter, the methodology adopted during the conduction and preparation of this EIA Study Report for the Arniko Highway Improvement Project is briefly described. The Chapter describes the general method adopted, and field data collection including analysis and Report presentation.

The EIA study has followed the basic steps outlined in Environmental Protection Act (EPA)/EPR-1997, and National EIA Guidelines-1993. Necessary information was generated through review of technical documents and field works. During field visits, area experts were involved in identifying issues and possible impacts related to the Project activities, by the method of inspection, verifications, observations and discussions with local residents and key informants. Secondary information was collected through published reports and interpretation of maps and photographs. Primary information was generated through questionnaire, checklist, measurement and consultation. Furthermore, local people were contacted and interviewed to solicit information. A number of stakeholder meetings and Focus Group Discussions (FGD) was held in the Project areas.

The principal steps undertaken in the EIA methodology to accomplish the assignment were:

- Literature review of Relevant Documents and Map Interpretation,
- EIA Scoping Document and TOR preparation and approval,
- Site inspection and field study to collect primary information on physical, biological, socio-economic, cultural and historical issues,
- Verification of secondary information through cross-check of data, interview and participatory discussion with local people,
- Public hearing to disseminate the Project related information and to incorporate the public interest and aspirations,
- Compilation of Data, Identification of potential impacts, mitigation measures, EMP, and other Chapters as per EIA requirements for final EIA report.

### 3.1 Preparatory Works for EIA Conduction

#### 3.1.1 Literature Review

Relevant information for the study was collected through extensive review of literature. Relevant documents and reports were collected and reviewed to detail out the nature of the Project and identify the preliminary list of potential environmental impacts. The detail review of “Draft Report on Detail Feasibility Study” of proposed Project was done extensively.

In order to develop checklist and questionnaire, this study has also reviewed extensively, the National Environmental Impact Assessment Guidelines (EIAG) 1993, the EIA guidelines for Forestry Sector 1995, Environmental Management Guidelines 1999, and Environmental Assessment in the Road Sector (A Policy Document of January 2000). JICA Guidelines for Environmental and Social Considerations (2010), ADB Safeguard Policy Statement (2009) and ADB Environmental Assessment Guidelines (2003) were also reviewed to include the construction related environmental issues in this report.

After the review of literature and documents, the Study Team delineated the areas, where the Project is expected to have its impacts. Maps were prepared showing potential development areas, natural resources and possible impacts on them from Project activities. Based on this information, a base-map of the Project area was prepared for its use during field surveys.

#### 3.1.2 Review of Relevant Government’s Policies, Laws, Guidelines and Manuals

The proposed Project attracts various national policies, laws, guidelines, manuals and standards of GoN. Apart from the GoN policies, laws, guidelines and standards, the Project will also attract the international convention treaties to which Nepal is a signatory. The reviews of the relevant documents were conducted and are summarized in Chapter 11 of this Report.

### 3.1.3 Study of Maps /Other Maps

In conjunction with the Project's technical reports, 1:25000 topographic maps were carefully reviewed and present changes occurred were noted during field verification by all experts within the direct and indirect impact zones in the Project area. Similarly, Geological Maps and Satellite Images are also used to study the existing geology of highway alignment.

Table 3.1-1 List of Maps Studied

SN	Map Type	Sheet No.	Scale
1	Topographical Maps, DoS, (Published Date 1997)	2785 06A, 2785 05B	1:25,000
2	Geological Map of Part of Bhaktapur and Kaverepalanchowk Districts		1:50,000
3	Satellite Imagery, Google Earth Imagery		

### 3.2 Preparation of Scoping Document (SD) and Terms of Reference (TOR)

The Scoping for the EIA was undertaken in accordance with the EPA/EPR-1997 to determine the scope of the EIA, and to inform stakeholders about the proposed Project and to receive their comments on relevant environmental issues and identify priority issues for environmental assessment. Scoping exercise, besides review of Project's Detailed Feasibility Report and other Project related literature, included publication of 15 days Public Notice (Annex-6), inspections of Project construction site, and discussions with local people, stakeholders and concerned government officials. The environmental issues of priority concerns in the scoping document were based on the experiences of the consultants on the similar type of Projects incorporating the concern received during formal and informal deliberations with local people and other concerned stakeholders.

The issues and possible impacts identified in the Scoping Document were categorically tabulated as Issues identified and prioritized for EIA Study and were incorporated in the Terms of Reference (ToR). The ToR was prepared by including these potential issues, as per the Schedule-4 of EPR pertaining to Rule-4 and Rule-5 (attached in Annex-10). The main EIA study was focused on the detailed analysis of the environmental issues identified in the approved SD and ToR.

The Scoping Document and ToR was approved by MoFE, after its formal review, dated 6th December, 2015.

### 3.3 Conduction of Field Data Collection for EIA Study

#### 3.3.1 Site Inspection and Field Study

After the approval of Scoping Document and ToR, field studies were conducted in the Project site areas in an extensive manner. A study team's professionals visited and collected the overall basic information regarding the Project site area and site-specific information.

The data collection and field study had been carried out in July – October 2014 and again during September 2017 to January 2018 with the addition of tunnel road on Sanga pass area.

#### 3.3.2 Field Study and Collection of Baseline Data

The detail field study was conducted to generate information on physical and biological resources and social status after fixing the alignment and the RoW. Information on major flora and fauna species was collected through alignment walk and interacting with the local people. Loss of agriculture land and forest area was calculated from cadastral survey prepared by Social survey unit. The study team also discussed with the officials of the district organization, local bodies, and district forest office and personnel to verify the information and collected their concerns and opinions. The brief description on the Field Study methods is given hereunder.

#### 3.3.3 Physical Environment Survey

Field observation and walk-through survey was adopted to verify information on drainage system, land stability and soil type, hydrological study of area, water sources (type, quality, and quantity),

solid waste management system/ spoil disposal and construction materials storage sites, ground water level, landslide prone/ swampy area, work camp and labor camp, and other construction related environment issues. Checklist was used to generate information on water drainage and insulation problem, erosion problem and possible accumulation of construction waste in the natural resources including agricultural land. Similarly, baseline data for air, water and noise quality were also measured and recorded (attached in Annex 2) with the following outlined method of survey

Table 3.3-1 Method of Survey of Air Quality, Water Quality and Noise Pollution

	Method of Measurement
NO <sub>2</sub>	Griess-Saltzman Reaction Method (ASTM-D 1607-91)
PM <sub>10</sub>	Gravimetric (LVA), JIS Z 8814 (1981) method
TSS	Oven Drying, 2540 D APHA
BOD	Winker Azide Modification (Dilution & Seeding), 5210 B PAHA
Noise Pollution	Sound level meter

### 3.3.4 Biological Environment Survey

A checklist was used to generate field level information on major plant species, mammals and birds, forest condition, forest types and status and occurrences of other wildlife. Local people and concerned authority personnel from Suryamode Perunge Community Forest, the District Forest Office (DFO), Forest Range-post Office, were contacted to collect information on the occurrence of the place species and status of wild mammals, birds and reptiles with focus on their movement and distribution using the parameters like, common, fair, sparse and rare. Likely environmental impact and practical mitigation measures due to proposed Project activities on biological environment were discussed with local people and concerned stakeholders like the Community Forest Users Group (CFUG) members and Department of Forests (DoF) officials.

Sampling and quantification methods used for collecting information on trees within the Project area are discussed hereunder.

#### Ecosystem: Fauna and Flora

Local people and concerned authority personnel from Suryamod Perunge Community Forest, the District Forest Office, Forest Range-post Office, were contacted to collect information on fauna and flora. According to the local people, it has just observed some kinds of frogs, snakes, and several kinds of wild birds in the exact project area that is very common around the region. However, there are some species living around the neighboring mountains. Possible ecosystem of surrounding areas are as shown in items and tables below:

#### 1) Non Timber Forest Product (NTFP)

Regarding NTFP, there were very few significant species reported. The NTFP reported within the Suryamod Community Forest and on the surrounding area of project site with their uses are in the following table.

Table 3.3-2 List of NTFP found around Suryamod Community Forest and along the Project Area

Local Name	Scientific Name	Use, Purpose	IUCN	NPWC Act
Kafal	<i>Myrica esculenta</i>	Food (fruit), medicine	-	-
Mayal	<i>Pyrus pashia</i>	Food (fruit), medicine, fodder	-	-
Jamun	<i>Syzygium cumuni</i>	Food (fruit), fodder	-	-
Ainselu	<i>Rubus ellipticus Sm</i>	Food (fruit)	-	-
Taru bans	<i>Bambusa nutans</i>	Basketry, crafts, mat boards and flooring tiles. Occasionally in house construction.	-	-
Ban negalo	<i>Drepanostachyum khasianum</i>	Basketry, crafts. Occasionally in house construction.	-	-
Narkat	<i>Phragmites maxima</i>	Basketry, crafts. Occasionally in house	-	-

Local Name	Scientific Name	Use, Purpose	IUCN	NPWC Act
		construction.		
Khar	<i>Imperata cylindrical</i>	Occasionally in house construction (roofing). Medicine	-	-
Amriso	<i>Thysanolaena maxima</i>	Broom	-	-
Tetapati	<i>Artemisia vulgaris</i>	Tea, flavor	-	-

Source: Field Survey, EIA Study Team, 2018

## 2) Faunal Species

Mammals like ban biralo (*Felis chaus*), kharayo (*Ochotona nepalensis*), dumsi (*Hystrix indica*), Ratuwa Mriga (*Muntiacus muntjak*), and syal (*Canis aureus*) were reported found in the surrounding forest of the project area. These animals do not have their permanent habitat on and around the Project area but have been spotted and seen by the community forest user personals as they commute. Based on their information it is known that these wild animals passes and move around from the surrounding forest to the Project area.

Table 3.3-3 List of Faunal Species reported in and around the Suryamod Community Forest

Local Name	Common Name	Scientific Name	IUCN	NPWC Act
Syal	Jackal	<i>Canis aureus indicus</i>	-	-
Chituwa	Leopard	<i>Panthera pardus</i>	-	-
Ratuwa Mriga	Common Deer	<i>Muntiacus muntjak</i>	-	-
Badel	Wild boar	<i>Sus scrofa</i>	-	-
Kharayo	Hare	<i>Lepus</i>	-	-
Ban Biralo	Wild Cat	<i>Felis chaus</i>	-	-
Dumsi	Porcupine	<i>Hystrix brachyura</i>	-	-
Chamero	Painted Bat	<i>Kerivoula picta</i>	-	-
Nyauri Musa	Common Mongoose	<i>Herpestes edwardsi</i>	-	-
Squirrel	Mauri Musa	<i>Sciuridae</i>	-	-

Source: Field Survey, EIA Study Team, 2018

## 3) Birds

Regarding birds, ban kukhura (*Gallus gallus*), chil (*Spizaetus nepalensis*) chyakhura (*Perdix hodgsoniae*), dhukur (*Streptopelia senegalensis*), jureli (*Hypsipetes sp.*), teetra (*Francolinus francolinus*) and kalij (*Lophura leucomelana*) were found.

Table 3.3-4 List of Major Birds Species reported in and around Suryamod Community Forest and along the Project Area

Local Name	Common Name	Scientific Name	IUCN	NPWC Act
Munal	Crimson-horned Pheasant	<i>Tragopan satyra</i>	-	-
Mayur	Indian Peafowl	<i>Pavo cristatus</i>	-	-
Dhukur	Spotted Dove	<i>Streptopelia chinensis</i>	-	-
Ban Kukhura	Jungle Fowl	<i>Gallus</i>	-	-
Suga	Rose-Ringed Parakeet	<i>Psittacula krameri</i>	-	-
Maina/ Saarung	Mayna	<i>Acridotheres Tritis</i>	-	-
Bhagera	Sparrow	<i>Passer domesticus</i>	-	-
Battai	Common Quail	<i>Coturnix</i>	-	-
Lato kosero	Spotted Owlet	<i>Athene brama</i>	-	-
Lampuchhre	Common Green Magpie	<i>Cissa chinensis</i>	-	-
Jureli	Red-vented Bulbul	<i>Pycnonotus cafer</i>	-	-
Rani chari	Scarlet Minivet	<i>Pericrocotus flammeus</i>	-	-
Chil	Kite	<i>Spizaetus nepalensis</i>	-	-
Kalij	kalij pheasant	<i>Lophura leucomelana</i>	-	-

Source: Field Survey, EIA Study Team, 2018

#### 4) Amphibian, Reptiles and Aquatic Life

Some of the aquatic life present in the small streams are Asala (*Schizothoracichthys progastus*), Budhuna (*Garra* sp), Hile (*Channa* sp.), katle (*Neolissocheilus hexagonolepis*) and Frog (*Rana Tigrina*) and reptile like Rat snake (*Pantherophis Obsoletus*), Grass snake (*Natrix natrix*) is also found in project area.

Insects like Fulvous Forest skimmer (*Neurothemis fulvia*), Lemon Pansy (*Junonia lemonias*), Ant (Peekhamian Mimicry), Grasshopper (*Caelifera*), Macdunnoughia Tetragona (*Macdunnoughia Puriplusia*) Tetragona, Lynx Spider (*Pescetia Viridans*).

All above species are not recorded in IUCN's Red List. In addition, field observation was done along the proposed alignment, especially the area of approach roads to the tunnels. The habitat is almost cultivated as narrow step-like farmland along the stream, and there are only small grass and flowers, such as rape blossoms except river-bank trees which is surveyed as trees and forest in following part. Stream is very steep and water depth is also shallow, therefore not aquatic creatures like fish has not been observed.

As a result, it has not been reported/observed any endangered species around the project site.

#### 3.3.5 Sampling and Quantification

Inventory of the likely loss of trees in Community Forest was made and a Diameter at Breast Height (DBH) was measured, and heights of each tree species were estimated, and all species were recorded and tabulated.

Based on the tree inventory, the total numbers of trees to be cut from the entire required forest area are calculated. Biological data are given in **Annex III**.

#### 3.3.6 Socio-economic and cultural Survey

The study team visited the entire Project area and households along the alignment and the RoW to gather information related to socio-economic condition of the people residing in the Project area. Census Survey of the project affected Households and three interaction meetings were conducted at project areas during the field survey. Municipality officials were also contacted to verify the socio-economic information. General level of socio-economic conditions of the local people was obtained by enquiring the likely affected people. The household survey was carried out to collect the baseline information on social, economic, cultural and historical aspect of the area. The structured household survey questionnaires include the questions of demography, economic status, literacy, ethnicities, religion, views regarding the Project, expectations from Project, historical and archaeological significance of Project area etc. Community social service structures including the location of temples and other historical and archeological structures were demarcated in the map and possible impacts predicted.

Possible loss of land and property was calculated through overlay of design map and cadastral map. To carry out the analysis on impact due to losses, a social impact assessment followed by a census of potentially affected persons and verification of their affected assets were conducted and discussed hereunder.

##### 3.3.6.1 Social Impact Assessment

The Social/Resettlement Team carried out the activities of social impact assessment based on the social safeguard policy of GoN. The Team visited the affected areas, identified and consulted key stakeholders and also identified affected families, following combined Census, inventory of losses and socio-economic survey of all households to be affected by land acquisition for this Project was conducted by using the structured questionnaire and checklist (given in **Annex VIII**). The social impact assessment was undertaken as a part of resettlement impact assessment. The study identified the following key social issues for investigation:

- Loss of private property and other assets (land and houses) and compensation modalities for these losses
- Population displacement
- Economic condition of Project affected people
- Identify SPAFs and vulnerable group along the proposed road corridor

### 3.3.6.2 Land Plot Survey

The Land Plot Survey was carried out by obtaining the cadastral maps of the Project Area and overlaying the Project's design over it. This survey identified the extent and effect of land loss, and then after prepared land loss records for each individual plot affected. Process followed for identification of Project Affected Peoples (PAPs) and their survey are as follows:

- Obtaining the designs of all the alignment from engineering design team.
- Obtaining cadastral maps from respective Survey Office in all districts viz. Bhaktapur and Kavrepalanchowk.
- Carrying out cadastral survey by experienced Surveyor team using cadastral survey equipment and total station to identify coordinate in the cadastral map because all cadastral maps of these areas are free sheet.
- Overlaying road design into cadastral map and delineate the boundary and plots of affected lands of the alignment.

List of Project Affected Households within the project area is attached in **Annex-IV** (Section G), which enlists the District, Municipality, name of the Household Head, family size, occupation and their annual income. Similarly, the list of project affected land parcels of both the district is attached in **Annex-IV** (Section H& I).

### 3.3.6.3 Assets Inventory

The asset inventory has been carried to prepare a complete inventory of affected persons and their assets affected by the Project. This inventory also records the ownership status of the affected persons such as legal title holder, non-title holder, encroachers and squatters etc. The social staff recorded the relevant information of affected persons with the help of affected people and local community (given in **Annex 4**).

### 3.3.6.4 Census, Socio-economic Survey and Asset Verification

The structured questionnaires were used to administer individuals within the target groups (Directly affect group by the project). Consultative meeting with local people, field observation and group discussion with APs and other stakeholder were conducted to collect the socio-economic data. A census of potentially affected persons was recorded. Combined census and socio-economic household survey using census form with the heads/ senior member of the affected families were conducted. The objectives of the socio-economic survey are to prepare profile of affected persons, assess incomes, identify productive activities and plan for income restoration, develop relocation options and develop social preparation phase for vulnerable groups (if required). The details of the outcomes are discussed in Chapter 5 and data given in **Annex IV**.

## 3.4 Preparation of EIA Report

### 3.4.1 Compilation of Baseline Information, Impact Identification, Prediction and Evaluation

Based on the primary and secondary information, the baseline information related to the issues as indicated in Scoping Document and Term of Reference, were compiled and are presented in Chapter 5 and Annex 2, 3 & 4 of this EIA study report. The possible environmental impacts were identified considering proposed Project activities and its interaction with surrounding environment in time and space and accordingly the impacts were evaluated and presented in Chapter 6 in accordance to Schedule 6 of EPR, 1997.

### **3.4.2 Prescription of Mitigation and Enhancement Measures, Monitoring and Auditing**

The mitigation and enhancement measures were proposed in order to ameliorate the beneficial impacts and avoid or mitigate the adverse impacts considering the identified impacts, their nature, extent and complexity, identified during the EIA exercise. While recommending the mitigation option, a realistic approach was applied such that the measures could be employed in the local context and discussed in Chapter 8. Monitoring plan is formulated to assess the effectiveness and implementation status of mitigation and benefit augmentation measures. Auditing plan was also designed to verify the past and current environmental performance and given in Chapter 10.

### **3.4.3 Preparation of Environment Management Plan**

Environment Management Plan (EMP) was prepared to ensure and evaluate the effectiveness of each of the mitigation and enhancement measures adopted to minimize the environmental impacts and to ameliorate the overall environmental conditions within the region of influence. The basic objectives of EMP are that it clearly spells out the environmental concerns of the Project and prescribes a systematic environmental management system to be followed to attain the environmental improvements in and around the Project vicinity. The associated costs for adopting mitigation measures and enhancement measures were also estimated and given in Chapter 9.

### **3.4.4 Alternative Analysis**

A Chapter on the possible alternatives to the Project's design and components was identified and discussed in Chapter 7.

## **3.5 Limitations**

### **3.5.1 Study Limitations**

The proposed Project is envisaged to upgrade and widen the existing road to provide better transportation facilities to the road users, enhance the socio-economic activity of number of villages within Bhaktapur and Kavrepalanchowk Districts, enhancement of tourism in the project influenced area, employment generation.

This study limits primary information along the alignment's RoW that is, within 25m on either side of the road alignment, for physical, biological and socio-economic and cultural information. Furthermore, the limitations of the socio-economic Household Survey, encountered during the survey were:

- The socio-economic household survey could not cover all affected households as the people could not be contacted during survey period, and these remaining people need to be contacted prior to Project implementation.
- The delineation of the boundaries of land to be acquired, obtained through overlaying the design on cadastral map, needs to be re-verified prior to Project implementation.

This study has followed the basic concept of EIA so as to make the report site-specific, to the extent possible. Hence, this study limits information generation along the road alignment and the right-of-way (RoW) i.e. within 25m on either side of the road for physical and biological information. Information on possible acquisition of land and property has also been limited to road alignment and RoW. However, emphasis has been given to generate Socio-economic information for each adjoining settlement to relate impacts with the settlement activities.

### **3.5.2 Project Limitations**

This EIA study's Project limitations are those activities that are proposed to be constructed within this Project, namely the widening and upgrading of existing road to 4 lanes main road with 2 service lanes on either side, construction of 1.3 km of double-tube tunnel road, 3 culverts and 4 bridges, 6 Pedestrian Crossing overhead bridges and associated land development works with Improvement of intersections and Bus Layby area, and slope protecting and improvement works are also included in the Project activities. Necessary other facilities such as toll gates, operation office, etc. are also included in the Project activities.

## Chapter 4 DETAILS OF THE PROJECT

In this Chapter, brief engineering details of the various components of the proposed Project are given, which have been referred from the Detailed Feasibility Report prepared by the JICA Study Team.

### 4.1 Type of Proposal

The present proposal is of the type for upgrading, widening and Improvement at some places for 14.91 km from Suryabinayak to Dhulikhel, including construction of 1.3 km of double-tube tunnel road at Sanga.

### 4.2 Design Standard and Right of Way

#### 4.2.1 Road Design Criteria

The main criterion followed for the design of the present project road is in accordance with the design criteria indicated in the ToR for the road. The other guiding principle for the adoption of design criterion being the Nepal Roads Standards (revised, 2070). The road is planned to be 4 lane divided highway standards with 2 service tracks each on either side of the highway. These factors are taken into consideration while adopting the design criteria of the road.

Table 4.2-1 Highway Design Standards, as per Nepal Roads Standards (revised, 2070)

S. N.	Description	Standards	Remarks
1	Number of lanes of highway carriageway	4	3.5 m / lane
2	Number of service road carriageway	2	3.5 m
3	Width of the central divider	3.0 m	
4	Width of road per lane	3.5 m	
4	Width of paved shoulder	2.5 m	
5	Width of bus-bays	3.0 m	
6	Number of access per km	2	
7	Design speed	60 km/hour	
8	Maximum super elevation	7%	
9	Minimum Radius of Horizontal Curve	130 m	For limiting speed of 60 km/hour
10	Maximum Vertical gradient	7%	
11	Maximum recover gradient after 7%.	4%	

Source: Nepal Roads Standards (revised, 2070), Dept. of Roads

#### 4.2.2 Right-of-Way (RoW)

As per Nepal Government's Road Standard, all roads that are designated as Highways have a Right-of-Way (RoW) of 25m on either side of its center-line. In the context of Arniko Highway, the then-Government in 1977/07/04 had amended to 25 yards (22.86 m) as a RoW only between Sanga Bhanjyang to Chandeshwori of Banepa, from KM 20.870 chainage to KM 26.585 chainage, however the remaining length, had 25 m. as the RoW.

All road widening is proposed within the RoW. However, at some locations, curve improvements have been also proposed. At these locations, the additional area required for curve improvement works will be acquired by the Project Proponent.

#### 4.2.3 Typical Road Cross-sections

As per the preliminary design, the typical road cross-sections are shown the figure below:



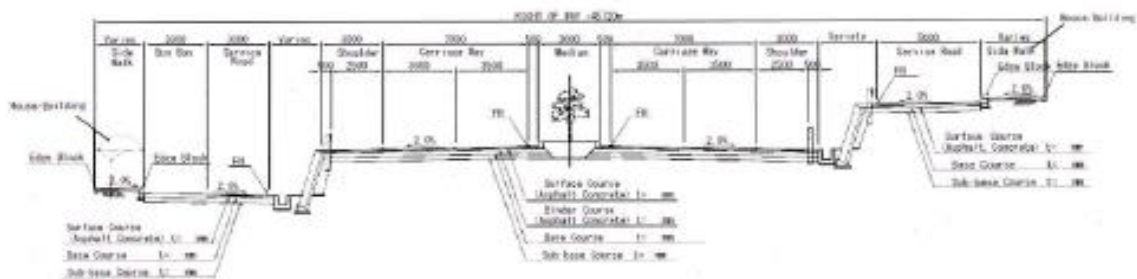


Figure-1 Typical Cross Section (Urban area near start point where existing ground is uneven)

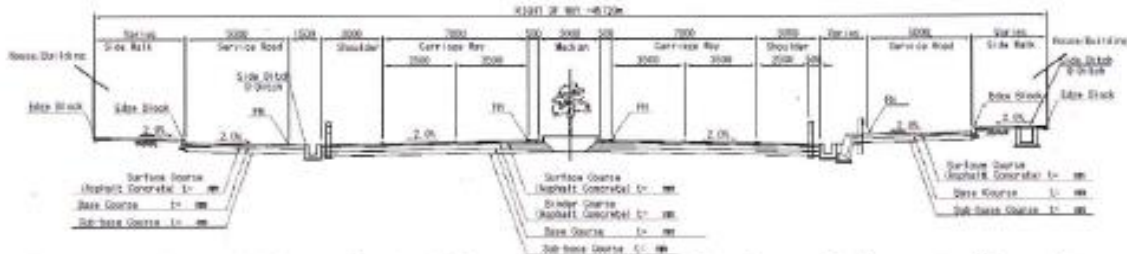


Figure-2 Typical Cross Section (Urban area near start point where existing ground is even)

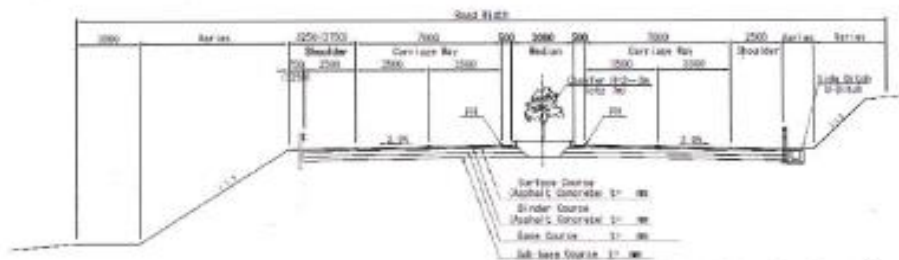


Figure-3 Typical Cross Section (Section without Service Road)

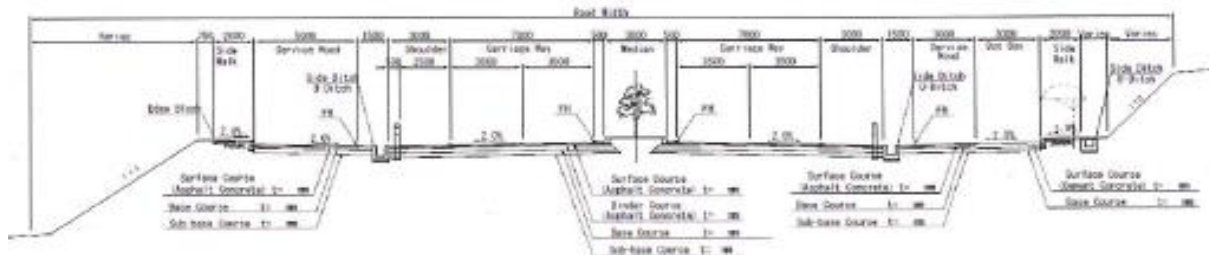


Figure-4 Typical Cross Section (Jagati - Nalinchowk and Sanga - Banepa Section)

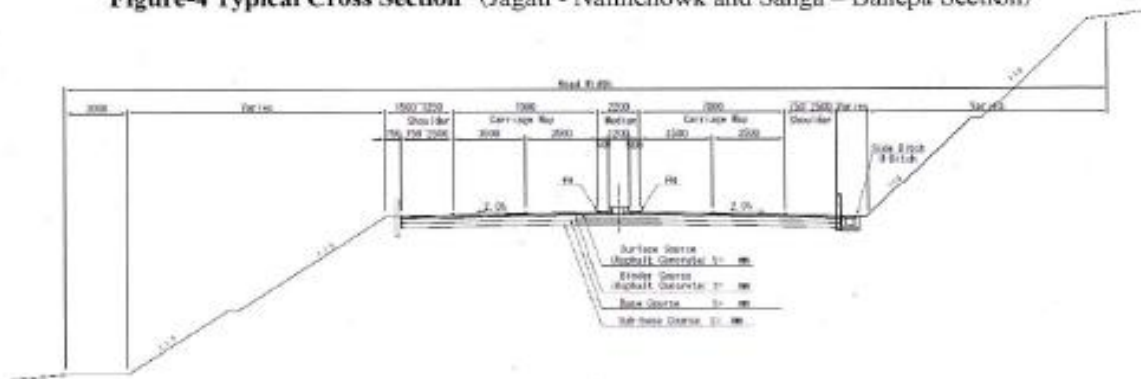


Figure-5 Typical Cross Section of Earth Section (Bypass between Nalinchowk and Sanga)

Figure 4.2-1 Typical Road Cross-section (1)

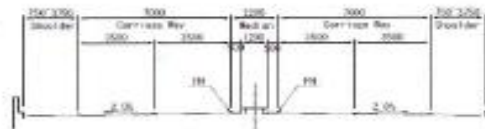


Figure-6 Typical Cross Section of Bridge Section (Bypass between Nalinchowk and Sanga)

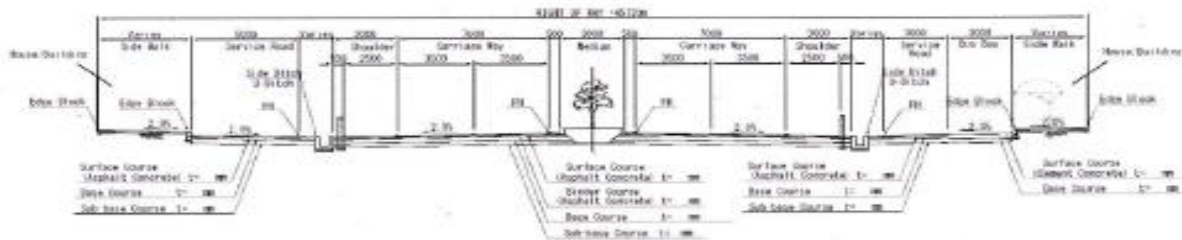


Figure-7 Typical Cross Section (Banepa Urban Area)

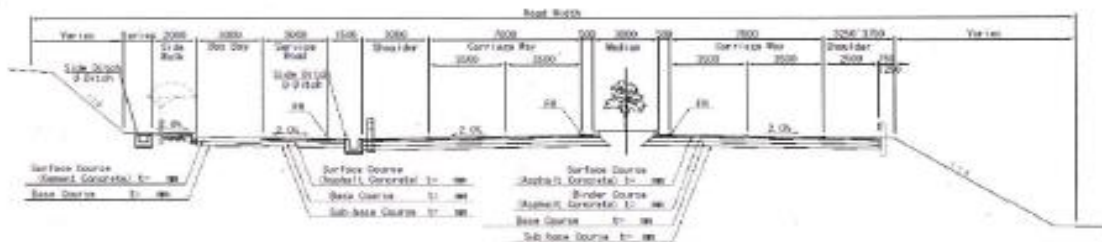


Figure-8 Typical Cross Section (Dhulikhel Urban Area)

Figure 4.2-2 Typical Road Cross-section (2)

Source: Preliminary Report, JICA Study Team, 2014

### 4.3 Project's Major Activities

The proposed road upgrading works includes standard road widening works that will be undertaken along the length of the road and major site-specific works undertaken where a significant road formation features has to be improved. A major activity for the proposed project includes:

#### 4.3.1 Widening of road surface from the present 2 lanes to 4 lanes

The major activity of this project is to widen the present two lanes carriageway to four lanes for the stretch of 14.91 km. The detailed design works for this proposed widening project has been carried out. The center-line of the road will not be changed, in majority of the road length, but need to be changed at some sections to maintain the desired design speed. For adding two lanes at both sides of the center line, the electric poles need to be relocated and road-side trees need to be cleared.

#### 4.3.2 Construction of New Road Alignment to Tunnel

The new approach road, diverging from the existing Arniko Highway at Palanse, to the Sanga Tunnel's west portal of length 640m is proposed. Similarly, at the east portal, a new approach road of length 370m is proposed.

These approach roads will be a part of Arniko Highway and is classified as National Highway Class II standard. The RoW of the road will be 50 m as according to the National Highway Class II Roads Standards of Nepal (NRS, 2070).

#### 4.3.3 Construction of Tunnel at Sanga Pass

The proposed double-tube tunnel will be 1.3km in length with internal concrete lining. The tunnel will have two lanes of 3.5 m wide in each of the two-tunnel section. The two tunnel tubes will be connected at the two locations for emergency purposes at 425m and 850m. There are two emergency bays at the center of each tube, for parking broken down vehicles. The tunnel will be equipped with all standards equipment and facilities for ventilation, lighting, emergency facilities and traffic control.

To secure the safety inside the tunnel, (i) Pedestrians, bicycles, Motorbikes, (ii) Vehicles carrying hazardous or flammable materials (iii) Vehicles with top and/or carriage higher than 5 m and (iv) Over loaded trucks, will not be allowed to use a tunnel, and will be directed to use existing Highway passing through Palanse-Sanga.

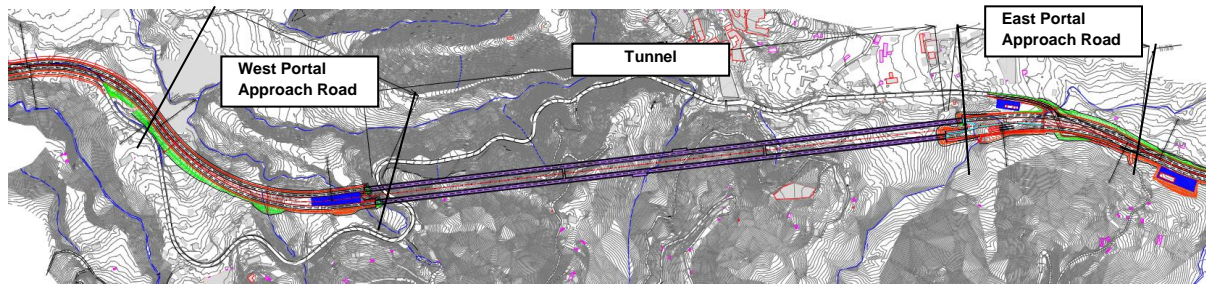


Figure 4.3 Tunnel Alignment and Tunnel Approach Road

Source: Preliminary Report, JICA Study Team, 2014

#### 4.3.4 Addition of Bridges and Culverts

The three existing bridges at Jagati, Sanga and Banepa are double-lane bridges and so, additional two-lane bridge need to be constructed, at the side of the present bridge. In addition, one slab culverts need to be widened and additional cross drainage structures added.

#### 4.3.5 Construction of Service Lane, Pedestrian Path, Road Crossing and Side drains

One-lane service lane road will be constructed at both sides of the road. The service lane will have lateral accesses. Construction of pedestrian pathways on both sides of the road will also be a major activity. Since the road will be cater high speed vehicles, pedestrian road crossing bridges will also need to be constructed at various junctions. Besides these, new side drains and repair of existing side drains will be necessary to improve road surface drainage and reduce erosion.

#### 4.3.6 Intersection Improvement Works

Intersection improvements works will need to be carried out at 3 different junctions for which additional land acquisition may be necessary. The proposed location of intersection improvements with a Grade Separated intersection are at: Chainage: 1+140 Jagati, 5+260 Palanse and 11+650 Banepa.

#### 4.3.7 Slope stabilization works, Retaining wall and Bio-engineering

Some slope stabilization works at certain sections will be necessary. Retaining walls and breast walls are also needed at certain sections. Bio-engineering measures will be undertaken in most of the areas to protect slope.

#### 4.3.8 Pedestrian Crossing Bridges

As the road passes through the urban area with lots of mobility of the local people, hence then Project have proposed to have under head bridges for the pedestrian crossing at 6 different locations along this Suryabinayak - Dhulikhel section. The detail and location of each proposed overhead pedestrian crossing is illustrated in Table.

Table 4.3-1 Location of Pedestrian Overhead Crossing

Chainage	Location	Chainage	Location
0+100	Suryabinayak Chowk	11+340	Banepa-II
0+960	Jagati	11+740	Banepa-III
11+040	Banepa-I	13+270	KU Intersection

Source: JICA Survey Team, 2014

### 4.4 Additional Land Acquisition

The Project intends to make the road meet its design criteria of Highway standards. To meet these criteria, the Project has proposed to the following:

- A. Curve Improvement Works at 43 locations

### B. New Approach Road to Sanga Tunnel with 640m and 370m new road

The total additional land area required for Curve Improvement is 7.07 ha. and Tunnel approach road is 6.26 ha.

The detail of the additional land area required is included in Annex I-1 and 2.

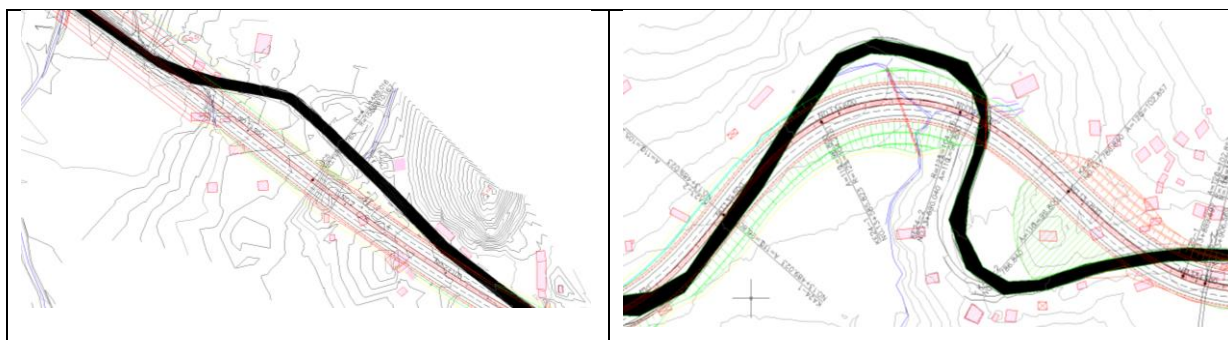


Figure 4.4 Typical Curve Improvement Section

Source: Preliminary Report, JICA Study Team, 2014

#### 4.4.1 Applied Technology

The Approach Road section is planned on relatively flat ground. In this regard, the construction technology will be machine-and-labor mixed, with no special technology, special equipment or material be required.

#### 4.4.2 Major Construction Equipment

The list of major construction equipment and its procurement conditions are summarized in Table 4.4-1.

Most of the major construction equipment used for the construction of roads except for piling rigs for bridge construction is available locally. Asphalt paver is owned by some of the construction companies. The reliability of such equipment in local market, however, is unknown, and the possibility of importing will also be considered during the basic design phase.

Table 4.4-1 List of Major Construction Equipment and Availability

S.N	Major Construction Machinery	Specification	Local Procurement	Import	Remarks
1	Excavator (Back Hoe)	0.45, 0.8m <sup>3</sup> bucket	○	○	
3	Bull Dozer	21ton	○	○	
4	Giant Breaker	1,300kg	○	○	
5	Dump Truck	4 ton, 10ton	○	○	
6	Truck Crane	4.9ton	○	○	
7	Motor grader	W=3.1m	○	○	
8	Tire Roller	8-20ton	○	○	
9	Vibration Roller	10ton	○	○	
10	Concrete Pump	90-110m <sup>3</sup> /hour	○	○	
11	Crawler Crane	50ton	○	○	
12	Generator	10-100KVA	○	○	
13	Asphalt paver		○	○	Local Contractors

Source: JICA Survey Team, 2014

#### 4.4.3 Construction Method of Road

The construction works of the road sector will include excavation of earth, hauling, placement and compaction of embankment materials, pavement, bridges, culverts, and other structural works and installation of road facilities and traffic signals. The proposed bridges and culverts are mostly reinforced concrete type of structures. They will be constructed basically by cast-in-place with all staging method using false works and formworks. All material, cement, reinforced bars, aggregates for concrete, bitumen, pipes etc. are available locally.



#### 4.4.4 Construction Method of Tunnel

At the time of preparation of this EIA Report, the method of construction of Tunnel is not finalized, as detailed geotechnical investigation is still not complete. However the design of tunnel has considered drill and blast method based on NATM, provided the structural strength of the underlying mass is appropriate. The detail construction method of the Tunnel will be determined after the detailed design of the tunnel is complete.

#### 4.4.5 Spoil Disposal Sites

Potential sites for the Spoil Disposal were selected as shown in Figure 4.4.4-1. All sites are located near the existing Highway, with rather narrow valley that can be used as flat area after the disposal

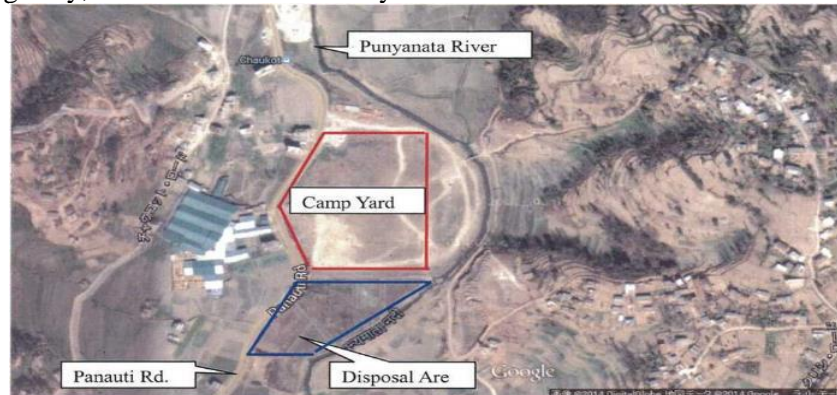


Figure 4.4.4-1 Sites for the Soil Disposal Site

The comparing with the disposal areas was carried out based on these four (4) items form the technical viewpoint of 1) Condition of Site, 2) Surrounding Environment, 3) Accessibility and 4) Others.

#### 4.5 Construction Planning

- Pre-construction Activities: Land Acquisition and Compensation, Relocation of Houses, Sheds, Shops etc. and rehabilitation of affected families, Relocation of Electric Power lines, Communication lines, Water Supply lines and Sewer lines
- Quarry and Storage facilities management: Material Storage, transport
- Traffic Management: Construction and provision of bypass to re-routing of traffic
- Camp Site Management: Contractor's labor camp, Contractor's equipment storage site, Contractor and Engineer's Office

#### 4.6 Associated Activities

A number of associated activities for upgrading works will be undertaken at ancillary sites away from the road corridors. These activities will include:

- Extraction of materials from quarries and borrow pits: construction materials, primarily for road gravelling and retaining wall construction will be sourced from quarries within the project area.
- Materials crushing and storage: the crushing of aggregates will be done at the quarry site and no crushing plants should be operated near the project areas. Storage of construction materials should be done at appropriate place which does not affect the local environment.
- Workforce camps: The project may need to establish a workforce camp if the majority of workers are from outside the area. These temporary camps should be located at places such that it does not disturb the local community and the environment.

##### 4.6.1 Materials to be used

The detailed estimates of material quantities are not available, however, based on road upgrading project of similar nature, the following Table 4.6-1 covers the estimate of material quantities is assumed to be required:

Table 4.6-1 Estimated of Material Quantities Required

Type of Material Required	Quantity of Material Required
Earthwork for Filling	60,000 m <sup>3</sup>
Sub-base course material	87,900 m <sup>3</sup>
Base course material	74,250 m <sup>3</sup>
Bitumen	386,100 lit
Asphalt Concrete	36,753 m <sup>3</sup>
Cement	5,000 ton
Aggregates	15,000 m <sup>3</sup>
Steel Reinforcement	8,000 ton

Source: Feasibility Report, Dept. of Roads, 2015

#### 4.6.2 Potential Emission Resulting from Implementation of the Proposal

The project is an upgrading project and does not emit polluting substances, but during its construction phase, mainly noise, dust and smoke will be emitted. Noise will be emitted during the operation of heavy equipment such as crushers, tracked excavator, grader, loaders, trucks, concrete mixers, asphalt plant, etc. Dust and Smoke will be emitted while operating the crushers and bitumen mixing plants. These polluting sources will be stationed away from settlement areas to minimize dust, noise and smoke to human being. Similarly, bitumen and concrete spillage may cause pollution and thus need to treat with caution.

#### 4.6.3 Energy to be used

The energy that is used in the operation of construction equipment such as crushers, bitumen and concrete plants will be petroleum fuel. In addition, the large workforce in the work camps will need cooking fuel and may have the tendency to use firewood, which need to be prohibited and use of kerosene or gas need to be encouraged.

#### 4.6.4 Manpower Requirement

The workforce required for the project has not been calculated in detail. However, from the records of similar previous project, it is estimated that 18,700 person-days of skilled manpower and 4,500,000 person-days of unskilled manpower would be required depending on the methodology of construction employed. The contractor is required to employ the unskilled manpower from the local communities as far as possible.

#### 4.6.5 Resources required for the implementation of the Proposal

The detailed estimate of costs for the entire 14.91 km road length is not yet available, however based on experience on upgrading works of similar road project, NRs. 2.785 billion will be used for the proposed upgrading works of this road.

### 4.7 Resources and Construction Materials to be consumed

The list of major materials and its procurement condition is summarized in Table 2-6. The basic construction material, such as fill material, rocks, crushers, aggregates, sub-grade (roadbed) material, cement, reinforcement bars, asphalt material and steel structures are available locally, including those products that are manufactured and imported from India. Therefore, the Project is planning to purchase these materials from the local industries, and there is no plan to develop a new borrows pits or quarry sites specific for the project. Also, there are sufficient amount of such materials at the wholesalers and there is no need for coordination of specific individual import for the Project.

The name and location of the potential business entities to be used in the Project, as well as the estimated volume of the raw material needed will be studied during the detail design. On the other hand, the steel structures and some large- sized pipes, No. 3 in Table 4.7-1, need to be ordered and be imported specifically for the Project.

Table 4.7-1 Lists of Major Construction Materials and its Procurement Conditions

S.N.	Major Construction Material	Specifications	Local Procurement	Import	Remarks
1	Cement		○	○	Low quality
2	Reinforced Bars		○	○	
3	Steel Material (Sheet-piles, pipes)			○	
4	Formworks Material		○		
5	Scaffolding/ Supporting, H-beams		○		
6	Aggregate, Sand, Borrow Soil		○		
7	Concrete Pipes	φ600 to 900mm	○		
8	Bitumen		○	○	
9	Rock Bolt		○	○	

Source: JICA Survey Team, 2014

#### 4.8 Implementation Mechanism

The Project will be implemented, or planned and constructed, by DOR with funding and technical assistance of JICA, MOPIT and MOFE will be supervising and coordinating institutions.

Table 4.8-1 Implementation Mechanism

Project Proponent	DOR
Supervising Institution	MOPIT
Funding (Loan) and Technical Assistance	JICA
Coordinating Institution	MOFE

Source: JICA Survey Team, 2014

#### 4.9 Institutions Involved

In addition to the institutions listed as the Implementing Institution in the previous Section, following institutions will be involved in each phase of the Project. District Coordination Committees will be consulted during the planning phase for information regarding the specific conditions in the Project Area, as well as for effective cooperation and coordination in local development.

Table 4.9-1 Institutions Involved

Organization Level	Institutions Involve	Planning Phase	Construction Phase	Operation Phase
District Level	District Coordination Committees	X		
	Compensation Determination Committees	X	S/M	
	District Forest Office	X	X	
	CFUs' Committee to be affected	X	X	
Municipality Level	Municipality Offices	X	S/M	S/M
	Water Users	X	S/M	S/M
	Other public or semi-public organizations in the affected Municipalities	X	S/M	S/M
	Project affected people and businesses	X	X	S/M
Other	National Electric Authority (NEA)	X	X	X

Source: JICA Survey Team, 2014

X: Involved in the Project implementation.

S/M: Involved in the supervision and monitoring.

**Compensation Determination Committee (CDC)** will be consulted for determination of the compensation and assistances. The Committees will supervise the implementation of their decision during the construction phase.

**District Forest Office (DFO)** will be involved in the decision of tree clearance and necessary compensation by DOR. CFUG to be affected will be consulted during the planning phase for

information regarding the forest use and dependency of the users. In the construction phase, it may be involved in the clearance activities if the coordination between DFO directs so.

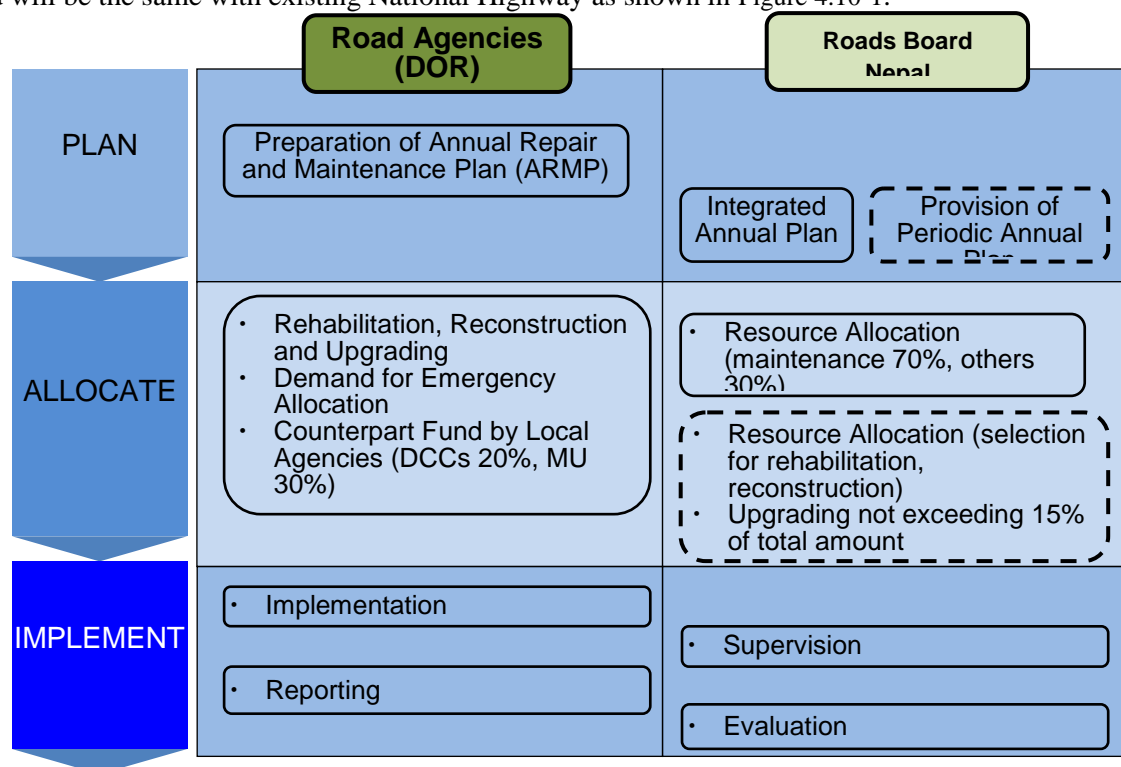
**Municipality and Ward Office** will be consulted during the planning phase for information regarding the specific conditions in the Project Area, as well as for effective cooperation and coordination in local development. The offices are also expected to act in assisting public consultation and information dissemination during the planning phase. Municipality and Ward Offices in construction phase and operation phase will supervise and monitor the impact of the Project, and convey opinions and grievances of the local residents to the Project Proponent, DOR.

**Water users** to be affected will be consulted during the planning phase for potential impacts on their facilities and water supplies. They will supervise and monitor the impact of the Project and convey opinions and grievances in construction phase and operation phase. Other public or semi-public organizations in the affected municipalities, including schools, hospitals, clinics, etc., through public consultation, will be consulted during the planning phase for information regarding the specific conditions in the Project Area. They will supervise and monitor the impact of the Project and convey opinions and grievances of the staff and users in construction phase and operation phase.

Physical resettlement and relocation will be coordinated during the planning and construction phase, after receiving rational compensation and assistances. DOR will be responsible for the monitoring of their livelihood after the resettlement. National Electric Authority (NEA) will be consulted in the planning phase regarding the supply of electricity for operation phase. In the construction phase, coordination between DOR and NEA will be necessary for construction of dedicated transmission line for tunnel operation. In operation phase, continuous operation and monitoring of the electricity supply will be coordinated between DOR and NEA.

#### 4.10 Maintenance Approach

Funding, institutional mechanism and human resources to be used for maintenance of the Approach Road will be the same with existing National Highway as shown in Figure 4.10-1.



Source: JICA Survey Team, 2014

Figure 4.10-1 Structure of Road Maintenance in Nepal

#### 4.11 Project Implementation Plan and Operation

The tentative summary of Project implementation schedule is as follows:



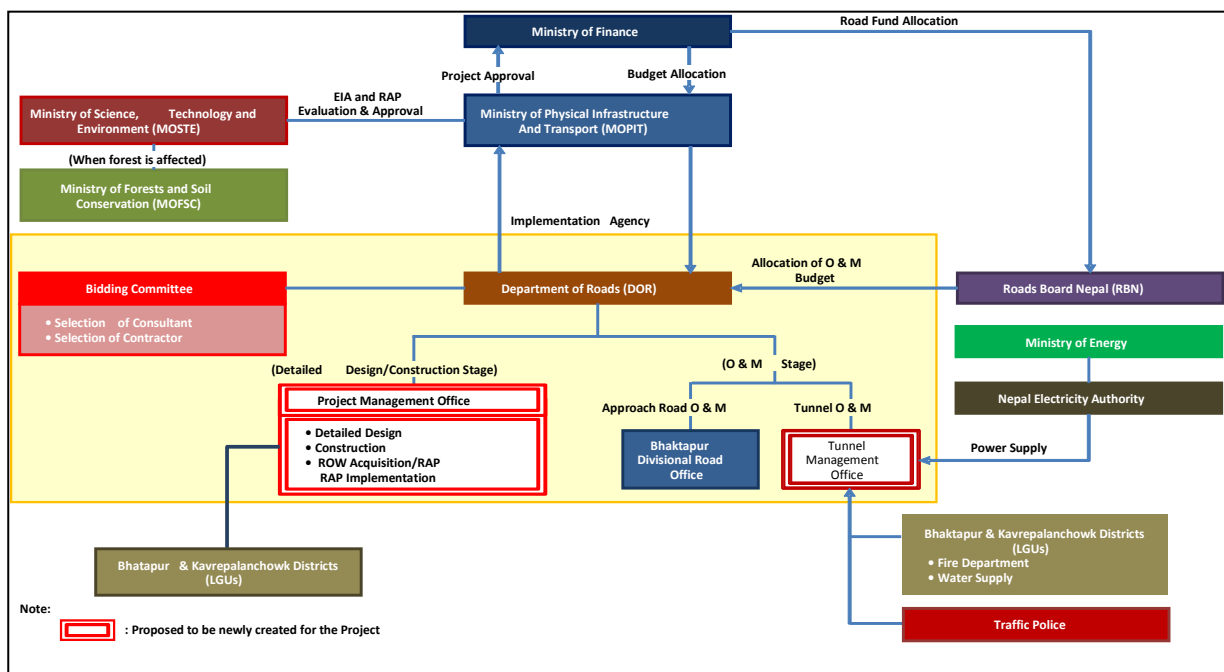
- Project Appraisal by JICA:
- Selection of Consultant for the detailed design:
- Detailed engineering design:
- Selection of construction contractor:
- RoW Acquisition:
- Construction start:

List of Site- Specific Environmental Management Plan are as follows:

- Pre-Construction and Construction Phase Plan
- Waste Management Plan
- Occupational Health and Safety Management Plan
- Spoil Site Management Plan
- Forest Clearing and its Management Plan
- Compensatory Re-plantation Plan
- Work/labor and Contractor Camps Management Plan

### 4.12 Project Implementation Organization Structure

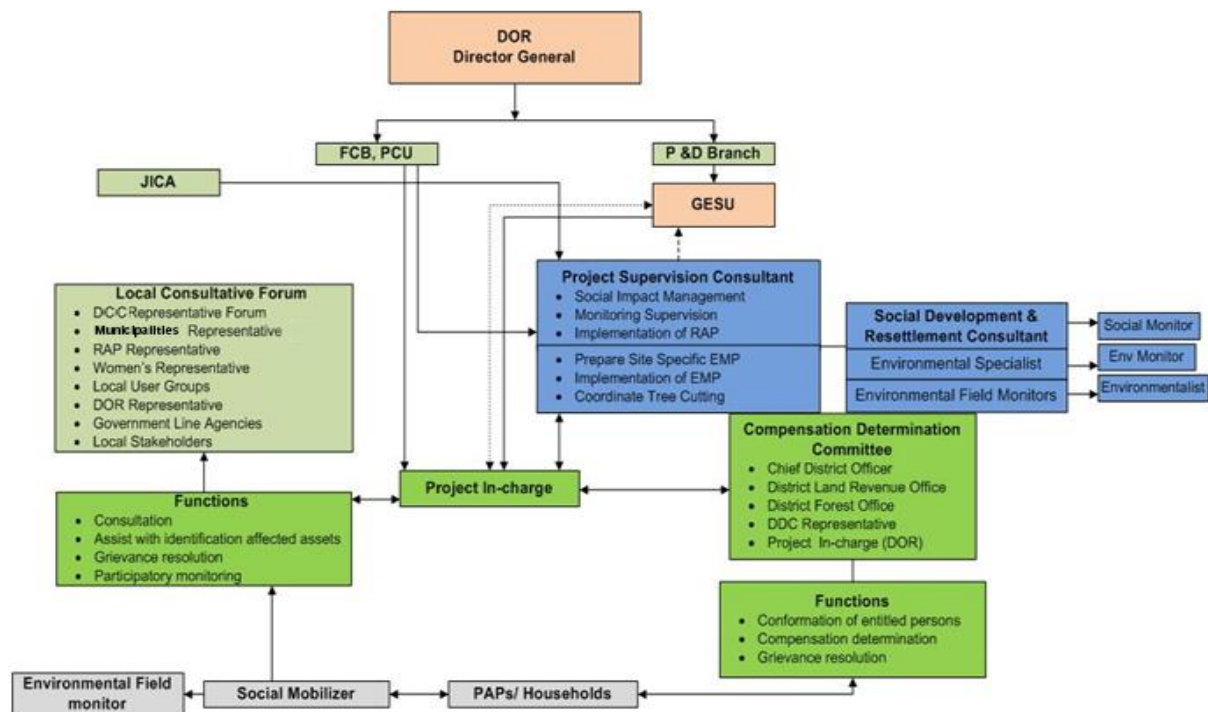
Overall coordination structure for Project Management Office of DOR and for Environmental Monitoring is as shown below.



Source: JICA Survey Team, 2014

\*MoSTE in the figure has been changed to MoFE

Figure 4.12-1 Project Implementation Organization



Source: JICA Survey Team, 2014

Figure 4.12-2 Organization Frameworks for the Implementation of RAP and Environmental Management Plan/ Site Specific Environmental Management

#### 4.13 Brief Roles and Responsibility of Project Implementation Organization

##### 4.13.1 Ministry of Physical Infrastructure and Transport (MoPIT)

The overall responsibility of the MoPIT comprises the coordination with the Nepal Planning Commission (NPC) and Ministry of Finance (MoF) for the final selection of strategic road network sub-project sections and the finalization concerning budget allocation. This ministry is the umbrella agency in Nepal undertaking the planning and construction of the Strategic Road Network, to be implemented through its Department of Road.

##### 4.13.2 Ministry of Forests and Environment (MoFE)

The Ministry will review the EIA report to ensure that the report is prepared as per EPA, 1996 and EPR, 1997, and approved TOR. Similarly, the Ministry will approve the EIA report providing comments and suggestions for design change, change in location, or incorporation of additional mitigation measures and monitoring requirements to minimize the adverse environmental impacts. Moreover, the Ministry will grant approval letter to Proponent under the Sub-Rule (4) of EPR within Sixty days from the date of receipt of the proposal instructing to ensure the implementation of mitigation measures and monitoring provisions during Project construction and operation stages.

##### 4.13.3 Project Proponent – Department of Roads

The Department of Roads is the Project Proponent for this Project. The Proponent will review the EIA report to ensure that it meets the EIA requirements and procedures as per EPA, 1996 (amended, 2007) and EPR 1997 (amended, 2007), and other environment related acts, rules and guidelines administered by concerned agencies. The Proponent will submit the final EIA report to the concerned line Ministry for review through the Ministry of Physical Infrastructure and Transport will get approval from the Ministry before its implementation.

##### 4.13.4 Municipality /District Coordination Committee

Municipality/DCC (formerly DDC) offices provides recommendation letters for the implementation of the Project, and recommending the implementation of mitigation measures. Coordination with locals during construction will also be provided.

#### **4.13.5 Local Stakeholders, NGO, CBOs and CFUGs**

Local stakeholders will support proponent in settling all sort of social disputes that are arouse during the process of acquisition of affected land and houses. Stakeholders will assist affected locals; poor people ensuring their support for resettlement and livelihoods from proponent's side.

## Chapter 5 EXISTING ENVIRONMENTAL CONDITION

### 5.1 Physical Environment

#### 5.1.1 Topography and Soil

The improvement of Arniko Highway starts at Suryabinayak of Bhaktapur District, within Kathmandu valley, and ends at Dhulikhel of Kavrepalanchowk District. The elevation of Bhaktapur District ranges from (1,372-2,166 masl) and lies at 27° 40' 00'' Northern Latitude, 85° 25' 00'' Eastern Longitude. The elevation of Kavrepalanchowk District ranges from (1,007-3,018 masl) and lies at 27° 37' 00'' Northern Latitude, 85° 25' 00'' Eastern Longitude.

Generalizing the topographical situation it can be said that the road alignment of the proposed improvement section of Arniko Highway begins in rolling topography at Suryabinayak area and continue almost to the western portal of the tunnel at about 5.200 Km. The proposed tunnel section of the road crosses the low rugged hilly terrain incised by deep gullies of Sanga Bhanjyang Hills which is located at the eastern boundary of Kathmandu Valley. From the eastern portal of the tunnel at Sanga the proposed road alignment of the improvement section follows the existing road alignment. This section of the road is aligned in the flat to rolling topography up to about 13 Km. From 13 Km onward to the end of the road passes through hilly terrain to Dhulikhel.

The Highway lies in Bhaktapur District and Kavrepalanchowk District. There are settlement areas in both side of the road corridor. Elevations above sea levels, of various obligatory points of the road alignments are given in Table 5.1-1.

Table 5.1-1 Elevation of Obligatory Points along Arniko Highway

S.N.	Location	Elevation (masl)
1.	Suryabinayak (Start Point)	1,319
2.	Jagati	1,325
3.	Bhatedhikuro	1,336
4.	Nalinchowk	1,388
5.	Palanse	1,440
6.	Saga	1,520
7.	Bhaisepati	1,486
8.	Pulbajar	1,440
9.	Banepa	1,460
10.	Dhulikhel (End Point)	1,500

Source: Topographic Maps, DOS, 1996

There are no unique, fragile or difficult topography, elevations and slope characteristic to this area.

Based on existing material regarding geology and soil, and interview from residents around the project area, there might not be possibility on soil pollution by Arsenic and other crucial contamination. Therefore, soil pollution may not occur in ordinal environment of construction and operation phases.

#### 5.1.2 Climate, Drainage System and Hydrology

##### 5.1.2.1 Climate

The climate of the project area varies depending on the elevation of various sections. The climate of area is cool and temperate. The average temperatures and rainfall of the project area districts are shown in the following Table.

Table 5.1-2 Average Temperature and Rainfall of Project Area

S.N.	Districts	Temperature		Average Annual Rainfall
		Maximum	Minimum	
1.	Bhaktapur	30° C	9° C	1,416 mm
2.	Kavrepalanchowk	28° C	5° C	1,570 mm

Source: District Profiles of Bhaktapur and Kavrepalanchowk Districts

The absolute maximum temperature of Bhaktapur District is 320°C and absolute minimum temperature is -20°C. The maximum annual rainfall of the district is about 1,400 mm.

### 5.1.2.2 Drainage System

The major rivers that come across the study area are shown in the Table 5.1-3.

Table 5.1-3 Major Rivers and Catchment Area

S.N.	Name of River	Chainage	Catchment area ( km <sup>2</sup> )
1.	Sipadol Khola	1+775	9.07
2.	Bhaisepati Khola	7+620	2.86
3.	Punyamati Khola	11+050	22.97

Source: Topographic Maps, DOS, 1996

The proposed new alignment has side-drains along the road on either side except in areas where the pavement is in embankment. Additional tick-drains are provided in areas where the level of the service lane is higher than that of the main highway. In addition to the existing cross drainage structures, several new cross drainage structures are proposed at different sections of the road to make the drainage system more efficient. Moreover, internal crossing of the side drains has been proposed at suitable sections of the road to avoid the unnecessary lengthening of the side drains.

### 5.1.2.3 Hydrology / Inundation Situation

The only inundation situation is seen at Banepa town's Pul Bazar area. Punyamati Khola discharge comes over the existing bridge during heavy rainfall durations and inundates portion of the road, bridges and surrounding houses, for a few days, until the water recedes naturally. The inundation situation is aggravated by deposition of debris that have accumulated along the khola banks and obstructed the flushing out of the excess water.



Figure 5.1-1 High Water Flow Level at Punyamati Khola Bridge Site

## 5.1.3 Water Quality, Air Quality and Noise of the Project Area

### 5.1.3.1 Water Quality Status

#### (1) Water Quality Status on Tunnel Portal Area

During the baseline EIA study, the water quality parameters were measured at small stream of Palanse located at west portal, which is about 157m away from the existing road. Similarly, at East Portal, Stream Water and Well water, which is about 60m and 134m away from the existing highway were sampled for tasting.

Mainly four parameters were measured of stream water. Surface Water parameter are: pH at 17oC, Total Suspended Solids, (mg/L), Biological Oxygen Demand, (mg/L) and E. coli Count, (MPN Index /100 mL).



Table 5.1-4 Sample Location

Sample Area	West Portal	East Portal	
	W1: Stream Water	W2: Rivulet Stream Water	W3: Well water
Elevation	1430m	1500m	1510m
Latitude	27° 38' 39"N	27° 38' 22"N	27° 38' 22" N
Longitude	85° 28' 03"E	85° 28' 55"E	85° 28' 22" E
location	Bhaktapur, Palanse-9	Banepa Municipality, Sanga-14	

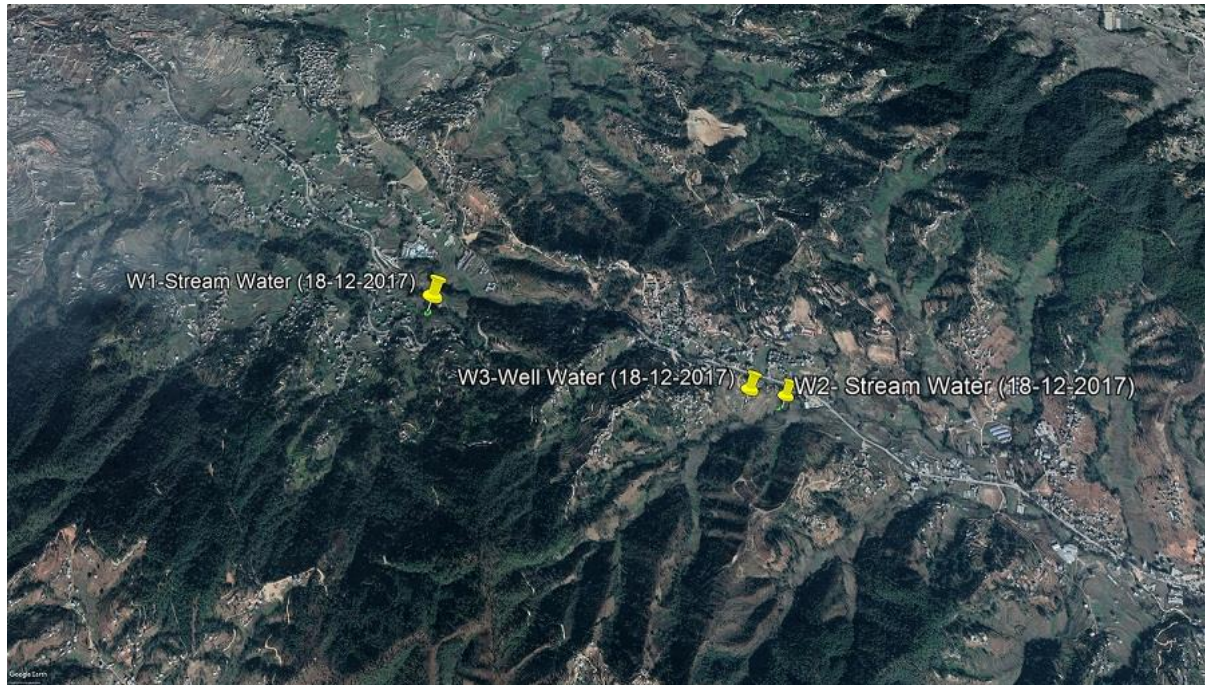


Figure 5.1-2 Locations of Sampling Point for Water at Tunnel Portal

All the observed value doesn't exceed the standard value of the parameter except for the E. coli Count of stream water of both portal side. All test result is within the standard on well water of east portal. Nepalese Discharge Standards 2001 is almost same level of WHO's Guidelines for drinking water 2004.

Table 5.1-5 . Surface Water Quality Results at West and East portal of Tunnel

S.N	Parameters	West Portal (W1: Stream Water)	East Portal		Nepalese Discharge Standards, 2001	WHO Standards, 2004
			W2: Stream water	W3: Well Water		
1	pH at 17 <sup>0</sup> C	7.4	7.5	6.6	6.5-8.5	6.5-8.5
2	Total Suspended Solids, (mg/L)	32	<1	2	30-200	500 max
3	Biological Oxygen Demand, (mg/L)	19	3	2	30-100	100 ppm Max
4	<i>E. coli</i> Count, (MPN Index /100 mL)	>1100	>1100	75	<i>E. coli</i> must not be detected in 95% of total sample examined*	>1100

\* National Drinking Water Quality Standards, 2005

## (2) Water Quality Status along Existing Road (Suryabinayak –Dhulikhel)

During the EIA study, the water quality parameters were measured at three rivers namely Chakka Khola, Bikateshwor Mahadev Khola and Punyamata Khola of Bhaktapur and Kavre district. Mainly four parameter were measured namely pH, Total Suspended Solids (TSS), (mg/l), Biological Oxygen

demand (BOD), (mg/l) and Coliform, (MPN Index/ 100ml). All the parameter in the three sites are within their permissible level and doesn't exceed the standard value of the parameter.

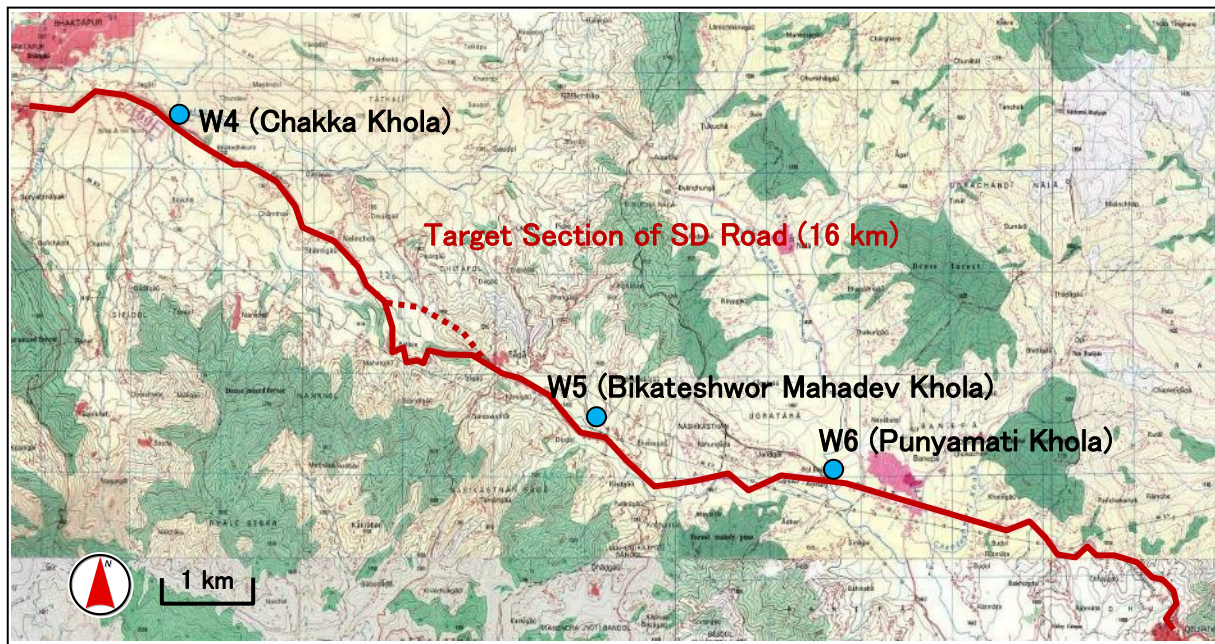


Figure 5.1-3 Locations of Sampling Point for Water at Existing Road

Table 5.1-6 Sample Location

Sample Area	W4: Chakka Khola, Bhaktapur	W5: Bikateshwor Mahadev Khola,	W6: Punyamata Khola
Monitoring Date	17-11-2014	17-11-2014	17-11-2014
Distance from Road	150m	200m	200m
Latitude	27°39'49.55"N	27°38'08.29"N	27°37'55.17"N
Longitude	27°39'49.55"E	27°38'08.29"E	27°37'55.17"E
location	Bhaktapur	Bhaisepati, Banepa	Pulbazar, Banepa

Table 5.1-7 Surface Water Quality Results of Existing Road

S.N	Parameters	Observed Value			Generic Effluent Standards into Surface Water, GoN 2001
		Chakka Khola	Bikateshwor Mahadev Khola	Punyamata Khola	
1	pH @ 17°C	7.2	7.2	7.3	5.5 - 9
2	TSS, (mg/L)	8	15	22	200, max
3	BOD, (mg/L)	6.8	7.8	30	100, max
4	Coliform (MPN Index /100 mL)	>1100	>1100	>1100	0 in 95% of total sample*

\* National Drinking Water Quality Standards, 2005

### 5.1.3.2 Air Quality Status

#### (1) Air Quality Status on Tunnel Portal Area

The air quality parameters that were measured during the monitoring were: Total Suspended Particles, Respirable Particulate Matter (PM<sub>10</sub>), and Respirable Fine Particles (PM<sub>2.5</sub>) for ambient air quality and Nitrogen Dioxide (NO<sub>2</sub>) for gaseous pollutant. Mainly air quality monitoring was carried out at two locations of west and east Tunnel portal area.

The monitoring area lies in the agriculture field at west portal side of tunnel. The dominating dust emission sources were primarily windblown dust from the land. Additionally, the secondary air pollution sources were contributed by the highway moving vehicles emitted smokes and dust. Similarly in East portal side, the monitoring area lies in the agricultural land above the road level



where the green dry bricks were stacked. The primary air pollution sources were the windblown dust either from the agricultural land or from the highway. During the monitoring hours, no brick making activities or loose soil was deposited.

Table 5.1-8 Air Quality Sample Location at Tunnel Area

Sample Area	A1: West Portal	A2: East Portal
Monitoring Date	15/16-12-2017	17/18-12-2017
Distance from Road	~100m	~150m
Elevation	1432m	1497m
Latitude	27° 38' 37.38" N	27° 38' 22.24" N
Longitude	85° 28' 4.66" E	85° 28' 52.00" E
location	Palanse-9, Suryabinayak Municipality	Sanga-14, Banepa Municipality

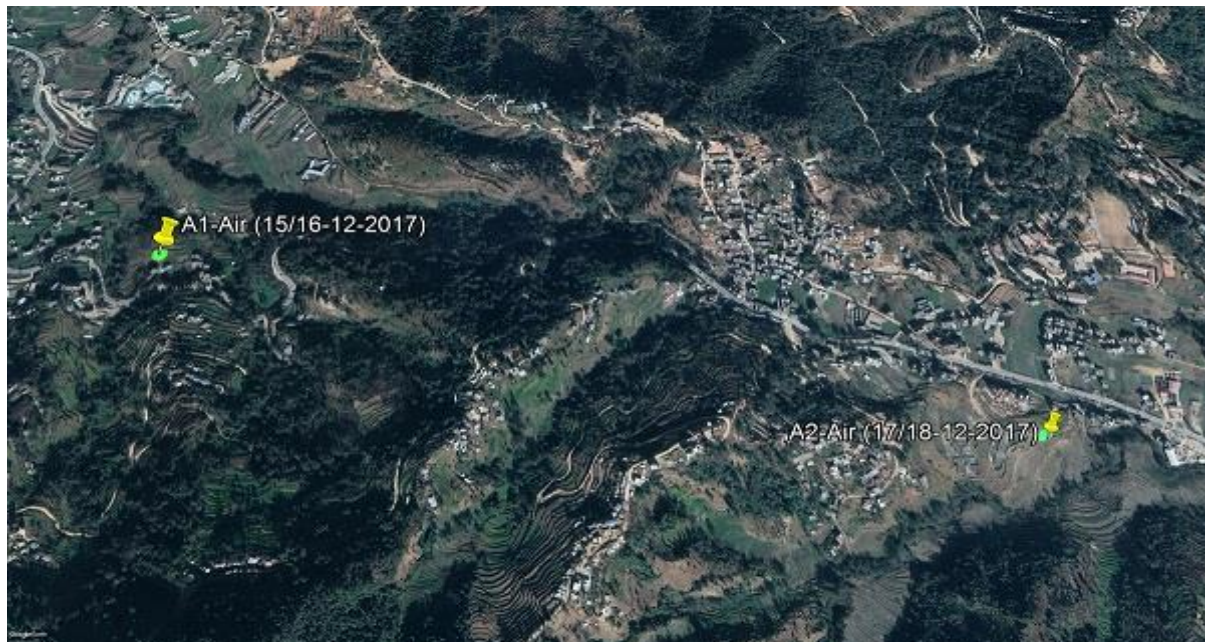


Figure 5.1-4 Locations of Sampling Point for Air at Tunnel Portal

For West and East Portal of Tunnel average value of TSP is less than that of standard value but observed value of PM<sub>10</sub> and PM<sub>2.5</sub> was greater than the standard value in the west portal and less in the east portal.

Table 5.1-9 Air Quality Results at West and East portal of Tunnel

S.N	Location/Parameters	Ambient Air Quality			Gaseous Pollutant	
		TSP	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>
1	A1: West Portal	169.82	150.64	65.74	13.96	0.15
2	A2: East Portal	89.33	84.08	60.43	<2.7	0.26
National Air Standard, 2012		230	120	40	70	80
WHO, 2004		150	50	25	500 (Max)	150 (Max)

Unit: µg/m<sup>3</sup>

## (2) Air Quality Status on Existing Road (Suryabinayak -Dhulikhel)

In order to get the baseline information of the air quality status along the alignment of this Project. The measuring points are set based on current traffic situations and road side population. Among the populous areas along the existing road, Suryabinayak (at Jagati) and Banepa are the area of heavy traffic collective houses, therefore, these two points are selected as the measuring points of air quality. For Jagati, as a background data, the point 100m far from existing road was also selected (Khowpa Engineering Collage). Therefore, totally three points are measured.



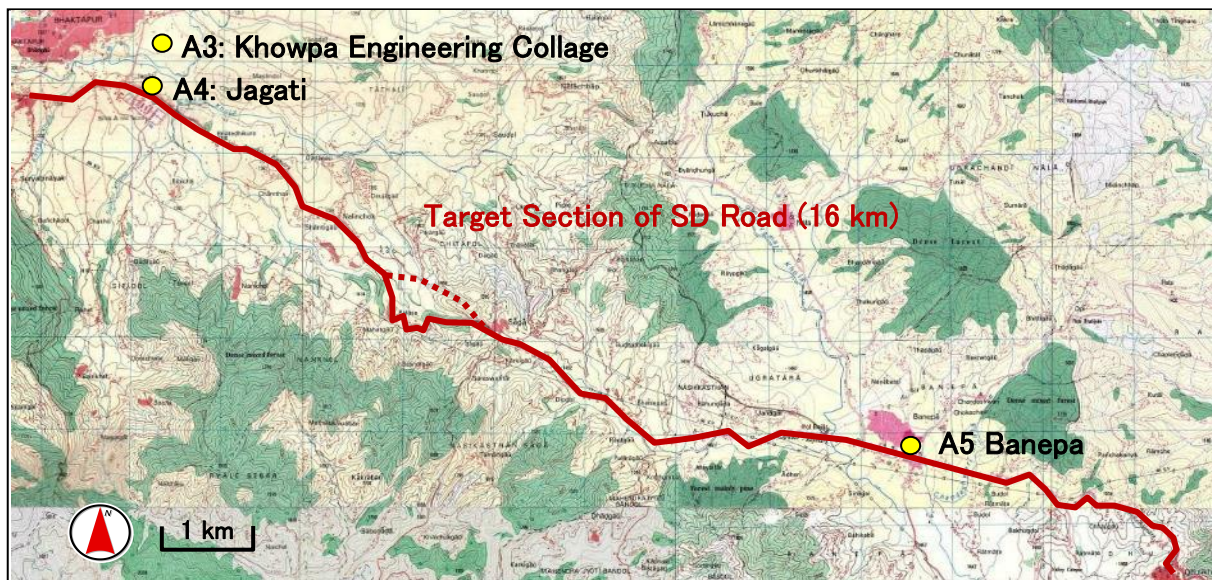


Figure 5.1-5 Locations of Sampling Point for Air at Existing Road

EIA study team has conducted the air quality monitoring at three stations along the existing road. The air quality parameters were measured three times for 24 hours. The air quality parameters were measured 3 times at a time interval of 15 days.

The air quality parameters that were measured during the monitoring were: Total Suspended Particles (TSS), Respirable Particulate Matter (PM<sub>10</sub>). The three stations that were selected for the air quality measurement were:

Table 5.1-10 Air Quality Sample Location

Sample Area	A3: Khowpa Engineering College	A4: Jagati	A5: Banepa
Monitoring Date	17-12-2014	19-11-2014	21-11-2014
Distance from Road	500m	5m	10m
Elevation	1,276m	1,277m	1,429m
Latitude	27°39'56"N	27°39'46"N	27°37'50"N
Longitude	85°26'20"E	85°26'21"E	85°31'18"E

At Khowpa Engineering College, Bhaktapur. The observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN. The major air pollution sources were piling and unloading of construction material (iron rod etc.), re-suspended dust due to playing game (football) at the sampling point and occasional light vehicles. At Jagati, Bhaktapur the observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN. The major dust pollution sources were the re-suspended of smokes/ particles from brick kiln and vehicular emission.

The intermitted traffic jam was observed nearby the sampling site. At Chadani Chowk, the observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN). The dust due to pavement sweeping, and high traffic were responsible for release of particulate matter in the sampling point. The particulate size of aerodynamic size 10 micrometer was found to be dominated over other sized particles. The graph showing the measurement of both TSP and PM<sub>10</sub> is shown below. Possible reason of exceeding level on total particulate matter and PM are unpaved road, brick construction, geographical characteristics of Bhaktapur basin, and so on. This tendency of high particulate matter is very common in and around Bhaktapur area.

Table 5.1-11 Ambient Air Quality Results

S.N	Location/Parameters	TSP	PM <sub>10</sub>	Gaseous Pollutant	
				SO <sub>2</sub>	NO <sub>2</sub>
1	Engineering College, Bhaktapur	622.36	603.87	18.8	4.37
2	Jagati, Bhaktapur	764.77	727.83	16	6.6
3	Chadani Chowk, Banepa	770.21	531.29	21.6	4.16

Unit: µg/m<sup>3</sup>

Nepalese National Ambient Air Quality Standard 2012 is bit lower in TSP and PM and stricter in SO<sub>2</sub> and NO<sub>2</sub> than WHO's Air quality guidelines 2004, as shown in the table below.

Table 5.1-12 Comparison of Air Quality Standard of Nepal and WHO

S.N	Parameters	National Ambient Air Quality Standard, 2012	WHO Standard, 2004
<b>Ambient Air Quality</b>			
1	TSP ( $\mu\text{g}/\text{m}_3$ )	230	150
2	PM <sub>10</sub> ( $\mu\text{g}/\text{m}_3$ )	120	50
3	PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}_3$ )	40	25
<b>Gaseous Pollutant</b>			
1	SO <sub>2</sub>	70	500 (Max)
2	NO <sub>2</sub>	80	150 (Max)

### 5.1.3.3 Noise Status

#### (1) Noise Status on Tunnel Portal

The noise level in the tunnel section has been measured at two of the tunnel portal sides. The noise levels were measured at the nearby location where air quality has been measured. The noise descriptors were calculated on the day time and night time.

Table 5.1-13 Noise Sample Location

Sample Area	West Portal	2East Portal
Monitoring Date	15/16-12-2017	17/18-12-2017
Distance from Road	about 120m North	about 200m South
Elevation	1427m	1504m
Latitude	27° 38' 37.74" N	27° 38' 21.86" N
Longitude	85° 28' 05.70" E	85° 28' 51.31" E
location	Palanse, Ward No.9, Bhaktapur	opposite of Nasika Bus Stop, Sanga-14

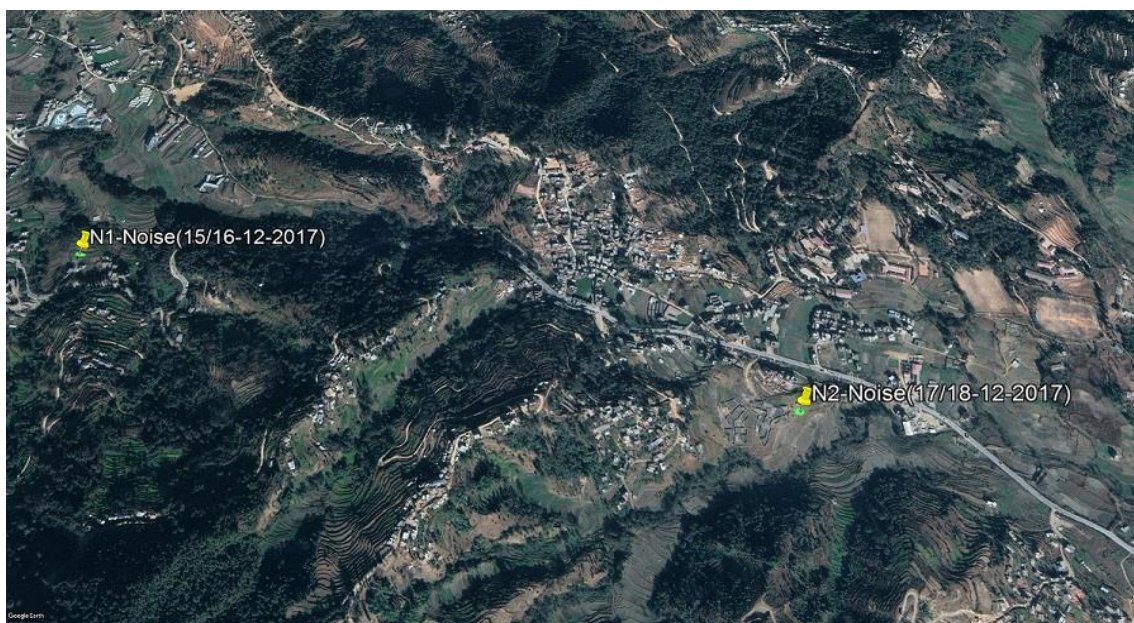


Figure 5.1-5 Locations of Sampling Point for Noise at Tunnel Portal

In East and West Portal of Tunnel, Sound Pressure Level of average day time ( $L_d$ ), during night time ( $L_n$ ) and Average day and night time sound pressure level ( $L_{dn}$ ) doesn't exceed the standard value of

the of GoN 2012. Extreme levels of noise are not detected at Project Site. Only vehicular noise is noticed along the main road side. Factory generated noise or vibration are not detected.

Table 5.1-14 Sound Pressure Level of West and East Portal

Unit: dB (A)

S.N	Noise Descriptors	N1: West Portal	N2: East Portal	National Standard
1	L <sub>d</sub> (Average day time)	53	48	63
2	L <sub>n</sub> (Average night time)	48	42	55
3	L <sub>dn</sub> (Average day and night time)	56	56	70

The National Noise Standard 2012 that came into effect as per the rule 15 of Nepal Government Environmental Protection Regulation 1997 that requires effective monitoring and collection of Day-time and Night-time noise level permitted limits as in the following table. The standard in residential area is almost same as European WHO's Guidelines 2009.

Table 5.1-15 National Noise Level Standards for Nepal

Area	Permitted Noise Level (Leq dBA)	
	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Rural Residential Area	45	40
Urban Residential Area	55	50
Mix Residential Area	63	55
Protected Area	50	40
Maximum Noise level permission by Residential Equipment		
S.N	Equipment	Max. Noise Level (Leq dBA)
1	Water Pump	65
2	Diesel Generator	90
3	Entertainment Equipment	70

## (2) Noise Status on Existing Road

The noise level in the Project area has been measured at three stations. The noise levels were measured at the exact location where air quality has been measured. The noise descriptors were calculated on the day time and night time.

Table 5.1-16 Noise Sample Location along Existing Road

Sample Area	Engineering College, Bhaktapur	Jagati, Bhaktapur	Banepa Chowk
Monitoring Date	17-11-2014	19-11-2014	21-11-2014
Distance from Road	100m	5m	10m
Elevation	1276±43m	1277±22m	1429±18m
Latitude	27°39'49.56"N	27°38'46"N	27°37'50"N
Longitude	85°26'20"E	85°26'21"E	85°31'18"E
location	Bhaktapur	Bhaisepati, Banepa	Pulbazar, Banepa

Table 5.1-17 Sound Pressure Level of Existing Road

Unit: dB (A)

S.N	Noise Descriptors	Engineering College, Bhaktapur	Jagati, Bhaktapur	Chadani Chowk, Banepa	Limit of GoN
1	L <sub>d</sub>	68	79	79	79
2	L <sub>n</sub>	53	73	74	74
3	L <sub>dn</sub>	67	81	82	82

During day time the noise level doesn't comply the standard value, during night time the noise level complies the permissible level at Khowpa Engineering College Station. At Jagati, during day time, night time and day and night time the noise level doesn't comply the permissible value and similarly



at Banepa Chowk, during day time, night time and day and night time the noise level doesn't comply the prescribed national noise standard, 2012 of GoN.

Jagati and Banepa shows the noise situation at these points recorded higher than national standard in both day and night time. Structures are relatively gathered and close to exiting road in these areas, therefore, the measured values of noise might be high because of car stopping, reflection from the structure, and other people's activities.

#### 5.1.4 General Geology

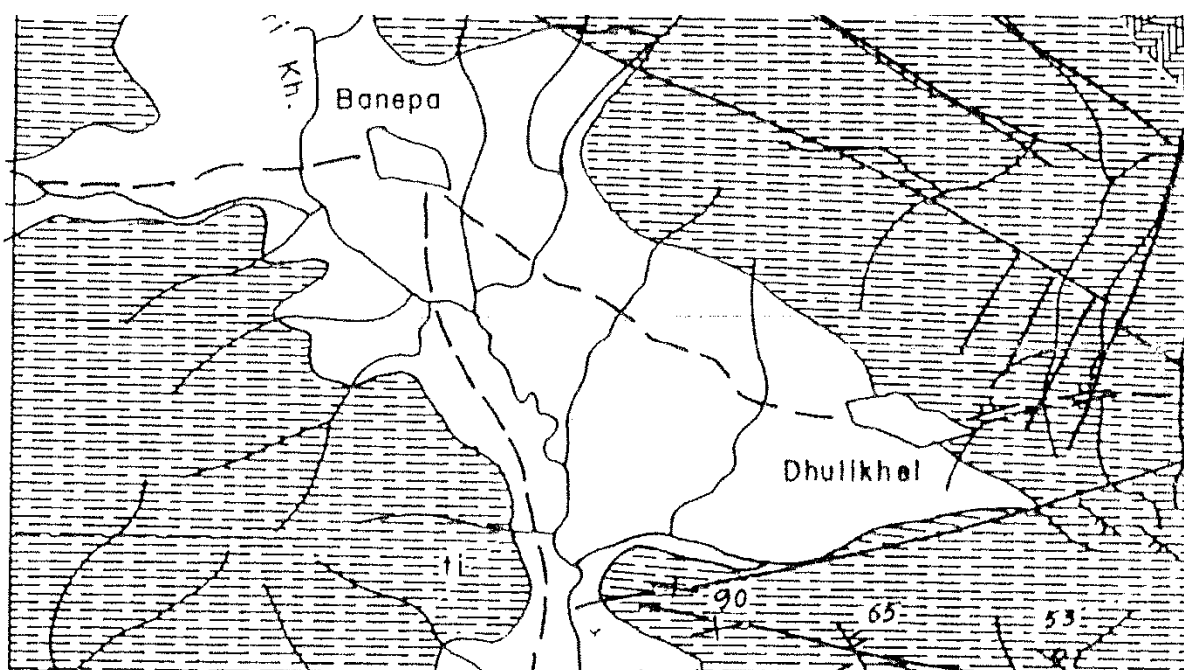
The road from Suryabinayak to Dhulikhel passes through the lacustrine sediment of Kathmandu Valley used for agricultural purpose covered by paddy field mainly at Jagati area, and through Tistung Formation at hill sides of Sanga and Dhulikhel. Geologically the area lies in Bhimphedi Group of Kathmandu Complex of Lesser Himalayas of Central Nepal overlain by quaternary sediments at some places.

From Suryabinayak to Palanse locality the area is covered by lacustrine deposit of Kalimati Formation. Kalimati formation comprises of grey to dark grey colored silty clay and clayey silt at places calcareous nature and phosphate minerals (vivianite) in this area. Organic clay, fine sand beds and peat layers are common in this formation. The area occupied by this soil in the area is designated to be moderately liquefiable with susceptibility to settlement due to soft silty clay, peat and plastic clay content. Similar type of clayey and silty lacustrine deposit is also found in Banepa area with intermittent occurrence of the rocks of Tistung Formation.

At Sanga Bhanjyang and Dhulikhel area, bedrock of Tistung Formation of Bhimphedi Group is well exposed. The formation comprises of greenish grey to brown, fine grained phyllite and slate inter-bedded with meta-sandstone and quartzite containing thin bands of argillaceous limestone. But in the project site, greenish grey to brown, fine grained phyllite and slate inter-bedded with meta-sandstone are observed. At Dhulikhel area top part of the bedrock is highly weathered and residual soil has formed at the top. The area where bedrock has exposed has very low liquefaction hazard, with negligible susceptibility to liquefaction even under high seismic shaking. At this zone damage in case of earthquake will be low.



Engineering and Environmental Geological Map of Kathmandu Valley (after DMG 1998)



Geological map of Banepa Dhulikhel Area (after stocklin and Bhattarai 1978)

Figure 5.1-6: Geological map of Project Area

### 5.1.5 Land Use Pattern along Road Alignment

Land use pattern of the project area is classified as Cultivated, Built up and Forest area. The inventory of land use that lies within the Highway corridor has been prepared. Chainage-wise description of the land use is shown in the following table.

Table 5.1-18 Present Land-Use Pattern along Highway Corridor

Chainage	Length (Km)	Location	Land use pattern	
			Adjacent to Highway	Beyond Highway corridor
0+000~1+250	1.25	Suryabinayak Area	Built-up area, Road-side houses	Built-up Area, Bhaktapur core city towards south
1+250~1+500	0.25	Jagati Area	Built-up area, Road-side houses	Vacant lands, dense settlement at south; Brick & Tile Factory at north
1+500~2+500	1.00	Jagati	Cultivated	Cultivated, Brick factories
2+500~3+200	0.70	Bhasghari Area	Built-up area, Road side houses	Cultivated, Brick factories
3+200~4+200	1.00	Nalinchowk Area	Cultivated	Cultivated, Scattered settlements
4+200~4+500	0.30	Nalinchowk Area	Built-up area, Road side houses	Cultivated, Scattered settlements
4+500~5+500	1.00	Nalinchowk Area	Cultivated	Cultivated, Scattered settlement
5+500~6+800	1.30	Palanse Area	Community Forest	Cultivated, Scattered settlements
6+800~7+100	0.30	Sanga Area	Built-up area, Road side houses	Cultivated, Scattered Settlements and Forest area
7+100~8+300	1.20	Sanga Area	Cultivated	Cultivated, Scattered Settlements
8+300~9+000	0.70	Janagal Area	Built-up area, Road side houses	Cultivated, Scattered Settlements
9+000~10+400	1.40	Janagal Area	Cultivated	Cultivated, Scattered Settlements
10+400~13+100	2.70	Banepa Area	Built-up area, Road side houses	Dense settlement at north, Cultivated & clustered settlement towards south
13+100~14+800	1.70	Dhulikhel Area	Cultivated	Cultivated and scattered settlement
14+800~15+862	1.06	Dhulikhel Area	Built-up area, Road side houses	Scattered Settlement

Source: Field Study, Dec. 2017

### Land Area Requirement within Project Area

Additional 13.838 ha. of total land area of different type will be required for permanent propose that will come under direct influence of the road construction Project. From the total additional private land (13.33 ha.) required by this project, 70.741ha of private land (cultivated) will be required for the curve improvement work on the existing Suryabinayak Dhulikhel road Alignment and remaining

62.65ha. of private land cultivated private land for the construction of Tunnel approach road. In addition, the total of 0.5 ha. of forest land of Suryamode Perunge Community Forest at the western portal area of tunnel for the construction of tunnel approach road will be required by this road improvement project.

The following Table illustrate the land used and land requirement by its type for this road improvement work.

Table 5.1-19 Present Private and Forest Land Required as per the Construction Line (Ha.)

VDC/Municipality		Private Land Area (sq.m.)		Forest Land	Total Area (m <sup>2</sup> )
Formal	Now	For Curve Improvement	Approach Road for Tunnel	Approach Road for Tunnel	
Bhaktapur	Bhaktapur	663.69			663.69
Sipadol	Suryabinayak	21,161.67			21,161.67
Nanghkel		6,796.75			6,796.75
Chitapol	Banepa		44,000.00	5,000	49,000.00
Nashika			18,648.00		18,648.00
Banepa		16,681.16			16,681.16
Dhulikhel	Dhulikhel	25,438.14			25,438.14
<b>Sub Total</b>		<b>70,741.41</b> <b>(7.074 ha.)</b>	<b>62,648.00</b> <b>(6.264 ha.)</b>	<b>5,000</b> <b>(0.5 ha)</b>	<b>138389.41</b> <b>(13.838 ha.)</b>

### 5.1.6 Section-wise Description of Present Road Corridor Condition

#### 5.1.6.1 Section I: Suryabinayak – Sipadol Khola Bridge Site at Jagati

Suryabinayak the termination point of Kathmandu - Bhaktapur Road Upgrading Project, which is already completed and is functional since May 2011. The end point of this 6-lane widening is extending up to 150m from this Suryabinayak main Chowk, eastwards along the road, to another Chowk (also known as Suryabinayak Chowk). The present proposed widening works is expected to start from this junction.

The Suryabinayak is a dense settlement area and houses are constructed along both sides of the road without any gaps left. The area in the northern side of the road belongs to Ward No. 12 of Bhaktapur Municipality and the southern side area falls into Ward No.1 of Suryabinayak Municipality (formal Sipadol VDC). The Bhaktapur Municipality's Ward No. 2, 6, 7, 11 and 12 is bordered by the Arniko Highway as it moves eastwards towards Jagati. Similarly, Suryabinayak Municipality's Ward No. 1, 2, 8 and 9 (formal Sipadol VDC) is bordered by the Highway. Suryabinayak is the main commercial center of Bhaktapur Municipality which falls along the Arniko Highway. The Suryabinayak Chowk junction is also the intersection point for reaching Bhaktapur old inner city, which is 600m northwards from this junction.

At Suryabinayak area, the city is highly built-up, consisting of multi-storied buildings (average 4-5 storied), mainly carrying business activities at ground floor and used as residential floors in upper floors. Moreover, the settlements along adjoining lateral roads are also seen growing very fast. The buildings are seen to maintain the Right-of-Way (RoW) of 25m at both side from the road's center line, hence there is no need for any demolition of private buildings for RoW clearance.

The start points of present proposed widening and upgrading works to 6-lane standard is presently a two-lane, black-topped road, with permanent side drains and other road amenities. Moving eastwards from Suryabinayak Chowk, there are road side trees (mainly of Kangiyo species), along both sides of the road, which is at 9m from the road center-line. These trees are intermittently spaced along the road. The road-sides are only sparsely built-up after crossing the Suryabinayak. The vacant road-side lands are agriculture patches are seen mainly growing vegetables. The road reaches Jagati area at 800m from Suryabinayak Chowk.

Jagati is another old market settlement of Bhaktapur and is also leads to the core city of Bhaktapur. Jagati is another commercial area but is smaller than Suryabinayak area. Row-type buildings are present at both sides of the Highway, but some vacant land plots are also present. At Jagati, there is an old road connecting it to Bhaktapur core city, and this old road is connected to the Highway, near Bhaktapur Brick and Tile Factory area. There are some old houses which face the old road, but now falling within the Highway's RoW, after its construction. There are altogether 13 old such old small houses which are more than 50 years old. These houses, even though they are old are still being used as shops selling daily commodities and house owners are residing in them.

Moreover the RoW of the Highway is seen to have been used for different kinds of purposes, such as : building temporary sheds for small business; used for stock piling of building materials (such as bricks, sand, aggregates, reinforcement steel rods, RCC hume pipes etc.) both by those who are constructing nearby houses and also for selling purpose by nearby Hardware shop owners; mechanical repair workshops; cottage vegetable farming; animal rest places; public water collecting place; and one case of converting into school playground (by enclosing the area with dry-brick staked masonry) by a small school at Jagati.

Intermittently spaced row-type houses are present at both sides of the Highway up to 250m from Jagati Chowk. Near to Jagati Chowk, at south of the Highway, 100m south of road's RoW, there is functioning Bhaktapur Brick and Tile Factory - covering about 15 hectares of land. This factory is a machine-made brick factory, established over 2 decades.

Moving eastwards from Jagati Chowk, there are road-side trees mainly of Kangiyo species and agriculture patches are seen mainly growing vegetables. The Highway then meets a small stream, known as Sipadol Khola, where a RCC bridge of 16m span is present. This Khola is flowing northwards and is a tributary of Hanumante River. This Khola is also the administrative boundary of Bhaktapur Municipality and Suryabinayak Municipality, and beyond the Khola is formal Chitapol VDC in the north of the Highway and formal Nakhel VDC in the south of the Highway.

#### **5.1.6.2 Section II: Sipadol Khola Bridge Site at Jagati – Bhatedhikuro - Nalinchowk**

After continuing from Sipadol Khola Bridge, the houses on either side of the Highway are only sparsely located. The area is largely vacant and used for agriculture purpose and land farther away from the Highway is used for making bricks. This location at Bhatedhikuro has several earthen roads connected to the Highway, mainly built by Brick Kiln factory operators. The brick factories are located more on the northern side of the Highway and southern sides of the Highway. The brick factories have covered wide area of land in the large scale. These factories had become major source of income opportunities for the people residing in this area. The topsoil of agriculture land is seen degraded because of soil used as raw materials for producing the brick in the large scale.

The Highway gains in elevation gradually from Bhatedhikuro up to Nalinchowk. The north side of Nalinchowk is seen to be bowl-shaped, terraced, north-facing paddy fields, without any house construction in this land. The south side has some scattered houses and paddy fields. At Bhatedhikuro junction, there is a gravel road leading towards south up to Nakhel village, which is at 1.5km from the Highway. At Nalinchowk intersection, there is a road leading to Deuja Gaun towards north of the Highway and this old settlement is around 500m from the Highway. This settlement is clustered type having around 150 households. Near to Deuja Gaun, another settlement called Dada Gaun is located.

#### **5.1.6.3 Section III: Nalinchowk – Palanse Section**

Moving ahead from Nalinchowk intersection, there are uphill agricultural lands facing towards south at left side and downhill agricultural lands at right side.

Along both sides of the road there are scattered types of houses. Moving eastwards there is a road leading to Pwargaun of formal Chitapol VDC of Suryabinayak Municipality towards north of the Highway and this settlement is around 500 m from the Highway. This settlement is scattered type having around 120 households. Moving ahead from Pwargaun road intersection, towards north there is a road leading to Ashapuri Poultry Farm, this road too leads newly completed 143 feet statue of Kailasnath Mahadev, situated at Suryabinayak Municipality (formal Chitapol VDC), a major attraction spot at present. The Highway gains in elevation gradually from Nalinchowk up to Palanse

Chowk. At Palanse Chowk intersection towards south there is a road leading to Mahatgaun of formal Nangkhel VDC at Suryabinayak Municipality and this settlement is around 200 m from the Highway. This settlement is scattered type consisting around 80 households.

#### **5.1.6.4 Section IV: Palanse – Sanga Section**

Moving ahead of Palanse Chowk Highway starts to meander, gains in elevation gradually from Palanse Chowk to Sanga.

At this section Highway, passes through hill side Suryamode Perungo Community Forest which is facing towards north and below the road level there is private forest. Mainly Salla, Uttis and Chilaune species of trees are found in the forest. Moving ahead along the Highway, at left side below the road level there is a path leading to Siddhibinayak temple, which is a small but well-known temple. As moving eastwards from this temple towards road intersection, the road gains in elevation up to Sanga Chowk.

Sanga is the highest point at about 1,520 m, which is also a saddle point, along the Suryabinayak – Dhulikhel section. Sanga saddle is the end point of Bhaktapur District and start of Kavrepalanchowk District. From the Sanga gate towards north there is a road leading to old settlement of Sanga. Moreover, this road leads to the new Kailasnath Mahadev statue temple. This settlement is of semi-clustered type having around 110 households. Newar are the dominant community residing in this settlement. At Sanga Gate, left side of Highway, there are rows of old mud mortar houses (without any gaps), age more than 40 years, are seen carrying business activities within 10 m from the center line of Highway. Beyond the rows of houses along the Highway, there is a pond named Basuki Pokhari, believed to have historical significance in the past. At Sanga Chowk, the road side economic activities are seen growing very fast due to the flow of people to view the statue of Shiva. Besides economic activities, people are seen engaged in agriculture at hill side of Sanga Bhanjhyang.

#### **5.1.6.5 Section V: Sanga – Bhaisepati – Janagal - Punyamati Khola Bridge site Section**

Sanga to Bhaisepati of this section lies in Banepa Municipality (formal Nasikasthan VDC). Banepa Municipality (formal Nasikasthan Sanga VDC) Ward No: 1, 2, 3, 4, 5 and 6 is bordered by the Highway. As moving eastwards of Highway from Sanga Chowk towards south, there is a road leading to Nepal Police Higher secondary which is situated at uphill terrain, also having scattered types of houses at uphill terrain. There is Police station at right side of Highway within the width of RoW, as moving down the Nepal Police Higher secondary intersection road. As moving ahead from police station at both the sides of road, the houses are seen built in scattered manner.

Towards south of the Highway, there is a road leading to pagoda-styled three storied Nasikasthan Temple. This temple has a great religious value, believed to cure disease when worshipping the goddesses of this temple. Beyond the temple compound, the agriculture patches are used for brick making purposes.

Moving ahead from Nasikasthan Temple towards south, around 200m from the Highway the vacant lands are excavated for brick making purposes, towards north the land is used for agricultural purposes. There is a road leading to settlement Dipdol towards north, around 200 m from the Highway, having around 70 households. Also, there is a road leading to Rautgaun, consists of around 50 households.

As moving eastwards of Highway, there is Bhaisepati Khola Bridge, having span of 16m. The bridge is of RCC type. The river flows from north to south direction, discharge of the river is low at dry season and high at monsoon period. After crossing the bridge, towards south, there is a road leading to Spinal Injury and Rehabilitation Center - moving eastwards of the Highway at left side, there are scattered types of houses seen at Bhaisepati, having around 150 households. Around 100m eastwards from Bhaisepati, at southern side, there is an old road leading Panauti, which is also the access road to inner settlements of Banepa Municipality (formal Nasikasthan Sanga VDC) like Kotthumka, Bansdol and Kharibot. Moving eastwards from Bhaisepati – Panauti intersection road, at right side of the road, there is small scale Yeti Plastic Industries, also scattered type of houses seen at both sides of the Highway.



Janagal Municipality's Ward No: 1, 4, and 8 is bordered by the Highway. Mainly scattered types of houses are seen at both the sides of the road; also temporary sheds are seen running small scale business. At Janagal there are small scale Industries like Curex Pharmaceuticals, Durbar Green house Project and Noodles Industry, situated at southern side of the Highway. These factories had become major source of income opportunities for the people residing in this area. Moreover, at right side there is a road leading to HRDC (Hospital and Rehabilitation Center for the Disable Children), which serves the disabled child.

Moving eastwards from this intersection point, there is Punyamati Khola Bridge having length of 32m. The Bridge is of RCC type. Mainly the siltation problem has been observed below the bridge section. At monsoon the water level is reached to the bridge this is the major problem at this section.

#### **5.1.6.6 Section VI: Banepa Section**

This section covers an area from Punyamati Khola Bridge to Budol. Banepa Municipality's Ward No: 5, 6, 8, 10 and 11 is bordered by the Highway. Banepa is the main city of Kavrepalanchowk District along the Arniko Highway. Dominantly a Newar community resides in this area. Banepa is seen develop as ribbon settlement along the main and lateral roads. As crossing the bridge moving eastwards at right side, there is a road leading to Nala, this road too joins inner settlement of Bhaktapur District. Banepa – Nala road is also used as the shortest route to reach Bhaktapur District from Kavrepalanchowk.

Mainly there are dense houses at northern side of the road. Along the RoW of Highway, there are dense rows of houses (having no gap between the houses), around 118 houses observed at left side and 139 houses observed at right side, around 1.5 Km road length (from Punyamati Bridge to Chandeshwori Khola). All the houses are seen built maintaining the width of RoW but at Banepa Chowk there is a four-story old mud mortar house within the width of RoW. All the houses carry commercial activities in the ground floor and other floors used for residence. The RoW of road is seen encroached for stockpiling of construction materials by hardware owners; temporary sheds for running small business and vehicles are placed in rows at both sides for hire. The city been carrying high commercial activity, the adjoining agricultural lands at northern and southern side of roads have been turning into residential plots in a very fast rate.

Beyond the rows of houses at southern side, there is Banepa Bus Park, the stop point for means of transport plying in this Highway corridor to reach different places of Kavrepalanchowk, Sindhupalchowk and Dolakha Districts. From Banepa Chowk, there is a road leading to Panauti Municipality (southern side); road leading to Ravi-Opi village (northern side) and eastwards road leading to Dhulikhel Municipality also continuation of Arniko Highway.

#### **5.1.6.7 Section VII: Dhulikhel Section**

This section covers from Budol to Dhulikhel Bazaar. Dhulikhel is the district head quarter of Kavrepalanchowk District. Arniko Highway covers Ward no.1, 2, 4, 6 and 7 of Dhulikhel Municipality. As moving ahead from Budol there are scattered types of houses seen at both sides of the road section. At KU Chowk, right side, there is a road leading to Kathmandu University. Kathmandu University is a highly reputed University and its establishment in Dhulikhel has had a great impact on the overall status of the Municipality.

KU Chowk and around University premises, there are scattered houses mainly used by the students studying in the university. Moreover, economic activities are seen around the University premises due to the flow of students. After moving ahead from KU Chowk the road starts to meander, right side of the Highway there is bowl shaped agricultural land facing towards south. Moreover, there are scattered types of houses seen along Highway. As moving eastwards of Highway there are scattered types of houses seen at both sides of the road at Bhasghari.

Dhulikhel is main junction point of BP highway (way to eastern districts of Nepal) and Arniko highway. After the completion of BP Highway and widening of this project road there will be increase in economic activity of this area. Dhulikhel is popular for typical Newari culture, its natural beauty and ancient traditions so that the resorts are open for the tourists to view and observe the culture.

Moreover, after the completion of widening project along Suryabinayak – Dhulikhel section there will be increase in price of land and economic activities along this road corridor.

#### 5.1.6.8 Overall Condition of the Suryabinayak – Dhulikhel Road

Arniko Highway was built under Nepal – China Cooperation and completed in 1966. In the national context, Arniko Highway has played a vital role in political and economic improvement. Arniko Highway (H03) is main link to the hills in the central and Eastern Regions and connects the Kathmandu with China (Tibet autonomous Region of People’s Republic of China). Besides this, a link from this highway at Dhulikhel is to be connected with Terai region in the near future (BP Lokmarga). This highway also branches off to other feeder roads like Lamosangu – Jiri, Dolalghat – Chautara and others. Moreover, this highway connects the urban area of Kathmandu with Thimi, Banepa and Dhulikhel.

At start point, Suryabinayak the road passes through the flat land and from Palanse section the road start to elevate through uphill forest from 1440 to 1500m at Sanga section. The road passes through the forest area at the right side of the road section starting from Palanse to Sanga Section. The average formation width of existing road is 8.5m including 6-6.5m bituminous surface. The general condition of road is satisfactory but due to the increasing volume of traffic, the road needs to be upgraded and widened to 4 lanes from its present 2 lanes.

#### 5.1.6.9 Baseline Information along the Proposed Alignment

The section/chainage wise baseline information along the proposed road alignment from Suryabinayak to Dhulikhel is discussed in Annex 2 G which includes area elevation rang, aspect of the area, Geology, Topography, soil type and land use patterns section/chainage wise.

#### 5.1.6.10 Bridges and Cross drainages

There are three bridges at chainage 1+780, 8+360 and 11+050 respectively of this section of the road. The foundation of the bridge is RCC type with reinforced precast railings. Mainly drinking water pipes are the utilities that are crossing through the bridges are seen. Single pipe cross drainages are available to drain the water from upstream to downstream.

Table 5.1-20 Bridges and Cross drainages along Suryabinayak – Dhulikhel section

Type / Location	Chainage	Length	Width
Sipadol Khola Bridge – at Jagati	1+780	16.00 m	7.00 m
Slab Culvert	5+900	1.50 m	8.00 m
Slab Culvert	6+900	4.00 m	8.00 m
Bikoteshore Khola Bridge – at Bhaisepati	8+360	16.00 m	7.00 m
Slab Culvert	9+000	1.00 m	7.00 m
Slab Culvert	9+900	2.50 m	8.00 m
Punyamati Khola Bridge – at Banepa	11+050	32.00 m	7.00 m

Source: Field Study, Dec. 2017

#### 5.1.6.11 Road-side Drains

Along the road, the side drains are generally observed. However, their conditions are not very functional at various sections. The side drains mostly made of brick masonry are open. All the drains are discharge into natural water courses. The details of the drain are attached in the **Annex-II**.

#### 5.1.7 Study of Construction Material Sources and Available Borrow Areas

As a major source of construction material, Shipaghat site was identified, along the Indrawati River. Aggregates and sand is also available from this source. Another material source is from hill cuttings at Malpi and Rosi Khola areas, near Panauti of Kavrepalanchowk district. All these candidate sources are existing operational sites. The following material sources are located, which are the candidate sites.

Location distribution of the sites is shown in the Map below.



Figure 5.1-4 Location of construction material sources

Table 5.1-21 Candidate Sites of Construction Materials

SN	Location	Material Source	Material Available	Owner-ship	Distance and Time to Banepa				Estimated Yearly Production	
					Banepa ~ Dhulikhel Black-Topped Road	Dhulikhel ~ Zero Kilo	Zero Kilo ~ Sipaghat Gravel Road	Total		Average Time (1 Way)
1	Sindhupalchowk District Kavrepalanchowk District Sipaghat	Indrawati River	<ul style="list-style-type: none"> <li>• Aggregates</li> <li>• Sand</li> <li>• Chips</li> <li>• Dust</li> </ul>	Govt. River Private Land & Crushers	3.7 km	13 km	10 km	<b>26.7 km</b>	2 hrs.	2,450,000 m <sup>3</sup> from 14 Crusher Plants
2	Kavrepalanchowk District Malpi, Kalati Bhumidanda, Ward No. 6	Hill Material	<ul style="list-style-type: none"> <li>• Aggregates</li> <li>• Dust</li> <li>• Base, Sub base</li> </ul>	Private Land & Crushers	Banepa ~ Malpi 7.46 km		Malpi ~ Kalati 1km	<b>8.46 km</b>	30 min.	175,000 m <sup>3</sup> From 5 Crusher Plants
3	Kavrepalanchowk District Roshi	Hill Material	<ul style="list-style-type: none"> <li>• Aggregates</li> <li>• Dust</li> <li>• Base, Sub base</li> </ul>	Private Land & Crushers	Banepa ~ Malpi 7.46 km		Malpi ~ Roshi 6.5 km	<b>13.96 km</b>	1 hr.	200,000 m <sup>3</sup> From 5 Crusher Plants

Source: Field Study, Jan. 2018

### 5.1.7.1 Details of Sipaghat Material Source Site:

Presently Major Material Source Site :

Material Source – River bed material from Indrawati River

- 16 km stretch of Indrawati River where river material gets deposited

Material Extraction Permitted by Government – for 2 months in January and February only

Material Collection, Crushing done by 14 Crusher Plants – situated in the River Banks

Average Daily Trucks (7 m<sup>3</sup>) per Crusher = 100

Total Production dispatched = 100 x 14 x 7 = ~ 9800 m<sup>3</sup>

Average Days of Operation per year = 250 days

Average Yearly Production = 250 x 9800 = 2,450,000 m<sup>3</sup>

Average Years of Production by Crushers = 7 years

Major Consumption Areas – Kathmandu, Banepa, Dhulikhel, Melamchi

### 5.1.7.2 Legal Standing Material Source Sites

Local Government, (District Coordination Committee Office DCC (formerly District Development Committee, DDC) Under Ministry of Federal Administration and Local Development, provides legal permission to operate the Crusher Plant. Crusher Plants are operated under Ministry of Industry's guidelines, after environmental approvals are received by the Crusher Plant operators. Taxes are levied by the District Coordination Committee, as local taxes, in volume basis, at the rate of NRs. 247 per Cubic Meter.

### 5.1.8 Candidate Soil Disposal Sites

As a preliminary investigation, the candidate site for soil disposal sites was identified. Two sites are identified as candidate sites, which are adjacent to each other, and is at 5 km from Banepa, at Panauti. In case that a new waste disposal areas is prepared for the project after contractor's decision, Initial Environmental Examination will be implemented for mitigation in the beginning of implementation stage.

Table 5.1-21 Candidate Sites of Soil Disposal Sites

SN	Location	Area Available	Estimated Fill Vol. with 60cm depth	Land Ownership	Distance and Time to Banepa		
4	Kavrepalanchowk District, Panauti	36,000 m <sup>2</sup>	21,600 m <sup>3</sup>	Private Land Mr. Pashupati Agrawal	Banepa ~ Panauti <b>Black-Topped</b> 5 km	5 km	15 min.
5	Kavrepalanchowk District, Panauti	12,400 m <sup>2</sup>	7,440 m <sup>3</sup>	Binod Khatri (c/o Shree Hari KC)	Banepa ~ Panauti <b>Black-Topped</b> 5 km	5 km	15 min.

Source: Field Study, Jan. 2018

### 5.1.9 Water Resources and present water use around the proposed Sanga Tunnel Area

Water resources around the Sanga area depends on both surface and groundwater. Tunnel construction and existence may cause changes on water flow of both surface and groundwater. It is required to monitor the water volume/water level of each water resource during the period of construction and operation. Present situation and baseline data is described as below;

#### 5.1.9.1 West Portal area of Tunnel

##### (1) Irrigation Water Situation (Surface Water)

Bagar Khola is the main stream (Kholshi) that passes just before the west portal of proposed tunnel i.e. Palanse, Bhaktapur. This Kholshi confluence with another stream about 400 m below the west portal of tunnel and the place is called Dovan. The emerging new stream below Dovan, mixes with another rivulet named Kholcha Khola coming from Sanga pass near Kathmandu Fun Valley. After this, the single stream joins Hanumante Khola downstream.

Field survey and interaction with local residents around the west portal of proposed tunnel revealed that Bagar Khola is a perennial stream and has water all the year round. Less discharge is observed during dry season especially March/April, but is never dry. Farmers around west portal of proposed tunnel are using this water for agriculture. Some farmers to the northern side of proposed tunnel are using water from Kholcha Khola emerging from Sanga pass. According to the farmers, water from these streams is sufficiently available for two cycle crops in a year and seasonal vegetables.

Farmers around Palanse, that is, western portal of proposed tunnel, generally have three cycles of crops in a year, two food crops with seasonal vegetables in between. Paddy, wheat, mustard are the major food crops planted and vegetables like potatoes, cauliflower and leafy items are the major seasonal vegetables grown around the project area. Generally, paddy is planted during June/July during monsoon season and harvested during October/November. After paddy, farmers plant either wheat or mustard depending upon their requirement and harvest during January/February. Seasonal vegetables are planted alternatively when the land will be vacant or as supplementary crop.

Kathmandu Fun Valley is not using water from these streams but has its own source of ground water from deep boring. Farmers around the west portal demanded not to ruin these stream water due to project activities but to conserve and make even better useable after project implementation.



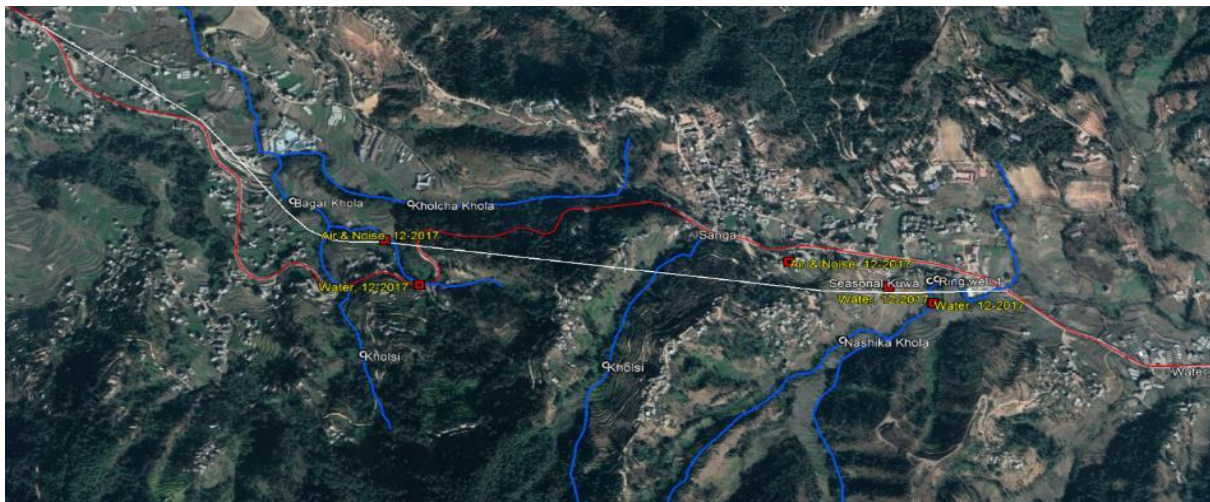


Figure 5.1-5 General Map of Watersheds at Palanse and Nashika Area

## (2) Drinking Water Situation

All the general people, farmers and restaurants around the proposed tunnel area have been using piped water for drinking purpose. Source of these piped water is the upstream region of Bagar Khola and Aashapuri hill which lies 700 m above Arniko Highway at Palase. Individual and group piped water supplies were observed during field survey, and were used for drinking and domestic purpose. No wells, Kuwas (small shallow aquifer) and boring water were observed around this area. Thus, the proposed tunnel activities seem to have no effect on drinking water supplies around the west portal. Water use survey of the farmers and general people, their location, crop pattern and feedbacks around the west portal of project area is given in Annex II-C5-Table A.

### 5.1.9.2 East Portal area of Tunnel

#### (1) Irrigation Water Situation

East portal of the proposed tunnel emerges about 300 m South of Nashika Temple of Kavre district covering Nasikasthan and Karkigau. Nashika Khola is the main stream that passes just below the east portal of proposed tunnel. This is the main stream lying along the new road alignment emerging from tunnel and joining the existing road. It meets another major stream Mahadev Khola about 1100 m below the northern side of eastern portal of tunnel. Field survey and interaction with local residents around the east portal of proposed tunnel revealed that Nashika Khola is a perennial stream and has water all the year round. Less discharge is observed during dry season especially March/April, but is never dry. Farmers around east portal of proposed tunnel are using this water for agriculture. According to the farmers, water from this stream is sufficient for agricultural activities for lands around this area. Farmers around the east portal demanded not to degrade this stream water during construction of road and tunnel but to conserve during project implementation.

Farmers around eastern portal i.e. Nasikasthan and Karkigau also have three cycles of crops and seasonal vegetables in between the two food crops when the land will be empty. Paddy, wheat, mustard and maize are the major food crops planted and vegetables like potatoes, cucumber, bitter gourd, cauliflower and leafy items are the major seasonal vegetables grown around the project area. Generally, paddy is planted during June/July during monsoon season and harvested during October/November. After paddy, farmers plant either wheat or mustard depending upon their requirement and harvest during January/February. Farmers around this area also plant potatoes as cash crop after paddy.

#### (2) Drinking Water Situation

All the general people and farmers around the east portal of proposed tunnel have been using piped water for drinking purpose. Source of these piped water are the upstream region of Nashika Khola which lies 700 m uphill of eastern portal of proposed tunnel. Two families own ring wells and are deriving water as an alternative source for daily activities. Individual and group piped water supplies were observed during field survey, which were used for drinking and domestic purpose. A seasonal

Kuwa (small shallow aquifer) was also observed below the Nashika temple which lies just below the eastern portal of tunnel. A stone tap lies just below the western side of Nashika Temple where locals were seen to be washing cloth and bathing. According to them this stone tap is an alternative source of water when piped water will be out of order or insufficient.

People on the light hand side of Arniko Highway while moving from Kathmandu to Dhulikhel and opposite of Nashika Temple also use the same source of drinking water as that around Nashika Temple i.e. upstream region of Nashika Khola brought from locally laid pipelines. Thus, the proposed tunnel activities seem to have little or no effect on drinking water supply around the east portal. Water use survey of the farmers and general people, their locations, crop pattern and feedbacks around the east portal of project area is given in Annex IIC5-Table B.

### 5.1.9.3 Mid-Section above Proposed Tunnel

#### (1) Irrigation Water Situation

The middle section of the proposed tunnel lies below the settlements of Sanga-Ittacha and Namuna Bastii of Kavrepalanchowk district. These two villages is separated by a small Kholsi (stream) with seasonal flow. This stream has a small catchment area and the flow length is short thus is seasonal. It meets with Kholcha Khola at Sanga pass and flows towards Kathmandu valley. Water from this Kholsi (stream) is not sufficient for agriculture, thus people around this area depend on rain water for farming i.e. monsoon of June/July.

Farmers around Sanga-Ittacha depend on water from this Kholsi for agriculture which is seasonal so is less productive but farmers from Namuna Bastii also has access to water from Nashika Khola so their land is productive compared to farmers from Sanga-Ittacha. People in this areas plant paddy in June/July when water is sufficient and harvest in October/November. After paddy, farmers plant potatoes where water is available and wheat or mustard where water is unavailable. So, farmers around these areas generally have two cycles of crop.

#### (2) Drinking Water Situation

Every household above mid-section of the proposed tunnel depend on piped water for drinking and household purpose. The source of these piped water is jungle of Kakrabarii which is about 600 m uphill of settlement. Excess water after drinking is used for farming seasonal vegetables and other food crops. A Kuwa (small shallow aquifer) is observed at the tunnel alignment which is reported to be dry after disastrous earthquake of 2015. No wells, other live Kuwas (small shallow aquifer) and boring water were observed around this area.

People around the main market place of Sanga pass of Arniko Highway use water brought from Khalchok area which is 700 m hillside and towards the southern corner of Sanga pass. Locally laid pipe lines are available for each household that supplies drinking water. Alternatively, this area also has four stone sprouts whose source is nearby Uttis (*Alnusnepalensis*) Forest and acts as supplementary supply of drinking water when piped water becomes insufficient.

Thus, the proposed tunnel activities seem to have no impact on drinking water supply above the mid-section of proposed tunnel. Water use survey of the farmers and general people, their locations, crop pattern and feedbacks above the mid-section of proposed tunnel area is given in AnnexIIC5-Table C.

### 5.1.9.4 Present Water Level around Sanga Tunnel Area (Ground Water)

People and farmers around the Western Portal of proposed tunnel are using piped water whose source is upstream region of Bagar Khola around Ashapuri. In this side of the tunnel, there are no sources of ground water like ring wells, boring wells or Kuwas that has been used as source of domestic or drinking water. There are small streams whose discharge increases during rainy season and decreases in the dry seasons. The settlements above the proposed tunnel alignment are also using piped water and no live wells were observed during field survey. A spring well (Kuwa) was observed below Sanga-Ittacha which is dry since earthquake of 2015.

At the Eastern Portal of proposed tunnel, although every household are using piped water for drinking and domestic purpose, two families have ring well whose details are given below. There is also a spring well (Kuwa) which have seasonal water. A stone tap lies just below the western side of Nashika Temple where locals were seen to be washing cloth and bathing. A dry and unused ring well was noticed at a private land of the eastern tunnel part. Water level information is given below:

Table 5.1-22 Water Level Survey of the water source of Tunnel Area

S.N	Sources	Owner	Construction Year	Depth (m)	Present Water Level
1	Ring Well	Ramji Dulal	2008	7.08m	1.29m
2	Spring (Kuwa)	Community	About 50 years	0.38m	0.22m
3	Ring Well	Niranjan Shrestha	2010	5.25m	1.90m

Source: Field Study, Jan. 2018

There are small stream water sources below the eastern portal of proposed tunnel and people are using water from it for irrigation. Change in water level before and after construction should be monitored observing water levels of these ring wells, stone tap, Kuwa and discharge of water in nearby streams.

### 5.1.9.5 River Environment (Surface Water)

There are three small streams that come across the project area are seasonal rivers that have minimum discharge during the dry season. In the monsoon season the Punyamati River is known to come across the bridge due to the siltation problem at the foundation of bridge. This river has sediment the larger volume of sand at the pillar of the bridge. In the city area like Suryabinayak, Banepa the dense population across the road side discharge their sewers to the river. Moreover, the use of fertilizers in agriculture land and the current practice of sand excavation from river had degraded the natural river environment.

## 5.2 BIOLOGICAL ENVIRONMENT

### 5.2.1 Protected Area and Endangered Species

There are no protected areas along the target project area. The nearest Shivapuri National Park is around 15km from the starting point of the project, Suryabinayak. It has not been reported any endangered species around the project site. Most of the area is already developed by socio-economic activities.



Source: Google Map

Figure 5.2-1 Location Map of the Nearest National Park and the Project Site

### 5.2.2 Roadside Trees along Suryabinayak – Dhulikhel Road

After the completion of the road in early 1970s, trees mainly Lahare Pipal (*Populus detoides*) were planted along both sides of the road. These trees gave an attractive aesthetic view of the road, but they



later became tall and grew to be weak and caused danger to the road users. So, in 2002, all these trees were cut from Koteshwor to Suryabinayak area. The trees of Kangio variety were spared from cutting.

The major plants along road side include Kangiyo (*Grevillea robusta*), and some others. In addition to the road-side Kangiyo trees, there are two old Pipal (*Ficus religiosa*) Trees at the road side (one at Nalinchowk and other at Janagal) which are very large used as a Chautari (resting place) and worshiped by local people with religious faith. These two old Pipal trees also need to be cleared. For cutting some religious trees, Pipal, along the project road, it has not been observed any opposing opinion from residents and it is common to cut such trees for road improvement project in Nepal.

Apart from that there are two young Pipal, one Rudraksha and one Bel trees also on this section which bears the religious beliefs and significances. Apart from the above mentioned Kangiyo trees species, there are bamboo bunches at 16 places along the road side with the following numbers of trees/pole size tree species on road side that needs to be cut during road widening/upgrading work. The total of 484 numbers of different species of standing road side trees need to be clear for the widening of this proposed road section. Available road side trees that need to clear are shown in the Table 5.2-1.

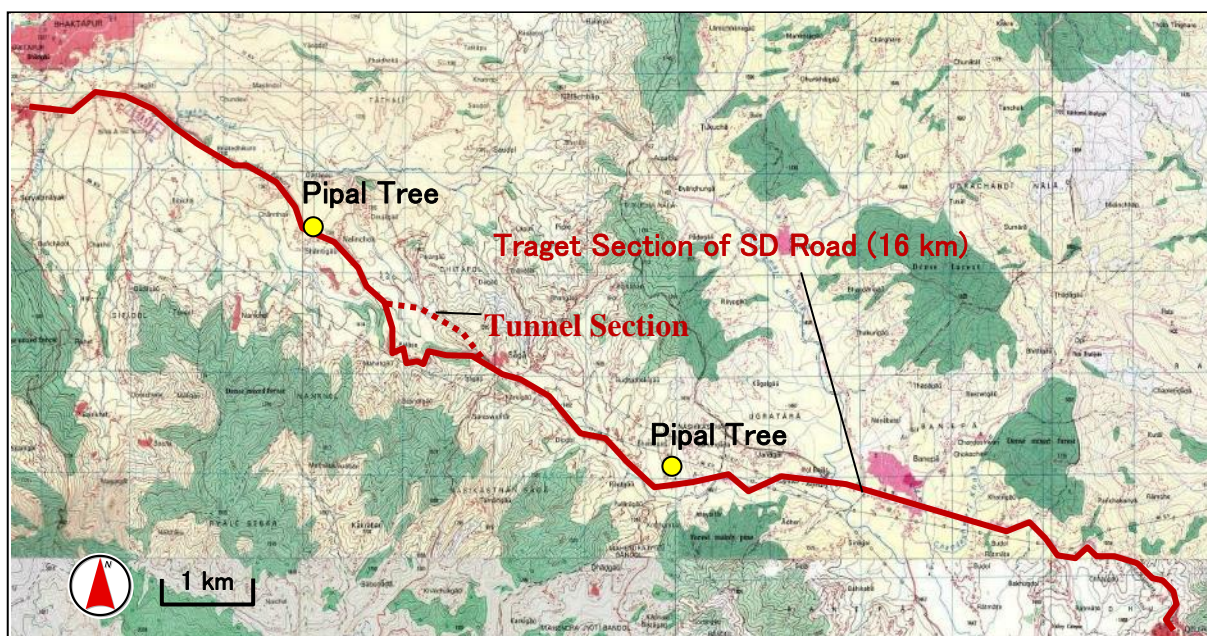


Figure 5.2-2 Location Map Pipal Tree

Table 5.2-2 Road-side Trees Affected

No.	Local Name	Scientific Name	Nos. of Trees		Total Trees
			Pole Size	Tree Size	
1	Utish	<i>Alnus nepalensis</i>	61	7	68
2	Kangiyo	<i>Grevillea robusta</i>	32	320	352
3	Bakaino	<i>Melia azederach</i>	12	4	16
4	Masala	<i>Eucalyptus spp</i>	1	8	9
5	Pipal	<i>Ficus religiosa</i>	2	3	5
6	Rudraksha	<i>Elaeocarpus ganitrus</i>	0	1	1
7	Bel	<i>Aegle marmelos</i>	0	1	1
8	Khari	<i>Imperata cylindrical</i>	3	4	7
9	Padmero	<i>Fraxinus pennsylvanica</i>	3	7	10
10	Mayal	<i>Pyrus pashia</i>	5	0	5
11	Koiralo	<i>Eucalyptus spp</i>	0	2	2
12	Kotmero	<i>Litsea polyantha</i>	4	0	4
13	Paiyu	<i>Prunus cecidois</i>	4	0	4
<b>Sub- Total</b>			<b>127</b>	<b>357</b>	<b>484</b>
<b>Total</b>			<b>484</b>		

Source: Field Study, Jan. 2018



### 5.2.3 Community Forest at Sanga Area: Suryamode Perunge Community Forest

#### 5.2.3.1 Forest and Trees through new Approach Road to Sanga Tunnel

The approach road to the proposed tunnel at Sanga, passes through a single Community forest named Suryamode Perunge Community Forest, of 21.87 ha. established in 1999. There are 200 members associated with this community forest at present. This community forest lies on the north facing sloping sides. The common species found in the community forest are as below.

Table 5.2-3 Common Species in the Community Forest

Location	Local Names	Scientific Name	Remarks (DBH*>30cm = Tree, DBH 10-30 cm = Poles)
Palanse Area	Salla	<i>Pinus roxburghii</i>	Tree
	Uttis	<i>Alnus nepalensis</i>	Tree and Pole
	Bakaino	<i>Melia azedarach</i>	Tree
	Mauwa	<i>Engelhardtia spicata</i>	Tree
	Chilaune	<i>Schima wallichii</i>	Tree and Pole
Sanga Area	Uttis	<i>Alnus nepalensis</i>	Tree and Pole
	Lapsi	<i>Choerospondias axillaris</i>	Tree
	Salla	<i>Pinus roxburghii</i>	Tree and Pole

\*DBH: Diameter at Breast Height, Source: Field Study, Jan. 2018

The west portal of the proposed tunnel (Palanse side) lies at the northern boundary of Suryamode Perunge Community Forest. The majority of the forest lies towards the southern side of the project area, and on the hill sides. Only a small strip of forest area which is 100m comes close to the tunnel's west portal. Hence, the total area required by the west portal access road of this forest is 0.5 ha.

The field visit and interview with the concerned stakeholders of the community forest depicted that least effect will be caused on the community forest due to extension of the road and tunnel project. However, few numbers of trees are seen to be needed for its clearance on both the left hand side and right hand side of the proposed new approach road.

#### 5.2.3.2 Forest and Trees at Western Portal Side

The west portal of the proposed tunnel is situated within RoW of the present Arniko Highway. In addition, the portal lies in the northern boundary of Suryamode Perunge Community Forest, some trees need to be cleared, as shown in the following Table 5.2-3.

Table 5.2-4 Tree Cutting Necessary at Suryamode Perunge Community Forest

S.N	Location	Name of Forest	Local Name	Scientific Name	Nos. of Trees		Total Trees
					Pole Size	Tree Size	
1	West portal of tunnel	Suryamode Perunge Community Forest	Lapsi	<i>Choerospondias axillaris</i>	0	9	9
			Mauwa	<i>Engelhardtia spicata</i>	0	70	70
			Salla	<i>Pinus roxburghii</i>	54	18	72
			Uttis	<i>Alnus nepalensis</i>	7	3	10
			Chilaune	<i>Schima wallichii</i>	0	2	2
<b>Total Trees of Community Forest at West Portal</b>					<b>61</b>	<b>102</b>	<b>163</b>

Source: Field Study, Jan. 2018

It is required that, 163 trees are to be cleared from Suryamode Perunge Community Forest which are of different species dominated by Salla and Mauwa.

As indicated in the 'Work Procedure for Providing the Forest Land for Other Use, 2063 and Forest Regulations, 1993, which state that proponent will manage a nursery to grow tree sapling and plant them in 1:25 ratio and additional 10 percent for each cleared tree. The Act makes it a requirement that every step be taken to ensure a healthy forest environment and conservation of the existing forests. The state has the capacity to providing land for project implementation provided that no adverse impacts on the environment occur. The state can also designate a forest as "protected" if the forest

land is of social, cultural or environmental importance. The government can provide parts of any type of forest for the implementation of national priority plan with the assurance that it does not adversely affect the environment. No activities can be performed on a protected forest without compensating the government of the adverse impacts that the project may cause. The Regulation further elaborates legal measures for the conservation of forests and wild animals.

After discussion with the users of the Suryamode Perunge CFUG and chairman of the same community forest, Mr. Arjun Ranamagar, the replantation area for the compensatory plantation of 4,500 saplings, in the ratio of 1:25 for cut trees, allocated by them is at Block No. 5 of Suryamode Perunge CF, which lies above the existing Arniko Highway of Palanse, is possible and recommended. Alternatively, location is also available at Block No. 2 of the same community forest at Dalledhunga, Bhaktapur. DoR will monitor the replantation activities through progress report from CFUG, and will take necessary countermeasures by cooperation with Department of Forests, if needed.

### 5.2.3.3 Private Trees at Western Portal Area of Sanga Tunnel

The new approach road alignment also passes through some private land where some trees exists, which are owned by individual people. Details of the trees to be cleared, location and ownership are given in the following Table. Trees which are to be cleared from the private land is to be compensated after discussion with the owner according to the size and mass of the cleared species at the prevailing market price.

Table 5.2-5 Private Trees Cutting Necessary at Palanse

Location	Owner	Local Name	Scientific Name	Nos. of Trees		Total Trees	Remarks
				Pole Size	Tree Size		
Palanse, Dovan to Bagar Khola	Deep Bahadur K.C	Uttis	<i>Alnus nepalensis</i>	36	6	42	Need appropriate compensation
		HadiBel	<i>Aegle sp.</i>	4	-	4	
		Mayal	<i>Pyruspashia</i>	2		2	
Above Bagar Khola	Kumar Ranamagar	Uttis	<i>Alnus nepalensis</i>	16	4	20	
		Lapsi	<i>Choerospondi asaxillaris</i>	2	-	2	
West portal	SanuThapaMagar	Uttis	<i>Alnus nepalensis</i>	10	2	12	
<b>Total</b>				<b>70</b>	<b>12</b>	<b>82</b>	

Source: Field Study, Jan. 2018

### 5.2.3.4 Private Trees at Eastern Portal Area of Sanga Tunnel

The east portal of the proposed tunnel lies behind the Nashika temple, just above the Nashika Khola and below the existing brick factory. The east portal of the tunnel and its approach road lies at a private land, where some trees are present. Details of the trees to be cleared, location and ownership are given in the following table.

Table 5.2-6 Private Trees Cutting Necessary at Nashika Area

Location	Owner	Local Name	Scientific name	Nos. of Trees		Total Trees	Remarks
				Pole Size	Tree Size		
Behind Nashika Temple	GauriNuchhe Pradhan	Uttis	<i>Alnus nepalensis</i>	0	6	6	Need appropriate compensation
Behind Nashika Temple	Rajaram Dulal	Uttis	<i>Alnus nepalensis</i>	1	5	6	
		Chilaune	<i>Schima wallichii</i>	0	1	1	
Behind Nashika Temple	Sanubabu Dulal	Uttis	<i>Alnus nepalensis</i>	4	7	11	
South of Steel Tank Factory	Angad Khadka	Uttis	<i>Alnus nepalensis</i>	6	6	12	
South of Steel Tank Factory	Badri Joshi	Uttis	<i>Alnus nepalensis</i>	6	3	9	
<b>Total</b>				<b>17</b>	<b>28</b>	<b>45</b>	

Source: Field Study, Jan. 2018

These trees which are to be cleared from the private land are to be compensated after discussion with the owner according to the size and mass of the cleared species at the prevailing market price.

### 5.2.3.5 Summary of Total Trees to be cut

Following Table shows the total numbers of trees to be cut by this Project, for the improvement and Tunnel construction.

Table 5.2-7 Summary of Total Trees to be cut by the Project

	Nos. of Trees		Total Trees
	Pole Size	Tree Size	
Road-side Trees	127	357	484
Suryamode Perunge Community Forest	61	102	163
Private Trees at Palanse Area	70	12	82
Private Trees at Nashika Area	17	28	45
<b>Total</b>	<b>175</b>	<b>499</b>	<b>774</b>

## 5.3 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

Suryabinayak–Dhulikhel the Six Lane Road Project is located in Bhaktapur and Kavrepalanchowk districts in which Bhaktapur lies within the Kathmandu valley. The socio-economic and cultural environment within the SD road section is presented below.

### 5.3.1 Population and Communities

With latest formed Suryabinayak Municipality in Bhaktapur 4 municipalities such as Bhaktapur, Suryabinayak, Banepa and Dhulikhel falls under the SD road section. The former two are located in Bhaktapur and the latter two falls under Kavrepalanchowk district.

According to the population census 2011, total population of Bhaktapur and Kavrepalanchowk district is 294,287 and 375,221 respectively. The population distribution between male and female of Bhaktapur and Kavrepalanchowk district is 50.05 percent and 49.95 percent respectively. Likewise the population of male and female of Kavrepalanchowk district is 47.32 percent and 49.89 percent respectively. The total population of the project affected Municipalities is 154,873 where the average household size is 4.5. The comparative ratio of population between two census years and project affected Municipality is given in the following table.

Table 5.3-1 Population distribution of the Project Affected Municipalities

Municipalities	Total HH		% Change	Total Population		% Change
	2001	2011		2001	2011	
Bhaktapur Municipality	15,722	17,639	12%	91,796	81,748	-11%
Suryabinayak Municipality	4271	4777	11%	22416	21004	-6%
Banepa Municipality	5,846	8,479	31%	31,010	37,838	18%
Dhulikhel Municipality	2,625	3,279	25%	13,444	14,283	6%
<b>Total</b>	<b>28,464</b>	<b>34,174</b>	<b>20%</b>	<b>158,666</b>	<b>154,873</b>	<b>-2%</b>

Source: CBS, 2011

### 5.3.2 Ethnic Composition

Multi-ethnic composition is the characteristics of population where Brahmin, Chhetri and Janajati are the major caste/ethnic groups residing along the project area. 73.65 percent populations are Janajati (mainly Newar), followed by Chhetri (35.37%) and Brahmin (22.82%) respectively. Population of Dalit covers 3.87% and the others occupied 8.92 percent among the project affected families across the section. Project should prepare livelihood enhancement programs targeting to project affected poor and vulnerable groups significantly. The caste/ethnic composition of the project affected Municipalities are presented as Table 5.3-2.

Table 5.3-2 Caste/ethnic Composition of Project Affected Municipalities (%)

Municipalities	Brahmin	Chhetri	Janajati	Dalit	Others	Total
Bhaktapur Municipality	3.48	4.41	87.44	0.64	4.03	100
Suryabinayak Municipality	3.36	43.56	42.06	2.8	8.2	100
Banepa Municipality	17.6	5.6	71.2	2.4	3.2	100
Dhulikhel Municipality	15.77	15.03	59.46	3.86	5.87	100
<b>Total Average</b>	<b>22.82</b>	<b>35.37</b>	<b>73.65</b>	<b>3.87</b>	<b>8.92</b>	

Source: CBS, 2011

Although it was observed that there are several different ethnics along the project site, the situation is very common in Nepal. According to instruction from MOFE and based on past project cases, the Project does not need to prepare ingenious people plan, because there are no marginalization and socio-economical differences among different ethnics around Kathmandu area and long the Arniko Highway. In addition, ingenious people plan is considered in remote mountainous area principally in Nepal based on past cases.

### 5.3.3 Direct Impact Area of the Project (DIA)

The project covers 4 Municipalities namely Bhaktapur Municipality and Suryabinayak Municipality of Bhaktapur, likewise, the Banepa and Dhulikhel Municipalities of Kavrepalanchowk district. The proposed road alignment passing through the different area as ward wise distribution is illustrated in following table.

Table 5.3-3 Direct Impact Areas and settlement of the Project Area

S.N	Municipality	Ward No.	Settlements
1.	Bhaktapur Municipality	8,7,5 & 4	Jagati
2.	Suryabinayak Municipality	8, 9 & 10	Suryabinayak, Chamthali, Bhatedhikuro, Nalinchowk, Palanse
3.	Banepa Municipality	8,7, 10, 13 & 14	Sanga, Bhaisepati, Pul Bazar, Banepa Bazar, Budol
4.	Dhulikhel Municipality	8,7, 6,3 & 4	KU Chowk, Dhulikhel Bazar

Source: Field Study, Nov. 2017.

The ward wise population distribution along the Zone of Influence is illustrated in Table below. However, the distribution of the Project Affected Families (PAFs) within the DIA has also mentioned in the report. The population and the households of the Project influence area (ZoI) is also shown in following table.

Table 5.3-4 Zone of Influence of Households and Population

District	Municipality	Affected Wards in DIA	Households within ZOI		Population within ZOI							
			Total		Total	Male	Female					
Bhaktapur	Bhaktapur Municipality	8	1456	4410	6694	21326	3440	3254				
		7	1564		7563		3790	3773				
		5	629		3287		1606	1681				
		4	761		3782		1876	1906				
	Suryabinayak Municipality	6	1096	2834	4683	12390	2337	2346				
		8	611		2701		1361	1340				
		11	316		1412		669	743				
		10	200		889		444	445				
		9	221		993		515	478				
		12	390		1712		880	832				
		Kavrepalanchowk	Banepa Municipality		13		760	5198	3332	23294	1597	1735
					14		310		1500		736	764
10	954			3888	1672	1916						
8	1407			6189	3132	3057						
7	981			4877	2446	2431						
6	786			3508	1767	1741						
Dhulikhel Municipality	8		386	2247	1816	9546	874	942				
	7		296		1287		607	680				
	6		187		847		404	443				
	3		558		2401		1214	1187				
		4	820		3195	1715	1480					
<b>Total</b>			<b>14689</b>		<b>66556</b>	<b>33382</b>	<b>33174</b>					

Source: CBS, 2011

### 5.3.4 Settlement Patterns

Most of the settlements along the SD road section are clustered and semi-clustered nature. Settlements of the market areas in Suryabinayak, Sanga, Banepa and Dhulikhel have cluster and developed as ribbon shape along the road corridor because of its commercial activities. Adarshachowk, Jagati, Nalinchowk, Jorpati, Palase, Pul Bazar, Budal's settlements are semi-clustered by type. Settlements of

the old areas like Banepa, Sanga, Bhaktapur and Nalinchowk have found compact however the remaining settlements along the road are disperse and liner. About 60 percent of the houses of the project areas are consist of RCC buildings while remaining are semi concrete with CGI sheet/ tile roofing and huts.

RCC buildings are found in large quantities in Banepa Bazar because of its long historic development that extended in liner pattern and also extended over the broader area now. The road side houses are considered to be high commercial value that have rented for different shops in ground floor and used as own residential purpose for the upper floors. The road side structures of Banepa Bazar is almost in set-back area at 25 yards (22.5m) from the center line, where only a single structure falls under this section.

Moreover, the other settlements like Nalinchowk, Palanse, Sanga, Bhaisepati, Pul Bazar, Budol, and KU Chowk have been growing faster due to easy access and increasing commercial activities along the road corridor. As the population increased various economic activities are also emerging in these areas by which pressure upon the land has been raising accordingly.

### **5.3.5 Description of Some Major Settlement Areas around Sanga Tunnel Area**

#### **5.3.5.1 Palanse: Western Portal of Tunnel**

The western portal of proposed tunnel lies at Palanse, Bhaktapur which is the eastern corner of Kathmandu valley. Arniko Highway curls and climbs the hills at Palanse to cross the Kathmandu valley. Palanse is located at the foothill of Aashapuri mound and between small ridges. 100 houses, sheds and business centers are located around Palanse. Out of total 100 infrastructures, about 20 of them are restaurants and refreshment centers. Most the people in this area are dependent on agriculture, some on services while others on trading and business. Settlements are all scattered around the agricultural fields at the base of Suryamode and Bandeshowri Community Forests, most of them concentrated around Arniko Highway. Small streams are widely spread around Palanse area, defining that it is a ridge area.

#### **5.3.5.2 Nasikasthan and Karkigau: Eastern Portal of Tunnel**

The eastern portal of proposed tunnel lies at Nasikasthan, towards the southern side of Nashika Temple and below Karkigau. This area lies immediately below Sanga pass after crossing Kathmandu valley and is relatively a flat land. Initially, the flat land was used for agriculture which now is continuously occupied by settlements. Most of the settlements are concentrated around Arniko Highway except Karkigau which lies at the northern base of Aashapuri hill facing eastern side of Namuna Basti. A longitudinal settlement can be seen at the left hand side of the proposed eastern tunnel portal, all along the right hand side of Arniko Highway while moving from Kathmandu to Dhulikhel. Other houses are located towards the left hand side of Arniko Highway. 80 houses and sheds are located at Nasikasthan with few shops and restaurants. People around this area have mixed occupations like farming, service, trading and foreign employment. Similarly, about 50 houses and sheds are located at Karkigau with most of the people dependent on agriculture.

#### **5.3.5.3 Namuna Basti: Mid-Section above proposed Tunnel**

Namuna Basti lies just above Sanga Pass towards the western side of Arniko Highway. The settlements area is based on a nose of a ridge with Sanga-Ittacha on its western side and Karkigau on its eastern side. Nashika Khola on the east and a small stream on the west flows at the base of the settlement separating the ridge from other hills. Few traditional model houses have been constructed at the top of the ridge to develop the settlement as sample village, thus the place is named as "Namuna Basti" meaning sample village. 50 houses and sheds are located at the top the ridge at Namuna Basti. Most of the people of this area are dependent on agriculture while few on service and foreign employment.

#### **5.3.5.4 Sanga-Ittacha: Mid-Section above proposed Tunnel**

Sanga-Ittacha also lies just above Sanga Pass and is a part of the eastern boundary of Kathmandu valley. It lies on the way to Kakrabari and is the head of Palanse where the western portal of proposed tunnel is situated. The proposed tunnel passes just below the settlement of Sanga-Ittacha. 40 houses

and sheds are located at Sanga-Ittacha and they are also located on top of a ridge as that of Namuna Basti. Most of the people of Sanga-Ittacha are dependent on agriculture with few on public service. Farmers of this area rely on the terraced farms towards the eastern side of settlement.

#### **5.3.5.5 Sanga Settlement**

Sanga pass is the eastern gate of Kathmandu valley and has a historical importance. This pass is in use from ancient time when people from the eastern part of Nepal, Tibet and east India used to walk and use this pass to enter Kathmandu valley. This place was the resting and refreshment center during that time. When vehicles enter Nepal, present Arniko Highway connected Kathmandu with Dhulikhel using this pass which now connects Tibet and other national highways. About 200 houses and sheds are located at Sanga Pass, most of them concentrated towards the northern side of Arniko Highway.

### **5.3.6 Some Public Structures in the vicinity of Sanga Tunnel Area**

#### **1) Jorpati Higher Secondary School**

The Jorpati Higher Secondary School has been running at this place since 2001. Previously it was running next to the Arniko Highway at Jorpati. It is a Higher Secondary School with grade 1 to 12. Total number of students, at present, is 270 according to Principal of this school. The total numbers of teachers are 35 where 19 are permanent government and the remaining 16 are privately appointed ones. The School has 1100 m<sup>2</sup> (2 Ropanis 3 Aana) of land, where school buildings are located. It has a narrow strip of land only and does not have a playground. The existing school building is a 3 storied RCC framed structure. Presently, the Ministry of Education has also granted NRs. 3.6 million to construct a building adjacent to the existing school building, replacing a shed. All the pre-construction processes (Loan agreement, approval of design from the municipality etc.) have been completed and construction is expected to start soon after contract finalization.

#### **2) Water Fun Park (Kathmandu Fun Valley)**

A Water Fun Park (named Kathmandu Fun Valley) is also located at the Palanse area. The main parts of the park is avoided by the road alignment design but auxiliary structures, such as gate complex, restaurants, will be affected.

#### **3) Private Steel Water Tank Factory**

At the east-tunnel portal site, adjacent to Arniko Highway, a steel water tank factory (named CFWY Steel Tank) is operating for the last 2 years. The approach road alignment affects the entire factory area. The factory land is about 1200 m<sup>2</sup> and it has a factory shed of 300 m<sup>2</sup> area. The factory operators have leased the land from Mr. Angat Khadka (local land owner) for ten years with agreement. The factory operators have invested something NRs. 70 million to run this factory. At present, 10 people are being employed by this factory.

### **5.3.7 Economic Activities**

Along the Suryabinayak – Dhulikhel road, economic activities such as business and agriculture has been running as a subsistent basis. Suryabinayak, Banepa and Dhulikhel being the major market centers run businesses while other areas are dominated by agriculture activities. During the focus group discussion with project affected people in Bhaktapur Municipality area, people expressed their views that about 40 percent people are involved into business, 20 percent in agriculture, 25 percent in service and the remaining are engaged into domestic work, labor and foreign employment. Likewise, Kavrepalanchowk section, about 45 percent project affected people have involved into business, 25 percent in agriculture and the 20 percent with services. Remaining people are involved into labor, foreign employment and household works for their livelihood.

People who are residing along the main and lateral roads predominately engaged in business and mostly retail markets for food, daily commodities and some construction hardware materials etc. Jagati vacant land is used for stock piling of brick by the factory owners. Moreover, at Palanse and Sanga highway areas café/ restaurants are established for income generation as an earning source. There are 138 small huts and the Thatched/corrugated roofing structures found along the alignment having different business by owned households or rented households.

Dhulikhel is considered as a touristic place being nearby Kathmandu for the scenic views of Himalayas and the Newari culture so that resorts and restaurants are established and operating various

other businesses too. Since the large number of vehicles passes through this road, six petrol pumps have also been operating along the SD road section. These are some different income generating and earning activities are running along the SD road section.

### 5.3.8 Land Holding Pattern and Land Use Situation

According to Census 2011, the average cultivated land holding size of Bhaktapur district is 0.16 hectare whereas in Kavrepalanchowk district 1.15 hectare. The socio-economic surveyed shows that 27.8 percent households have less than 0.025 ha of land and 7.3 percent households have 0.025 to 0.05 hectares of land holding size. 30.7 percent of households have 0.1 to 0.2 ha of land and 21 percent of households have more than 0.2 ha of land holdings categorically.

About 10 years back, the land along the corridor was used as agriculture purpose. Most of the lands were used for Paddy and wheat cultivation however rest of others used as seasonal vegetables farming. Since the recent year's development due to changing demands, the land owners have sold their lands to residential house builders – mostly the adjoining and proximity area with the main roads. So the attached land with the Highway is used as residential purpose excessively. At present, people of Nalinchowk, Palanse and others have still used their road side land for agriculture purpose. The major crops grown here are paddy, maize, wheat, potato and vegetables.

### 5.3.9 Migration Situation

The trend of out-migration is negligible from the Municipality areas but in-migration is significantly high. The volume of in-migration is rapidly rise in the Municipality as compare with the census 2001 but the ratio of in-migration is negative in project affected Municipalities that envisaged in census 2011. The Maoist Warfare had affected to increase the population by migration in these areas before a decade from the Sindhupalchowk, Dolakha and Ramechhap districts specifically. The motive of migration is to getting better socio-economic opportunities and secures life. Step-migration is also characterized within the Municipality after increasing population and created business possibilities along the roadside. Although migration is the natural phenomenon but the increasing population has been raising pressure upon public facilities and the land price of the area significantly.

### 5.3.10 Directly Affected Infrastructures and Land

#### 5.3.10.1 Houses/ Structures Affected

Within the project areas, development of settlement has been taking place at a very rapid rate. The field observation and the socio-economic survey show that altogether 234 different house/structures will be affected by the SD road project as showed in Table 5.3-5.

There is not equal delineation of RoW across the SD road by which people do not convinced to accept the two different provisions of RoW applied nearby areas. The RoW across the Sanga to Banepa (Chandeshwori Khola) is only 22.5m or 25 yards however, remaining all sections has 25m in both sides. The new improved SD road design has taken wider area to improve curve and maintained design speed. Since the widening of the SD road will not much impact upon residential structures within the setback area but the curve improvement design has further affected beyond the existing RoW. A large amount of compensation cost needed for the affected land and structures. The total numbers of different types of house/structures are given as table below.

Table 5.3-5 Summary of Households to be acquired by Project

Location	Households Nos.	Remarks
<b>A. Curve Improvement Works and RoW maintenance</b>		
1. RoW maintenance in Existing Road	161	
2. New Curve Improvement in Existing Road	57	
<b>Sub Total of A</b>	<b>218</b>	
<b>B. New Approach Road to Sanga Tunnel</b>		
1. West Portal side (Palanse Area)	10	
2. East Portal side (Nashika Area)	6	
<b>Sub Total of B</b>	<b>16</b>	
<b>Total including Sanga Tunnel (A+B)</b>	<b>234</b>	

Source: RAP Report, 2018

A detail list of affected households within Project Area, as per RAP 2018 Report, is included in **Annex IV-G**.

Table 5.3-6 Summary of Types of Households to be acquired

No.	House Type	Number of House Structures
1	Simple Hut/Sheds	3
2	Thatched roof, walls constructed with bamboo and mud/stone	10
3	Tile/iron roof, walls constructed with brick/ mud/stone	126
4	Iron sheet/roofing with stone/ brick wall/cemented plaster	47
5	RCC Building	48
6	Movable kiosk /wall/fence etc.	0
<b>Total</b>		<b>234</b>

Source: RAP Report, 2018

### 5.3.10.2 Land Requirements

Additional private land, which lies beyond the present RoW of 25m on either side, is required for the Project for road improvement works. They are mainly for Curve improvements at 40 locations.

For construction of new approach road, additional area of land will be required.

Table 5.3-7 Summary of Additional Land to be acquired by Project

	Area (in m <sup>2</sup> )	Area (in Ropanis)	Remarks
<b>A. Curve Improvement Works</b>			
1.Land Improvement for Curves Improvement	55,063.16	108.24	40 locations in 14.91 km
2.Land for Curve Improvement at KU Chowk	15,678.25	30.82	3 locations near KU Chowk
<b>Sub Total</b>	<b>70,741.41</b>	<b>139.06</b>	
<b>B. New Approach Road to Sanga Tunnel</b>			
1.West Portal side (Palanse Area)	44,000.00	86.49	West Portal side road = 580 m
2.East Portal side (Nashika Area)	18,648.00	36.66	East Portal side road = 370m
<b>Sub Total</b>	<b>62,648.00</b>	<b>123.15</b>	
<b>Total including Sanga Tunnel</b>	<b>133,389.41</b>	<b>262.21</b>	

Source: RAP Report, 2018

A detail list of affected lands for curve improvement and new approach road , as per RAP 2018 Report, is included in **Annex IV-K**.

### 5.3.11 Cultural and Religious Environment

The cultural and religious activities of the residents' people are found very interesting. People celebrate Hindu and the Buddha religion according to their tradition intensively. Dashain, Tihar, Buddha Purnima, Lohshar and Jatras (Bisket Jatra and the others) are the major festivals performed by the people visiting different temples and shrines nearby their settlements. The Bisket Jatra is celebrated in Sanga and Bhaktapur area in the 1<sup>st</sup> Baishakh each year as like New Year of Nepal. In this Bisket Jatra (carnival), Idol of Siddhi Ganesh will demonstrate in this Sanga festival. However, the project does not affect such cultural performance.

#### 5.3.11.1 Temples / Shrines and Cultural Sites

Along the RoW of the road, there is one temple (Nasikasthan Temple) of Sanga and a few small shrines. Of these, the Ganesh and Shiva shrine at Nalinchowk, Shiva Shrine at Sanga, and Ganesh Shrine at Janagal are very close to the road, however, these structures are not affected by the project. Nasikasthan Temple of Sanga along with other few small shrines does not have any impact with the new tunnel option from Palanse to Sanga with new alternative road alignment with tunnel.





Figure 5.3-1 Small Hindu Shrine along Roadside at Jorpati

### 5.3.11.2 Cultural Environment

The project area comprises of a multicultural environment. Mainly Barahmin, Chhetri, Janajati and Dalit are the major caste/ethnic groups residing along the project area. Majority of them, the Newar community is found in Suryabinayak, Jagati, Sanga, Banepa and Dhulikhel. The Newar communities follow their own cultural tradition which includes festivals, rituals, marriages and other social values uniquely. Dashain, Tihar, Nava Durga Jatra, Maghi Sakranti, Holi, Bisket Jatra, Hile Jatra (Ghingtangmuni Jatra), Gai Jatra, Lakhe Dance, Krishna Asthami Jatra, Harisiddhi Trishakti Jatra and Bhagwati Jatra are the main feasts and festivals celebrated in the project area.

### 5.3.11.3 Public Water-Stands



Figure 5.3-2 Non Functioning Small Water Sprout

The local people depends watersources such as water from tube wells and natural sprouts or “*Dunge-Dhara*”. Fast urbanization of the areas has also negatively affected the water sources of these *dharas* and only few are producing water. Among the five public water sprouts along the SD road section one is not functioning in Bhaktapur area. The widening of the road will affect four functioning water sprouts of the project area within the proposed design in Kavre section. In addition to the public water stand, the private households have constructed their water taps at Nalinchowk and some other areas that also needed to be relocated.

Table 5.3-8 Public water stands along the RoW

S.N	Chainage	Location	Side (R/L)	Distance from Center Line	Type	Remarks
1	1+890	Bhatedhikuro	Right	10 m	Dhunge Dhara	Not Functioning
2	7+255	Sanga	Right	9 m	Kuwa	Functioning
3	7+895	Sanga	Right	9 m	Kuwa	Functioning
4	8+860	Sanga	Left	12 m	Kuwa	Functioning
5	14+300	Dhulikhel	Right	22m	Kuwa	Functioning

Source: Field Study, Nov. 2017

### 5.3.11.4 Basuki Pond

A local pond is located at Sanga towards the left hand side of Arniko Highway while travelling from Kathmandu to Dhulikhel, shown in the figure below.

The pond is named after the ‘king of snakes’ (Basuki) and is said to be constructed 100 years back to supply water to extinguish accidental fires of surrounding houses of Sanga. This pond covers an area

of 48m x 30m (1,440 m<sup>2</sup>), (3 ropani 14 Anna) and has a perennial source of water underground and stream water. This pond has an enclosed brick masonry wall.



Source: Google Map / JICA Survey Team 2018

Figure 5.3-3 Location Map of Basuki Pond

The Basuki Pond Management Committee has cleaned and extended the pond with its own initiation and utilized it for the fishery purpose. Depth of the pond is approx. 3.5m where water level is observed to be of 1.5m depending on the availability of water from its natural source and rain water.

The Basuki Pond has become socio-environmental pride and also source of income of the society. The pond has annual earnings of NRs. 200,000 per year, however 30 percent of its earnings goes to purchase fingerlings (Bhura) and fish feeding materials. The remaining fund is used for the improvement of pond and social welfare. It is regulated by the “Basuki Pond Management Committee”.

It is estimated that the impact on the pond water by the tunnel component might be limited, however, the water level of the pond should be monitored during both construction period and operational period, periodically.



Figure 5.3-4 Basuki Pond at Sanga

### 5.3.12 People's Perception about the Project

Project area people were widely consulted about the SD road widening and upgrading plans. During the formal and informal meetings with local people and representatives, they have raised their issues regarding RoW and compensation to their affected properties. They said that the DOR should provide the compensation of land and the structures that have within RoW. The affected people have formed struggle committees to pressurize the government for achieving compensation in both districts. They have view that before starting the road improvement project; DOR should deal the issues of amicable compensation modality. Despite some issues, the majority of local people have also perceived to construct the 6 lane road as soon as possible.

#### 5.3.12.1 Opinion on Desired Compensation

On the desired compensation type, the majority of people have indicated that cash compensation is acceptable. The cash compensation of the project affected properties should be determined as proportionate with market price or corresponding with the replacement cost.

### 5.3.12.2 Opinion on Rehabilitation and Resettlement Measures

The project affected people have to resettle from the current area with a suitable resettlement plan so that they get a house similar to their present house nearby location. Families which have not male household head indicated that a suitable house be built by the project for them. Some families who have been generating income from their houses, e.g. from renting out to shops, renting out to families have voiced concerns about such losses. They have demanded amicable compensation scheme for such loss, in addition to compensation for hardships, rehabilitation allowance, and transportation allowance.

### 5.3.13 Health and Sanitation Situation

Being adjacent area with capital city-Kathmandu, different health institutions are providing health services to surrounding people along the SD road section. Bhaktapur District Hospital, Bhaktapur Cancer Hospitals are serving people in Bhaktapur and Spinal Injuries Hospital, Dhulikhel Hospital, Janagal Disable Curing Hospitals and different Health posts and Sub-health posts are also providing health services to the periphery people. The narrow and the congested existing roadway have great difficulties to reach emergency cases of patients to these hospitals or outreach health services in Kathmandu. Different institutions are operating in the health field both districts. Sub- health posts and the Health posts are the major health service provider in the project area but Hospitals are the major service provider in urban center. Besides, there are so many others health institutions also operating in different sector in the districts. Being close proximity area with major cities like Kathmandu, Bhaktapur, different NGO/INGOs are also operating health service by establishing different health institutions like Disabled Cure Center, Spinal Injuries and curing cancer. The overall health service providers' institutions by districts are presented in table below.

Table 5.3-9 Health Service Providers by Districts

S.N	Institutions	Districts	
		Bhaktapur	Kavrepalanchowk
1	Hospital	1	2
2	Institutions	8	3
3	PHCC/HP	9	14
4	SHP	12	80
5	PHC Outreach Clinic	50	306
6	EPI Clinic	144	332
7	NGO/INGO	20	29
8	FCHV	189	986

Source: CBS Census, 2011

Being scarcity of sufficient supply of water, the sanitation system is poor in the SD road section. Despite the proclamation of open defecating free district-Bhaktapur has found poor sanitation system in the SD road section. The private safety tank and drained out into the rivers is common here likewise the road side drainage across the SD road corridor is not maintained due to undulating landforms and the distribution of settlements over there.

### 5.3.14 Educational Status

Educational institutions are running largely nearby Suryabinayak- Dhulikhel section. Kathmandu University is located between Banepa and Dhulikhel, the Khwopa Engineering College of Bhaktapur and other Multiple Campus and renounced Higher Secondary Schools like Birendra Sainik Higher Secondary School at Sallaghari, Dipendra Police Higher Secondary School of Sanga and some other Higher Secondary Schools are running nearby this SD road section in Banepa and Dhulikhel Municipality areas. All these renounced educational institutions are providing quality education in different level and faculties in this area.

The proportion of completed level of education by the districts people has shown that around 3 percent people who are the schooling age are out of enrolment in two districts. The proportion of primary completed in Bhaktapur and Kavrepalanchowk districts is 23.40% and 37.64% respectively. In Lower Secondary level, 17.73 % got in Bhaktapur and 20.44 % in Kavrepalanchowk district. As the level increased ratio of education of Kavrepalanchowk is decreased as comparing with Bhaktapur district. Education Status of these districts is also shown in the Table5.3-11.

Table 5.3-10 Completed Level of Education by the Districts People

Districts	No Schooling	Primary	LS School	Secondary	SLC	Plus 2	Graduate	Post Graduate	Non-formal	Others	Not Stated
<b>Bhaktapur</b>	7660	54560	41340	30724	35627	31289	14992	5788	193	9736	1282
<b>%</b>	<b>3.28</b>	<b>23.40</b>	<b>17.73</b>	<b>13.18</b>	<b>15.28</b>	<b>13.42</b>	<b>6.43</b>	<b>2.48</b>	<b>0.08</b>	<b>4.18</b>	<b>0.55</b>
<b>Kavre</b>	8373	94278	51323	29516	26087	16058	5208	1536	166	16113	1783
<b>%</b>	<b>3.34</b>	<b>37.64</b>	<b>20.44</b>	<b>11.79</b>	<b>10.42</b>	<b>6.41</b>	<b>2.08</b>	<b>0.61</b>	<b>0.07</b>	<b>6.43</b>	<b>0.71</b>

Source: CBS 2011

### 5.3.15 Social Infrastructure Facilities

#### 5.3.15.1 Water Supply

The physical landform of this area is as like fragmented valley surrounded by small foot hills which has become the origin place of water resources over the area. Piped drinking water is the main sources of drinking water across the project area however underground and traditional water spouts are also utilised as drinking sources of water to the roadside houses. Scarcity of drinking water in the dry season is also genuine problem due to lack of sufficient source of water over the area.

Tap/piped water is the main sources of drinking water to households in Bhaktapur and Kavrepalanchowk by 78% and 79 % respectively. More than 10 percent people of project districts depend on well/kuwa and around 5 percent by Spout water. Remaining are depending on Tub well, rivers/stream and sources of others in the both districts. The limited sources of water, lack of sufficient water supply project and the traditional distribution system are some hindrances in this sector. The rehabilitation work for these damaged facilities of water supply should be required consultation with concern community and authority. The ratio of drinking water facilities of the districts is presented in table below.

Table 5.3-11 Sources of Drinking Water by type and districts

Districts	Total HH	Tap/Piped	Tub/ Hand pump	Well/Kuwa	Spout	River/stream	Other	Not Stated
Bhaktapur	68557	53438	2607	6637	3342	42	2081	410
<b>%</b>	-	<b>77.95</b>	<b>3.80</b>	<b>9.68</b>	<b>4.87</b>	<b>0.06</b>	<b>3.04</b>	<b>0.60</b>
Kavre	80651	63832	217	10188	4760	540	417	697
<b>%</b>	-	<b>79.15</b>	<b>0.27</b>	<b>12.63</b>	<b>5.90</b>	<b>0.67</b>	<b>0.52</b>	<b>0.86</b>

Source: CBS 2011

#### 5.3.15.2 Cooking Energy

Using of cooking energy is diversified between two districts. Bhaktapur as being nearby capital area, 69 percent of the households used LP Gas and 25 percent firewood. Adversely, being by mostly hilly area 78 percent of the households of Kavre has used firewood and 16 percent by LP Gas. Nearly 4 percent of the households of Kavrepalanchowk used Bio-gas. Kerosene, electricity and other sources of cooking energies are used in these districts. Table below shows about the situation of the using status of cooking energy by households in the districts.

Table 5.3-12 Fuel Used for Cooking by Districts

Districts	Total HH	Wood/ firewood	Kerosene	LP Gas	Cow Dung	Bio-gas	Electricity	Others	Not Stated
Bhaktapur	68557	17272	2095	47463	56	190	125	941	415
<b>%</b>	-	<b>25.19</b>	<b>3.06</b>	<b>69.23</b>	<b>0.08</b>	<b>0.28</b>	<b>0.18</b>	<b>1.37</b>	<b>0.61</b>
Kavre	80651	63092	548	12959	60	3213	31	49	699
<b>%</b>	-	<b>78.32</b>	<b>0.68</b>	<b>16.07</b>	<b>0.07</b>	<b>3.98</b>	<b>0.04</b>	<b>0.06</b>	<b>0.87</b>

Source: CBS 2011

#### 5.3.15.3 Market Centers

Bhaktapur, Banepa and Dhulikhel are the major market centers along the SD road section. As being center location, Banepa Bazar provides greater market service to its periphery sub-centers and the resident people in wider areas. The Banepa Bazar is one of the main agriculture collection center and market place for industrial commodity to the periphery sub-market centers. Dhulikhel is also serving as touristic place and a market center to its periphery people likewise Bhaktapur also provides attraction as touristic city and services to its residential people.

### 5.3.15.4 Communication and electricity

Tele communication is the popular means of communication along the SD road section. Telephone lines are extended along the both sides of the existing road in both districts. Altogether 490 telephone poles including metal, cement and wooden poles are found standing within the RoW. Likewise, 588 electric poles are also extended similarly along the road corridor which should be relocate and rehabilitate corresponding with concern NEA authority by the project developer. Though, the cell phone has become the most utilized means of communication in this area. Postal service is also operating in the Municipality level via *Ilaka* postal offices.

### 5.3.15.5 Transportation

Bus, Micro bus, good's carriage trucks and Tipper are the major means of transportation similarly the two stock vehicles are abundantly passes through this road. The great numbers of quarry material loaded tippers and the construction material like brick, stone and sand were carried through this route to capital city-Kathmandu. After operation up BP Highway and connection of Mid-hill Highway from different districts, a huge number of small and medium types of vehicles have been passing through this road. So, the SD road has become as like bottle neck location for the north-eastern region of Nepal.

### 5.3.15.6 Agriculture Development

The area is rich for agriculture production due to fertile soils and marketing facility. Vegetable farming is one of the major agriculture products in winter and dry season however paddy as cereal crops grown mainly in rainy season. It was the tendency of growing wheat in winter season but due to population pressure along the corridor that have been changing as residential area caused decreased of crops production recently. The District Agriculture Development Offices (DADOs) and the Agriculture Service Centers provides agriculture services to needy people in the area. Besides, animal husbandry for dairy products and poultry farming has become profitable occupation in these areas now. But the risk of this sector has also been facing greatly time to time.

Cereal and cash crops are also produced in the districts. Paddy, Maize, Wheat, millet, Buckwheat and Barley are the major cereal crops while Oil seed and potato as cash crops produce as subsistence level. Lentils, chick pea, Black gram, Soya bean are also produce different areas and various amount in both the districts. Cattle, Buffalos, Goat, Sheep, Pigs, Fowl and duck rearing are significantly run in these districts. Poultry is the hugely done business in Bhaktapur likewise goat, cattle and buffalos rearing for meat and milk in Kavre district.

## 5.4 Socio-economic Information of the Surveyed Affected household

The demographic characteristic is used to identify the nature and the activities of project affected people along the SD road section. The socio-economic information will be utilised to see the existing situation of the project affected people and insight to address the issues accordingly. The census/socio-economic survey questionnaire has kept in **Annex VIII**.

### 5.4.1 Demography of Affected Municipalities

The population composition of project affected surveyed households is presented in table below.

Table 5.4-1 Population Distribution of Project Affected Surveyed Household

Districts	Municipality	Households	Male	Female	Total
Bhaktapur	Bhaktapur Municipality	14	45	39	84
	Suryabinayak Municipality	99	287	271	558
Kavrepalanchowk	Banepa Municipality	78	203	192	395
	Dhulikhel Municipality	43	123	120	243
<b>Total</b>		<b>234</b>	<b>658</b>	<b>622</b>	<b>1,280</b>

Source: Census/Socio-economic Survey, Jan-May 2018

The socio-economic status of PAPs is presented here based on the information obtained from the socio-economic survey of 234 Households that is 82% of the total 384 affected HHs. The survey was targeted to census socio-economic survey however few land/house owners could not catch at the survey time that have rented their house to others and lived outside from the project area. The total population of surveyed households is 1,280 where 658 (51.40%) are male and 622 (48.60%) female.

Detail of surveyed household is attached in **Annex IV-G**.

### 5.4.2 Age Category of Project Affected Population

The age wise population distribution of PAPs has analyzed here to see the active and dependent population ratio along the project area. The survey shows that the population between 0 to 14 years which is defined as 'minor age' covers 24.1% of population while other dependent aged group (>60 years) covers by 9.4%. More than two-third (69.5%) of the project affected population are known as economically active age group (15-59 years). Age wise population ratio can also show the availability of work force along the road corridor if the project needed to use them in the project operation phase. Table below shows the age wise distribution of population along the project area.

Table 5.4-2 Population size by age group

Districts	Municipality	HHs	>4 Yrs	5-14 Yrs	15-59 Yrs	<60 Yrs	Total
Bhaktapur	Bhaktapur Municipality	14	6	8	55	15	84
	Suryabinayak Municipality	99	49	76	399	34	558
Kavrepalanchowk	Banepa Municipality	78	25	75	263	32	395
	Dhulikhel Municipality	43	26	44	134	39	243
Total		234	106	203	851	120	1280
%			<b>8.2</b>	<b>15.9</b>	<b>69.5</b>	<b>9.4</b>	<b>100</b>

Source: Census/Socio-economic Survey, Jan-May 2018

### 5.4.3 Caste/Ethnic Composition

Ethnic composition plays vital role still in various Nepalese societies that reflect directly in the socio-economic status and living standard of the people in general. Therefore, ethnicity, culture, and religions are also account as important factors needing attention when new projects are conceived, designed, and implemented. The responses of these social attributes to outside interventions should be considered according to the social value and attitude prevailing in the societies as like tradition. After establishment of democracy in 1990, huge numbers of project were introduced in different development sectors, the discriminated castes and ethnic population were considered to be uplifting their socio-economic status mainly in donor funded projects however emphasize has also given to the government funded project in some extent these days. Consideration of class (such as poor, disabled, women headed poor households, single woman etc.) should be more rational to address in the context of changing socio-economic status of caste/ethnicity in project area while implement the resettlement action plan. The ratio of Brahmin and Chhetri along the project areas is found 4.7 and 24.8 percent respectively. Majorities (52.6%) of them are Janjaties (mainly Newar and Tamang) who residing along the SD road area while 2.6 percent of Dalit and the same ratio by others are found in the project area. The Municipality wise caste/ ethnic composition of the project affected households are presented in table below.

Table 5.4-3 Ethnic Composition of the project Affected Households

District	Municipality	HHs	Brahmin	Chhetri	Janjati	Dalit	Others	Total
Bhaktapur	Bhaktapur Municipality	14	-	-	14	-	-	14
	Suryabinayak	99	1	37	44	5	12	99
Kavre	Banepa Municipality	78	2	13	42	0	21	78
	Dhulikhel Municipality	43	8	8	23	1	3	43
Total		234	11	58	123	6	36	234
%			<b>4.7</b>	<b>24.8</b>	<b>52.6</b>	<b>2.6</b>	<b>15.4</b>	<b>100</b>

Source: Census/Socio-economic Survey, Jan-May 2018

### 5.4.4 Occupational Status

The socio-economic survey of the affected families' shows that more than one-third (26.9%) of the populations depend on trade/business. Likewise, agriculture and households work that covers 20.3 and 18 % respectively. 15.4 % of the project affected population depends on different service sectors. Majority of the households depends on Trade/business. The 18 percent of domestic workers are also contributing agriculture, business and domestic works necessarily. Dependency on labor, foreign employment, and pension are also responded as their earning occupation. The number and proportion of occupational status of PAPs have been presented in the table below.

Table 5.4-4 Occupational Status of Surveyed HHs (not included student and &lt; 6 yrs.)

Occupations	Bhaktapur District		Kavrepalanchowk District		Total	%
	Bhaktapur	Suryabinayak	Banepa	Dhulikhel		
Agriculture	8	93	63	37	201	20.3
Business/Trade	20	99	85	61	265	26.9
Service	8	84	45	15	152	15.4
Domestic work	25	29	78	45	177	18
Labor	5	28	8	10	51	5.1
F. Employment	0	23	11	200	43	4.3
Others	7	40	19	31	97	9.8
<b>Total</b>	<b>51</b>	<b>356</b>	<b>279</b>	<b>188</b>	<b>986</b>	<b>100.0</b>

Source: Census/Socio-economic Survey, Jan-May 2017

#### 5.4.5 Educational Status

The census/socio-economic survey along the SD road with project affected households shows that 89.4 % of the populations are literate. The overall educational status of the project affected population is comparatively high. Of the total literate population, about 40 percent of them are having higher education (+2 to Bachelor) status. Nearly 14 percent of the literate population can read and write that means they gained or acquired such skill of knowledge by non-formal education or something else. However, 10.4 percent of the project affected populations are found illiterate. The Table 5.4-5 below shows the educational status of the project affected surveyed households.

Table 5.4-5 Educational Status in the Surveyed Households

Districts	Municipality	Illiterate	Read write	1-10	10 passed	Certificate	Bachelor	Total
Bhaktapur	Bhaktapur	4	11	13	15	13	13	69
	Suryabinayak	37	44	198	58	83	29	449
Kavrepalanchowk	Banepa	47	32	104	68	32	15	298
	Dhulikhel	15	52	39	23	26	18	173
Total		103	139	354	164	158	75	989
%		10.4	14.1	35.8	16.6	15.6	7.6	100.0

Source: Census/Socio-economic Survey, Jan-May 2018

#### 5.4.6 Skilled Availability

Very limited persons among project affected people seem to have acquired training skills on various activities from which they would have employed and support their livelihood. 81 persons out of 164 of PAPs have computer knowledge and 23 have different technical knowledge found with them. In addition, 29 persons have sewing skill and another 7 persons have driving skill. Carpenter, mason and some other kinds of skill are also found among them which can utilize in project implementation phase. The Table below shows the skill availability among them.

Table 5.4-6 Status of Skill persons of Surveyed households

Districts	Municipality	Mason	Carpenter	Sewing/cutting	House wiring	Driving	Technical work	Computer	Others	Total
Bhaktapur	Bhaktapur	0	1	5	0	0	2	10	0	18
	Suryabinayak	1	2	10	0	2	9	49	0	73
Kavrepalanchowk	Banepa	0	1	8	1	4	11	5	10	40
	Dhulikhel	0	5	6	0	1	1	17	3	33
<b>Total</b>		<b>1</b>	<b>9</b>	<b>29</b>	<b>1</b>	<b>7</b>	<b>23</b>	<b>81</b>	<b>13</b>	<b>164</b>

Source: Census/Socio-economic Survey, Jan-Feb 2017

#### 5.4.7 Land holding size

The widening and improvement of SD road project has designed alignment mainly in existing road passes through urban and semi urban area nearby Dhulikhel, Banepa and Bhaktapur. Since the area is away from the settlement is used as agriculture activities traditionally. Being surveyed with the adjoining area of the RoW land holding is found small in size. The surveyed shows that 27.8 percent households have less than 0.025 ha of land likewise 7.3 percent households have 0.025 to 0.05 hectares of land holding size. 30.7 percent of households have 0.1 to 0.2 ha of land and 21 percent of households have more than 0.2 ha of land holdings. The presented status of the land holding can't show the actual situation of land holding size of the project affected households due to lack of



database and unitary land recorded system in the country. The Table 5.4-7 shows the land holding situation of the project affected households.

Table 5.4-7 Distribution of Households by Land Holding Size

Districts	Municipality	> 0.025 ha	0.025-0.05 ha	0.05-0.1 ha	0.1-0.2ha	< 0.2 ha	Total
Bhaktapur	Bhaktapur Municipality	11	1	3	2	1	18
	Suryabinayak	12	4	14	24	14	68
Kavre-palanchowk	Banepa Municipality	30	10	9	31	21	101
	Dhulikhel Municipality	4	0	1	6	7	18
Total		57	15	27	63	43	205
%		27.8	7.3	13.2	30.7	21	100

Source: Census/Socio-economic Survey, Jan-Feb 2017

#### 5.4.8 Annual Household Income, Income Range of Affected Households

Comparatively, 7.7% of the project affected households falls in low income group who earn less than NRs 0.05 million (NRs.50, 000) per year. About 32.1% of the project affected families are in a range of annual income between NRs 0.1 to 0.2 million (NRs.100, 000 to 200,000) that occupies medium level of income group. Likewise, 41% of the surveyed households have annual income between NRs 0.2 to 0.5 Million (NRs.200, 000 to NRs 5000, 000) who is account as higher income group that covers 19.2% of the households. The project can consider the low-income groups while implement the livelihood enhancement programs according to the RAP. Average annual income of the project affected households by Municipalities is shown in Table 5.4-8.

Table 5.4-8 Average Annual Income range of the Surveyed Households by area

Municipality	< 0.05 Million	0.1-0.2 Million	0.2-0.5Million	> 0.5 Million	Total
Bhaktapur Municipality	1	4	6	3	14
Suryabinayak Municipality	6	27	41	25	99
Banepa Municipality	6	29	34	9	78
Dhulikhel Municipality	5	15	15	8	43
%	7.7	32.1	41.0	19.2	234

Source: Census/Socio-economic Survey, Jan-May 2018

#### 5.4.9 Food Sufficiency from own Agriculture production

Food sufficiency is measured in terms of months that the families' sufficiency of own farm production for the annual household's needs. According to the results of the survey, only 4.27% households have food sufficiency for the whole year. A majority (67.95%) of the households have only food sufficiency less than 3 months by their own production because most of the households depend on business and wage-based economy. Nearly one-fifth (17.95%) of the households' have food sufficiency up to 3 to 6 months. The food sufficiency situation of the project affected families will be one of the logical parameter to address in favor of compensation and other allowances to them. The following Table 5.4-9 shows the food sufficiency status of the project affected families across the SD road project.

Table 5.4-9 Food Sufficiency Months of the HHs from Own Production by months

District	Municipality	> 3 Month	3-6 Months	6-12 Months	< 12 Months	Total
Bhaktapur	Bhaktapur Municipality	4	4	5	1	14
	Suryabinayak Municipality	75	15	5	4	99
Kavre-palanchowk	Banepa Municipality	50	15	8	5	78
	Dhulikhel Municipality	30	8	5	0	43
Total		159	42	23	10	234
%		67.95	17.95	9.83	4.27	100

Source: Census/Socio-economic Survey, Jan-Feb 2017

#### 5.4.10 Copping Strategies of Food Deficit

The project affected households apply several supplementary options as coping strategy of food deficit. About 82 % of the households make their food deficit by business activities. Likewise, 11.6% households depend on wage labor and 6.8 % by remittance. If the business of the project affected

families lose due to road intervention there will be great impact upon their livelihood status. Therefore, business allowance is also essential for the project affected people. The number of project affected families who depend on their alternative livelihood is presented as Table 5.4-10.

Table 5.4-10 Alternative means of Food Deficiency

Districts	Municipality	Business	Wage Local	Remittance	Total
Bhaktapur	Bhaktapur Municipality	5	2	0	7
	Suryabinayak Municipality	70	5	0	75
Kavrepalanchowk	Dhulikhel Municipality	23	-	5	28
	Banepa Municipality	22	10	5	37
<b>Total</b>		<b>120</b>	<b>17</b>	<b>10</b>	<b>147</b>
<b>%</b>		<b>81.6</b>	<b>11.6</b>	<b>6.8</b>	<b>100</b>

Source: Census/Socio-economic Survey, Jan-May 2018

#### 5.4.11 Cultural Background of the Project area

The multiple caste/ethnic population and religious composition of the project municipalities reflects the prevalence of the socially, religiously and culturally mixed population and diversification in the tradition and socio-culture condition. They have their own typical characteristic and manifests as such music and dance; art and craft, folklore and folktales; languages and literature, festivals and celebration and foods and drinks.

Dashain, Tihar and Teej are the most popular festivals among Hindu (Brahmin and Chhetri) whereas *Mohani*, *Ma: Puja*, *Jatras* and *Swanti* (Tihar) are famous among Newar community. A variety of foods and drinks are consumed during these festivals. ‘Brata’ the fasting is also of great importance and it is popular among several religious groups in the project areas. Buddha Jainti, Shivaratri, Janaipurnima and Nepal Sambat is other important festivals. Similarly there are several pilgrimage sites, temples, stupas and monasteries situated in the Project areas and they are somehow associated with these groups. The temples and monasteries are place of worship (daily and/or in special occasion) by Hindu and Buddhist and other religious group as well.

#### 5.4.12 Summary of Resettlement Action Plan (RAP)

A report on Resettlement Action Plan (RAP), 2018, for the Project Affected People has been prepared separately, based on the Project’s Preliminary Design, which has estimated the costs for compensation of private land and housing properties, and other mitigation and enhancement costs. The RAP, if required, will be updated during the Final Detail Design phase, following the final alignment and design components of the Project.

#### Summary of Possible Impact on PAPs

The RAP Report 2048, has based its results on the Census/Socio-economic survey conducted in the period of January to February 2015, December 2017 to February 2018 and again updated in May 2018 along the road alignment (Suryabinayak to Dhulikhel) based on the JICA Preparatory Survey’s preliminary design, which has estimated number that a total of 1488 persons from 284 households, including 10 institutions, to be affected, because of acquisition of their land and houses, by the Project, for the improvement of the alignment (and addition of tunnel section). The summary of the affected land and houses, as presented in the RAP Report, 2018, is discussed briefly hereunder.

#### Land and House Structures Required for Acquisition

Private land is one of the major private properties affected by the Project. Project affected land is basically for: private land beyond the existing ROW – required for curve improvement and approach road for tunnel. In total, 13.33 hector of private land will be required for the Project for curve improvements along the existing road (at 43 locations), and new approach road to tunnel portals at Nalinchowk and Nashikasthan (total length 1010m). The Tables below shows the Summary of land requirements and Project Affected households and numbers of people.

Table 5.4-12 Summary of Land Required for Acquisition

S.N.	Municipalities	Land Area (Sq. m.)	Remarks
1	Bhaktapur	663.69	Land required for curve improvement
2	Suryabinayak	71,961.42	Land required for curve improvement and Tunnel Approach Road (West side)
3	Banepa	35,329.16	Land required for curve improvement and Tunnel Approach Road (East side)
4	Dhulikhel	25,438.14	Land required for curve improvement
<b>Total</b>		<b>133,392.41</b>	

Source: RAP Report 2018

Table 5.4-11 Summary of Project Affected Household Structures and its Population (PAPs)

Type of Loss	Number of Project Affected Household Structures			Number of Project Affected Persons (PAPs)		
	Legal	Illegal	Total	Legal	Illegal	Total
<b>A. Households Required for Relocation</b>						
1. Private Households (Structures within the ROW)	-	161	161	-	864	864
2. Private Households (Structures on private land beyond ROW, for Curve Improvement & Approach Road)	73	-	73	416	-	416
3. Non-private Structures (minor sheds, government owned boundary walls, shrine)	2	8	10	-	-	0
<b>Total Affected Structures (1+2+3)</b>	<b>75</b>	<b>169</b>	<b>244</b>	<b>416</b>	<b>864</b>	<b>1280</b>
<b>B. Required for Land Acquisition only (Not required for resettlement)</b>						
4. Land owner only (Family HHs)	40	-	40	208	-	208
<b>Total Affected Households (1+2+3+4)</b>	<b>115</b>	<b>169</b>	<b>284</b>	<b>624</b>	<b>864</b>	<b>1488</b>

Source: RAP Report 2018

### Structures Types

Residential, business, and institutional structures are three major types of project affected structures across the project areas. There are few residential structures with small business along the road; however, the other structures were set backed after the Roads Act, 2031. The Project will need to resettle 234 private house structures and 10 minor non-private structures also and 40 HHs with land.

Table 5.4-13 Types of Houses/Structures for Resettlement

No.	Type	Number of Houses
1	Simple Hut / Shed	3
2	Thatched roof, walls constructed with bamboo and mud / stone	10
3	Tile / iron roof, walls constructed with brick / mud /stone	126
4	Iron sheet / roofing with stone/ brick wall/cemented plaster	47
5	RCC framed building	48
<b>Total</b>		<b>234</b>

Source: RAP Report 2018

### Vulnerable groups

This study report has adopted the definition of vulnerable community who are commonly landless, marginal farmer living below subsistence level nearby project settlement. In Nepal, the term indigenous people (*Adhibasi*) equates with ethnic groups (*Janajati*).

Along the entire project alignment, some of the people whose castes are *B.K, Nepali* are found residing are classified as vulnerable groups who are categorized under Marginalized and Disadvantage group respectively according to Nepal Foundation for Indigenous Nationalities (NEFIN, 2004) that is

also applied by the Government of Nepal. However, based on the socio-economic and income status of the resident people, women heading house and handicapped headed there are about 26 % of the people (75 Households families) who can be categorized as vulnerable groups who are residing in this project alignment. Following Table illustrate the different type of vulnerable groups of Households within this Project Alignment who will be impacted due to this project.

Table 5.4-14 Vulnerable groups of Household within the Project Alignment

Among Social Vulnerable Groups		Number of Household		
		Outside RoW	Within RoW	Total
A. Total Affected Households		115	169	284
B. Social Vulnerable Groups	Poor Household	8	54	62
	Women Headed Household	2	10	12
	Dalit	All Dalit are not consider in vulnerable group.		
	Other category, if any. e.g. handicapped headed etc.	0	1	1
	Sub-Total of B	10	65	75
C. Project Affected Households not belonging in Social Vulnerable Groups = (A) - (B)		105	104	209

#### 5.4.13 Compensation Costs

The Cost Estimation for the compensation for acquisition of the private properties have been detailed in the Resettlement Action Plan (RAP) Report, 2018. The EIA Report has taken the RAP Report's estimation for compensation of land and houses to be acquired for the Project and its Summary is provided in Table 8.3-2.

## Chapter 6 IDENTIFICATION OF ENVIRONMENTAL IMPACTS

This Chapter identifies the potential environmental impacts associated with the Project's activities. All the environmental impacts that have been predicted during the Scoping stage and identified during the EIA stage has been categorically analyzed and assessed based on characteristics of existing condition and sensitivity of environmental components (physical, biological, socio-economic & cultural and chemical). The beneficial impacts due to Project implementation are discussed for Project Construction phase and Project Operation phase. Then after, likely adverse impacts are analyzed and elaborated in detail, with their potential impact level and evaluation of significance of the impact on the surrounding environment – for all identified impacts.

### 6.1 Beneficial Impacts

Several benefits arise from the Project during its construction phase and operation phase. There can be various beneficial impacts due to implementation of the proposed project and its operation. Apart from the need to mitigate the adverse impacts of the proposed project, the comparatively large issues with the implementation of the road project will foster the local communities and environment with numerous beneficial impacts like area development and socio-economic development. In this way, local people, private sector, and interested stakeholders have large opportunities to build up, enhance such positive impact of the project for their wellbeing. EIA Study analyzed the extent of these beneficial impacts. Some of these priority issues includes, which are listed in the order of priority as per the findings from scoping exercise for Identification of significant environmental Issues to be considered by EIA study are as follows.

#### 6.1.1 During Construction Stage

##### 6.1.1.1 Generation of Employment opportunities and Increase in Income

The immediate beneficial impacts form this Suryabinayak - Dhulikhel Road Improvement Project become apparent in the construction phase. Depending on the demographic and socio-economic setting in a given location, there will be various employment opportunities for the local population. As the alignment clearance and embankment filling works require labors, it is likely that locals will be preferred to work in these Projects to get into new economic opportunities.

During construction, employment large numbers of unskilled and skilled labors will be generated locally along entire road length where construction works are underway for about 18,700 man-days of skilled and 4,500,000 man-days of unskilled manpower is estimated to be necessary. The Project will provide adequate skill development training for masonry works and carpentering to increase the skills of local work candidates. The nature of impact will be direct with high in magnitude, site specific in extent and mid-term in duration.

##### 6.1.1.2 Increase in income of local people through opportunity to work and activities

The construction activities will not only increase the income sources of the local people, but will open opportunities for additional businesses such as the establishment of local tea stalls and small restaurants and shops. Also the established tea stalls and shops will foster their business with the influx of construction workers in the Project area. An expanded local market will be created by the immigration of workers. Local residents can take advantage of these new opportunities by expanding their existing local industries and establishing new ones. The consumption of local products such as vegetables, dairy products and meat products will significantly increase which directly create the opportunities for new income generation activities. As a result, a significant amount of cash from the Project works will be channeled into the local economy and will generally foster the development of other micro-enterprises. *The nature of impact will be direct with high in magnitude, site specific in extent and mid-term in duration.*

### 6.1.1.3 Technical skills and capacity enhancement of locals

This road widening and upgrading Project has propose the maximum use of local people for construction works lies in the unique chances for the transfer of skills and technical knowledge in construction and related technical sectors. Considerable number of employed work forces will convert themselves into fully skilled labourers in works such as masonry, gabion wires weaving, construction of dry and foundation walls, embankment filling, slope stabilization, rock cutting, bio-engineering works etc. These skills will not only benefit the locals by providing long-term employment opportunity but also contribute to local human resource development in Project areas that otherwise have restricted opportunities. *The nature of impact will be direct with high in magnitude, site specific in extent and long-term in duration.*

## 6.1.2 During Operation stage

### 6.1.2.1 Shortening of Travel Time and Travel Distance

The most viable and effective factor among several other economic benefits for this Project is the shortening of travel time. Due to the steep gradient of more than 10% and numerous sharp curves, every car, bus and truck has to significantly slowdown as they pass through Bhaktapur–Sanga-Dhulikhel section. As half of the vehicles passing through this road section are made up of heavy vehicles such as public buses, trucks and Containers especially those that are ferrying goods and commodities from China broader and from Eastern part of Nepal and India, massive slowdowns are encountered by the rest of the other road –users. With the completion of the proposed road widening and upgrading works, traffic flow will be smoother as well as travel time towards destination will be shortened.

In order to calculate the travel time before and after completion of the proposed road widening and upgrading works, the study team has performed velocity survey. The result is that travel time could be reduced by about 20 minutes. *The nature of impact will be direct with high in magnitude, Local in extent and Long-term in duration.*

### 6.1.2.2 Saving of Vehicle Running Cost

As mentioned above, after completion of the proposed road section, it is possible to reduce travel time by about 20 minutes and to have smooth wide ravel distance shortened. This will result in less fuel consumption as well as longer engine life–span. Thus, this will contribute to both energy and cost-savings. *The nature of impact will be direct with high in magnitude, Local in extent and Long-term in duration.*

### 6.1.2.3 Reduction of Traffic Accidents

Due to the numerous steep slopes and sharp curves at Dhulikhel and Sanga area, the possibilities of road accidents are undeniable. Collisions between oncoming vehicles, vehicles falling off cliffs while avoiding oncoming vehicles and the sudden breakdowns of older vehicles that cause huge traffic congestions are some of the happenings common in this road section. However, with the completion of the proposed tunnel, traffic accidents can be greatly reduced. *The nature of impact will be direct with high in magnitude, Local in extent and Long-term in duration.*

### 6.1.2.4 Access improvement for people

Better access to social services and public facilities are expected especially for the ambulance access to hospitals in Kathmandu. Also using the wide and smooth Road, neighboring residents will have better access too, especially for working women who are more dependent on public transportation. *The nature of impact will be direct with high in magnitude, Local in extent and Mid-term in duration.*

### 6.1.2.5 Control on Air Pollution

There will be less air pollution along the existing highway because the volume of the traffic is expected to be diverted to the Project road.



Similarly, when there is a bypass road for congested highway, with gentler gradient, the use of fossil fuel by the vehicles will reduce as a whole, which means less emission of the Greenhouse gas and Ozone depleting substances.

#### **6.1.2.6 Economic benefit**

The local people along with projected affected people can get economic benefit during the project construction period such as employment opportunity, establishment of small types of grocery shop or tea shop etc. Similarly, locals are likely to be involved in various income generation activities including construction of the project.

#### **6.1.2.7 Industrial, Trade and Business Development**

Establishment and operation of various sorts of cottage and small-scale industries including large-scale industries will further generate employment opportunity to the locals. Implementation of industrial development subprojects at different locations of the project Municipalities will increase due to the upgrading and widening of the existing road. Locals are likely to be involved into the trade and business activities of various forms generating livelihood at local level increasing income.

#### **6.1.2.8 Tourism Development**

Implementation of tourism development sub-projects around the area due to the road improvement and easy smooth excess of the area. Numerous possibility of the development of new tourism area within the project area is highly potential and beneficial.

#### **6.1.2.9 Motivation to Highway Tunnel Construction and Operation**

Nepal is predominantly a hilly /mountainous country where the road and highways follow the contours and hence are long and difficult to maintain. There are innumerable places, similar to Sanga Pass, where steep slopes and sharp curves dominate the road system and tunnels are desirable. But due to sophistication of construction costs, tunnels for highways have not been developed in Nepal, as desired. Therefore, the introduction of a tunnel section and its operation along the Arniko Highway, in Sanga Pass, will be an encouraging factor for developing other tunnel roads within the country.

### **6.2 Adverse Impacts**

Environmental Impacts anticipated during the Project construction and operation phase on Physical, Biological, Socio-economic and Cultural Environment are discussed in this section. The major activities during construction phase are site clearance, earthworks, stockpiling and soil disposal and other civil works etc. Civil works and other activities will create dust, noise and vibration rendering likely impact on the surrounding environment. Especially for noise, the baseline measurement showed higher values than national standard, and additional noise from construction equipment may be accumulated the original noise circumstances. Clearance of forest area in the tunnel western portal will be Biological issues relate to the implementation of the Project. Similarly social issues such as acquisition of private property and land and its compensation and resettlement related issues will also be significant during pre-construction and construction phases.

Following are the anticipated adverse environmental impacts, identified during EIA Study process, and discussed in detail, in this Chapter, hereunder.

#### **6.2.1 PHYSICAL ISSUES**

##### **6.2.1.1 Construction Stage**

- Temporary and Permanent change in land use
- Impacts on air, noise and water quality degradation due to construction activities
- Impacts / issues originated from waste generation
- Impacts / issues on Top Soil

- Impacts due to Labor Camp, Contractor's Camp operation and temporary settlement
- Impacts due to slope instability, landslides and erosion of slopes after cut and fill activities
- Impacts on River flow regime and river environment
- Impact upon existing public utilities, existing Physical Structures and infrastructures
- Impact/Issues of Occupational Health and Safety (OHS) due Construction Activities
- Impact/Issues due to operation of Asphalt concrete plant/hot mix plant
- Impact/Issues due to operation of Crusher plant and Batching plant.

#### 6.2.1.2 Operation Stage

- Impact of land fragmentation, difficulty to farmers to farm in such fragmented plots
- Air pollution due to Traffic exhaust gas on the Road
- Noise Pollution from the traffic on the Road to nearby local residents
- Issues related to High Speed Highway and Road Safety

### 6.2.2 BIOLOGICAL ISSUES

#### 6.2.2.1 Construction Stage

- Permanent loss of Trees / Forest Areas

### 6.2.3 Socio-economic Issues

#### 6.2.3.1 Pre- Construction Stage

- Impact due to Relocation of Physical Facilities

#### 6.2.3.2 Construction Stage

- Impact due to Private/Commune Property Acquisition for Construction
  - Loss of agricultural land, private land and properties
  - Loss of well, spout, and other water related facilities
  - Fragmentation of agricultural land
  - Issues on difficulty in movement due to construction works on existing roads, tracks etc.
  - Issues of land acquisition and compensation
- Occupational health, and safety of workers
  - Occupation health and safety condition of labor and locals on site during construction
  - Road safety issues during construction works
  - Child labor during construction
- Impact due to Outside Workers
  - Impact due to pressure on social service facilities such as drinking water, school, health post etc. by influx of construction workers

#### 6.2.3.3 Operation Stage

- Impacts / issues due to road accidents and road safety
- Inaccessible due to fragmentation of public and private land

### 6.2.4 Impact during Pre-construction and Preparation Phase

#### 6.2.4.1 Physical Environment

Site clearance will be the major activity in this stage. Existing infrastructures such as electric poles and pylons, irrigation canals and water supply pipelines set up within the project area will need to be relocated and other structure clearance within the carriage width will be required. During the time of such activity within the project area; locals will be directly affected by noise and air pollution. Furthermore, existing local tracks of various types will also be affected requiring either Overhead bridge or subway passing zones as the mitigation measures.

### 6.2.4.2 Biological Environment

Tree loss will be the major biological impact from the implementation of the proposed road widening and upgrading project alignment. Mitigation will be required in the form of compensatory re-planting for the loss of community forests. Community Forest User Groups where necessary, the marking, controlled felling, removal and handover of overall trees compensated in the ratio of 1:25 will require monitoring and maintenance for five years.

### 6.2.4.3 Socio-economic and Cultural Environment

Impact upon private property and acquisition of cultivated land for project implementation will be the major concern of local people. Locals will have deep interest and concern about the compensation of affected houses and affected private lands. Moreover, households depends upon agriculture for their livelihood and will be loss their private property due to implementation of this Highway widening an upgrading project are categorized as severely affected families and has been considered as Severely Project Affected Families (SPAFs) who require compensation as well as resettlement.

## 6.2.5 Impacts during Construction phase

### 6.2.5.1 Adverse Impacts in Physical Environment

#### (1) Change in land use, loss of productive agriculture land

Changes of land use due to the construction widening/upgrading of this section of road alignment are mainly conversion of agricultural land may result in numerous social and ecological consequences. The proposed area for curve improvement and new road alignment will have a RoW of 50m width (25 m either side of the center line).

Land acquisition will have to be made for total RoW. The road alignment will pass through private land areas. The areas of land use change and expected loss of land illustrated in **Table 6.2-1**.

Table 6.2-1 Summary of Additional Land to be acquired

Location	Land Area (in m <sup>2</sup> )	Land Area (in Ropanis)	Remarks
<b>A. Curve Improvement Works</b>			
1.Land Improvement for Curves Improvement	55,063.16	108.24	40 locations in 14.3 km
2.Land for Curve Improvement at KU Chowk	15,678.25	30.82	
<b>Sub Total of A</b>	<b>70,741.41</b>	<b>139.06</b>	
<b>B. New Approach Road to Sanga Tunnel</b>			
1.West Portal side(Palanse Area)	44,000.00	86.49	For West Portal side road = 580m
2.East Portal side(Nashika Area)	18,648.00	36.66	For East Portal side road = 370m
<b>Sub Total of B</b>	<b>62,648.00</b>	<b>123.15</b>	
<b>Total including Sanga Tunnel Approach Road</b>	<b>133,389.41</b>	<b>262.21</b>	

The Impact of land use change will be direct in nature, high in magnitude with site specific in extent and long term in duration.

#### (2) Impacts on air, noise and water quality degradation due to construction activities

- Air and noise pollution due to operation of drilling machines, excavators, vehicle on roads
- Excessive dust production and noise pollution due to operation of crusher plants, concrete batching plant and bitumen mixing plant etc.
- Physical impact upon air, noise and water due to Quarry site operation
- Degradation of water qualities of existing rivers
- Vibration and Noise pollution due to blasting activities
- Entire the road alignment corridor

- At locations where crusher plants, concrete batching plant and other machine are operated
- Spoil tipping, soil erosion and mixing in water bodies causing water quality degradation.

The impact will be direct in nature with medium in magnitude, local in extent and short-term in duration

### (3) Vibration and Noise pollution due to construction activities

Mechanical equipment such as generators, excavators, bulldozers, piling rigs, stabilizers, drills, stone crushers, graders, vibratory rollers, concrete-mixing plants, and screening plants can generate significant noise and vibration during construction. The cumulative effects from several machines together with blasting may cause significant nuisances. Local residences, schools etc. will be the major impact receivers during the time of construction.

Vibration will further aggravate the disturbance to the local people in the entire project area is likely. Excavation and blasting activity will be carried out especially at the tunnel entry and exit portal areas and portions where hard rocks are available. It is anticipated that impact from vibration and noise pollution at road section near settlement and market area and at tunnel locations of Sanga and its adjoining areas are likely to be affected. The impact will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

Noise simulation (prediction) has been done by using the baseline data. According to the noise baseline survey, the levels along the target road are almost same as upper limit of standard or less than the standard. However, in the future, the noise levels may rise by the environmental standard due to increased traffic volume and speed. The cross-section between Sanga and Banepa, where there was no affection by noise from town area and 20m from carriageway, was targeted for the prediction by using following brief calculation method of  $L_{Aeq}$  under simple condition in "ASJ RTN-Model 2008 by The Acoustical Society of Japan". Following table shows the results of prediction.

$$L_{Aeq, T} = 82.3 + 10 \log_{10} (1+3.47 q) - 10 \log_{10} l + 20 \log_{10} V + 10 \log_{10} NT + 10 \log_{10} 3.6/2T$$

- $L_{Aeq, T}$  : Equivalent continuous A-weighted sound pressure Level of time T (dB)
- V : Vehicle speed (km/h)
- T : Time (s)
- NT : Traffic volume in time T (number)
- l : Distance from carriageway to survey point (l)
- q : Heavy vehicle ratio (< 1)

Table 6.2-2 Prediction Level of  $L_{Aeq}$  at the Point between Sanga to Banepa

Unit: dB (A)

Time	2017 (present situation)	2025 (estimated year of operation commencement)	2035 (10 years after completion)	Limit Of GON
9 AM	65.4	67.2	68.2	63
2 PM	62.3	64.2	65.1	63
10 PM	55.8	57.7	58.5	55

According to the result of prediction, it is presumed that noise level of several road side areas might exceed the standard due to increasing road traffic.

#### 6.2.5.2 Impacts / issues due to originating from solid wastes, soil waste & Liquid waste generation

##### (1) Solid waste disposal issues

Operation of labor camps can cause impact upon ambient environment if camp operation will not be planned in advance. The main issues of concern are unmanaged disposal of solid and liquid wastes

into watercourses, natural drains and improper disposal of storm water and black water in the cultivated land and village areas existed in the chainages.

- Construction of road and excavation of tunnel
- Construction and use of the construction yard, concrete mixing plant, storage, etc.,
- Construction and use of the Workers' Accommodation, including septic tanks,
- Construction and operation of the water treatment facilities for the turbid water from construction sites.

The impact of solid waste disposal will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

## **(2) Issues of Spoil/Soil waste issue from Excavation and quarry works**

The extraction of materials from inappropriate places or in excessive amount can seriously damage the local environment. For example, quarrying from a high slope and fragile terrain can result slope instability; extraction of sand and gravel in excessive amount from river can cause riverbank cutting, erosion, and changes of river regime. This will eventually affect the local environment in terms of erosion, flooding of cultivated land, damage to community infrastructures, affect road and road embankment itself and eventually affect the entire livelihood of local people. General scouring of river beds resulting in endangerment of bridges and continuous degradation of the river regime are potential impacts of quarry operation.

In hills, side-tipping of excavated spoils from tunnel and road width excavation are often likely, which invites most hazardous environmental and social impacts. Such construction practices overload unstable slope areas and geologically hazard areas triggering slides, cause valuable soil erosion, destroy vegetation, cause hazard to settlement at downhill side, disrupt natural drainages and pollute water sources etc. Impact of land use change will be direct in nature, high in magnitude with site specific in extent and long term in duration.

## **(3) Surface water contamination and from unsanitary disposal of Liquid waste**

Other major issues of concern with the establishment of labor camp are likely to be uncontrolled open defecation by construction workers, unmanaged disposal of toilet wastes into watercourses, natural drains. Surface water contamination is likely if toilet waste and other sanitary waste dispose haphazardly in the entire project area.

- Construction and use of the Workers' Camp, including septic tanks

*The impact will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.*

## **(4) Chemical, combustible and Toxic Materials such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. residues mixing in land and water bodies**

The use of chemicals such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. is inevitable during the time of construction. All these chemicals are hazardous materials used for road construction and maintenance activities. The storage of such chemical might be an environmental problem that can only be met by special precautionary measures. Containers of such chemicals such as bitumen drums often get damaged during transit, leading to a leakage in storage places which often are not or not adequately cleaned up afterwards. It is likely that the bitumen could remain at the boiling area and decanter sites for many years after the completion of road construction if it is not properly rehabilitated.

Release of bitumen into the environment through runoff into surface water is likely during the construction phase if no any caution measures will be taken seriously; such hazardous chemicals can also cause pollution due to their spillage in large quantity. The typical primary and secondary effects of water pollution include health hazards to the downstream water users and impact on local fisheries are likely. The impact will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

## **(5) Hazards caused by combustible and Toxic Materials**

Combustible and Toxic Materials will be needed to blast hard rock during excavation of tunnel portal and opening road tracks at rocky portions. Extensive environmental damages in terms of slope failure,

excessive rock fracturing, damage to nearby property due to vibration as well as rock splinters, injury, disturbance to wildlife, air pollution, water pollution etc. are likely during construction if the use of explosives will not carry out carefully. Hazards from explosive are especially anticipated at the tunnel portal areas during the time of tunnel excavation and blasting. Likewise, locals inhabited near to the all proposed tunnel portals are likely to affect with noise, air and water pollution if handling of explosives will not be carried out safely. Further, water bodies and inhabitants downstream will also be affected with the haphazard disposal of such combustible and toxic materials causing nuisance and health hazards. The impact will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

### 6.2.5.3 Impacts due to Labor Camp, Contractor's Camp operation and temporary settlement

#### (1) Temporary loss of land

Additional 5 ha of land will be acquired to establish labor camp and contractor's camp at the vicinity of the project area. Out of the total area required for the camps site, 5 ha of land are within the required RoW area by the project, 2 ha. in the barren land area whereas 3 ha. of additional private land is required for the construction of labor Camp, Contractor's Camp. However, the land acquired for the establishment of labor camp and camp for contractor will not be acquired for the overall duration of five year project period. As the construction work will be executed with the section wise package basis; land for the establishment of labor camp and contractor's camp will be acquired temporarily for the completion of certain package and section of road construction. Labor camps will be established according to construction packages; as there will separate packages for bridge construction, section wise road construction, slope stability and retaining works etc.

Tentative open spaces for the establishment of labor camps have been identified along the proposed highway. Other project sites such as project engineer camp station, construction material and Chemicals storage and vehicle parking areas, workshops etc. could also be established at the identified open spaces. 5 labor camp sites are identified which will be established according to the construction package during construction. The identified labor camp areas along the proposed highway are presented in the following table. The impact of temporary loss of land will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

Table 6.2-3 Possible Location of Labor Camp Sites of Existing Road

S.N	Location	Chainage	Side from existing Road	Present Status of Land
1	Jagati	1+550	Left	Used for Brick Collection
2	Basghari (Bhaktapur)	3+100	Left	Barren Land Near Party Palace
3	Palase	5+300	Left (west Portal of Tunnel)	Barren Land
4	Sanga	7+800	Right	Barren Land
5	28-kilo	13+600	Left	Agricultural Land

#### (2) Solid waste disposal issues

Operation of labor camps can cause significant impact upon ambient environment if camp operation will not be planned in advance. The main issues of concern are unmanaged disposal of solid and liquid wastes into watercourses, natural drains and improper disposal of storm water and black water in the cultivated land and village areas existed in the project area and camps locations. The impact of solid waste disposal will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

#### (3) Surface water contamination from unsanitary disposal of toilet waste

Other major issues of concern with the establishment of labor camp are likely to be uncontrolled open defecation by construction workers, unmanaged disposal of toilet wastes into watercourses, natural drains. Surface water contamination is likely if toilet waste and other sanitary waste dispose



haphazardly in the entire project area. The impact will be direct in nature with medium in magnitude, site specific in extent and short-term in duration.

#### **6.2.5.4 Impacts/issues due to slope instability, landslides and erosion of hill slopes after cut and fill activities**

Slope stability can be upset by creation of road cuts, fill or embankments activities. Excessive steepness of cut slopes, deficiency of proper drainage, altered and concentrated water flows and excessive slope loading from spoil disposal can result in landslides and soil erosion. Disturbance during construction with vibration, spoil disposal and slope cutting/filling activities can upset the delicate balance between stabilizing factors.

- Construction of the soil disposal site, and disposal,
- Construction of the new road
- Construction, widening and curve improvement of the existing Road

#### **6.2.5.5 Impact due to Tunnel Excavation**

A series of controlled blasting might be required to excavate tunnel portals proposed at Sanga Pass depending of the rock and geological formation of the area. Blasting activities likely to be produce seismic hazards including landslide and soil erosion at the tunnel portal areas during the time of tunnel excavation.

Moreover, houses, settlements including shrines are situated near by the Tunnel portal areas and above the hill in which the tunnel has been proposed. However, severe impacts upon existing houses and infrastructures existed above the hill has not been envisaged due to construction activity.

Impact of air, noise and vibration are likely during construction and excavation of tunnel portals. However, no any settlements and houses are existed at the tunnel portals area.

Impact due to due to Tunnel Excavation and Blasting will be will be direct in nature with high in magnitude, local in extent and mid-term in duration.

#### **6.2.5.6 Landslide triggering due to excavation through blasting activities**

Landslide is likely at the hilly terrain alignment of the proposed highway alignment where required substantial earth cuttings for the formation of road width. Significant number of construction equipment and machines will be used for the excavation of hilly terrain for road construction and excavation. Blasting will be especially carried out at the rocky and hilly portion where excavation through construction machines and excavator will be impossible. Landslides after blasting at hilly portion are likely for the fresh cutting and virgin hill area of the proposed highway alignment. Landslide will be triggered especially due to side tipping and stockpiling of blasting materials without dispose it into proper spoil dispose sites.

Such haphazardly tipped off and piled materials will be on the verge of landslide rendering endangered to the downhill cultivated lands, forest and vegetation, water bodies and local inhabitants and their private property. This situation may lead to environmental degradation in terms of air pollution, land pollution, pollution of surface water and permanent changes of land use if not rehabilitated after the completion of construction works. Standing crop or future cultivation on land will be disrupted. If not appropriately stockpiled with drainage facility, rain water can carry the sediment into water bodies affecting their quality as well as aquatic life. This sort of impact can be envisaged if blasting activities is used during tunnel excavation work at Sanga Pass area.

Impact due to excavation through blasting activities will be will be direct in nature with medium in magnitude, site specific in extent and mid-term in duration.

#### **6.2.5.7 Soil erosion, gully formation at new open cut sections**

Consequences of soil erosion and gully formation not only affect the safety and serviceability condition of roads but also have chain effects on the farmers with the loss of crops or farmland, degradation due to silt/debris deposition, degradation of water quality, loss of vegetation and on other existing infrastructures. This sort of impact is likely in entire highway alignment of new cuttings especially at steep slope and fragile geological areas, at new road alignment and at road widening at

slope. Impact of soil erosion, gully formation at new open cut sections will be direct in nature with medium in magnitude, site specific in extent and mid-term in duration.

#### **6.2.5.8 Impacts/issues due to incorrect disposal of excess excavated earth material**

Construction materials are usually stockpiled for relatively short period without covering. It is often done on riverbeds or riverbanks, forest area, open spaces, and cultivated land. This situation may lead to environmental degradation in of air pollution, land pollution, pollution of surface water, and permanent changes of land use if not rehabilitated after work complete. Standing crop or future cultivation on such land is disrupted. So while stockpiling construction material following area should take into consideration.

- Place where considerable vegetation is available.
- Low land inundation Forest area where folding and water logging is prone
- Agricultural field where folding, water logging is prone.
- Settlement area where excess road will be blocked inundation with materials

Impact of incorrect disposal of spoil and excavated materials will be direct in nature, moderate in magnitude with local in extent and mid-term in duration.

#### **6.2.5.9 Impact due to generation and disposal of spoil from Tunnel area at Sanga Pass**

The spoil volume from Tunnel excavation for two holes for tunnel at Sanga pass is estimated to be 100,000m<sup>3</sup> that will cause several impacts if didn't treat properly to the surrounding environment. In hills, side-tipping of spoils are often likely, which invites most hazardous environmental and social impacts. Such construction practices overload unstable slope areas and geologically hazard areas triggering slides, cause valuable soil erosion, destroy vegetation, cause hazard to settlement at downhill side, disrupt natural drainages and pollute water sources etc. Although, substantial amount of the excavated material will be reused for filling and construction material; huge amount of spoil will be required to be disposed safely into the proper tipping sites. *Impact due to generation and disposal of huge amount of spoil from proposed tunnels will be direct in nature with high in magnitude, local in extent and mid-term in duration.*

#### **6.2.5.10 Impacts on River flow regime and river environment**

The impact upon river/stream flow and its regime is anticipated to be higher during construction phase. The construction civil works includes storage of materials excavated for bridge foundation, Concrete Batching Plants etc. Such construction activity will produce anticipated adverse impacts such as siltation and deposition at lower downstream sections and on agriculture land situated at river banks.

- Water intake for the concrete plant, other construction facilities and the Workers' Camp,
- Construction of the soil disposal site, and disposal,
- Construction of the new road alignment
- Construction, widening and upgrading of the existing road

*Impact on river flow regime and river environment will be direct in nature, low in magnitude with local in extent and short-term in duration.*

#### **6.2.5.11 Due to temporary flow diversion during construction of bridges**

Construction of bridges generally carried out with the temporary flow diversion of river through narrow channel. However, the flow diversion likely to modify the natural flow of river water by concentrating flows at certain periods increasing the speed of flow. Such diversion of river may generate water depletion, water logging, and a concentration of water flow as well as increase the speed of flow, which will be erosive in nature. In absence of proper diversion management a concentrated flow of diversion can lead to scouring, bank cutting, gullying and soil erosion at downstream land, which in turn can cause slope instability and trigger landslides.

*The impact will be direct in nature, low in magnitude with site specific in extent and short-term in duration*

### 6.2.5.12 Impact upon existing public utilities, existing Physical Structures and infrastructures

The construction, widening and upgrading of the existing road might split existing community for permanently. During the Construction Phase, temporal closure of existing road may cause difficulties of movement among the population nearby. The activities and the potential impacts are

- Construction of the new road and the construction, widening and upgrading of road with curves improvement of the entire existing road alignment
- Construction and widening of the Road will split the existing community permanently
- Temporal closure of existing road during construction will cause difficulties in movement. Shocked

Table 6.2-4 List of Electric Poles along the Alignment that are likely to be affected

Side	Metal Poles	Concrete Poles	Wooden Poles
<b>Bhaktapur</b>			
Right	98	20	7
Left	121	62	13
<b>Total A</b>	<b>219</b>	<b>82</b>	<b>20</b>
<b>Kavrepalanchowk</b>			
Right	121	119	26
Left	118	117	31
<b>Total B</b>	<b>239</b>	<b>236</b>	<b>57</b>
<b>Sub-Total (A+B)</b>	<b>458</b>	<b>318</b>	<b>77</b>
<b>Total Poles</b>	<b>853</b>		

Source: Field Study, Nov. 2017

### 6.2.5.13 Impact/Issues of OHS due Construction Activities

As labor forces requires to undertake works especially in rock cutting, hazardous materials handling, heavy equipment operations, tree felling, transporting and translocation of heavy construction materials etc. they are prone to various risks and health hazards in absence of works undertaken without adequate safety measures. Other potential impacts to health are respiratory, eye disease due to exposure to dust, gas emissions during pavement works especially in bitumen works.

Occupational Health and Safety of labors during construction and widening of the road alignment will be significant issue. Working safety measures will be executed by the contractor to workers providing ample numbers but not limited to helmets, boots, rubber gloves, and masks as required. Life of worker will be ensured by maintaining Life insurance of each worker of the project. First aid facilities for the workers will be provided at working sites as well as at labour camp sites. If possible, one qualified nurse or first aider will be present at all times. Routine check-ups of labours will be performed; this will be at least once per week for each labour workers. Similarly, Health and Safety of the local people will be another significant issue during construction stage of the project. *The impact will be direct in nature, high in magnitude, local in extent and mid-term in duration.*

### 6.2.5.14 Impact/Issues due to operation of Asphalt concrete plant/hot mix plant

Operation of asphalt concrete plant/ hot mix pants and use of Bitumen during it is one of the most hazardous materials during road construction and maintenance activities. Bitumen storage, transfer and burning causes the frequent environmental problems that have to be handle with special precautionary measures. Bitumen drums during transportation often get damaged and leads to leakage in stored and hot mix pant area which cannot be adequately cleaned up afterwards. During application and mixing of bitumen often have health and occupational hazard leading to workers injures and burn hence required protective equipment. Burning of local forest timber as firewood for heating bitumen causes the environmental air pollution as well as the release of it into surrendering area can runoff into surface water causing pollution. *The impact will be direct in nature, high in magnitude, local in extent and long-term in duration.*

### 6.2.5.15 Impact/Issues due to operation of Crusher plant and Batching plant.

Establishment and operation of Stone crushing plant and Batching plant cause massive air pollution and noise pollution to the nearby area. Siltation and pollution of surface water resulting from uncontrolled runoff from storage piles, also damage to the local crops and surface water to the nearby surrounding area. It emits excessive noise and dust from the plant while on operation will distrust to nearby settlements, schools, health post etc. Crushing Plant site is the prone area of possible accident and injuries as there will be continuous flow of heavy vehicles for carrying and transporting the materials to construction site.

Crushing plant as well as concrete batching plant sites are high risk areas for accidents and injuries. Also, there will be continuous flow of heavy vehicles for carrying the materials to construction sites. If their path is along school and busy market area, there will always be potential risk of serious accidents. River flow regimes are likely to be changed if extraction of sand and gravel in excessive amount from river bed and river banks causing river bank cutting and erosion.

*The impact will be direct in nature, Medium in magnitude, Site Specific in extent and mid-term in duration.*

### 6.2.5.16 6.2.3.2 Adverse Impacts in Biological Environment

#### (1) Permanent loss of Trees / Forest Areas

Additional 0.25 ha of forest will be affected (calculated within the width of 25m from center at both side of road alignment).

The total numbers of road tree losses are 484. Apart from that there are there are Bamboo (Bans) bunches at 16 places along the road side with the following species of trees on some quantity on road side that needs to be cut during road widening/upgrading work. The total numbers of tree losses with reference to road side trees along the road alignment is summarized in the **Table 6.2-4**. *The impact will be direct in nature with high in magnitude, regional in extent and long-term in duration.*

Table 6.2-5 Summary of Total Trees to be cut by the Project

	Nos. of Trees		Total Trees
	Pole Size	Tree Size	
Road-side Trees	127	357	484
Suryamode Perunge Community Forest	61	102	163
Private Trees at Palanse Area	70	12	82
Private Trees at Nashika Area	17	28	45
<b>Total</b>	<b>275</b>	<b>499</b>	<b>774</b>

#### (2) Indirect impact of forest area degradation and possible loss of vegetation for timber and fuel wood by construction labor

- Pressure on forests for fuel wood in labor camps
- Illegal collection and cutting of forest trees will be occurred
- Impact on the forest resources due to increased accessibility
- Pressure on forests for fuel wood in labor camps
- Impact on the forest resources due to increased accessibility
- Possibility of forest fire due to labors entrance into forest area

*The impact will be indirect in nature, medium in magnitude, local in extent and mid-term in duration*

### 6.2.5.17 Adverse Impacts in Socio-economic and Cultural Environment

#### (1) Impact due to Private Property Acquisition for Construction

##### 1) Loss of agricultural land, private land and properties

It is estimated that 13.33 ha of private cultivated land will be permanently acquired for maintaining a 50 m RoW and 234 houses are fall within the alignment that should be displaced. **Table 6.2-6** illustrated the total area of affected land and house by districts.

Table 6.2-6 District Wise Total area of Land and Houses Affected

Section	Land For	Cultivated Land (Ha.)	Affected Houses
Curve Improvement Works and RoW maintenance	RoW maintenance in Existing Road	5.51	161
	Curve Improvement in Existing Road	1.56	57
New Approach Road to Sanga Tunnel	West Portal side (Palanse Area)	4.4	10
	East Portal side (Nashika Area)	1.86	6
<b>Total</b>		<b>13.34</b>	<b>234</b>

- About 13.33 Hectare of cultivated land is likely to be acquired permanently along the entire road length.
- About 234 houses are likely to be removed within the entire road alignment length where the alignment affects private houses of different types.

*The impact of land acquisition will be direct in nature, high in magnitude, local in extent and long term in duration.*

## 2) Impact on small landholders due to land and properties acquisition

The economic earning and status of small landholding farmers will be decline due to land acquisition. Causing fragmentation of agricultural land and declining the agriculture production due to loss of agricultural land. As a result, marginal land holding populations are likely to be affected due to increase in food shortage. Those farmers will be severely affected with the acquisition of their land and property. The project will not consider the poverty reduction plan over the area rather than addressing equal compensation scheme like others. Deficit in the storage of foods for marginal land holding farmers will further be affected severely with the permanent acquisition of their cultivated land. However, there are not only negative effects upon the dwelling communities. The constructions and widening of Road along the proposed area will get diversify benefits in the long run. The compensated people may expect to manage the losses properties by utilizing the received compensated money. The increasing development of the project brings various positive opportunities. *The impact will be direct in nature, high in magnitude, local in extent and long term in duration.*

## 3) Fragmentation of agricultural land

Fragmentation of agricultural and other lands increases due to construction and widening of the existing road project will likely to be declined in productivity, increase in labor intensive farming and reducing commercial farming around the area. Locals adjacent to the road alignment and Severely Project Affected People (SPAPs) will have inaccessibility in moving between their private lands situated adjacent to the road during construction and upgrading activities going on. During widening/upgrading and construction of road project will prevent direct movement and accessibility into their lands due to various activities. This sort of difficult will be faced by the locals inhabited at the entire length of the road alignment. Similarly, people inhabited adjacent to the road alignment and adjacent areas are likely to be deprived from their existing economic activities (such as agricultural practices) during the time of road construction. *The impact will be indirect in nature, medium in magnitude, site specific in extent and short term in duration.*

## 4) Decrease in agriculture production creating food shortage

Change of land use mainly on agricultural land have major impacts in reduction of fertile and cultivated land leading to loss of crops, loss of productive area, increase in food deficiency, increase in malnutrition, loss of habitat of wildlife. For entire road length where the alignment passes through private land, particularly the road line passed though directly affected 4 municipalities and nearly 13.33 ha of cultivable land will be acquired on agricultural land affecting crop production. Around 45 metric tons of cereals/ grains will be lost every year. The loss of production will be compensated by enhancing intensive agriculture with the remaining lands due to pressure and market possibilities. *The impact will be direct in nature, high in magnitude, local in extent and long term in duration.*

## 5) **Issues due to difficulty in movement due to construction works across existing roads, tracks etc.**

Fragmentation of agricultural and other lands increases due to construction and widening of the existing road project hence, productivity will decline, labor intensive farming and less commercial farming. Locals adjacent to the road alignment and Project Affected People (PAPs) will have inaccessibility in moving between their private lands situated adjacent to the road during construction and upgrading activities going on. During widening/upgrading and construction of road project will prevent direct movement and accessibility into their lands due to various activities. This sort of difficult will be faced by the locals inhabited at the entire length of the road alignment. Similarly, people inhabited adjacent to the road alignment and adjacent areas are likely to be deprived from their existing economic activities (such as agricultural practices) during the time of road construction. This type of impact especially envisaged due to road excavation works near to the cultivated lands of local, dust and noise pollution due to machine operation, likely accidents, vibration, probable landslides during road width formation, haphazard felling of trees along proposed alignment and side tipping upon private cultivated lands. *The impact will be indirect in nature, medium in magnitude, site specific in extent and short term in duration.*

### (2) **Occupational health, and safety of workers**

#### 1) **Occupation health and safety condition of labor and locals on site during construction**

As labor forces requires to undertake works especially in rock cutting, hazardous materials handling, heavy equipment operations, tree felling, transporting and translocation of heavy construction materials etc. they are prone to various risks and health hazards in absence of works undertaken without adequate safety measures. Other potential impacts to health are respiratory, eye disease due to exposure to dust, gas emissions during pavement works especially in bitumen works.

Occupational Health and Safety of labors during construction of the proposed road alignment will be significant issue. Similarly, Health and Safety of the local people will be another significant issue during construction stage of the project. During construction, existing local tracks and vehicle tracks will be affected and may need to be either closed temporarily or synchronize with the construction vehicles. Construction activities on the project site are likely to cause hindrance to pedestrian and existing traffic flow if not managed properly. Although, this is not likely to be a major problem; it could affect the passage of the existing traffic.

Road safety issues during construction works will be significant to construction workers, passenger vehicles etc. Safe handling of construction vehicles and equipment during construction phase will be an important issue for contractor. Collection and transportation of construction materials, disposal of spoil from excavation will be executed smoothly during construction. Existing Arniko highway and B.P. Highway will not be disturbed during the time of construction and widening/upgrading of the exiting road alignment. Road safety of the highway will be ensured by managing existing traffic properly. *The impact will be direct in nature, high in magnitude, local in extent and mid-term in duration.*

#### 2) **Road safety issues during construction works**

Excavation of road having rocky portions required substantial amount of heavy equipment. Accidental explosive hazards are likely during transportation, storing and its use during the time of construction phase. Mismanagement of equipment will likely to claim human life and property accidentally. *The impact will be direct in nature, high in magnitude, local in extent and short-term in duration.*

#### 3) **Safety issues due to handling, transporting, storing and use of toxic and combustible materials**

Handling, transportation, storage and use of toxic and combustible materials will be major issue of concern especially during various construction related activities Loss of life and property is likely if due care has not been taken while handling of such toxic and combustible materials. *The impact will be direct in nature, medium in magnitude, local in extent and short term in duration.*

**4) Gender involvement and Child labor during construction**

During construction, women workers will involve in various kinds of construction activities. They could be discriminated or sexually harassed by male workers, might have different wage scale or women and man and involvement of child labor as well which have been monitors and discontinued. *The impact will be indirect, low, local, short term and hence insignificant.*

**(3) Impact due to Outside Workers****1) Possible social conflict and social pollution; impact on social, cultural and religious practices due to in-migration of people**

Conflict between workers and local people is likely during the time of construction. Conflict is likely as there could be a struggle between local people and labor workers for same commodity and natural resources. Such impacts are likely through the entire road length during the time of construction, especially at market places and at community forest area where workers and local will be interacted directly. *The impact will be indirect in nature, medium in magnitude, site specific in extent and short term in duration.*

**2) Impact due to pressure on social service facilities such as drinking water, school, health post etc. by influx of construction workers**

Influx of people is anticipated during the time of construction. Pressure upon existing natural resources such as water, existing food availability, existing educational facilities are likely to be affected with the increase in the number of outside workers and the utilization of such resources and increase in the number of student in the existing educational facilities. Such impacts are likely at the existing market and settlement areas such as at Bhaktapur, Jagati, Sanga, Banepa and Dhulikhel Settlement area are likely to be affected. *The impact will be direct in nature, medium in magnitude, site specific in extent and short term in duration.*

**3) Degradation of sanitation and hygiene condition**

Locations where labor camps are established there are likely possibilities of degradation of sanitation and hygiene condition due to influx of workers and migrant populations. *The impact will be indirect in nature, medium in magnitude, site specific in extent and short term in duration.*

**6.2.6 Possible Environmental Impacts Related to Project Operation Phase****6.2.6.1 Impact on Physical Environment****(1) Obstruction to local movement between adjacent lands and settlement of highway alignment****1) Inaccessibility between adjacent settlement and market areas**

The proposed highway crosses existing settlement and major market areas at 9 locations. Some of the settlements and market areas from where the proposed alignment passes are significant in terms of social and economic value as well as historical and cultural noteworthy. Inaccessibility to the locals is anticipated with the implementation of project through such significant settlement areas. The following table presents major settlement areas along the exiting road section that are likely to be affected with inaccessibility to locals obstructing movement between adjacent lands and settlements due to widening/upgrading and construction of new road alignment. Similarly, inaccessibility between existing forest and agricultural land are anticipated at different settlement areas along the proposed highway alignment. *The impact of Inaccessibility between adjacent settlement and market areas will be direct in nature, high in magnitude, local in extent and mid-term in duration.*

Table 6.2-7 Major Settlement areas along the road on Arniko Highway

S.N.	Settlement Name	Chainage	Remarks
1	Suryabinayak Chowk	0+000	Situated at the RoW
2	Jagati	1+100	Situated at the RoW
3	Nalinchowk	3+900	Situated at the RoW



S.N.	Settlement Name	Chainage	Remarks
4	Palanse	5+000	Situated at the RoW
5	Sanga	6+500	Situated at the RoW
6	Janagal	8+200	Situated at the RoW
7	Banepa	10+500~12+000	Situated at the RoW
8	KU Chowk	13+300	Situated at the RoW
9	Dhulikhel area	14+800	Situated at the RoW

Source: Field Study, Nov. 2017

## 2) **Impact of land fragmentation, difficulty to farmers to farm in such fragmented plots**

Widening/upgrading of existing highway with construction of new road alignment will break up the existing land use pattern avoiding direct movement of locals between adjacent lands and settlements. Locals will have very significant impact if they lack accessibility from direct movement between adjacent lands. The impact is anticipated at Khet and Bari lands from 2km to 6+200km, 6+500 to 9+500km and 14km to 14+600km at either side of road. *The impact of land fragmentation will be direct in nature, high in magnitude, local in extent and mid-term in duration.*

## 3) **Air pollution due to Traffic exhaust gas on the Road**

The operation of this section of Arniko Highway can be expected to increase air pollution from heavy vehicle emissions. The major source of air pollution will be vehicular emission assuming if no any other air pollution sources such as industries will be established within the project area. Oxides of nitrogen and carbon and dust might be the main air pollutants during operation. The traffic flow are likely to increase over the years but there will also be ample opportunity to others for such emissions into atmosphere therefore no significant adverse air quality impact is predicted from the operation of project. *The impact will be direct in nature, low in magnitude, regional in extent and long term in duration.*

## 4) **Noise Pollution from the traffic on the Road to nearby local residents**

Vehicle movement could be the chronic noise exposure as large number of vehicles will run through Arniko highway on this section resulting communication problems and leading to elevated stress level as well as associated behavioral and health effects of the local people. This sort of pollution could cause auditory fatigue, temporary and permanent lessening of hearing ability, sleep disorders, and can contribute to learning problems in children. *The impact will be direct in nature, medium in magnitude, regional in extent and long term in duration.*

## 5) **Issues related to High Speed Highway and Road Safety**

Road safety and safe driving could be one of the major issues for highway safety due to high speed. Road accident is likely due to faulty road geometry, irregular road surface, over speeding etc. Accidental loss of life and property is likely if well ventilation and lightning system and its sufficient backups will not be maintained properly during the time of operation of this section of Arniko Highway. Lack of required traffic signals including other enhancement measures will likely to lead in the number of accidents within the road. *The impact will be direct in nature, high in magnitude, regional in extent and long term in duration.*

## (2) **Impact on Biological Environment in Operation Phase**

### 1) **Pressure on forest resources, gradual encroachment, and loss of forest resource**

Gradual encroachment into forest area existed periphery to the project area is likely with the gradual increment in the population within the project area. Tree felling, wood cutting, illegal export of fuel wood and other forest products including Non Timber Forest Products (NTFPs) are likely during the operation of proposed highway. *The impact will be indirect in nature with low magnitude, site specific in extent and short term in duration.*

### **(3) Impact on Socio-economic and Cultural Environment in Operation Phase**

#### **1) Impacts / issues due to road accidents and road safety**

It is anticipated that the road traffic accidents are likely due to the high speed vehicles. Although the highway will have separate lane for to and fro movement; high speed vehicles accident are likely. Traffic flows are unlikely to create many community safety issues because the road will not have direct access to the local villages except through some intersections. *The impact will be direct in nature with medium magnitude, regional extent and long term in duration.*

#### **2) Impact on livelihood based on sale and transport of various agricultural products from field.**

Majority of the residents of the project Municipality depends upon agriculture for their livelihood. The loss of cultivated farm land and traditional existing practice of livelihood and trades based upon agriculture of the locals will be affected directly. The implementation of project further alters the livelihood pattern of local people changing their life style and cultural habits. This sort of impact has been predicted for small landholding farmers and poor people who are depended upon livelihood based on selling of agricultural products daily. Such affected families inhabited along the highway alignment will be identified as Project Affected Families (PAFs) who will require special consideration for rehabilitation and resettlement. *The impact will be direct in nature, medium in magnitude with low extent and long term duration.*

#### **3) Impacts due to increase population pressure, change in social behavior**

Various socio-economic and cultural changes are likely in the project areas and adjacent area due to widening/upgrading and construction of this section of Arniko Highway project. Together with the change in land use pattern economic activities of the locals will be altered. The overall inter-regional connections will also be expected to bring changes in the life style of locals. Trafficking, prostitution, consumption and import of alcoholic products are expected to be increased especially at existing settlement areas and likely at the service and facility sites that will be introduced by this smooth Highway after widening. *The impact will be direct in nature with medium magnitude, regional extent and long term in duration.*

#### **4) Inaccessible due to fragmentation of public and private land**

Locals adjacent to the proposed highway alignment and Severely Project Affected People (SPAPs) will have inaccessibility in moving between their private lands situated adjacent to the highway due to prohibition of direct crossings. Implementation of project will prevent direct movement and accessibility into the highway and adjacent lands. This sort of difficult will be faced by the locals inhabited at the adjacent to the entire length of the proposed highway alignment. *The impact will be direct in nature with medium magnitude, regional extent and long term in duration.*

#### **(4) Summary of the Evaluation of Impacts**

The impacts discussed are mainly identified and predicted impacts. In general, direct impacts are identified and indirect impacts are predicted. These impacts are evaluated, hereunder, to know their environmental significance, taking into consideration their magnitude, extent and duration.

The environmental impacts are ranked high, medium or low magnitude in the basis of judgmental evaluation of the impact vis-à-vis the nature and size of the project. Similarly, the impacts is categories into long-term, medium-term & short-term according to the impact's likely lasting duration due to the operation of the project.

In the absence of quantitative data, the environmental study-team's experts' judgment has been used for determining the Magnitude- based primarily on experiences from similar projects. The allocation of scores for the Magnitude (High, Medium & Low), Extent (Regional, Local & Site-specific) and Duration (Long-term, Medium-term & Short-term) for each impact is done as per the National EIA Guidelines, 1993.

The total scores of impacts of over 75 areas considered Very Significant; impacts having 50 to 75 are considered Significant; and impacts having total score of less than 50 are considered Insignificant for

this Project. However, some of the impacts whose total score exceeds 50 may not be significant in view of the nature of the predicted impacts. Some impacts having less than 50 score could also be considered significant. For example, impacts likely to occur outside the project's core area and of indirect nature may not be significant although the total score exceeds 50.

The beneficial and adverse impacts on Physical, Biological, Social and economic and Cultural Environment due to implementation of the Proposed Project during construction and operation phase has been predicted and prioritized on the following section.

There are series of adverse issues requiring corrective, compensatory, and preventive mitigation measures. Further analyses of the predicted impacts are observed into various sub-issues with site specific analyzes its location together with its magnitude and extent with the implementation of this project. Further attempts have been made to anticipate the occurrence of each impacts base of the result of various project components and activities.

## 6.2.7 Evaluation of Impacts

The impacts are broadly categorized in two categories – identified impacts and predicted impacts. In general, direct impacts are identified and indirect impacts are predicted. These identified and predicted impacts have been evaluated to know their environmental significance, taking into consideration of: Magnitude, Extent and Duration.

The environmental impacts are ranked either High, Medium or low Magnitude in the basis of judgmental evaluation of the impact vis-à-vis the nature and size of the Project. Similarly, the impacts are categorized into Long-term, Medium-Term and Short-term according to the impact's likely lasting duration due to the operation of the Project. Quantitative data on number of trees to be felled and number and area of land and house affected are used as the basis of determining the Magnitude of the impact. In the absence of quantitative data, the environmental study-team's experts' judgment has been for determining the Magnitude-based primarily on experiences from similar Projects.

### 6.2.7.1 Magnitude of Impact:

The magnitude of impact is determined on the basis of each potential impact's severity. It also indicates whether or not the impact is reversible. Parameters are summarized below.

Table 6.2-8 Parameters of Impacts

High/Major Magnitude	The magnitude of impact is considered to be serious of a major adverse impact cannot be mitigated. A major adverse impact would affect the potential subsistence, recreational and commercial use of biophysical resources, with the result that the value of resource would be reduced far below publicity acceptable level.
Medium Magnitude	Moderate to minor unmitigated impacts of a similar nature would make the resources still usable but at some inconvenience to the public.
Low Magnitude	Minor impacts which could be mitigated through general mitigation measures that do not have significant impact on local environment.

### 6.2.7.2 Extent of Impact:

The spatial extent or the zone of influence of the impact should always be determined. The extent of an impact may be confined to the Project site or area. Parameters are summarized below.

Table 6.2-9 Parameters of Extent of Impacts

National	If the resources are affected at nation scale, it is known as a national impact.
Regional	An impact area considered to be of regional level if it extends beyond the Direct Impact Area to a larger region
Local	If the impact of the proposed Project is limited to the Direct Impact Area alone, it is called a local impact.
Site	If the impact is confined to the Project site alone, it is a site-specific impact.

Specific	
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### 6.2.7.3 Duration of Impact:

As environmental impacts have a temporal dimension, they should be discovered through an environmental impact assessment. Impacts arising at different phases of the Project cycle need to be appropriately considered. The types of impact produced during different phases of construction of a Project are generally of temporary nature. Parameters are summarized below.

Table 6.2-10 Parameters of Duration of Impacts

Long Term	An impact that lasts beyond 20 years is considered to be long term
Medium Term	An impact that continues for more than 3 years but less than 20 years may be considered as medium term
Short-Term	An impact that lasts for only 3 years after Project initiation may be classified as short term

The allocation of scores for the Magnitude (High, Medium & Low), Extent (Regional, Local & Site-specific) and Duration (Long-term, Medium-term & Short-term) for each impact is done as per the National EIA Guidelines, 1993, which recommends the following scoring values.

Table 6.2-11 Scoring Values

Magnitude	: High/Major = 60	Medium = 20	Low = 10
Extent	: National/Regional = 60	Local = 20	Site Specific = 10
Duration	: Long-Term = 20	Medium-Term = 10	Short-Term = 5

According to this Guideline, the total scores of impacts of over 75 is considered Very Significant; impacts having 50 to 75 are considered Significant; and impacts having total scores of less than 50 are considered Insignificant for this Project. However, some of the impacts whose total score exceeds 50 may not be significant in view of the nature of the predicted impacts. Some impacts having less than 50 score could also be considered significant. For example, impacts likely to occur outside the Project's core area and of indirect nature may not be significant although the total score exceeds 50.

The impact evaluation is done based on the above scoring method and given under the heading of "Evaluation of Significance of Potential Impacts" given for each identified potential impact, in Chapter 6 of this Report.

Table 6.2-12 Beneficial Impacts (Construction Phase) : Magnitude of Impact

Issue No.	Possible Impact Identified	Impact Prediction			Total Score	Significance of Impacts	Responsibility
		Magnitude	Extent	Duration			
BC-i	Generation of Employment opportunities and increase of Income	H	SS	M	80	Very Significant	Contractor/Project Proponent
		60	10	10			
BC-ii	Increase in income of local people through opportunity to work and activities	H	SS	L	90	Very Significant	Project Proponent
		60	10	20			
BC-iii	Technical skills and capacity enhancement of locals	H	SS	L	90	Very Significant	Contractor/Project Proponent
		60	10	20			

**Note:** Magnitude (H-High, M-Medium, L-Low), Extent (R-Regional, L-Local, SS-Site Specific), Duration (LT-Long Term, MT-Mid Term, ST-Short Term).

Table 6.2-13 Beneficial Impacts (Operation Phase) : Magnitude of Impact

Issue No.	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
		Magnitude	Extent	Duration			
BO -i	Shortening of Travel Time	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO -ii	Saving of Vehicle Running Cost	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO -	Reduction of Traffic	M	R	LT	100	Very	Contractor/Project

Issue No.	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
		Magnitude	Extent	Duration			
iii	Accidents	20	60	20		Significant	Proponent
BO –iv	Access improvement for people	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO –v	Reduction on Air Pollution	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO –vi	Economic benefit	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO –vii	Industrial Development	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			
BO –viii	Tourism Development	H	R	LT	140	Very Significant	Project Proponent
		60	60	20			

**Note:** Magnitude (H-High, M-Medium, L-Low), Extent (R-Regional, L-Local, SS-Site Specific), Duration (LT-Long Term, MT-Mid Term, ST-Short Term).

Table 6.2-14 Adverse Impacts : Magnitude of Impact

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
<b>Physical Environment (Construction Phase)</b>								
<b>P1</b>	<b>Temporary and Permanent change in land use</b>							
P1-i	Road width formation clearance, construction of cross drainages, retaining structures, river training works, etc.	Socio-economic impact on residents along the road due to loss of agricultural land.	H	SS	LT	90	Very Significant	Project Proponent
			60	10	20			
P1-ii	Road formation clearance	Socio-economic impact on resident who is related to forest activities due to loss of forest area.	H	SS	LT	90	Very Significant	Project Proponent
			60	10	20			
	Operation of Quarry Sites, Borrow pits Sites	Limited impact is anticipated	L	SS	ST	25	Insignificant	Contractor/Project
P1-iii	Acquisition of cultivated land due to construction and road width formation	Cumulative impact on socio-economic situation of residents who lost cultivated land and decrease in agricultural production	H	SS	ST	75	Significant	Contractor/Project Proponent
			60	10	05			
<b>P2</b>	<b>Impacts on air, noise and water quality degradation due to construction activities</b>							
P2-i	Road formation clearance Transportation of construction material	Social impact on resident along road and road users with Air pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	M	L	ST	45	Insignificant	Contractor
			20	20	05			
P2-ii	Road formation clearance Transportation of construction material	Social impact on resident along road and road users with Noise pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	M	L	ST	45	Insignificant	Contractor
			20	20	05			
P2-iii	Operation of crusher plant, concrete batching plant and bitumen mixing plant	Social impact to local people due to Excessive dust production and noise pollution due to operation of crusher plants, concrete batching plant and bitumen mixing plant etc.	M	L	MT	50	Insignificant	Contractor
			20	20	10			
P2-iv	Operation of Quarry sites and burrow pits	Physical impact upon air, noise and water due to Quarry site	L	SS	ST	25	Insignificant	Contractor
			10	10	05			

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
P2-v	Road formation clearance and track opening During the construction of Culverts and bridges structures at Chakku, Bikateshwor, Punyamati & Chandeshwori Rivers. Siltation and deposition at lower, downstream sections on river banks altering the level of pH and Suspended Solid. Surface water contamination from unsanitary disposal of waste on nearby water bodies altering the BOD level.	Biological impact due to degradation of water qualities of existing Chakku, Bikateshwor, Punyamati & Chandeshwori Rivers. Siltation and deposition at lower, downstream sections on river banks altering the level of pH and Suspended Solid. Surface water contamination from unsanitary disposal of waste on nearby water bodies altering the BOD level.	L	SS	ST	25	Insignificant	Contractor
			10	10	05			
P2-vi	Hill side rock cutting for road width formation	Physical impact on resident along roadside due to Vibration and Noise pollution during blasting and road excavation activities	M	SS	ST	35	Insignificant	Contractor/ Project Proponent
			20	10	05			
<b>P3</b>	<b>Impacts / issues due to originating from solid wastes, soil waste &amp; Liquid waste generation</b>							
P3-i	Construction and use of the stock yard, concrete mixing plant, storage, etc.,	Physical impact to local resident due to produced Solid Wastes	M	SS	ST	35	Insignificant	Contractor/ Project Proponent
			20	10	05			
P3-ii	Construction and use of the Workers' Camp.	Physical impact to local resident due to produced Solid Wastes	M	SS	ST	40	Insignificant	
			20	10	05			
P3-iii	Construction and use of the septic tanks at campsite	Physical Impact due to produced Solid Wastes and Liquid Waste to surrounding Environment	M	SS	MT	40	Insignificant	
			20	10	10			
P3-iv	Construction of the Approach Road to Tunnel and Tunnel excavation work	Social and Physical Impact to resident around tunnel area due to production of Spoil/ Soil Waste	M	SS	MT	40	Insignificant	Contractor/ Project Proponent
			20	10	10			
P3-v	Generation of Spoil/Muck/Soil and construction of Spoil Disposal Site		M	SS	MT	40	Insignificant	
			20	10	10			
P3-vi	Reinstatement of Stock yard, Labor and Contractor camps.		M	SS	MT	40	Insignificant	
			20	10	10			
P3-vii	Reinstatement of Bitumen yard and fuel, lubricants storage area	Physical Impact to locales due to production of Liquid Waste	M	SS	LT	50	Significant	Contractor/ Project Proponent
			20	10	20			
<b>P4</b>	<b>Impacts / issues on Top Soil and Soil Contamination</b>							
P4-i	Activities of construction equipment and tools	Physical Impact to Soil Contamination due to construction activities	L	SS	MT	30	Insignificant	Contractor/ Project Proponent
			10	10	10			
P4-ii	Construction and use of the stock yard, concrete mixing plant, storage, etc.		L	SS	MT	30	Insignificant	
			10	10	10			
P4-iii	Excavation of the hills and road alignment for track opening.	Physical Impact to top Soil due to construction activities	L	SS	ST	25	Insignificant	Contractor/ Project Proponent
			10	10	05			
<b>P5</b>	<b>Impact of chemical, toxic and non-toxic materials upon Environment</b>							
P5-i	Mechanical parts/ vehicle maintenance and cleaning and mixing of its discharge into water bodies	Physical Impact with Chemical contamination on of water bodies due to mechanical parts/ workshop/ vehicle maintenance and cleaning and mixing into water bodies	M	SS	ST	35	Insignificant	Contractor
			20	10	05			
P5-ii	From Construction materials for road site	Physical Impact with use of chemical such as epoxy,	M	SS	ST	35	Insignificant	Contractor

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
		gypsum, additives, admixtures, cements, bitumen etc. residues mixing in land and water	20	10	05			
<b>P6</b>	<b>Impacts due to Labor Camp, Contractor's Camp operation</b>							
P6-i	Labor Camp and Contractor's camp operation	Socio-economic impact on residents due to Temporary loss of land	M	SS	ST	35	Insignificant	Contractor
			20	10	05			
P6-ii	Labor Camp and Contractor's camp operation activities	Social Impact to residents due to Solid waste disposal issues	M	SS	ST	35	Insignificant	Contractor
			20	10	05			
P6-iii	Labor Camp and Contractor's camp operation activities	Physical impact to surface due to contamination from unsanitary disposal of toilet waste	M	SS	ST	35	Insignificant	Contractor
			20	10	05			
<b>P7</b>	<b>Physical Impacts due to slope instability, landslide, erosion of hill slopes along road alignment</b>							
P7-i	Blasting at tunnel portals and rocky alignment areas	Physical and Social Impact to local resident of the area with Landslide triggering during excavation through blasting activities	M	SS	MT	40	Insignificant	
			20	10	10			
P7-ii	Slope cutting for road width formation Excess spoil disposal Construction and excavation activities	Physical impact on Slope instability due to landslides and erosion of fresh cut hill-side slopes and valley sides slopes	H	L	MT	90	Very Significant	Contractor
			60	20	10			
P7-iii	Slope cutting for road width formation and clearance of vegetation	Social impact on local resident due to Soil erosion, gully formation at new open cut sections	M	SS	MT	40	Insignificant	Contractor
			20	10	10			
<b>P8</b>	<b>Physical Impacts due to incorrect disposal of excess excavated earth material</b>							
P8-i	Road formation clearance, slope cutting Direct disposal of spoil into nearby river, agricultural land and hill slope	Social and physical impact due to Direct disposal and deposition of materials at the valley side of the road affecting river and vegetation cover and agricultural	H	L	MT	90	Very Significant	Contractor
			60	20	10			
P8-ii	Excavation of the hills and road alignment for track opening. Direct dispose of excavated materials to natural drainages.	Physical impact due to Disruption / blockages of natural drainage with excavation materials (Small drainages and large drainage systems).	H	L	MT	90	Very Significant	Contractor
			60	20	10			
P8-iii	Road formation clearance	Socio-economic impact due to direct disposal and deposition of excavated materials on valley side affecting agriculture land, & triggering of erosion/slides	H	L	MT	90	Very Significant	Contractor
			60	20	10			
P8-vi	Road formation clearance and track opening	Physical and social impact with in road RoW due to future washout during heavy rains damaging road width	H	L	MT	90	Very Significant	Contractor
			60	20	10			
<b>P9</b>	<b>Impacts on River flow regime and river environment</b>							
P9-i	Diversion of at Chakku, Bikateshwor, Punyamati & Chandeshwori river during construction of bridge foundation	Biological and physical impact on water use due to temporary flow diversion during construction of bridges	L	SS	ST	25	Insignificant	Contractor
			10	10	05			
P9-ii	Disposal of construction wastes to rivers and water bodies	Biological and physical Impacts on water due to operation of Crusher Plants, Concrete Batching Plants and storing of material if on	L	SS	ST	25	Insignificant	Contractor
			10	10	05			



Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
		river banks.						
P9-iii	Haphazard disposal of excavated materials during construction of highway at upstream areas such as at river corridor	Social impact on agriculture land due to Siltation and deposition on river banks	L	SS	ST	25	Insignificant	Contractor
			10	10	05			
P9-iv	Construction activity	Social and physical impact due to Potential Food damage to residents along the major rivers	L	SS	ST	25	Insignificant	Contractor
			10	10	05			
P9-v	Diversion at Chakku, Bikateshwor, Punyamati & Chandeshwori river during construction of bridge	Physical impact on river due to temporary flow diversion during construction of bridges	L	SS	ST	25	Insignificant	Contractor
			10	10	05			
<b>P10</b>	<b>Impact upon existing public utilities and Physical Structures and Infrastructures</b>							
P10-i	Road formation clearance	Physical damage to existing highway road surface, damage to culverts etc., causing difficulty in local movements.	H	SS	MT	80	Very Significant	Contractor/Project Proponent
			60	10	10			
P10-ii		Physical Impact to Electric poles, pylons situated along road side	H	SS	LT	90	Very Significant	Contractor/Project Proponent
			60	10	20			
P10-iii		Social Impact to users due to damage on existing irrigation canals, water pipelines, local trails, etc.	H	SS	MT	80	Very Significant	Contractor/Project Proponent
			60	10	10			
<b>P11</b>	<b>Impact/Issues of OHS due Construction Activities</b>							
P11-i	Road Track clearance, construction of structures and bridge	Physical impact to labors due to Occupational Health and Safety issues during construction	H	L	MT	90	Very Significant	Contractor/Project Proponent
			60	20	10			
P11-ii	Road formation clearance and opening of tunnel portal	Physical impact to labors on Safety issues due to handling of explosives, during transporting, storing and use	M	L	ST	45	Insignificant	Contractor/Project Proponent
			20	20	05			
P11-iii	Construction vehicles will run on existing roads disturbing other local transportation and movement of the local	Social Impact to road users due to Road safety issues during construction works	H	L	ST	85	Very Significant	Contractor/Project Proponent
			60	20	05			
<b>P12</b>	<b>Impact/Issues due to operation of Asphalt concrete plant/hot mix plant</b>							
	Road Surfacing activities	Physical impact to locals due to Increases air pollution from plant	H	SS	ST	75	Significant	Contractor/Project Proponent
			60	10	05			
<b>P13</b>	<b>Impact/Issues due to operation of Crusher plant and Batching plant</b>							
	Road construction work Crushing of aggregated	Physical impact to Local people and labor force due to air, noise and water pollution with plant	H	SS	MT	80	Very Significant	Contractor/Project Proponent
			60	10	10			
<b>Operation Phase</b>								
<b>P14</b>	<b>Obstruction to local movement between adjacent lands and settlement of highway alignment</b>							
P14-i	Operation of alignment without direct accessibility to people between adjacent lands	Social impact to resident due to inaccessibility between adjacent settlement & market areas	M	L	MT	50	Significant	Contractor/Project Proponent
			20	20	10			
<b>P15</b>	<b>Impact due to land fragmentation, difficulty to farmers to farm in such fragmented plots</b>							
P15-i	Implementation project	Social impact to resident due to possible fragmentation of agricultural land with the implementation of project & difficulty caused by it to access the land	M	L	MT	50	Significant	Contractor/Project Proponent
			20	20	10			
<b>P16</b>	<b>Impact Air pollution due to Traffic exhaust gas on the Road</b>							
P16-i	Plying of vehicles	Physical impact upon air due	L	R	LT	90	Very	Project

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
		to plying of vehicles	10	60	20		Significant	Proponent
<b>P17</b>	<b>Impact of noise Pollution from the traffic on the Road to nearby local residents</b>							
P17-i	Operation of the project	Social Impact to resident along road due to noise pollution; as large number of vehicles will run through this section of highway.	M	R	LT	90	Very Significant	Contractor Project Proponent
			20	60	20			
<b>P 18</b>	<b>Issues related to High Speed Highway and Road Safety</b>							
P18-i	Operation of tunnel and plying of large number of vehicles	Social Impact to road users due to road safety and safe driving issue	H	SS	LT	90	Very Significant	Contractor/ Project Proponent
			60	10	20			
P18-ii	Installation of traffic signals and indicators including separate traffic lane	Physical impact to road users due to traffic management	M	SS	LT	50	Significant	Contractor/ Project Proponent
			20	10	20			
<b>Biological Environment (Construction Phase)</b>								
<b>B1</b>	<b>Permanent loss of Forest Areas</b>							
B1-i	Road formation clearance	Biological impact in forest due to Loss of mature trees and forest	H	SS	LT	90	Very Significant	Contractor/ Project/ CFUGs
			60	10	20			
B1-ii	Road formation clearance	Socio-economic impact to users of forest due to depletion of NTFP resources such as chir resin, sal oleo-resin, etc.	H	SS	LT	90	Very Significant	Contractor/ Project Proponent/ CFUGs
			60	10	20			
B1-iii	Road formation clearance	Socio-economic impact to CFUGs due to acquisition of forest land	H	SS	LT	90	Very Significant	Contractor/ Project
			60	10	20			
B1-iv	Road formation clearance	Biological impact upon shrub land and loss of vegetation	M	L	LT	60	Significant	Contractor/ Proponent
			20	20	20			
<b>B2</b>	<b>Impact due to disturbance to species of flora and fauna of the forest area</b>							
B2-i	Road formation clearance	Biological impact due to possible depletion of threatened species	M	L	LT	60	Significant	Contractor/ Project Proponent
			20	20	20			
<b>B3</b>	<b>Impact upon wildlife habitat, biodiversity of forest area due to construction work</b>							
B3-i	Road formation clearance	Biological impact on wildlife due to Fragmentation of forest land, their movement / corridor & breeding area	L	SS	ST	25	Insignificant	Contractor/ Project Proponent
			10	10	05			
B3-ii	Road formation clearance	Disturbance to wildlife by construction works	L	SS	ST	25	Insignificant	Contractor/ Proponent
			10	10	05			
B3-ii	Road formation clearance	Limited impact on natural habitat	L	SS	ST	25	Insignificant	
			10	10	05			
B3-iv	Labor camp, equipment storage and workshops	Biological impact on forest area due to wildlife poaching, illegal tree felling and fire hazards	M	L	ST	45	Insignificant	Contractor/ Project Proponent
			20	20	05			
<b>B4</b>	<b>Indirect impact of forest area degradation, possible loss of vegetation for timber &amp; fuel wood by</b>							
B4-i	Contractor's camps operation activities	Physical impact on forests for fuel wood in labor camps	M	L	MT	50	Significant	Contractor
			20	20	10			
B4-ii	Accessibility of construction workers, smuggling and wood trafficking at the project forest areas	Physical impact on the forest resources due to illegal utilization by construction workers.	M	L	MT	50	Significant	Contractor
			20	20	10			
B4-iii	Contractor's camps operation activities	Illegal hunting / trapping / fishing or trading of locally found fauna species	M	L	MT	50	Significant	Contractor
			20	20	10			
<b>Biological Environment (Operation phase)</b>								
<b>B5</b>	<b>Gradual encroachment into forest areas, and loss of forest resource due to forest clearance.</b>							
B5-i	Increase in settlement areas	Biological Impact on forest	L	SS	MT	30	Insignificant	Project

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
	along the existing highway road side	area due to possible Encroachment of forest areas	10	10	10			Proponent/C FUGs
<b>Socio-Economic &amp; Cultural Environment (Construction Phase)</b>								
<b>S1</b>	<b>Impact due to Private/Public Property Acquisition for Construction</b>							
S1 –i	Road formation clearance	Socio-economic impact to the residents of road side due to Land Acquisition; 13.33 ha additional cultivated land will be acquired permanently.	H 60	L 20	LT 20	100	Very Significant	Contractor/ Project Proponent
S1 –ii	Road formation clearance	Socio-economic impact to resident of road side due to acquisition of residential houses	H 60	L 20	LT 20	100	Very Significant	Contractor/ Project Proponent
S1 –iii	Road formation clearance Contractor's camp operation activities	Socio-economic impact to endless farmers and small landholders due to acquisition of their land	H 60	L 20	LT 20	100	Very Significant	Project Proponent/ Local Stakeholders
S1 –iv	Road construction activities	Socio and physical impact to resident along road side due to Fragmentation of agricultural land	H 60	L 20	LT 20	100		Proponent/ Stakeholders
S1 –v	Road formation clearance	Socio-economic impact to resident of land due to decrease in agriculture production after land loss	H 60 20	L 20	LT 20 10	100	Very Significant	Project Proponent/ Stakeholders
<b>S2</b>	<b>Impact due to Outside Workers</b>							
S2 –i	Contractor's camp operation activities	Socio-Cultural impact on social, cultural and religious practices due to in-migration	L 10	SS 10	ST 05	25	Insignificant	Project Proponent/ Local Stakeholders
S2 –ii	Contractor's camp operation activities	Social impact to local due to degradation of sanitation and hygiene condition of the area	M 20	SS 10	ST 05	35	Insignificant	Contractor/Project Proponent
S2-iii	Immigration of outside workers, establishment of labor camp, economic activity of labors with locals at market and settlement areas	Physical impact to local resident due to Pressure upon existing natural resources such as water, existing food availability, existing educational facilities with the increase in the number of outside workers and the utilization of resources.	M 20	SS 10	ST 05	35	Insignificant	Contractor/Project Proponent
S2-iv	Road construction and acquisition of private land and property	Social impact on area due to Conflict between workers and local people during the time of construction as there could be a struggle for same commodity and natural resources.	M 20	SS 10	ST 05	35	Insignificant	Contractor/Project Proponent
<b>S3</b>	<b>Depriving locals form continuation of their economic and business activities during the construction of road</b>							
S3 –i	Road construction activities	Socio-economic impact to small business holders due to deprive from their economic activities during road construction	M 20	SS 20	ST 05	45	Insignificant	Contractor/ Project Proponent
S3 –ii	Road construction activities	Impact on people's cultural behavior and local economy	M	SS	ST	45	Insignificant	Project Proponent/

Issue No.	Project Activities	Impacts	Impact Prediction			Total Score	Significance of Impacts	Responsibility
			Magnitude	Extent	Duration			
		due to economic activities	20	20	45			Local Stakeholders
<b>S4</b>	<b>Health and safety issues during Construction</b>							
S4 – i	Track opening, construction of structures and bridge	Physical impact to labors due to Occupational Health and Safety issues during construction	H	L	MT	90	Very Significant	Contractor/ Project Proponent
			60	20	10			
S4 – ii	Track opening During Vibration, high decibel of noise, dust and air pollution might deteriorate human health of locals.	Social impact to labors and local people due to Health and Safety issues with construction activities	H	L	MT	90	Very Significant	Contractor/ Project Proponent
			60	20	10			
S4 – iii	Road formation clearance and opening of tunnel portal	Physical impact to labors on Safety issues due to handling, transporting, storing and of explosives.	M	L	ST	45	Insignificant	Contractor/ Project Proponent
			20	20	05			
S4 – iv	Construction vehicles will run on existing roads disturbing other local transportation and people.	Social Impact to road users due to Road safety issues during construction works	H	L	ST	85	Very Significant	Contractor/ Project Proponent
			60	20	05			
<b>Operation Phase</b>								
<b>S5</b>	<b>Social and cultural impacts due to Road Operation</b>							
S5 – i	No direct accessibility to people in the road alignment	Possible impact on livelihood based on business of various agricultural products.	M	L	LT	60	Significant	Project Proponent/ Local Stakeholders
			20	20	20			
S5 – ii	Increase in Vehicular movement entire the road length	Social & Physical impact to road users due to increase traffic accidents because of the speed and heavy flow of vehicles	M	R	LT	100	Very Significant	Project Proponent/ Local Stakeholders
			20	60	20			
S5 – iii	Increasing number of labor workers for other opportunities and increase in outside migrants	Social impact along project area due to Trafficking and prostitution, consumption and import of alcoholic products because of heavy flow of migrants in the project Municipalities.	M	SS	LT	50	Significant	Project Proponent/ Local Stakeholders
			20	10	20			
S5 – vi	Prevention of direct accessibility into the highway	Social impact to resident due to Inaccessible / separation due to fragmentation of land	M	SS	LT	50	Significant	Proponent/ Local Stakeholders
			20	10	20			

**Note:** Magnitude (H-High, M-Medium, L-Low), Extent (R-Regional, L-Local, SS-Site Specific), Duration (LT-Long Term, MT-Mid Term, ST-Short Term).

**Note: Nature of Impact: D= Direct; IN= Indirect; R= Reversible; IR= Irreversible at site-specific level**

Magnitude	High/Major = 60	Medium = 20	Low = 10
Extent	Regional = 60	Local = 20	Site Specific = 10
Duration	Long-Term = 20	Medium-Term = 10	Short-Term = 5

These points / scores for Magnitude, Extent and Duration are taken from the National EIA Guidelines, 1993.

Significance of Impact :

Total Score:	More than 75	:	Very Significant
	50 to 75	:	Significant
	Less than 50	:	Insignificant

## Chapter 7 ALTERNATIVE ANALYSIS

Environmental Assessment is a tool that provides opportunities to explore possible alternatives with and within the Project. This Chapter explores the various alternatives of the Project road in order to select the most optimum road alignment considering the technical, economical, environment, social and road safety parameters. Alternative assessment may include: Alternative Route and Location, Alternative Design and Construction Methods, Alternative Resources (alternative construction materials).

During the EIA study, Alternative Analysis was carried out considering the location and likely environmental impacts of project activities for each alternative were documented. During the assessment of possible alternatives, the design, project area, available technology, operation procedure, construction method (including schedule and raw material) and environmental management methods were considered. Likely impacts of each alternative were evaluated and compared in terms of potential environmental impacts beneficial and adverse, capital and operating costs, suitability under the local conditions, institutional and monitoring requirements. To extent possible, cost, benefits of each alternative were quantified, incorporating the estimated cost of any associated mitigation measures. The best and environmentally sound alternative was recommended for further assessment. The alternative analysis was carried out whether or not the risks resulting from the implementation of the proposal can be accepted. Alternative option such as no action option, also analyzed during the EIA study.

Alternative analysis has been considered as an integral part of the EIA study. The technical feasibility, economic viability and environmental acceptability govern the alternative analysis. Detailed Engineering Survey and Design of the proposed alignment was conducted after comparing the different alternative route. However, the EIA study team has made the assessment on the environmental impact assessment and economic viability of different section of alternatives, which is presented in this Chapter.

### 7.1 Non-Implementation of the Project

Comparison of the No-Implementation Option and With-Project Option are summarized in following tables. Without the Project, general social benefit listed in Table 7.1-1, 'With-Project Option,' will not be achieved soon. In the environmental and social aspects, negative Project impacts are not significant and mitigation measures are available. Since the Project Area is located in Bhaktapur, Suryabinayak, Banepa and Dhulikhel municipality Area, the land use change from farming land to housing, commerce and industry will continue no matter with or without Project.

Table 7.1-1 Comparison of the Forecast of No-Project Option and With Project Option  
(1: General Social Benefit)

	No-Project Option	With-Project Option
<b>Construction Phase</b>	1. Project benefit listed on the right will be available with other, later Project in Nepal.	1. Technical skills and capacity enhancement of <b>local engineering and construction companies</b> 2. Technical skills and capacity enhancement of workers

	No-Project Option	With-Project Option
<b>Operation Phase</b>	<p>2. The technology of road necessary to unite remote places in Nepal may not be tested and presented in near future.</p> <p>3. Without increased road capacity nor the alternate route to Kathmandu from the Eastern part of the country, Kathmandu will remain very vulnerable against large disaster or rising economic needs in the capital area.</p>	<p>3. <b>Application as a model case of six lane road in Nepal</b></p> <p>4. <b>Reduction of traffic jam occurrence on this section of Arniko Highway</b></p> <p>5. <b>Provision of alternative route</b> to and from Kathmandu Valley in case of catastrophic disaster such as big earthquake (<b>Disaster Preparedness</b>)</p> <p>6. <b>Access improvement</b> for people to facilities and services in Kathmandu Valley</p> <p>7. <b>Increase of road capacity</b> to accommodate increased traffic volume in year 2030</p> <p>8. Shortening of travel time</p> <p>9. Shortening of travel distance</p> <p>10. Saving of vehicle running cost</p> <p>11. Reduction of vehicle failure</p>

Table 7.1-2 Comparison of the Forecast of No-Project Option and With Project Option  
(2: Environmental and Social Items)

	No-Project Option	With-Project Option	
		Planning & Construction Phase	Operation Phase
<b>Physical Environment</b>	* Existing condition of air and noise, all over the standard, will continue.	* Increased air pollution (dust) and traffic jam will occur at along this section of Road after the operation of B.P Highway from Eastern part of the Country.	* About 70 % of the traffic will use the road section. * Concentration of air pollution material will increase along the section. * Air and noise condition along the existing highway will be made better by road design that is easier to drive in upgraded road.
	* Existing road alignment and RoW of road will remain as they are.	* Existing road alignment and RoW will be changed due to Curve improvement and new road alignment at Sanga section may be change giving stress to the local stakeholders.	* In case the pre-Project the sharp turns and curves are located in poor and risky condition for daily road users and for high speed vehicles use, additional the high gradient at the Palase and Sanga section will be considered to mitigate the high speed highway standard.
<b>Biological Environment</b>	* No urgent change will occur, but vegetation and fauna species in the area will decrease gradually by urbanization of the Project Area.	* Few area of community forest and the road side vegetation will be cleared to widen and upgrade the highway.	
<b>Socio-Economic and Cultural Environment</b>	* Urbanization will spread in the Project area by high demand for housing, office and commerce space in the capital area.	* Local material suppliers, engineering firms, contractors and workers will benefit for the Project construction work and duration	* Urbanization, land use change from farmland to housing and commerce, will occur faster than 'No-Project Option' in the Project Area, especially along the Alignment. * Commercial facilities along the existing highway near Dhulikhel Banepa, Bhaktapur will receive more traffic and commuter after the smooth, easy and fast access highway.

## 7.2 Alternative Design and Technology

The proponent has compared various designs and the other design is more costly than the present design and more environmental deteriorating. So the proposed design and technology is suitable for the proposed project to make cost effective and environmental sustainable.

## 7.3 Alternative Locations

The proponent has compared various locations of project sites with respect to various trade-offs. For example, alternately selected various alternative routes with consideration of shortest possible length, stable geology, minimum loss of forest and cultivated land, avoidance of deteriorating other natural resources (discussed hereunder).

## 7.4 Alternative Schedules and Process

The proponent has compared various project implementation schedules and process of implementations.

## 7.5 Alternative Resources

The proponent was also compared among the resources consumed for the proposed project for construction and operation phase. For example types of comparison among construction materials for infrastructures. Use of raw materials and types of fuel required will also be analyzed.

## 7.6 No Action Alternative

On account of the above discussion on the importance and rationality of this proposed road, the No Action alternative has been rejected- based on economic and development aspects rather than from the environmental point of view. The adverse impacts need to be mitigated through the suggestive mitigation measures presented in Chapter 6 of this Report.

## 7.7 Alternative Alignments Sections

Possible alternatives to the proposed alignment were analyzed, keeping in view the associated environmental issues for each alternative. Three locations were identified where alternative alignment was proposed as of Feasibility Study, which locations are discussed in detail hereunder.

The alternative alignments selected from among the five alternatives for detailed comparison to select the optimum alignment proposed during the Data Collection Survey are shown in following figure and table.

During the first field survey, three alternatives mentioned below were studied for improvement of the Existing road in Sanga mountainous area.

**Alt-1:** Widening of existing road (Widening and improvement of alignment)

**Alt-2:** Alternative route (Bypass between Nalinchowk and Sanga with New Road)

**Alt-3A:** Alternative route (Bypass between Nalinchowk and Sanga through Tunnel-North Route)

**Alt-3B** Alternative route (Bypass between Nalinchowk and Sanga through Tunnel-South Route)

Impacts on social and natural environment, traffic functions, traffic safety, socio-economic activities, Construction/ maintenance cost were compared to select the optimum alternative.

The above alternatives are shown in Figure 7.1-1. It is understood that Alt-1 will require large scale cut of mountains and structures and contribute to significant increase in the construction. It will also have adverse impact on the natural environment and as it requires construction of large scale structures, safety concerns during construction and along the detour road are also high. On the other hand, Alt-2 has the advantage in terms of minimizing the adverse impact on natural environment, but requires new relocation of houses at the east side where it meets with the existing road.



During the second field survey, based on the detail information obtained from the topographic survey and geological investigation, comparison of alignment was further conducted for Alt-3 (Bypass between Nalinchowk and Sanga with Tunnel) determined during the initial field survey.

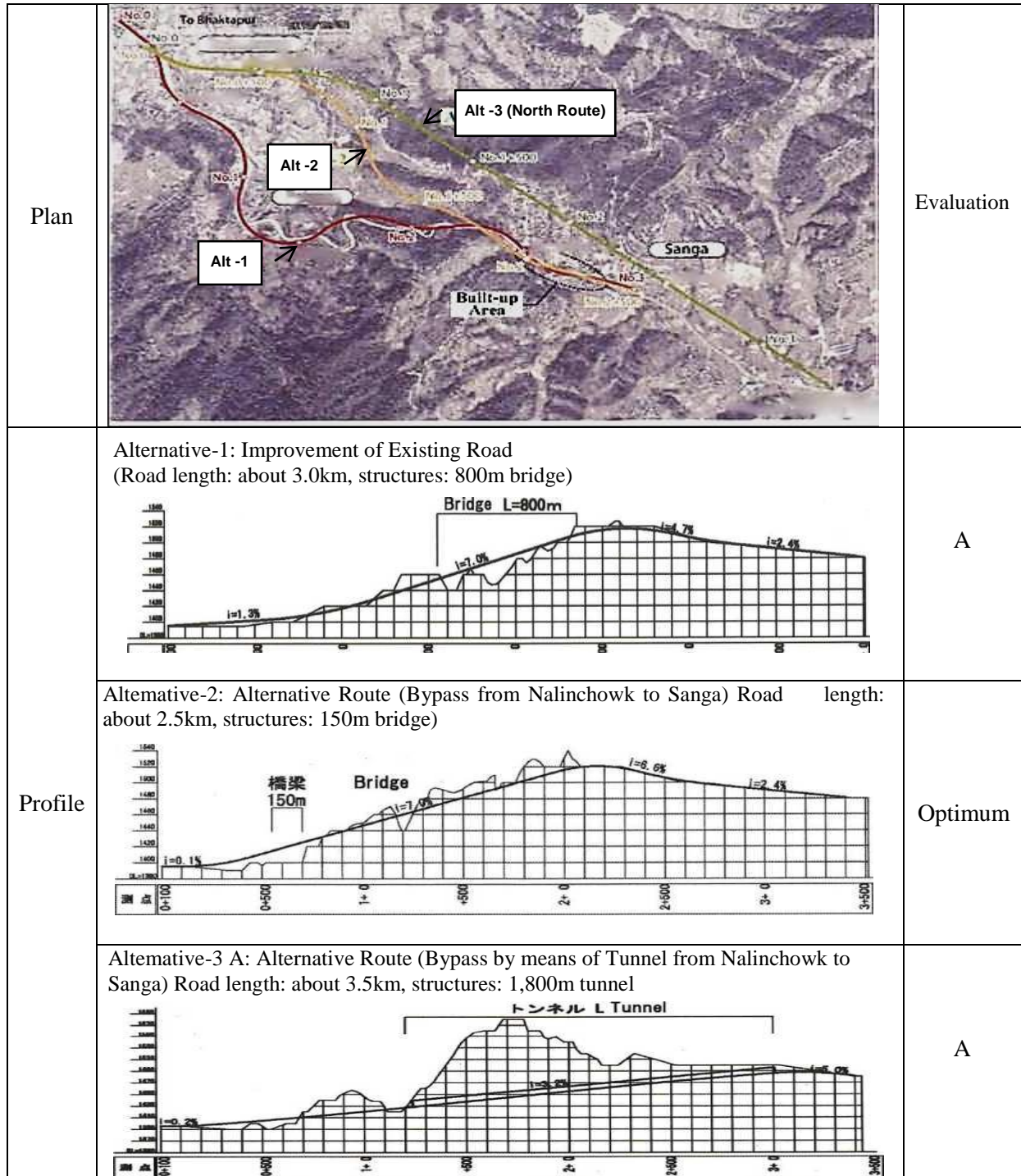


Figure 7.7-1 Detail of Alternative Routes between Nalinchowk and Sanga

Table 7.7-1 Secondary Comparison for Alt-2 Selected During Field Survey

Geometric Condition	Inferior than Alt-2 (Horizontal curvature is 115m and Vertical grade 6.7%, design speed 60km/h)	A	Superior than Alt-1. ((The horizontal curvature is Smoother (500m) although vertical grade is slightly steeper (7.0%), design speed 60km/h)	o
Environment	Number of affected houses is small, Required land is almost equal to Alt-2	o	Number of affected houses is large, Required land is almost equal to Alt-1	A
Cost	Requires approx. 100m long Bridge	o	Requires two bridges approx. 150m to 100m long. Embankment height is 30m requires stability analysis.	A
Evaluation	Under Study			



### Re-alignment at Sanga Pass with Road and Tunnel Alternative

Road Route 1: New Road Route (Yellow)

Tunnel Route 2: South Route (Red)

Tunnel Route 3: North Route (Blue)

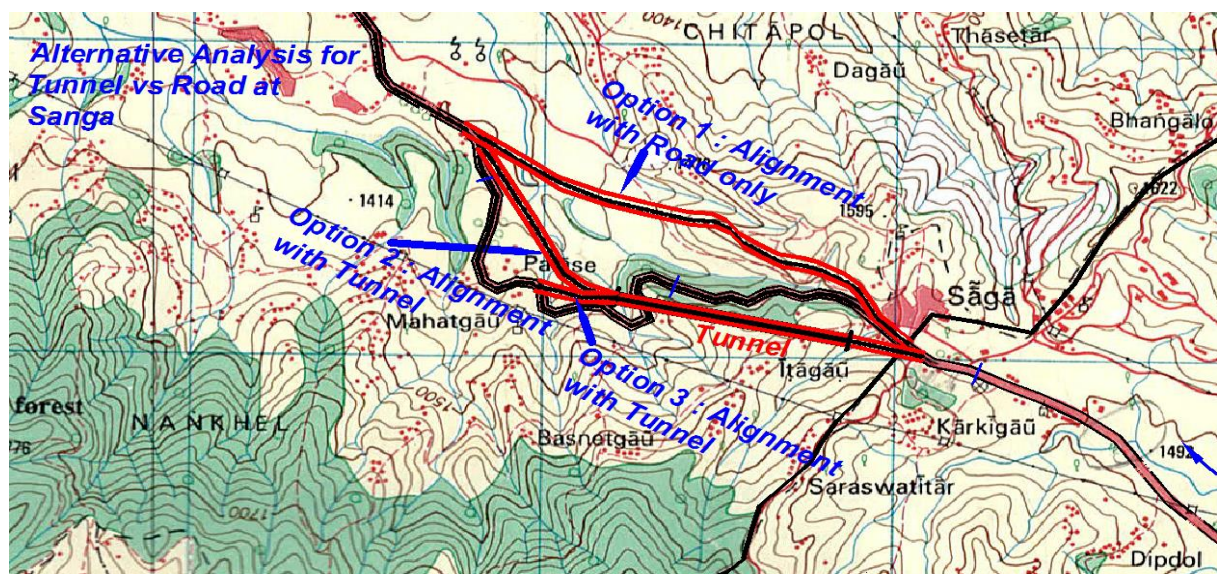


#### Details of Alternative 3B with Sanga Tunnel at South Route

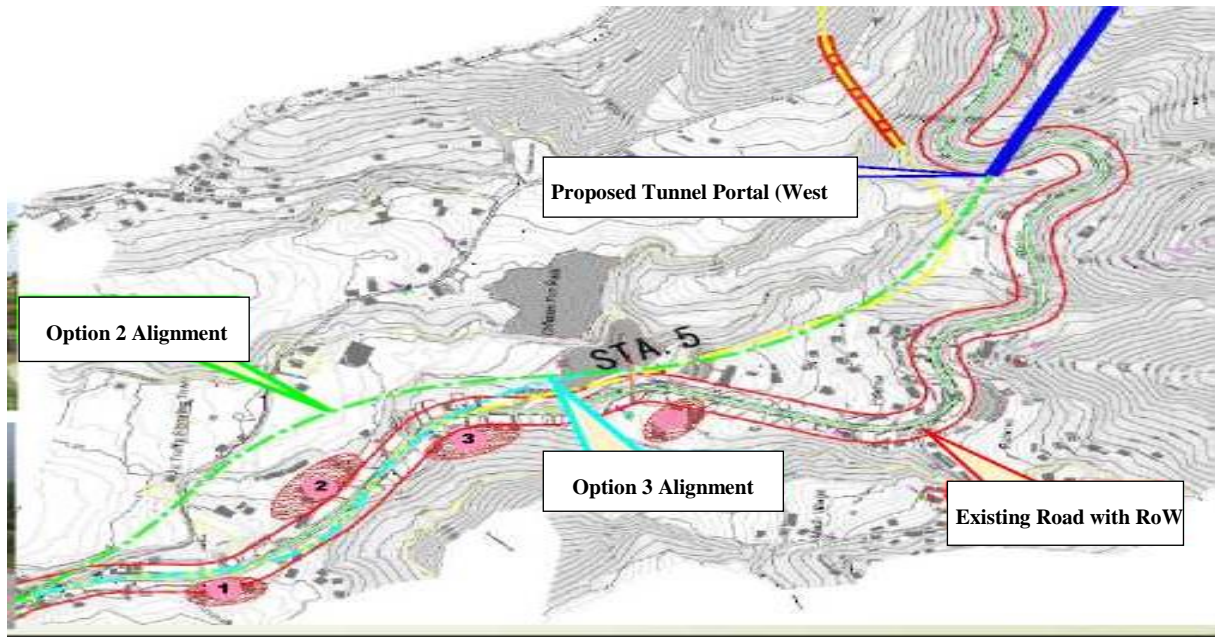
Alternatives at Sanga Tunnel was also studied to find the optimal alignment. As the first alternative, a road-only alternative was studied (Option 1, in Figure below). However, this alternative was not considered feasible due to high grade and high cutting slopes, causing much environmental impacts.

As an alternative to Option 1, alternative with Tunnel section was studied and found to be feasible. For Tunnel option, two tunnel approach road alignment option were studied, namely Option 2 and Option 3 (in Figure below). Options 2 and 3 have same Tunnel, but only different alignments for Approach road. Option 2 had a longer approach road requiring larger land acquisition and house demolition. Option 3 has shorter approach road length and lesser land and house acquisition. Thus Option 3 was selected as feasible and acceptable alternative.

**This EIA Report has considered Alternative 3B with Option 3 Alignment as the final option and the EIA is done for this alignment.**







### 7.8 Improvement of Sharp Curve (Ahead of Dhulikhel)

Another location where the alignment of the existing road needs to be changed drastically is near Dhulikhel. The curvature radius here is so small ( $R=50m$ ) that the vehicles have difficulty negotiating for smooth and safe drive along the section. Two alternatives as shown in Table-5 were studied as remedial measures of this section. The first alternative is the measure proposed by the Survey Team, while the second alternative is the measure proposed in the project “Detailed Design of Upgrading/Widening of Roads to Six Lane Standard, Arniko Lokmarga (Suryabinayak - Dhulikhel Section)” conducted by the. GON in July 2011. The comparative study is shown in Table 7.8-1. Alt-1 is selected, as it is superior than Alt-2 in terms of driving comfort, impact against environment and construction cost.

Table 7.8-1 Comparative Study for Improvement of Sharp Curve (Ahead of Dhulikhel)



Geometric Condition	<ul style="list-style-type: none"> <li>• Design speed 60km/h</li> <li>• Horizontal curvature is 115 m (with transitional curve)</li> <li>• Vertical alignment 5.3%</li> </ul>	o	<ul style="list-style-type: none"> <li>• Design speed 60km/h</li> <li>• Horizontal curvature is 130 m (without transitional curve)</li> <li>• Vertical alignment 6.6%</li> </ul>	A
Drive Comfort	Higher than Alt-2, (The horizontal curvature is slightly gentler in case of Alt-2 but the grade is steeper and can significantly decrease the running speed (especially of trucks and buses)	o	Lower than Alt-1	A

Environment	<ul style="list-style-type: none"> <li>• Number of affected houses is equal to that of Alt-2</li> <li>• Required land area is smaller than Alt-2</li> <li>• Land to be acquired is mostly open area</li> </ul>	o	<ul style="list-style-type: none"> <li>• Number of affected houses is equal to that of Alt-1</li> <li>• Required land area is bigger than Alt-1</li> <li>• Land to be acquired is paddy field</li> </ul>	A
Cost	Maximum cut height is approx. 17m but, does not require purchasing of earth. Also excavated earth can be utilized for fill	o	Maximum fill height is .20m and requires huge volume of earth. Also, embankment on the paddy field may require countermeasures against stability	A
Evaluation	Superior than Alt-2 in terms of drive comfort, environmental impacts and construction cost	A		



Figure 7.8-1 New Alignment with Improvement of Sharp Curve at Dhulikhel and KU Chowk

**7.9 Minimizing the Impact on Resettlement and Cultural Resources**

One of the major issues of the previous road RoW throughout the alignment was the major problem and possible to affect heavy big residential houses and commercial area of Banepa municipality. After following the given reduced RoW from Sanga to Banepa area large numbers of such comical and heavy structure settlement have been saved. As shown in following figure the given alignment has saved several big residential houses of the commercial area.



Figure 7.9-1 Alignment with Reduced RoW at Banepa Area



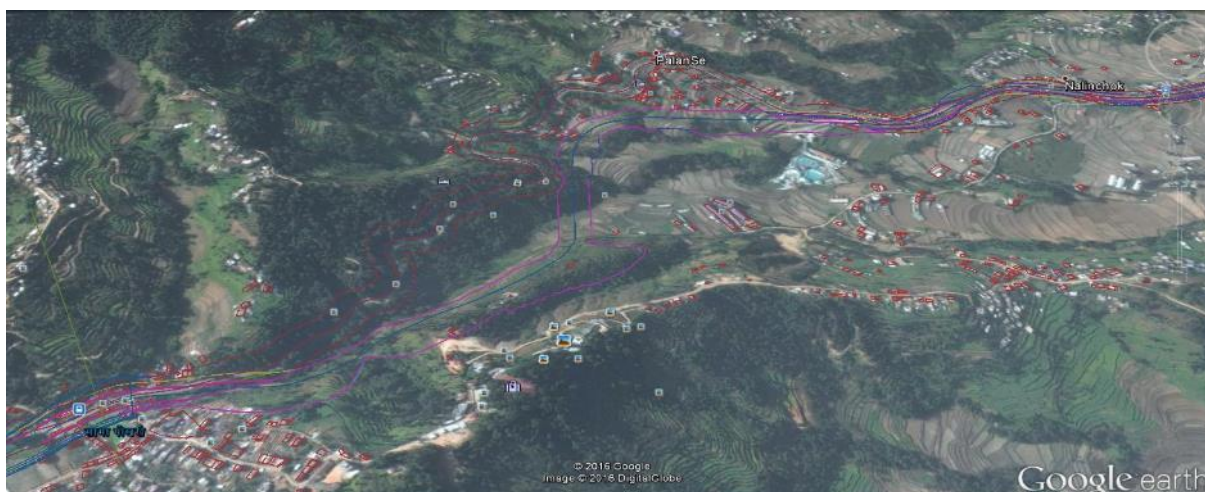


Figure 7.9-2 New Proposed Improved Grading Alignment from Nalinchowk to Sanga

### 7.10 Spoil Disposal Sites

Potential sites for the Spoil Disposal Site were selected as shown in Figure 7.10-1. All sites are located near the existing Highway, with rather narrow valley that can be used as flat area after the disposal



Figure 7.10-1 Sites for the Soil Disposal Site

The comparing with the disposal areas was carried out based on these four (4) items from the technical viewpoint of 1) Condition of Site, 2) Surrounding Environment, 3) Accessibility and 4) Others.

### 7.11 Technology

The technology, the construction equipments and the operational facilities were selected with considerations to minimize the negative impacts on environmental and social condition.

- A. Machine excavation was selected for the excavation of the Road extension work so that noise and vibration will be minimized in the surrounding area.

### 7.12 Construction Procedure of Operation and Time-Schedule

Time schedule for the Construction Works were studied during the Basic Design Phase. To minimize the environmental and social negative impact, following arrangement was proposed.

- A. Intersections with the existing Highway will be constructed in the last phase of the Construction Phase, using one to two nights for each intersections. By this arrangement, the Road will be fully open with the minimum interruption on and from the local traffic.
- B. During rainy season, the earthworks and excavation of fragile area will be strictly restricted. Excavation of Bridge foundation works along at Chakku, Bikateshwor, Punyamati & Chandeshwori rivers will be avoided during rainy season especially during the months of June

to September when high flood and inundation at the river banks likely. Similarly, site clearance works and affected tree felling will be carried out during dry seasons only when vegetation growth is fair.

- C. The construction period scheduled on October to June will be the most favorable for project area to provide food grains against the work done by the local inhabitants.
- D. Construction works will be executed employing local people as far as possible whereas population depended upon agricultural will not be affected with the highway construction.
- E. Seasonal calendar will also be taken into account to manage construction works avoiding implication from agricultural practice at local level and other religion of national importance which could directly affect the duration of construction.

### 7.13 Raw Materials to be used

The necessary raw materials were listed as in the following table.

Table 7.13-1 Major Construction Materials and Procurement Conditions

No.	Major Construction Material	Road	Local Procurement	Import
1	Cement	○	○	○
2	Aggregate, Sand	○	○	
3	Formworks material	○	○	
4	Reinforced steel bars	○	○	○
5	Steel material(Sheet-piles)	○		○
6	Scaffolding/ Supporting	○	○	
7	Concrete pipes (φ 600 to 900 mm)	○	○	
8	Crusher run (Crushed stone, shoulder stone)	○	○	
9	Bitumen (Asphalt emulsion (Tuck coat), Asphalt mixture)	○	○	○
10	Diesel oil	○	○	○
11	Fill material	○	○	

Source: JICA Survey Team, 2017

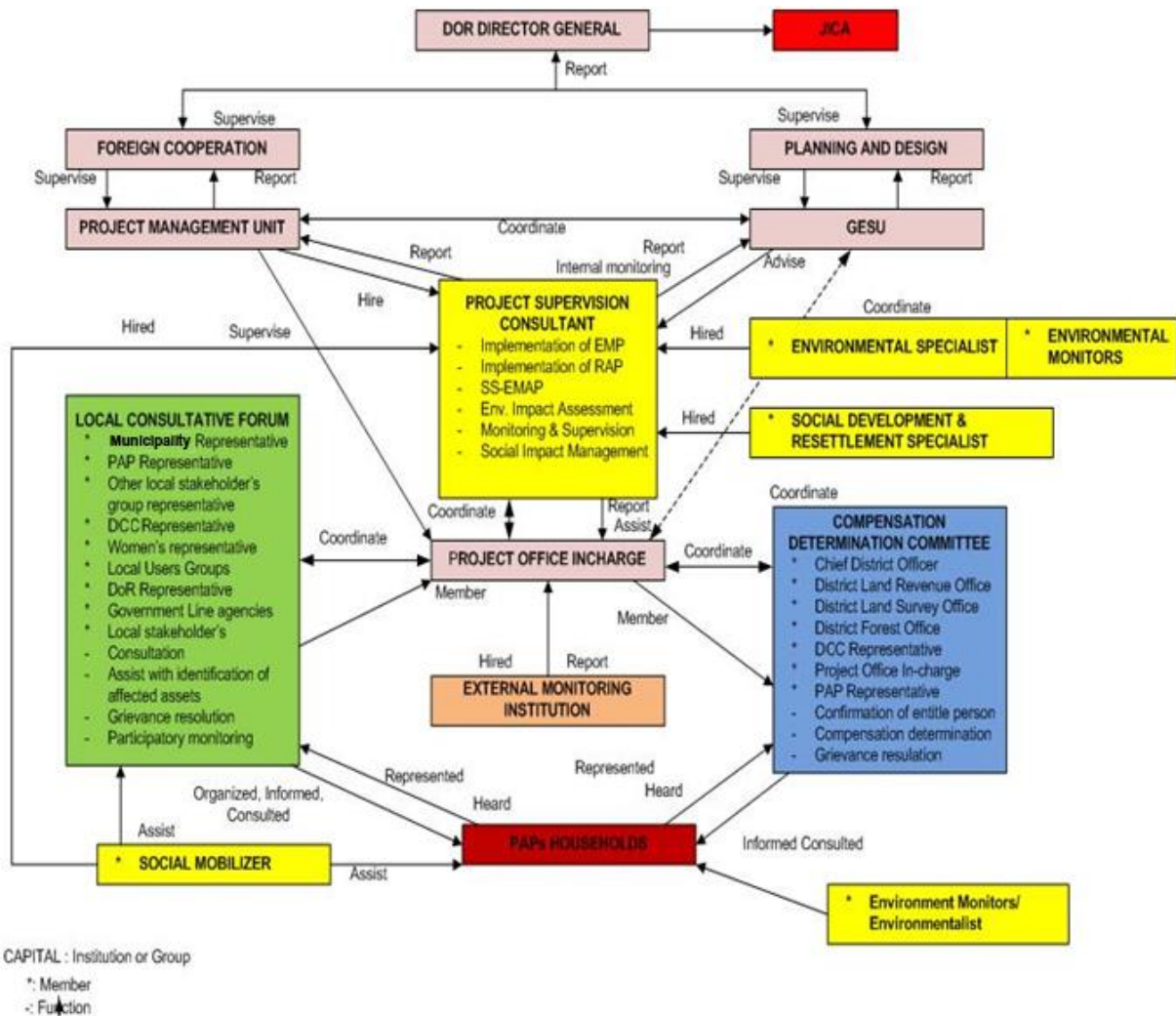
The necessary volume of each material will be estimated in the Detailed Design Phase. In the Basic Design Phase, the procurement of local materials were maximized to contribute the local economy. Also, the aggregate, sand, crusher run are to be purchased from existing queries and providing businesses, without constructing specific queries for the Project, so that the impact on the local vegetation and slope stabilities will be minimized.

### 7.14 Environmental Management System

Although the road widening and upgrading is bit a new Project in Nepal, the institutional structure, distribution of responsibilities and funding for monitoring activities during the Planning and Construction Phases will follow the instructions of the Environmental and Social Management Framework (ESMF).

As shown in following figure, institutions, consultants, specialists and Project Affected Persons/ Households will be coordinated as described in the implementation of RAP and Environmental Management Plan. DOR DG will take the overall responsible in implementation and reporting to JICA.

The determination of institutional structure, distribution of responsibilities and funding for monitoring activities during the Operation Phase will need further discussion, coordination, and budget arrangement by DOR and other related institutions.



Source: Prepared by JICA Survey Team based on the interview with GESU, DOR, 2014

Figure 7.14-1 Organization Framework for the Implementation of RAP and EMP

### 7.15 Whether or Not the Risks Resulting from the Implementation of the Proposal can be accepted

The proposed Project is likely to cause some socio-environmental impacts or risks, as identified during the Scoping of this Project. The EIA study evaluated such impacts and risks and the items were evaluated to produce significant negative impacts to the environmental or social condition.

There was no impact evaluated as ‘very significant,’ or the point being over 75.

It will be necessary in the public communication during the Planning, Construction, and Operation Phases that such impact are anticipated, monitored by DOR, and the grievance redress system is available for public comments. DOR will be responsible to conduct the periodical monitoring and any activities to remedy the significant negative impacts caused by the Projects.



## Chapter 8 MITIGATION MEASURES

In this Chapter, the beneficial as well as adverse impacts due to the construction of the road has been identified and evaluated. In order to attain long-term and sustainable benefits from this widening and upgrading of this Road Project, its implementation should be guided by principle of environmental friendly construction and operation. For this, the study team identified the most effective augmentation measures for beneficial impacts and mitigation measures for possible perceived adverse impacts to minimize the environmental impacts of Project implementation needs to be adopted are presented in this Chapter.

Incorporation of mitigation measures in the detail design and tender document and subsequent implementation are recommended. Incorporation of mitigation measures in the detail design and tender document and subsequent implementation are recommended.

### 8.1 Beneficial Impacts Augmentation Measures

#### 8.1.1 Construction Phase

##### 8.1.1.1 Augment Employment opportunities

The Project will encourage local people to participate in construction works of this highway. Locals including poor people as well as women will be encouraged to participate in construction works. However, no any sort of huge Projects could be implemented without workers immigrated from outside the Project area. All of the participated contractors will be requested to encourage local labors and skilled as well as unskilled labors including other workers for the construction of Highway.

##### 8.1.1.2 Augment opportunities of New Income Generating Activities (IGAs)

Implementation of Project will encourage local people to establish small-scale industries, cultivate/harvest citrus, apples and vegetables and other cash crops, dairy products and NTFPs, and expand their subsistence livelihood to other micro enterprises. All these will increase productivity, and earning of the people. The benefit augmentation measure will thus be to promote cooperative, and provide bank finance for setting-up business enterprises.

##### 8.1.1.3 Enhancement in Technical Skills and Know-How

More skilled workers will be generated after the completion of the Project. Further, local skill workers will get opportunity to enhance their skills after their involvement into the Project construction works. Local skilled workers will have more familiar with new technologies related to construction works and further will have opportunities and knowledge about tunneling excavation methods and experiences.

#### 8.1.2 Operation phase

##### 8.1.2.1 Shortening of Travel Time

Construction and widening/upgrading of this section of highway itself will be an augmentation measures for freight transportation in the present scenario; as majority of the freight transportation ply through existing highway to import commodities for capital city and vice versa. Road safety including proper establishment of traffic signals and security will enhance transportation services.

##### 8.1.2.2 Shortening of Travel Distance

Construction and widening/upgrading of this section of highway itself will be an augmentation measures for passenger and freight transportation by decreasing the travel distance as compare to the present scenario as the majority of the transportation ply through existing highway capital city and vice versa. However, the widening/upgrading of this Road will somehow also shorten the total travel distance.

### **8.1.2.3 Saving of Vehicle Running Cost**

As the operation of proposed tunnel road will illuminate the existing long narrow, steep curve road from Nalianchowk to Sanga with decrease of 500m in length of the road, it will decrease the vehicle running cost in terms of energy and fuel. In order to augment the vehicle running cost the proposed highway should be designed as per the standard design with proper drainages in between the embankment and small streams so that the road is functional for the design period. The Project will conduct periodic maintenance of the road to avoid major failures. Project should check for weak areas prior to rainy season and take necessary precautions in advance. The timely completion of the Project is of utmost importance.

### **8.1.2.4 Reduction of Traffic Accidents**

As the existing Arniko highway is steep and curved due to which frequent accidents on the existing highway is occurring. After the construction of the new alignment a widening/upgrading of the existing road condition, people will not have to travel through the steep and curved section of the highway which will decrease the traffic accidents accordingly. To operate the highway smoothly regular maintenance work should be carried out along the highway. In order to avoid accidents speed limit in the highway should be maintained and the provision of penalty in case of violation of traffic rules in the highway should be carried out. Proper sign boards showing the signs of the traffic should be installed at the accident prone areas.

### **8.1.2.5 Access improvement for people**

Widening/upgrading of the existing road and construction of new alignment will be maintained user friendly establishing enhancements and legal and smooth access will be further established at interchange areas maintaining proper traffic regulations. Four lanes main road and one lane each on either side as a service lane will be established to maintain road and user safety. Facilities such as parking sites, restaurants and rest area etc. will further serve for relaxation to travelers avoiding fatigue especially to people involved in freight transportations. Access to adjacent Municipalities will be improved with the gradual development of rural roads connecting with interchanges.

### **8.1.2.6 Control Air Pollution**

As the construction of new alignment with linear slope and tunnel road from Palanse to Sanga section, the vehicle will not have to pass through the steep slopes due to which the vehicle will emit less greenhouse gases. Thus the air pollution in the area will significantly decrease. To control air pollution in the area the old vehicles which emit more flue gas should not be allowed to pass through the road section. The heavy loaded vehicle, old trucks should be allowed to pass through the existing highway without proper emission pass.

### **8.1.2.7 Economic Benefit**

Involvement of local people in economic activities will be higher in percentage than existing scenario. Large number of population of Project vicinity will be engaged in various sorts of economic activities generated during the time of operation of the Project that will boost the economic benefit of local as well as other people.

## **8.2 Adverse Impact Mitigation Measures**

Mitigation Measures required during the Project's Pre-construction, Construction and Operation phase is discussed in this section. The measures to prevent or to minimize the impacts due to implementation of Project within the proposed Project area have been discussed in this section. Mitigation measures for the affected existing physical structures situated within the 50m of RoW width will also be required to minimize its severity and impact in the environment and to the people.

All the adverse environment impacts upon Physical, Biological, Socio-economic and Cultural Environment are discussed below and required mitigation measures of corrective, compensatory and preventive types are proposed in order to avoid, reduce or minimize such impacts as well as augmentation measures for achieving beneficial environmental impacts with the implementation of Project. There are also a number of other matters that will require detailed designs that consultant

engineers have prepared and assuming all significant adverse environmental impacts due to construction. That will be avoided devising good engineering design and minimize operational environmental pollution and impacts as far as applicable. Different guidelines, reference manuals, criteria and general practices exercised and published by GON and DOR<sup>1,2, 3</sup> will be followed to safeguard environment.

The major activities during pre-construction and construction phase are site clearance, earthworks, road excavation, excavation for the construction of road side structures, disposal of spoil and other civil works and those works will require measures that could mitigate the adverse impact upon existing environment. Civil works and other activities will further likely to create dust, noise and vibration rendering likely impact of slope instability and landslides; these activities will further be required corrective and preventive mitigation measures. Haphazard disposal of spoil in the nearby private lands, cultivated lands and water bodies of Chakku khola, Bikateshwor Mahadev Khola, Punyamati Khola, Chandeshwori Khola will likely to affects the physical environment of the Project area requiring preventive mitigation measures.

Compensatory and preventative mitigation measures will be required to mitigate biological issues relate to removal of forests, impact upon wildlife, aquatic habitat and avian fauna during the implementation of the Project. Similarly, compensator mitigation measures will be followed for social issues such as acquisition of private property and land and its compensation and resettlement. Moreover, corrective and compensatory measures will be followed in order to mitigate the impacts upon affected existing infrastructures such as water supply pipelines, electric poles and irrigation facilities existed within the proposed highway alignment.

## **8.2.1 Pre-construction and Preparation Phase**

### **8.2.1.1 Physical Environment Mitigation Measures**

#### **(1) Selection of Route**

Alignment route with all alternatives has been analyzed and presented in Chapter 7 for the finalization of appropriate route for the highway that can server in constructing highway in environmental friendly manner avoiding or minimizing environmental degradation in terms of loss of flora and fauna, avoiding slope instability and soil erosion, avoiding disruption of water bodies, minimum loss of cultivated agricultural land and avoiding impacts of social and cultural in nature. Alternative analysis has been carried out as a preventive mitigation measures in terms of different aspects and criteria such as Total Length, Road Geometry, Geology, Hydrology Environmental Impact, Social Impact, Land Use pattern, Difficulty in Construction, Operation and Maintenance, Sustainability and Construction Cost. Among different alternatives studied, this one is selected as feasible alignment that will be easier for construction maintaining smooth gradient, having technical viability and with less environmental implications.

#### **(2) Review of the Alignment**

A final alignment has been established with 50m RoW from the road center avoiding majority of the sensitive receivers. However, some significant construction impacts that could affect stability, forest as well as other social and cultural environment will be revised. Therefore the alignment will be further fine-tuned at detailed design stage to avoid such impacts and unnecessary burdens in terms of technical, financial, environmental and social nature. Consultation with local stakeholder and severely affected people will further anticipated to solve that sort of problems before commencement of construction works.

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<sup>1</sup>Environmental Management Guidelines, DOR, GEU, 1999

<sup>2</sup>Environmental and Social Management Framework. DOR, GESU 2007

<sup>3</sup>Environmental Assessment in the Road Sector of Nepal DOR, GESU 2000

### **(3) Detail Survey and Design**

Detail survey and Design will be carried out and assessed the potential impacts and losses of properties and land. The survey will be carried out avoiding or minimizing the loss of private land as far as applicable. The survey and study will be culminated with all possible preventive measures to avoid or minimize slope instability, disruption of water systems, minimize disturbance to settlements, minimize forest loss and avoiding loss of cultural assets and social norms.

Furthermore, dust, noise and air pollution during site clearance and preparation will be minimizing through appropriate measures. Existing infrastructures such as electric poles and pylons, irrigation canals and water supply pipelines set up within the project area has been identified and budget has been allocated for the relocation of such infrastructure. Furthermore, passing zones areas required at appropriate locations as mitigation measures for affected existing local tracks of various types to access the lands adjacent to the proposed highway has been identified. Further, details of these information will be incorporated in detail survey and design report.

### **(4) Review of Mitigation Measures**

All the mitigation measures presented in the EIA report will be reviewed by detail design team to ensure the incorporation of measures into Bill of Quantity (BOQ) and tender documents. Contractor will be responsible to implement all of the measures during and after the commencement of construction work as per proposed. Further, the project will finalize the required mitigation measures that will be implemented rigorously to avoid significant adverse environmental impacts.

### **(5) Inclusion of EMAP and Mitigation Measures in BOQ**

All the measures and provision mentioned in the EMAP will be reflected in the BOQ to ensure it effective implementation avoiding and preventing environmental degradation during the time of construction and operation of the project. All the provisions regarding the safe disposal of spoil into identified tipping sites and its rehabilitation will be mentioned in the BOQ. Similarly, provisions for the operation and reclamation and site clearance of labor camps, batch mixing plant sites, contractor's camp sites etc., will be explicitly mentioned into BOQ while issuing Tender Document for the contract. Whereas, compensatory mitigation measures of re-plantation will be awarded to local communities, people, local clubs or NGOs as a separate contract for re-plantation and maintaining the trees for at least 5 years period although the loss of forest and vegetation has been mentioned in EMP. The contractors must clearly quote those activities in BOQ rate, and provide beforehand any comments in case of opposing these clauses.

### **(6) Inform contractors to address Mitigation Measures**

Contractors will be informed about project nature and its likely environmental impacts and required mitigation measures at the different stages of the project before its implementation. A series of meetings with interested contractors will be carried out to solicit further information from them as well as to disseminate project information. Power Point Project presentations of the project including environmental issues will be carried out before construction phase. Contractors will be responsible to address all the environmental related issues as per the tender documents. Furthermore, contractor will address environmental mitigation measures in construction survey report prepared after the commencement of construction survey. The report will be further reviewed by EMU of the project for monitoring as well as ensuring effective implementation of proposed mitigation measures.

### **(7) Biological Environment Mitigation Measures**

Clearing of trees and other desirable vegetation will be discouraged to contractor's cure members during the time of site clearance. Only those trees and vegetation which are absolutely necessary to operate the sites will be cleared. As loss of road side trees will be the major biological impact from the widening/upgrading and construction of this section of Arniko Highway compensatory mitigation measures of re-plantation will be awarded to local communities, forest user groups, Local clubs or NGOs as a separate contract for re-plantation and maintaining the trees for at least 5 years period. The affected and vulnerable slopes will be stabilized applying appropriate engineering designs together with bioengineering. Consultation with district forest office, Community Forest User Groups etc. will

be consulted during the time of tree felling and the felling activity will be carried out after consulting with relevant government officer. Only those trees which are absolutely necessary to operate the sites will be marked and fell for track opening. Loss of all kind of forest such as private, government and community forests will be compensated with the re-plantation in the ration of 1:25 within the project area and will require monitoring and maintenance for five years. Felled trees will be handed over to district forest office and respected groups as per existing rules and practice.

## **(8) Socio-economic and Cultural Environment**

Acquisition process of both public and private land will be required to be completed before the starting of site clearance and construction works. Amount of land to be acquired has been documented and analyzed. Similarly, compensation and resettlement issues have also been studied and will be completed before the starting of construction works.

Compensation Determination Committee (CDC) will be established with the consultation of local stakeholders and local government body. Cash compensation amount will be determined as per Act<sup>4</sup> and rates established by CDC. List of affected houses and affected private lands has been recorded and analyzed. Loss of land and property of the affected people will be addressed either through cash compensation or through cash and equity share compensation. Project Affected Families (PAF) and Seriously Project Affected Family (SPAF) has been identified and categorized as per guideline<sup>5</sup>.

SPAF is defined as a family who loses over 25% of its total land holdings or whose land is reduced to an uneconomic holding or who is being displaced. Resettlement and Rehabilitation Plan has been prepared to clarify the entitlements for resettlement and for compulsory purchase of land and other matters for compensation. Alternatively land will be given together with sufficient compensation to enable families to build & move to new houses as preferred such that the AFs will have better living standard or are no worse off than if they were not affected. Similarly, there are some of the cultural sites, temples and mane of local importance existed within the RoW of the proposed alignment that will be relocated for the implementation of existing highway project.

Similarly, some of the cultural sites, temples and major local importance existed within the RoW of the proposed alignment will be relocated at the appropriate places as requested by locals during the time of compensation distribution in the Construction Phase.

## **Physical Environment**

### **1) Addressing Temporary and Permanent change in land use**

- Likely change in land use pattern of 13.33 ha of land into Highway alignment and its RoW is inevitable with the construction of 14.91 km Project. Land use cover within the 50 meter will be changed permanently into the carriage width of Project.
- Land use pattern of adjacent land will be taken into account during construction in order to avoid erosion and other detrimental effects. Appropriate mitigation measures will be carried out in order to avoid severe impacts upon adjacent land use pattern. Appropriate engineering structures will be provided to prevent landslides and river cuttings maintaining natural drainage pattern of the terrain within the project area.
- As heavy equipment and road excavation will be carried out for excavation of road sections; labor intensive construction method will be adopted within the appropriate sections for the road width opening.
- Land acquired for temporary purposes will be reclaimed and rehabilitated. Cultivated land and other private land will not be used for the establishment of labor camp, crusher sites, worker camp site, for the disposal of spoil etc. Lands such as barren land and other government land will be acquired for temporary purpose which will be reclaimed after the completion of construction works.

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<sup>4</sup> Land Acquisition Act

<sup>5</sup> Land Acquisition Guidelines 1989

## **2) Reducing air, noise and water quality degradation due to construction activities**

### **i) Reducing air pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads**

Contractor will carry out dust protection measures during road construction phase such as plastic sheets will be used to prevent the residences that are close enough to receive such impacts. Drill machines, excavators, load and unload heavy vehicles etc., will be avoided while wind velocity is high enough to disperse and erode excavated materials. Vehicles transporting soil, sand and other construction materials will be covered with tarpaulin sheets to avoid impact from dust. Water will be sprinkled to excavated material to avoid sheet erosion and emissions to nearby human settlements or forest areas. Similarly water will be sprinkled on the road and exposed surfaces in order to minimize the spreading of dust to close receivers. Contractor will carry out excavation and drilling activities only from 5 am to 6 pm. Excavation during evening and night hours will be avoided. As far as possible; labor intensive construction methods will be applied at the alignment existed nearer to settlement, school, health post etc.

### **ii) Preventing noise pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads by using appropriate machine and time management.**

All heavy equipment and machinery of contractor will be fitted with noise pollution control devices that are operating correctly. Contractor will provide ear mufflers to construction crew working at high noise exposure areas such as crusher sites. Noise barriers will be used in order to break the line of sight between the noise source and the possible receptors. Contractor will use various materials and barrier, façade patterns can be used to obtain maximum reflection, absorption or dispersion of noise without being aesthetically ugly. Noise barriers commonly employed consist of earth mounds or walls of wood, metal, or concrete which form a solid obstacle between the road and roadside communities. Labor intensive construction methods will be applied at the alignment proposed nearer to settlement, school, health post etc., as far as possible in order to avoid noise pollution. Project will provide awareness trainings to local drivers avoiding noise pollution in operating construction machines.

### **iii) Mitigating excessive dust production and noise pollution due to operation of crusher plants, concrete batching plant and bitumen mixing plant etc.**

Contractor will fit Stone Crushing equipment with approved dust control devices and operated in accordance with manufacturer's specifications. Contractor will establish crusher plant only at the selected and identified sites. Crusher plant Stone Crushing Plant should be operated only during daytime. If necessary and if requested by locals based on rational reasons, timing of operation should be planned in consultation with local communities so as not to disturb local schools, health posts, markets, settlement areas etc. Contractor will compensate to the affected landowners if land and crops are damaged due to operation of crushing plant. Contractor should clean and brought to original condition after closure and dismantling of the crusher in order to avoid siltation and deposition at downstream. Contractor will compulsorily adopt the technical preventive and safety measures to control dust and avoid noise pollution. Further, the contractor must exert all efforts to supervise this work site, especially to prevent children from approaching the plant.

### **iv) Avoiding physical impact upon air, noise and water due to Quarry site operation**

Physical impact upon air, noise and water due to operation of quarry was anticipated to be negligible hence no any mitigation measure has been proposed. It is anticipated that no more quarry sites will be required for stone and boulder except for sand mining. It is calculated that excavation and road width opening of the section of Arniko highway will generate substantial amount of stones and boulders required for road construction.

### **v) Avoiding degradation to water qualities of existing rivers**

Construction activities will be carried out in environmental friendly way so as to avoid adverse impact upon water quality of Major River adjacent to proposed alignment and other water bodies. Disposal of construction waste and spoil into the river will be avoided. Adequate sanitation facilities will be provided at the labor camps with the adequate supply of water for washing, cleaning and drinking purposes. Labor camps will be established only at the pre-identified sites establishing appropriate

drainage and installing pit latrines and toilets. Open defecation will be avoided strictly at the vicinity of labor camps. Similarly, labor workers will be provided with awareness trainings and further contractor will be responsible for mitigation if any sort of improper sanitation condition has been carried out by work force. Disposal of wastewater from labor camps and organic wastes from kitchen will be disposed safely in pits avoiding direct disposal in water bodies. Liquid wastes from vehicle washing and workshop waste will not be disposed directly into river system and nearby water bodies.

#### vi) Minimizing/ Managing Emission of CO<sub>2</sub>

- Ensure proper maintenance status of vehicles with respect to emissions.
- All the heavy equipment and machinery will be fitted with air pollution control devices that are operating correctly.
- Conduct awareness program on energy efficiency for transport issues.
- Enforce the requirements for vehicles testing and warrant of fitness.
- Develop vehicles standards to maximize energy efficiency.

### 3) Minimizing/ Managing Impacts due to Waste

#### i) Minimizing/ Managing Impacts due to Solid Waste

To minimize the impact due to solid waste following measures will be applied:

- Institutional coordination and budget plan for hiring collection and disposal service providers will be undertaken.
- Workers and managers will be trained for appropriate source segregation.
- Direct disposal of solid waste by the construction workers in the water bodies will be strictly prohibited.
- Knowledge and awareness about the biodegradable and non-biodegradable waste to the workers will be provided.
- Work camp will be established far from the water bodies.
- Separate bins for the collection of biodegradable and non-biodegradable waste will be established at the worker camps.
- Strict code of conduct will be followed in the camp and the penalty for the violation of rules will be regulated

#### ii) Minimizing/ Managing Impacts due to Soil Waste

To mitigate the impact due to soil waste during Pre-construction careful and thorough communication will be undertaken in the Pre-construction Phase so that the site(s) are planned in the accepted area with sufficient safety measures and design. In order to minimize the impacts due to soil waste following methods are proposed:

- Natural water source below the disposal site shouldn't pose significant threat.
- The irrigation canal below shouldn't be damaged due to the deposition of soil.
- The agricultural land below downstream shouldn't be damaged due to disposal activity.
- Careful and thorough communication will be undertaken in the Planning Phase so that the Disposal Site to be accepted.
- Design the Disposal Site so that the impacts on the water use downstream is minimized.
- Natural water source below the disposal site shouldn't pose significant threat.
- The irrigation canal below shouldn't be damaged due to the deposition of soil.
- The agricultural land below downstream shouldn't be damaged due to disposal activity

#### iii) Minimizing/ Managing Impacts due to Liquid Waste

To minimize the impact due to liquid waste following measures will be applied:

- Required capacity of site specific septic tanks will be installed at the facilities.
- The septic tanks will be managed in appropriate manner.
- The bitumen will be stored at proper place and not scattered along the road. Contamination of it with the water body source will be avoided as possible.
- The fuel/lubricants for the construction vehicles will be stored in a proper place and the contamination with the water bodies will be avoided.



- Cleaning of construction vehicles in the water bodies will strictly be prohibited
- Direct disposal of chemical wastes from workshop upon water bodies will be strictly prohibited.
- Workshops and chemical storage sites will not be established nearer to the water bodies and river side

#### **4) Minimizing/ Managing Impact due to Soil Contamination and Top Soil**

To minimize the impact due to soil contamination following measures will be applied:

- Educate and aware workers about the negative impacts of soil contamination.
- Conduct training on good handling of the oils and chemicals to avoid soil contamination.
- Prepare guidelines of handling, recycling and discarding the empty containers or bags of the chemicals.
- Designation of site managers to monitor condition of stock yards.
- Storage and handling of bitumen will be done properly as per the manual and guideline and contamination with the existing water source should be avoided.
- Strict code of conduct should be regulated in the construction area and avoid spilling and leakage the chemicals in the work area.
- Pouring of oils/lubricants will be avoided so that it does not degrade the agricultural land located nearby of the construction area.

To minimize the impact due to soil contamination following measures will be applied:

- Carefully Stripping and safely storing nutrient Topsoil for later use
- Use it as valuable resource in back filling and during Bio-engineering works
- Use in slope filling and embankment fill before the plantation and bio-engineering work.

#### **5) Avoiding chemical impact upon Environment**

##### **i) Avoiding chemical contamination in water bodies due to mechanical activities/ workshop/ vehicle maintenance, cleaning and mixing**

Workshops and chemical storage sites will not be established nearer to the water bodies and river side. Bitumen drums will be stored at designated locations and not scattered along the road. If contaminated; the contaminated runoff from storage areas will be captures in ditches or ponds with an oil trap at the outlet. Contaminated and worn plastic sheet will be packed into drums and disposed into safe disposal site. Direct disposal of chemical wastes from workshop upon water bodies will be strictly prohibited.

##### **ii) Site clearance and removal of residues of chemical such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. avoiding impact upon land and water bodies.**

During site clearance, all cut and grubbed materials will be kept at a secured location so to maintain environmental safety. Contractor will be responsible to restore all the construction related sites including workshop into their original state. Contractor will obey the Toxic and Hazardous Chemical Handling and Management Plan for handling and use of all sort of toxic materials and will comply till the completion of construction and site clearance. The boundaries of the water body particularly existing nearby rivers will be left undisturbed and tidy with the completion of construction. If unavoidable, drainage channels of adequate capacity will be provided for the water body being impacted by storm waters.

In case of bituminous wastes, dumping will be carried out over a 60 mm thick layer of rammed clay so as to eliminate any chances of leaching. In case of filling of low-lying areas with wastes, contractor will ensure the ground level matches with the surrounding areas. In this case of storing of rainwater care will be taken that low lying areas are not used for storage. In case oil and grease are trapped for reuse in a lined pit, care will be taken to ensure that the pit will be located at the lowest end of the site. The Contractor will regularly educate his workforce location of disposal site as well as the specific requirement for the management of these sites. The waste management practices adopted by the Contractor, including the management of wastes at construction camps etc. Will be controlled on a regular schedule by the Project EMU during the progress of construction.

**iii) Avoiding hazards caused by explosive, combustible and Toxic Materials**

The Contractor must educate the workers to undertake safety precaution while working at the plant / site as well as in the around heavy equipment. Contractor will ensure the occupational health & safety measures of labor work force. Contractor will obey the Occupational Health and Safety Management Plan prepared for the project. The Contractor will further ensure all vehicles must possess a Pollution under Control (PUC) Certificate, from designated authority by the DoR, which and will be renewed regularly. The Contractor must also ensure that all machinery, equipment, and vehicles will comply with the existing noise and emission norms of GoN.

No bituminous materials will be discharged into side drains. Nearby tree, vegetation and private property will be protected during bitumen spraying work. Skilled labor will be used while hand placing the pre-mixed bitumen material. Contractor will responsible to provide safety equipment i.e. gumboots and gloves to the workers while handling bitumen. While applying Tack Coat, spraying of bitumen will be done in the wind direction. The labor will wear jacket while spraying the bitumen. Transportation, storage and use of explosives will be carried out as per Act<sup>6</sup>.

**6) Safe operation of Labor Camp, Contractor's Camp etc.****i) Recovering and rehabilitating temporary loss of lands**

All construction camp sites and facilities will be dismantled and removed from the site right after the completion of construction work. The site will be restored to an original condition prior to commencement of the works. Contractors will be recommended for photographic documentation to verify and settle possible disputes before and after the establishment of such sites. Further, oil and fuel contaminated soil will be removed and transported and buried in waste disposal areas. Construction campsite will be planted grasses after site clearance to recover into natural condition. Saplings planted will be handed over to the community, forest user groups with due arrangements meeting the cost for further maintenance and watering for at least five years; and Soak pits and septic tanks will be covered and effectively sealed off.

**ii) Avoiding direct disposal of Solid waste**

Labor camps and contractor's camp will be established at the pre-identified appropriate place within the project area. Consultation with the local people is an important step prior to the establishment of such camps. The contractors will further ensure that labor workers will not dispose chemicals, raw sewage, and wastewater effluent.

**iii) Managing safe disposal of toilet waste to prevent surface water contamination**

Contractor will ensure the operation of labor camps will not produce nuisances and adverse environment impact to the locals. Sanitary wastes and excreta will be safely disposed into septic tanks. The contractors will further adopt good management practices ensuring sustainable supply of water to rest rooms as well as for washing and bathing purposes, energy for cooking and other necessary purposes, and ample drinking water for labor workers and other project staffs. The contractors will further ensure that labor workers will not dispose chemicals, raw sewage, and wastewater effluent. Prior to the close out of construction the worker camps will be removed and restored to the original condition as far as is reasonably practicable. Construction camps will be established in areas with adequate natural drainage channels in order to facilitate flow of the treated effluents. Contractor will ensure that no any sort of negative impacts upon environment and local community and no any sort of contamination into the natural drainages and water resources from the operation of camps within the project area. It is further anticipated that contractor will work under close coordination with Environmental Monitoring Unit (EMU) of Highway project.

**7) Slope instability, landslide and erosion****i) Maintaining fresh cut slopes to prevent slope instability, landslides and erosion**

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<sup>6</sup> *Explosives Act, GON, 1961*

Angle of slope cutting will be maintained for fresh cutting slopes in order to avoid instability, landslide and erosion. However, section with highly weathered rock exposure area will be considered duly providing civil engineering structures.

The exposed slope should be protected using conventional civil engineering structures in conjunction with bio-engineering techniques. It is also advised to do minimum damage to vegetation during construction. Exposed slopes should be planted with suitable vegetation as soon as possible using previously stockpiled top-soil.

All areas susceptible to erosion, such as cut and fill areas will be protected by either temporary or permanent drainage works. Measures will be taken to prevent ponding of surface water and scouring of slopes. Newly eroded channels will be backfilled and restored to natural contours. Where crossing unstable terrain is unavoidable, minimize the road width for the section affected to reduce disruption to the slope. Special attention will be given to drainage and will leave a temporary road surface until a stable condition is achieved.

#### **ii) Avoiding landslides due to excavation activities**

Labor and machine will be used in order to maintain cut slope angle which will prevent subsequent landslide of fresh cutting hill area. Further landslide will be prevented with the stockpiling of material at the inward side of formation width. Side tipping and stockpiling of materials at the outward facing slopes and at the valley side will be avoided strictly in order to prevent air pollution, land pollution, pollution of surface water and permanent changes of land use pattern of the adjacent lands. If stockpiling will be required; appropriate drainage facility will be provided preventing possible washout of materials from rain water into water bodies and other properties situated at the downhill.

#### **iii) Managing impact from tunnel excavation and blasting**

Locals will be aware about the possibilities of such hazards and will be strictly prohibited from travelling towards tunnel portal and periphery areas during blasting and excavation. Blasting and excavation of tunnel portal if required will be done in controlled manner that will not be carried out during evening and night hours. Contractor will comply to the Tunnel Construction Management Plan including other necessary guidelines<sup>7</sup> published by GON for slope protection works. Blasting should strictly follow the license requirements from Ministry of Home Affairs. Likely seismic hazard will be taken in account during blasting. Where the vibration from blasting is exceeding the maximum permissible level, information from the blasting will be used to modify blasting patterns and calculate a reduced charge for future blasts with the aim of eradicating damage and to minimize damage and seismic hazards as far as possible. However, the details of likely seismic hazard will be studied during detail design phase of the project. In the event that blasting is required it will be carried out in line with the rules under the Act<sup>8</sup> in the prescribed manner and after prior notice to all local residents and the local town authorities. Impact due to generation and disposal of huge amount spoil from Tunnel will also be managed properly.

#### **iv) Avoiding landslides due to excavation through blasting activities**

Blasting will be especially carried out at the rocky and hilly portion where excavation through construction machines and excavator might not be possible technically. Blasting will not be carried out at the other portion of the alignment except for the opening of tunnel portals and at the hard rock portions where machines and equipment could not work properly for road width formation. Blasted materials will be managed and will be avoided from direct tipping at the valley side. Labor and machine will be used in order to maintain cut slope angle which will prevent subsequent landslide of fresh cutting hill area. Further landslide will be prevented with the stockpiling of blasting material at the inward side of formation width. Side tipping and stockpiling of blasting materials at the outward facing slopes and at the valley side will be avoided strictly in order to prevent air pollution, land pollution, pollution of surface water and permanent changes of land use pattern of the adjacent lands. If stockpiling will be required; appropriate drainage facility will be provided preventing possible

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<sup>7</sup> *Guide to Slope Protection Works, DOR, GON, 2007*

<sup>8</sup> *Explosives Act, GON, 1961*

washout of blasting materials from rain water into water bodies and other properties situated at the downhill.

#### **v) Preventing soil erosion and gully formation at new open cut sections**

In order to avoid soil erosion and gully formation; cut spots and embankments will avoid the creation of angle greater than the natural angle of repose for the local soil type. Re-vegetation of cut slopes will be carried out as soon as possible. Destruction of vegetation in the right of way will be minimal as far as applicable. Disturbed areas will be replanted immediately after disturbance has stopped maintaining the slope angle and will not wait for the completion of construction works. Drainage improvement works will be carried in order to control volume and speed of water flows in water courses in the vicinity of exposed soils and slopes. Further, contractor will comply with EMAP and guidelines<sup>9</sup> published by GON for sustainable management of environment.

### **8) Avoiding haphazard disposal of spoil**

#### **i) Avoiding direct disposal and stockpiling of excavated materials at the valley side of road**

The generated large amounts of spoil will be disposed properly into the identified spoil disposal sites. Although it could be difficult in keeping balance between cut and fill, and expensive of haulage distance to the disposal site; side tipping of excavated materials will be strictly avoided during the time of construction. Awareness will be provided to contractor's crew members to avoid environmental and social impacts along the proposed highway with the haphazard disposal of spoil. Excavated materials will be loaded into trucks and will be taken to identify spoil disposal sites for safe disposal. Stockpiling of excavated materials at the valley side will be restricted to avoid land slide, soil erosion, destruction of vegetation, hazard to settlement at downhill side, disrupt upon natural drainages and pollute water sources.

Cut and fill material during construction will be balanced as far as applicable. However, the widening/upgrading and construction of this section of Arniko Highway project will require massive amount of cuttings as well as filling to maintain the highway alignment and its periphery including raising embankment at several chainages. Whereas, not all the cut materials will be suitable for filling and therefore; the surplus rock and soil based materials will be disposed at identified spoil disposal site safely. A massive amount of spoil and haphazard disposal must be controlled to avoid potential impacts. Sites for stockpiling of material should be located away from cultivable lands and settlements, drinking water intakes, public places, near school and health centers. Sites for stockpiling of material should be located away from forest area, sensitive ecosystem, fragile and landslide prone slope or terraces etc.

#### **ii) Managing Stockpiling**

Stockpiling of earth fill will in most cases not be permitted during the rainy season unless covered by a suitable material. Stripped material should not be stored where natural drainage will be disrupted. Stockpiled material should be protected from erosion prior to rainy season, including construction of drainage, trenches and ponds around the heap. As necessary, seal the area so surface water pollution does not occur. Storage of material on private property will be allowed only if written permission is obtained from the owner or authorized lessee. Furthermore, compensation for land and crops damaged due to stockpiling of materials should be given by the Contractor to the affected landowners and the site should be cleaned and brought to original condition after closure and removal of the stockpile.

#### **iii) Managing Spoil from road excavation**

Excess spoil originating from change 0+000 to 14+900 will be disposed at identified tipping sites by the project. Appropriate civil engineering structures will be provided to channelize the adjacent rivers avoiding erosion and mass wasting into water bodies. Toe wall and protection wall will also be provided to stabilize disposed spoil. A level of compaction will be done during disposal. The details of appropriate civil engineering structures required for each disposal sites including drain management will be decided by Construction Management Team prior to construction of that stage as per

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<sup>9</sup> *Environmental Management Guidelines, DOR, GEU, 1999*

requirements. All the spoil disposal sites will be closed after its proper rehabilitation maintaining proper drainage system and planted with vegetation after well managed landscaping. Some of the disposal sites will be developed into play grounds and parks whereas some will be developed into facility sites, resting and recreational areas etc.

The proposed and identified spoil disposal sites are also shown in the following figure.

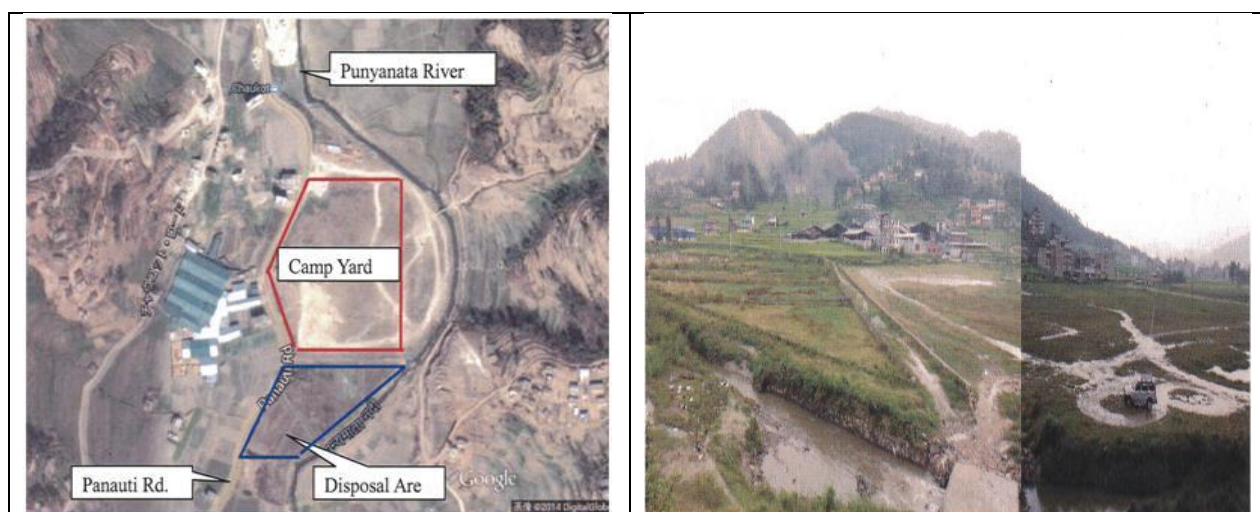


Figure 8.2-1 Proposed Disposal Site

#### iv) Avoiding impact upon natural drainage from disposal

The proposed highway alignment crosses natural streams and drainages at different locations. However, the road works proposed are designed to improve the drainage discouraging soil erosion in the operational phase. Impact upon natural drainage during the construction stages will be avoided as far as applicable. Haphazard disposal of spoil and other construction materials into the natural drainage will be avoided in order to prevent the natural flow of the drainage triggering landslide and mass wasting at the downstream. Proper water management and natural flow of existing drainages will not be disturbed.

#### v) Prevent blockages to natural flow of existing river

Direct side tipping and deposition of excavated materials at the valley side of the proposed road alignment will be avoided. Side tipping and haphazard disposal of spoil and other construction materials into the valley side will be avoided where the proposed alignment runs quite close to some major rivers and direct tipping will likely to disrupt the flow of rivers, water depletion, water logging, and as well as increase the speed of flow which will be erosive in nature.

#### vi) Avoiding direct disposal and deposition on valley side affecting agriculture land, other lands

Direct disposal of excavated materials and soil affecting top soil of agricultural lands and private lands will be avoided. The deposition of excavated material on valley side will be avoided in order to prevent land slide and erosion. The construction works and disposal works will not produce significant impact upon other public land adjacent to the proposed highway alignment. Similarly, impact upon infrastructures and water resources available at the nearby settlement areas and agricultural lands will be avoided. During the commencement of construction; the contractor will have been primed by informing the detailed EMAP and incorporating environmental assessments in the bidding and contract documentation. The contractor will be required to follow method statements and plans in advance of commencement of construction as required in the EMAP for Construction related management plans including other plans incorporated in BOQ.

Following are the plans for the contractor to follow during the commencement of construction civil works but not limited to:

- Muck / Spoil Site Management Plan
- Top Soil Saving Management Plan
- Occupational Health and Safety Management Plan

Muck/Spoil Site Management Plan will include the following necessary required steps and guidelines that will be abide by the contractor but not limited to:

- Spoil will be disposed properly at identified spoil disposal site.
- Spoil disposal sites will be rehabilitated by providing proper water drainage systems and applying bioengineering techniques and plantation.
- Direct and haphazard disposal of spoil upon valley side River, water bodies, cultivated and private lands will be strictly avoided.
- Disposal of spoil upon natural forest will also be strictly avoided.
- Excess muck and earth will not be disposed of on fragile hill slopes instead will be used for back filling of gabion walls and other toe and retaining walls.
- Locals feed backs and consent including guidelines<sup>10</sup> lined by the government agency will be followed to safeguard environment.
- Wherever possible, surplus spoil will be used to fill eroded gullies and depressed areas.
- If feasible, spoil material will be disposed in abandoned quarries and borrow pits as means to help restore original contours;
- Contractors will be advised to use the excavated materials for reclaiming the degraded land in near vicinity in consultation with local communities on their preferences.
- Spoil on fragile slopes, flood ways, wetland, farmland; forest areas, natural drainage path; religious and culturally sensitive sites, canals and other infrastructures will never be disposed;
- Acidic and saline spoil will not be spread onto agriculture land.
- Spoils will never be disposed on areas that will create inconvenience to the local community or it will deprive the livelihood of people.
- Spoil material may be discharged to a landfill or tipping site that is constructed using a series of small spoil benches to prevent slope overloading;
- The spoil will be placed in layers of 30 cm with compaction on each layer,
- After the disposal, the site will be landscaped, provided with proper drainage, plant with vegetation, and will provide adequate protection against erosion and scouring.
- Spoil will not be disposed in rivers, lakes and water bodies;
- Exposed areas will be planted with suitable vegetation following the GESU/DoR Manual on 'Vegetation Structures for Stabilizing Highway Slopes- a Manual for Nepal'.
- Contractor will be responsible to provide adequate compensation to land and property; if damaged by spoil storage and disposal;
- Spoil disposal sites will be developed into community facilities like park by reclaiming;
- Spoil will be used in local road net and embankment construction works.

#### **vii) Avoiding dangers of future washout during heavy rains, damage to road width**

Valley side tipping will be strictly avoided that could washout affecting downhill settlements and cultivated lands. Fresh cutting outer slopes throughout the alignment will be maintained with the angle of cutting slopes.

### **9) Addressing likely River flow regime and change in river environment**

#### **i) Preventing change of river flow regime**

The construction works will be carried out without aiming the change in river flow regime. However, river training works will be carried out the several locations of the River in order to channelize the river further strengthening river banks as required. Direct disposal of excavated material upon rivers and natural drainage will be strictly avoided. Crusher Plants, Concrete Batching Plants etc., will be operated only at the selected sites to avoid adverse impact upon environment. Contractor will obey the physical and construction related management plans. Further, probable siltation at lower downstream sections upon agricultural land will be monitored during the construction period.

#### **ii) Addressing impacts due to operation of Crusher Plants, Concrete Batching Plants and storing of material if on river banks**

<sup>10</sup> *Guide to Slope Protection Works, DOR, GON 2007*

Crusher plants, concrete batching plants will be established and operated at the selected and identified sites only. Proper traffic signals and markings will be provided at the vicinity of such plants in order to avoid accidents and injuries. Extraction of sand and gravel from River beds will be avoided. Substantial amount of stones and boulders are expected to be acquired from the excavation and opening of road width. For the storage of construction materials; contractor will provide bricks and sands for flooring in order to prevent soil and water contamination due to oil spillage.

Similarly, contractor will provide damp –proof flooring for the storage of cements will be carried out as per standard codes. Further, contractor will store blasting materials as per the specific provisions provided in the Act<sup>11</sup>.

### **iii) Avoiding siltation and deposition at lower, downstream sections, on agriculture land on river banks**

Contractor will select the stockpiling sites that are located away from cultivable lands and settlements, drinking water intakes, public places, school and health centers. Sites for stockpiling of material will be located away from forest area, fragile and landslide prone slope or terraces etc. Crusher plant will be operated establishing proper drainage systems avoiding direct flow and deposition of crushed materials into river systems to avoid deposition at the downstream.

### **iv) Addressing impacts due to temporary flow diversion during construction of bridges**

Temporary flow diversion of river will be managed during the time of bridge construction. Excavation of bridge foundation will be carried out only in dry season to avoid concentration of flow. Proper diversion will be managed and checked regularly to avoid scouring, bank cutting, gulying and soil erosion at downstream lands.

### **v) Avoiding potential Food damage along the major rivers**

The possible bank erosion sections are especially along the river banks where alignment situated close to major rivers. Major river training works will be carried out at the river corridor along the road alignment. River bank protection will be executed applying suitable civil engineering structures such as gabion wall, stone masonry etc. to prevent banks of major rivers. River guiding and channeling works will also be carried out in order to maintain smooth alignment gradient as well as to avoid sharp bending.

## **10) Avoiding impact upon existing Physical Structures and Infrastructure**

Affected major infrastructures such as roads and tracks, water supply pipelines and community tap stands, water storage tanks, irrigation canals and electric poles and pylons will be either relocated or will be compensated as far as applicable.

### **i) Minimizing damage to existing highway road surface, damage to culverts etc., avoiding difficulty in local movements**

During construction, affected tracks and highway need to be either closed temporarily or will be repaired continuously without halting it from operation. Traffic of existing highway will be managed properly together with the construction vehicle of highway during the time of construction. Road surface together with other road side structures will be repaired properly if it is damaged due to the operation of heavy construction vehicle of this road project.

### **ii) Addressing Impact upon Existing Roads and Tracks**

Implementation of project will not affect to the accessibility of local people. Subways and flyover for accessibility has been proposed in the detail design to maintain smooth running of existing accessibility within the project area. It is anticipated that about 6 passing zones (overhead bridges) have been proposed under priority basis analyzing need of the locals along this section of Arniko Highway alignment to cross the busy road at heavy settlements intersections.

### **iii) Relocation of Electric Poles and Pylons**

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<sup>11</sup> *Explosives Act , GON, 1961*



Relocation of affected electric poles will be required as a mitigation measures to the suitable places near the alignment of proposed highway. Similarly, affected electric pylons will be relocated at suitable location after coordinating with related government agencies. The cost of relocation has been incorporated in the detail design under the heading of Provisional Sum. Relocation of locally distributed wooden and iron electric poles will also be carried out after acquiring consensus of local authority and government line agencies as well as coordinating with locals during the time of relocation.

#### **iv) Relocation of existing water supply facilities**

All the affected water supply pipelines and water collection reservoirs will be relocated after the close coordination with locals and related managing body. Although the households existed within the proposed alignment need relocation; locals inhabited adjacent to the RoW will not be deprived from the utilization of resources. Project will make sure that the water supply will not be cut completely during the construction and relocation period by providing with alternative and temporary means. The overall cost of relocation has been incorporated in the detail design under the heading of Provisional Sum.

#### **v) Addressing impact upon Existing Irrigation facilities**

The majority of affected irrigation canal are earthen type existed at the different chainages of the proposed section of highway. The implementation of this highway widening/upgrading works will not deprive locals from using water sources that have been using since their ancestry. All the affected irrigation canals will be either relocated or will be provided with subway passing to maintain the existing network.

The supply will not be cut completely during the construction and relocation period. Rigorous monitoring will also be carried out during the time of construction to ensure the haphazard disposal of construction material into the irrigation canal. The overall cost of relocation and maintenance has been incorporated in the detail design under the heading of Provisional Sum in BOQ.

### **11) Avoiding impact of OHS due Construction Activities**

Working safety measures will be executed by the contractor to workers providing ample numbers but not limited to helmets, boots, rubber gloves, and masks as required. Life of worker will be ensured by maintaining Life insurance of each worker of the project. First aid facilities for the workers will be provided at working sites as well as at labor camp sites. If possible, one qualified nurse or first aider will be present at all times. Routine checkups of labors will be performed; this will be at least once per week for each labor workers.

Awareness programs to local people will be provided regarding environment health and safety. Furthermore, handling, transportation, storing and use of different Machines, equipment and petroleum product will be other issues of safety during construction. It is recommended that contractor will further comply with the Safety Plan developed in the detailed design stage. Similarly Construction Traffic Management Plan will be developed in the detailed design stage that will comply by contractor to maintain flow of construction vehicles without hampering good flow of passenger vehicles.

### **12) Avoiding impact due to operation of Asphalt concrete plant/hot mix plant**

Speeds limits will be established for vehicles within the works sites of the project area. Bitumen plant will be controlled maintaining appropriate distance from the sensitive receiver etc. but located at convenient sites nearby project area and more than 100 m from sensitive receptors such as schools and residence in order to avoid air and noise pollution.

### **13) Avoiding impact due to operation of Crusher plant and Batching plant**

The rock crusher plant and Batching plant activities will be controlled maintaining appropriate distance from the sensitive receiver etc. but located at convenient sites nearby project area and more than 100 m from sensitive receptors such as schools and residence in order to avoid air and noise pollution.

Contractor will fit Stone Crushing equipment with approved dust control devices and operated in accordance with manufacturer's specifications. Contractor will establish crusher plant only at the selected and identified sites. Crusher plant Stone Crushing Plant should be operated only during daytime. If necessary and if requested by locals based on rational reasons, timing of operation should be planned in consultation with local communities so as not to disturb local schools, health posts, markets, settlement areas etc. Contractor will compensate to the affected landowners if land and crops are damaged due to operation of crushing plant. Contractor should clean and brought to original condition after closure and dismantling of the crusher in order to avoid siltation and deposition at downstream. Contractor will compulsorily adopt the technical preventive and safety measures to control dust and avoid noise pollution.

### **Biological Environment**

Mitigation measures for the loss of trees will be compensatory re-plantation at the ratio of 1:25.

For all lost number of trees of the community forest area, saplings of locally affected tree species will be planted within the barren areas of Suryamode Perunge Community forest, existing along the proposed section of Arniko highway alignment. There is enough area for re-plantation with this community forest and the Chairman of the Suryamode Perunge Community User Group has welcomed the idea of replantation in this forest. Similarly for the loss numbers of road side trees the re-plantation will be done in the center median of the road once its constructed. FUGs will be coordinated for mitigation works as well as during felling of affected tree and site clearance at pre-construction phase. FUGs will be further handed over with compensatory re-planted trees after the completion of plantation works and will be responsible for protection for at least five years. Consultation with Department of Forests and other related government bodies will be carried out for the execution of such works. Planting in road right of way, adjacent areas and other public areas in consultation with local people can help to support local flora and fauna as well as lost number of existing road side trees of this section. Compensatory planting in locations away from the road impact zone may provide additional habitats and migration routes for local animals, while also guarding against erosion. Compensatory plantation of at least twenty five saplings of determined size for every tree cut is done as per policy and site-specific prescriptions of the Department of Forests.

It should be ensured that plantation is carried out only in areas where water can be made available during dry seasons and the plant can be protected during the initial stages of their growth. The species will be identified in consultation with officials of forest department, giving due importance to local flora. It is recommended to plant mixed species in case of both avenue or cluster plantation. The saplings for plantation can be supplied by the Forest Department or managed from local nurseries or nurseries of the District Road Office. Costs for providing saplings will be borne by the road construction funds. Planting should be done wherever possible with native species, which are likely to require little maintenance and may prove beneficial in maintaining ecosystem integrity.

### **Socio-Economic & Cultural Environment**

#### **1) Compensation to the private lands for acquisition**

Adequate provisions and compensation arrangements will be maintained in the Resettlement and Rehabilitation Action Plan. Further, clear picture and number of PAF and SPAFs will be depicted in Local Area and Vulnerable Community Development Plan to satisfy and compensate all PAFs in a fair and timely manner before the commencement of construction works. Land transfer certificate will be provided to PAF and SPAFs. The project will further encourage locals in the involvement of agricultural extension services to increase local crop production and adopt better hill farming techniques. Different models expressed and accepted by the locals for the transformation of land and properties during the Scoping meetings are as follows:-

- compensation of land for land
- compensation of cash for land
- compensation of both cash and share in Project (equity) for land
- compensation of share in Project (equity) for land

- compensation for cash for residential house
- compensation for cash for other private infrastructure

The project will present and provide different sorts of options of compensation for the acquisition of affected lands. Compensation of affected land in terms of share equity in the project has been prioritized option presented to the locals by the project proponent. However, acquisition of private land will be executed regarding the prevalent Acts<sup>12</sup>.

Land will be compensated "land for land", or in cash, according to PAP's choice whichever possible. Structure will be compensated "house for house", or in cash, according to PAP's choice whichever possible. In principle, compensation will be done by cash.

## **2) Compensating affected residential houses**

Those affected population will be considered as Project Affected Families/People (PAFs/Ps). The project will compensate all loss of private land and property. Similarly, the resettlement principles will be adopted providing compensation and resettlement assistance to all affected persons based upon the GON norms and prevalent practices. Acquisition of private land, house and buildings will be executed regarding the prevalent Acts<sup>13</sup> and Regulations.

## **3) Minimizing agricultural land from fragmentation**

The proposed alignment will be fine-tuned during detail design stage to avoid fragmentation of agricultural land as far as applicable. The alignment will be finalized maintaining existing land use pattern undisturbed to possible extent. The final alignment will be drawn in-between the two different types of land use pattern to avoid fragmentation as far as possible. Passing zones will be provided to access adjacent lands fragmented by the proposed highway.

## **(9) Health and safety issues during Construction**

### **1) Maintaining Occupational Health and Safety of labors during construction**

Occupational Health and Safety of labors during construction of the proposed highway alignment will be significant issue. Working safety measures will be executed by the contractor to workers providing ample numbers but not limited to helmets, boots, rubber gloves, and masks as required. Life of worker will be ensured by maintaining Life insurance of each worker of the project. First aid facilities for the workers will be provided at working sites as well as at labor camp sites. If possible, one qualified nurse or first aider will be present at all times. Routine checkups of labors will be performed; this will be at least once per week for each labor workers. Similarly, Health and Safety of the local people will be another significant issue during construction stage of the project. Awareness programs to local people will be provided regarding environment health and safety. Furthermore, handling, transportation, storing and use of different Machines, equipment and petroleum product will be other issues of safety during construction.

During construction, existing local tracks and vehicle tracks will be affected and may need to be either closed temporarily or synchronize with the construction vehicles. Construction activities on the project site are likely to cause hindrance to pedestrian and existing traffic flow if not managed properly. Although, this is not likely to be a major problem; it could affect the passage of the existing traffic.

### **2) Addressing Health and Safety of the local people**

Construction work and excavation of road alignment will not be executed during night hours. Time schedule of road excavation and road closure will be fixed and will be informed to locals as well as dissemination related information through voice media and newspaper. Awareness will be provided to

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<sup>12</sup>Land Acquisition Act, 2034

<sup>13</sup>Land Acquisition Act, 2034

locals about health and safety regarding construction work. It is recommended that contractor will further comply with the Safety Plan developed in the detailed design stage.

### **3) Proper handling of explosives during transporting, storing and use**

Handling of explosives, its transportation, storing and use will be other issues of safety during construction. Handling of explosive will be carried out as per prevalent Act<sup>14</sup> and regulations. It is recommended that contractor will further comply with the Explosive Handling and Safety Plan developed in the detailed design stage.

### **4) Managing accidental hazards and road safety during construction**

Construction Traffic Management Plan will be developed in the detailed design stage that will comply by contractor to maintain flow of construction vehicles without hampering good flow of passenger vehicles. Road safety issues during construction works will be significant to construction workers, passenger vehicles etc. Safe handling of construction vehicles and equipment during construction phase will be an important issue for contractor. Collection and transportation of construction materials, disposal of spoil from excavation will be executed smoothly during construction. Existing Arniko Highway connecting Kathmandu to Chinas broader and Eastern Part of the country and the lower Terai region through B.P highway not be disturbed during the time of construction work and upgrading of this section of Arniko Highway alignment. Road safety of the highway will be ensured by managing existing traffic properly.

### **5) Managing Gender involvement and Child labor during construction**

To minimize the impacts on gender following measures will be applied:

- Avoid total closure of the important access to the market, water source or river as much as possible.
- If obstruction is not avoidable, information dissemination to the community regarding the timing of start and finish of the obstruction will be carefully and thoroughly conducted in the manner that as many local women as possible has access to the information.
- Preference will be given to the residents in the Affected Area who wish to work as unskilled labor in the Project without discrimination by sex.
- The advertisement of the recruitment will be designed in the manner that as many local women as possible has access to the information.
- When found necessary and appropriate, trainings and consultation for job/skill improvement will be operated.
- Contractor should follow the Child Labor Prohibition and Regularization Act, 2000 which enacted in favor of the welfare of the Children's right.
- Prohibits the involvement of children less than 16 years of age to employ in the works.
- The Child Labor Prohibition Act and Regularization will be followed in all the works carried out under the Project.
- Awareness programs will be organized to educate parents, local people on the child labor act.

### **6) Addressing Impacts due to Sanitation, Public Health Condition Infectious Diseases such as HIV/AIDS**

- Contractor and labor workers will be responsible to maintain healthy sanitary and hygiene condition of labor camps and its vicinity. Provide HIV related education and test to the willing workers.
- Awareness programs will be organized to educate the workers about the Sexually Transmitted Diseases (STD) to the workers.
- Providing first aid facility to the workers on site and also on the camp.
- Workers should be checked every months in the project site

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<sup>14</sup>Explosive Material Act, 1962

- The contractor will strictly obey the construction related management plans that will be prepared during the time of Site specific EMAP.
- Provide training on awareness about sanitation, hygiene, safe-sex and family planning for the workers.

Provide sufficient care-taking staff to conduct cleaning and monitoring activities on camp site

## **(10) Preventing impact from outside workers**

### **1) Addressing possible impact from in-migration of people on social, cultural and religious practices**

Security systems will be established to avoid various sorts of conflicts between the local and immigrants during the time of construction. As majority of the rural areas along the proposed highway is; conflict upon existing natural resources between inhabitants and in-migration people will be avoided establishing police post at several locations as appropriate. The project will further encourage local people to participate in the construction and upgrading of this section of highway generating their livelihood.

### **2) Managing influx of people**

Contractor will be responsible to manage all the labor workers maintaining their daily schedule of labor camp and working hours of workers. Local NGOs and stakeholders will introduce programs against alcohol abuse, violence, sexual abuse etc. Local educational institutions existed nearer to the project alignment will upgrade themselves in order to recruit likely increase number of students.

### **3) Avoiding conflict between workers and local people**

Security system will be established to avoid conflict between workers and local people. Some of the workers have habit of drinking alcohol, sanitation problems which creates problems with local people. However, contractors will be responsible to control their own labors those are imported from outside the project area. Whereas, contractor will be responsible to encourage locals for labor work including women providing both of the gender with equal wages not less than district rate.

### **4) Maintaining sanitation and hygiene condition**

Contractor and labor workers will be responsible to maintain healthy sanitary and hygiene condition of labor camps and its vicinity. Furthermore, the contractor will strictly obey the construction related management plans that will be prepared during the time of detail design phase of the project.

## **8.2.2 Operation Phase**

### **8.2.2.1 Physical Environment**

#### **(1) Addressing the impacts of obstruction to local's accessibility between adjacent lands and settlement of highway alignment**

##### **1) Avoiding inaccessibility between adjacent settlement and market areas**

Significant settlement and market area will not be disturbed with the proposed alignment. Due to the reduced RoW to 22.5 meter, all the settlement along the Banepa Bazar, has been untouched in the design. Almost, 6 passing zones has been proposed and presented in above section in order to provide accessibility for local movement at different locations with huge settlements and intersection area. However, the size and location of such crossings will be finalized during the detail design stage with the series of consultation with local affected people. Locals will be motivated to use proposed passing zones for their accessibility between the adjacent lands. Further, traffic signals and other enhancement facilities to access passing zones will be provided to avoid accidents from direct crossings of highway alignment.

## **(2) Minimizing land fragmentation**

### **1) Minimizing fragmentation of agricultural land**

Optimum design of alignment has been proposed in destructing existing land use pattern as far as possible. The final alignment has been proposed and maintained to construct in-between two types of land use pattern i.e. in-between cultivated and forest land to minimize fragmentation of cultivated land and other land use patterns as far as applicable. Similarly, passing zones will be introduced at different chainages in order to mitigate the barring from the direct movement of locals between adjacent lands. Such passing will support movement to locals including transportation of local materials, cattle movement etc.

### **2) Surface runoff and lead off drains**

Direct impact due to surface runoff upon public and private lands, water resources, and natural drainage will be avoided by providing lead off drains at the appropriate sections of highway alignment. The direct disposal of road side surface lead off drains upon private cultivated lands and properties will be avoided. Surface runoff and road side lead off drains will be managed properly in order to prevent significant adverse impacts upon public and property. Locations of runoff and lead off drain will be further taken into account in the detail design stage that will not trigger further landslide and soil erosion at the basement area of the highway alignment as well as inundation and siltation of private and cultivated lands.

## **(3) Avoiding impact on air, water and noise during project operation**

### **1) Avoiding noise pollution**

Traffic signals will be installed properly where exist sensitive receivers such as forest areas, hospital and school areas to avoid excessive blow of horns. As no any highway project could be implemented and operated avoiding substantial noise pollution level, thus it is inevitable that sound from the vehicle movement could not be mitigated and reduced into negligible level. However, plantation of bush and hedge, bamboo plantation etc., will be applied as noise barriers in the vicinity of sensitive receivers. The project will provide appropriate education to local drivers as awareness training to minimize sound pollution. Sound barrier will be installed in the highly sensitive receptor locating near this road like school, college, hospital if the project feel necessary during operation stage.

### **2) Avoiding air and water pollution**

Control of air quality and amount of exhaust gas on the road by the by vehicular emissions will be difficult within the scope of road. However the prohibition of the old vehicles that do not meet the emission level shall be applied which will decrease the amount of vehicular emissions in the highway. Period air quality will be monitored during operation phase to ensure no significant adverse impact upon air quality due to operation of the project.

River water quality will be more significant during the operation of the project. The provisions of water quality monitoring (using parameters tested during baseline) will be carried out in order to maintain rivers and river systems under condition prior to construction phase. If there have been significant adverse impacts on water resources due to the operation of project; necessary steps of action will be executed to maintain water quality prior to construction.

## **(4) Safe operation of Highway**

### **1) Addressing road safety and safe driving**

Road safety measures will not be compromised during the operation of highway. Environmental enhancement including safe driving will be provided installing all measures established in Asian Standard Highways. Road accident will be avoided as far as possible maintaining road geometry, regular road surface, controlled speed of vehicle etc. Umpteen traffic signals including other enhancement measures will be provided considering driving safety along the highway.

## **2) Managing local traffic**

Local traffic will be managed establishing interchange at the starting point Suryabinayak and the end point at Dhulikhel area in order to release and enter local vehicles. These junctions are the major points from where local tracks will be interconnected with proposed highway. Asian Highway Standard traffic signals will be established in each entry and exit points as well as along the highway. Road markings, signals including traffic lightings will be established for the smooth ply of local and highway traffics. Highway traffic personals will also be recruited and will be deployed at the appropriate locations especially at the entry and exit points including interchanges. Further, pamphlets and brochures will be distributed for the dissemination of information regarding the traffic rules including do's and don'ts while travelling along the highway, rules of entry and exit from highway, information of highway lane, use of interchange, directions etc. In addition, information and help desk will be established at each entry point of the highway.

## **3) Maintenance**

To avoid any impact to surrounding environment, maintenance of structures, such as tunnel, road, and belonging facilities for ventilation and drainage will be implement appropriately based on operation and maintenance schemes.

## **4) Emergency Cases**

Establish operational organization especially for tunnel section to fulfill emergency counter measures for traffic accident, vehicle trouble, and fire.

## **(5) Biological Environment**

### **1) Avoiding forest resource encroachment and minimize forest resource clearance**

Environmental Monitoring Unit of the widening and upgrading Highway project will be established in order to monitor overall environmental condition and likely impacts due to operation of the project. However, forest user groups will also be responsible for monitoring to avoid such likely impacts. Moreover, site enhancement projects and area development projects will be launched in order to maintain and enhance greenery within the project Municipalities as well as adjacent other Municipalities. Promotion of local agricultural products including NTFPs and bamboo plantation and conservation programs will be included in area development projects.

Construction work will not destroy vegetation cover beyond extreme cut and fill area during excavation. Contractor will ensure in avoiding massive excavation of forest area and vegetation of project sites without disturbing wild life habitats. The project management will closely coordinate with Forest Office and forest user groups to control illegal felling of trees, illegal poaching and trappings by other outside wildlife poachers, wildlife traders and timber smugglers.

## **(6) Socio-economic & Cultural Environment**

### **1) Avoiding road traffic accidents and Road Safety during operation**

To avoid the accident road traffic signals and road marking and other safety measures will be applied to reduce driving risks and providing enhancements to driving conditions near the intersections. In order to avoid illegal crossing and accidental crossings by the local people; barbed fencing will be carried out along the length of the highway. Awareness campaigns at the local level will be conducted to avoid such accident during operation. It is further anticipated that much traffic will be diverted from the currently overburdened single track linking Kathmandu with Terai. Overall road facilities will be enhanced and driving conditions will be improved by providing substantial traffic signals and other facilities. Passengers as well as freight will be motivated to use the Highway alignment by providing service and facility sites within the project area.



## 2) Minimizing impact on livelihood based on business of various agricultural products

The project is expected to improved transportation facilities including substantial economic benefit to the country. Similarly, the major benefits of the project recognized by the different stakeholders are potential employment opportunities & increase in income, generation of revenue, reduction in travel time & vehicle operating costs, tourism development, and decrease in market value of commodities in densely populated capital city Kathmandu, enhancement of local potential areas through area development projects etc. Nevertheless, the livelihood condition of the severely affected people will be changed permanently from agriculture to service oriented and business motive forms after widening and upgrading of this section of Arniko highway. The project will attempt to generate employment opportunity with in the project during operation. As many of the affected people especially PAFs will have opportunities in the project construction in appropriate designations. Moreover, the project will implement agricultural enhancement programs to enhance and promote local agricultural products as well as to enhance the capacity of adjacent cultivated lands. The project will also motivate local farmers in promoting cash crops and high value agro products.

## 3) Avoiding trafficking and prostitution, minimizing population pressure, change in social behavior

The highway will serve freight transportation enhancing economic benefits to the intra and international entrepreneurs. Although import and export of alcoholic products benefitted to such business; consumption of alcoholic products at local level especially by poor, labor and those depending upon subsistence livelihood will be avoided by providing awareness trainings. During operation; awareness trainings will be provided to poor peoples' communities who will be more vulnerable to such impacts. Besides, such impacts will be minimized by increasing the local manpower and stakeholders as workforces to the extent possible. However, for the proposed project local labor force may not be adequate to accomplish the construction work, the necessary administrative and security measures will be adopted in coordination with the District Administration Office. Also, programs to communicate and interact with local communities through appropriate public interaction programs will keep good relationship between the local communities and project staff.

## 4) Addressing separation of public and private land due to fragmentation

Locals inhabited adjacent to proposed highway will be provided with passing zones at 6 several locations as appropriate. However, the locations suitable for the establishment of such passing zones will be finalized after a series of consultation with affected people along the alignment and will be finalized during the final stage of detail survey and design period.

### 8.3 Tentative Cost Estimation of Mitigation Measures

#### 8.3.1 Compensatory Plantation and Its Protection

The compensatory plantation, as envisaged by the Department of Forest, MoFSC is in the ratio of 1:25. The planted tree seedling / saplings have to be protected and managed for at least 5 years. Total no. of trees to be cleared and needing compensatory plantation is Trees: 647 nos. Compensatory plantation at 1:25 ratio and number of trees plantation necessary is 16,175 nos. The cost for compensatory plantation is estimated as presented in following table.

Table 8.3-1 Compensatory Plantation Cost for Road Side Trees and Community Forest

A. Road side trees and Community Forest					Remarks
Tree No. to Cut	647 nos.	Poles 188	Trees 459		
Tree Cutting Costs		Pole size	Tree size	Total	
		Rs.56,400	Rs. 275,400	331,800	
Replantation (@ 1:25)	16,175 nos.				As per provision of MoFSC
Replantation Costs					
Seedling Cost				404,375	

Cost of Plantation				242,625	
Protection/ Conservation Costs (5 yrs.)				5,200,000	(Cost @ Rs. 10,000 pm for 13 months yearly for 5 yrs.)
<b>Sub-Total of A</b>				<b>6,178,000</b>	
<b>B. Privately owned Trees</b>					
Tree No. to Cut	127 nos.	Poles 87	Trees 40		No compensatory Plantation is required for privately owned trees
Tree Cutting Costs		Pole size	Tree size	Total	
		Rs.26,100	Rs. 24,000	50,100	
<b>Sub- Total of B</b>				<b>50,100</b>	
<b>Total Tree Cutting Costs (A+B)</b>				<b>6,228,900</b>	

### 8.3.2 Compensation for Private Property

Table below presents the tentative estimated cost for the resettlement and rehabilitation. The rate of land and structures has been calculated based on market cost survey interviewed with project affected people and non-project affected people, discussion with local level meeting and discussion with local level real state planner. During the discussion with local people they clearly stated that they would not accept the government land price which was very low than the current market priced. However, Compensation Determination Committee (CDC) will decide the compensation amount of project affected property during the project implementation period.

Table 8.3-2 Estimate of Compensation for Property Acquisition

SN	Particulars	Nos. / Units	Amount (NRs.)	Remarks
1	Private Land Acquisition Costs	13.33 ha.	5,533,721,000	Refer RAP Report, 2018
2	Temporary Land Lease	LS	2,500,000	
3	Compensation for loss of Private Houses	234 nos.	363,121,089	Refer RAP Report, 2018
4	Compensation for loss of Private Trees	127 nos.	635,000	
5	Compensation for loss of crops	LS	2,000,000	Refer RAP Report, 2018
6	Business Disruption Allowance	102 nos.	9,180,000	Refer RAP Report, 2018
7	Displacement Allowance for Residential families	234 nos.	21,060,000	For 6 month Payment
8	Support Allowance for Vulnerable People	75 nos.	3,750,000	Refer RAP Report, 2018
	<b>Total</b>		<b>5,935,967,089</b>	

### 8.3.3 Costs of Enhancement Measures and Environmental and Social Supports

Cost of enhancement measures and social support are presented in the table below:

Table 8.3-3 Cost of Enhancement Measures Environmental and Social Support Costs

SN	Particulars	Nos. / Units	Amount (NRs.)
1	Training to enhance the skills of local workers	500 nos.	1,200,000
2	Livelihood Enhancement Skills and Training to PAF	145 nos.	6,525,000
3	Orientation to School Children	10 nos.	200,000
4	RAP implementation		3,050,000
5	Restoration of damaged community infrastructures	LS	3,000,000
6	Improvement/Enhancement of community infrastructures, Temples etc.	LS	3,000,000
7	Orientation of EMP to Authority, Concerned agencies, Consultation & contractors groups	LS	3,000,000
8	Erection of Signs and Signals at road crossings	LS	300,000
9	IEC material distribution	LS	300,000
10	EMAPs Implementation	LS	200,000
11	Plantation along the Road Side	LS	1,500,000
12	Training on Road Operation and Risk	LS	100,000
13	Awareness Programme on NTFP conservation/preservation practices	LS	200,000
	<b>Total</b>		<b>22,575,000</b>

The above mention trainings will be based on the training need assessment. The training program will be conducted through Project Design and Supervision consultant by hiring individual trainer or training provider institution.

### 8.3.4 Costs of Environmental Mitigation Measures

Cost of other mitigation measures are presented in the table below:

Table 8.3-4 Cost of Other Environmental Mitigation Measures

SN	Particulars	Nos. / Units	Amount (NRs.)
1	Air, Water and Noise Quality Monitoring	LS	2,000,000
2	Cross drainage	5 nos.	Included in Project Cost
3	Cost of water treatment plant	1 nos.	Included in Project Cost
4	Cost for installation of noise barriers	LS	Included in Project management Cost
5	Sprinkling of water to Reduce Air pollution	LS	10,000,000
6	Bio-engineering on new cut /embankment slopes	LS	5,000,000
7	Environmental protection & natural resources management in community forest with NTFFP	LS	3,000,000
8	Implementation of OHS and Safety Materials	LS	5,000,000
9	Waste Management	LS	1,000,000
11	Relocation of affected Irrigation canals/water supply	LS	1,000,000
12	Relocation of culturally affected site	LS	1,000,000
13	Improvement of Public Services	LS	3,500,000
14	Construction of Check Post	LS	5,000,000
	<b>Total</b>		<b>36,500,000</b>

### 8.3.5 Summary of Costs of Mitigation Measures

Table below presents the summary of the tentative estimated cost environmental mitigation measures.

Table 8.3-5 Summary of Cost Estimation of Mitigation Measures

SN	Items	Amount (NRs.)	Percentage
1	Compensatory Plantation Costs	6,228,100	0.10%
2	Private Property Compensation Costs	5,935,967,089	98.91%
3	Environmental and Social Enhancement Costs	22,575,000	0.38%
4	Other Environmental Mitigation Costs	36,500,000	0.61%
	<b>Total Environmental Mitigation Costs</b>	<b>6,001,170,189</b>	<b>100.0%</b>

## Chapter 9 ENVIRONMENTAL MANAGEMENT PLAN

The preparation of Environmental Management Plan (EMP) is determined as a key part of the EIA report. The proponent is required to implement the mitigation measures, while the environmental monitoring works should be performed by the concerned agency (ministries), and auditing by the Ministry of Forests and Environment (MoFE) in accordance with the provisions of the EPR, 1997.

### 9.1 Objective of EMP

The primary objective for the preparation of EMP is to implement proposed mitigation measures effectively and enhance monitoring program as well as further plan for environmental auditing for smooth and sustainable implementation of the Project. The specific objectives of EMP are:

- to define environment management principles and guidelines for all phases (pre-construction, construction and operation) of the Project;
- to establish the roles and responsibilities of all agencies involved in Project environmental management;
- to formulate protection measure implementation plan for the mitigation of significant adverse environmental impacts including augment beneficial impacts;
- to provide necessary staff skills and a detailed accounting of the estimated costs to implement the plan;
- to formulate a monitoring programs for baseline, impact and compliance monitoring;
- to establish a separate institutional body i.e. Environmental Monitoring Unit (EMU) to ensure effective and timely implementation;
- to formulate an environmental auditing and evaluation of mitigation program to be implemented after the construction of Project.

### 9.2 Roles and Responsibility

Key stakeholders/agencies involved directly and indirectly for environmental management of the project are as follows:

- Ministry of physical Infrastructure and Transport (MoPIT)
- Ministry of Forests and Environment (MoFE)
- Project Proponent
- Construction Contractor
- Stakeholders
- Municipality Development Committee (same as former VDC)
- District Coordination Committee (DCC)
- Supervision Consultant
- Non-Governmental Local Bodies such as CBOs, NGOs and CFUGs

The main roles and responsibilities of the above agencies at different stages of Project implementation phase are shown as followings.

#### 9.2.1 Pre-Construction Phase

##### (1) Ministry of Physical Infrastructure and Transport (MoPIT)

The overall responsibility of the MoPIT comprises the coordination with the Nepal Planning Commission (NPC) and Ministry of Finance (MoF) for the final selection of strategic road network sub-project sections and the finalization concerning budget allocation. MoPIT ministry is the umbrella agency in Nepal undertaking the planning and construction of the Strategic Road Network, to be implemented through its Department of Road.

**(2) Ministry of Forests and Environment (MoFE)**

The Ministry reviews the EIA report to ensure that the report is prepared as per EPA (1996) and EPR (1997) as well as approved TOR. MoFE approves the EIA report after providing comments and suggestions in terms of environmental management. MoFE will grant approval letter to Proponent under the Sub-Rule (4) of EPR within Sixty days from the date of receipt of the proposal instructing to ensure the implementation of mitigation measures and monitoring provisions during Project construction and operation stages.

**(3) Project Proponent (Department of Road, DoR)**

The Proponent reviews the EIA report to ensure that it meets the EIA requirements and procedures as per EPA and EPR, and other environment related acts, rules and guidelines administered by concerned agencies. The Proponent will submit the final EIA report to the concerned line Ministry for review through the MoPIT and will get approval from the Ministry before its implementation.

**(4) Municipality/District Coordination Committee**

Municipality/DCC (Formerly DDC) will provide recommendation letter for the implementation of the Project after the study of EIA report instructing to ensure the implementation of mitigation measures.

**(5) Local Stakeholders, NGO, CBOs and CFUGs**

Local stakeholders will support proponent in settling all sort of social disputes that are arise during the process of acquisition of affected land and houses. Stakeholders will assist affected locals; poor people ensuring their support for resettlement and livelihoods from proponent's side.

**9.2.2 Construction Phase****(1) Project Proponent**

The proponent will provide all the information of likely impacts and its mitigation measures as mentioned in EIA report to construction contractor before the construction and operation of highway and its associated structures. Proponent will ensure that construction contractor will carry out the construction work in environmental friendly way and implementing mitigation measures as mentioned in the EIA report as per requirement.

**(2) Construction Contractor**

Construction contractor will execute construction work in environmental friendly manner without undermining the issues and mitigation measures identified and mentioned in the EIA report. Establishment and operation of labor camp and sanitary condition of the camp will be maintained. Contractor will strict restrictions for laborers from illegal felling of trees and use of natural resources. Side tipping of spoil will be avoided and only recommended spoil disposal sites will be used for tipping and will be reclaimed and rehabilitated covering with vegetation and maintaining drainage after its closure. Contractor will encourage local level employment in the construction of Project.

**(3) Stakeholders, NGO, CBOs and CFUGs**

Local stakeholders, NGO and CBOs will ensure the transparency in the construction activities are maintained throughout the construction period. Similarly, such bodies will ensure that the environmental enhancement and mitigation measures and monitoring is carried out as per approved EIA report and will also ensure the priority to local employment and implementation of Project as per EIA report. CFUGs will be responsible to provide area and space for compensatory re-plantation and will be responsible for the protection and conservation of planted species at least for 5 years.

### 9.2.3 Operational Phase

#### (1) Project Proponent

The Proponent will ensure the operation of Project with environmental friendly manner ensuring the implementation of mitigation measures proposed in EIA report. The Proponent will further ensure the local level employment in the Project; ensure clean emission on ambient environment, ensure all safety measures for highway operation.

#### (2) Local Bodies, NGO and CBOs

Local bodies such as Municipality/DCC (former DDC), NGO and CBOs will conduct monitoring and supervision works to measure the effectiveness of environmental enhancement of beneficial impacts and mitigation measures implemented for adverse environmental impacts of the proposed Project.

### 9.3 Estimated Budget for EMP Implementation

In this Project, each organization listed in the following tables will bear the responsibility for implementation of the EMP in the described Phases.

Table 9.3-1 Funding and Responsible Organization for the Implementation of EMP

Funding	Phase	Responsible Organization
JICA	Planning Phase (Detailed Design Phase)	DoR with Engineering Design Consultant
	Construction Phase	DoR with Construction Supervision Consultant or Construction Contractor
GON	Operation Phase	DOR

Source: JICA Survey Team, 2017

For implementation of EMP, Environmental Management Unit (EMU) will be established. The cost required for the establishment of EMU is presented in the table below.

Table 9.3-2 Estimated EMU Cost of the Project

S.N.	Particulars	Man-month	Rate	Total Amount
		MM	Rs./MM	Rs.
1	<b>Manpower Cost</b>			
	EMU Chief	36	Rs. 160,000	Rs. 5,760,000
	Environmentalist/Biologist	36	Rs. 140,000	Rs. 5,760,000
	Forest and Watershed Management Specialists	12	Rs. 140,000	Rs. 1,920,000
	Sociologist/ Socio-economist	36	Rs. 130,000	Rs. 5,760,000
	Public Relation/ Resettlement Officer/Legal Officer	36	Rs. 120,000	Rs. 5,760,000
	Senior Lab Technician (Lab In-charge)	36	Rs. 120,000	Rs. 5,760,000
	Administrative/ Account / Support officer	36	Rs. 120,000	Rs. 5,760,000
	Field Technicians/Civil engineer	36	Rs. 125,000	Rs. 5,760,000
	<b>Sub Total 1</b>			<b>Rs. 42,340,000</b>
2	Environment Monitoring Unit	LS	Rs. 500,000	Rs. 500,000
	EMU Office establishment	LS	Rs. 200,000	Rs. 200,000
	Lab establishment	LS	Rs. 100,000	Rs. 100,000
	Office supplies/consumable	LS	Rs. 200,000	Rs. 200,000
	Maintenance of EMU office & Lab	LS	Rs. 100,000	Rs. 100,000
	Transportation facility	LS	Rs. 100,000	Rs. 100,000
	<b>Sub Total 2</b>			<b>Rs. 1,200,000</b>
3	<b>Monitoring Costs for:</b>			
3a	Ministry of Physical Infrastructure and	LS	Rs. 500,000	Rs. 500,000

S.N.	Particulars	Man-month	Rate	Total Amount
		MM	Rs./MM	Rs.
	Transport			
3b	Ministry of Forests and Environment	LS	Rs. 500,000	Rs. 500,000
<b>Sub Total 3</b>				<b>Rs. 1,000,000</b>
<b>Total (1+2+3)</b>				<b>Rs. 44,540,000</b>

#### 9.4 Environmental Monitoring Plan (EMoP)

Three types of monitoring are envisaged in the plan, namely: Baseline Monitoring, Compliance Monitoring and Impact Monitoring. Since the required databases for the environmental baseline are already collected by the EIA study, the Project is not envisaged to require Baseline Monitoring. The compliance monitoring comprises two parts; the first is the compliance to the enhancement actions and second compliance to mitigation actions including the corrective actions issued.

The impact monitoring in the plan relates to only those measurable indicators in the socio-economic, Cultural/Physical, Chemical and Biological environments. For each of the monitoring indicators, monitoring methods, frequency of monitoring, responsible parties along with the required cost estimates have been estimated. The benefits augmentation and mitigation measures as included in Chapter 6 will be implemented as follows.

Detailed Site Specific – EMAP will be developed by prior to commence of Construction works, which will detail the environmental mitigation measures, in a site specific manner, mentioning the quantities, locations, magnitude, extent etc., for all the possible adverse impact due to the project activities.

##### 9.4.1 Plan for Beneficial Impacts Augmentation Measures

Hence the GoN has planned to extend the widening of this Highway from Suryabinayak to Dhulikhel focusing on curves and turn improvement with smooth lining of the road geometry at several such extreme places like Sanga pass area and KU Chowk at Dhulikhel where it requires a massive change in alignment with huge turns and curves improvement.

Livelihood generation will be the major beneficial impact during construction as well as operation phases of the Project through its implementation. Similarly, substantial reduction in existing practices of the consumption of vehicle fuel for freight transportation, smooth and short traveling distance with drastic reduction of traffic problem and congestion while approaching toward the Valley from other parts of the country; safe, easy and time saving transportation as compare to the existing steep and sharp curving road are the major beneficial impacts of the Project.

The Project further aims to enhance beneficial measures with the construction of new alignment and widening /upgrading of this road section Project. Hence enhancement measures has been proposed to augment beneficial impacts of the Project which will be undertaken in appropriate time at appropriate location with appropriate cost.

The following matrix table presents Environmental Management Plan for augmentation measures for the beneficial impacts.



Table 9.4-1EMP for Beneficial Impacts Augmentation Plan

No.	Project Activities	Impacts	Monitoring of Impact	Beneficial Impacts Enhancement Measures	Responsible Agency		Associated Costs
					Implementing Agency	Supporting Agency	
<b>Construction Phase</b>							
i	Employment of Labors	Generation of Employment opportunities and increase of Income	<ul style="list-style-type: none"> <li>Inspect &amp; confirm labor related clauses are adequately stated in Contractor's Contract Document</li> </ul>	<ul style="list-style-type: none"> <li>Locals including Project-affected families, poor people as well as women will be encouraged to participate in construction works and give first priority for work</li> </ul>	Contractor/ Sub Contractor	Project	No additional costs associated
ii	Employment of Labors	Increase in the income level of local people through opportunity to work and involve in income generation activities	<ul style="list-style-type: none"> <li>Site inspection &amp; labor interview</li> <li>Verify with contractors payroll</li> </ul>	<ul style="list-style-type: none"> <li>Whenever practical, scheduling the construction works during the agricultural off-season to enable local people to become engaged</li> <li>Include binding clause in Contractor's Contract Document to give priority for local people with govt. accepted wage and recruit local labor impartially without favor or gender discrimination</li> </ul>	Contractor/ Sub Contractor	Project	No additional costs associated
iii	Employment of Labors	Strengthening of skills and capacity of locals	<ul style="list-style-type: none"> <li>Inspect related clause in Contractor's Contract Document</li> <li>Inspect Contractor's Training to labors details</li> <li>Site inspection &amp; labor interview</li> </ul>	<ul style="list-style-type: none"> <li>Provide on-the-job training and practical training to local workforce on operation of equipment&amp; construction works</li> <li>Include binding clause in Contractor's Contract Document for providing on-the-job training to local workforce</li> </ul>	Contractor/ Sub Contractor Consulting Engineer	Project	Additional budgeting should be done as required
<b>Operation Phase</b>							
i	Operation of 6-lane highway	Shortening of Travel Time	<ul style="list-style-type: none"> <li>Inspect Project's construction design and plans</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing the travel duration and transportation of goods and services time</li> </ul>	Engineer, Contractor	Project	No additional costs
ii	Operation of 6-lane highway	Shortening of Travel Distance	<ul style="list-style-type: none"> <li>Inspect Project's construction design and plans</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing the travel and transportation of goods and services distance</li> </ul>	Engineer, Contractor	Project	No additional costs
iii	Operation of 6-lane highway	Saving of Vehicle Running Cost	<ul style="list-style-type: none"> <li>Inspect Project's construction design and plans</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing the vehicles condition, maintenance and running cost</li> </ul>	Engineer, Contractor	Project	No additional costs
iv	Operation of 6-	Reduction of Traffic	<ul style="list-style-type: none"> <li>Inspect Project's</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing and controlling the Traffic</li> </ul>	Contractor,	Project /	No additional

No.	Project Activities	Impacts	Monitoring of Impact	Beneficial Impacts Enhancement Measures	Responsible Agency		Associated Costs
					Implementing Agency	Supporting Agency	
	lane highway	Accidents	construction design and plans	Accidents and possible obstacles on road conditions	Proponent, Engineer	Traffic Police	costs
v	Enhancement of transport facilities	Application as a Model Case	<ul style="list-style-type: none"> <li>Examining the similar other road project</li> </ul>	<ul style="list-style-type: none"> <li>Developing and promoting this work as the Model for other transport development work</li> </ul>	Contractor, Proponent, Engineer	Project	No additional costs
vi	Enhancement of Social Services facilities (road, service area at west portal side, water supply and irrigation canals )	Access improvement for people	<ul style="list-style-type: none"> <li>Interact with local people using service roads Inspect road surface, intersections, service roads, and tunnel periodically and recommend for reconstruction if damage is found</li> </ul>	<ul style="list-style-type: none"> <li>Scientifically designed side access to service road that is acceptable to local users</li> <li>Prohibit haphazard development of side access entry to service</li> </ul>	Contractor, Engineer	Project	No additional costs
vii	Enhancement of Local Environment	Control Air Pollution	<ul style="list-style-type: none"> <li>Examine the air quality periodically of the area</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing air pollution control around the area</li> </ul>	Proponent, Engineer	Project /MoFE	No additional costs
viii	Enhancement of Local Economy	Economic benefit	<ul style="list-style-type: none"> <li>Inspect enhancement / increase in local economic / business activities within influence areas</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing economic activates</li> </ul>	Proponent, Engineer	Project	No additional costs

Source: JICA Survey Team, 2014

### 9.4.2 Plan for Adverse Impacts Mitigation Plan

Proposed mitigation measures for adverse impacts identified are presented in the respective Chapter of the EIA report. Most of the proposed mitigation measures are considered to be the civil Engineering and their costs are presented in the Project cost and also have been briefly presented in the following Matrix. Environmental Management Plan/Environmental Monitoring Plan will be managed by project owner, DoR, and most of activities are implemented by contractor and supervision consultant which contract with the project owner. A proposed mitigation plans during and after construction are shown in the table below.

Table 9.4-2 EMP for Adverse Impacts Mitigation

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
<b>Physical Environment (Construction Phase)</b>							
P1	<b>Temporary and Permanent change in land use</b>						
P1- i	Road width formation clearance, construction of cross drainages, retaining structures, river training works, etc.	Loss of agricultural land.	Engineering structures will be provided to prevent landslides and river cuttings maintaining natural drainage pattern of the terrain within the project area. Land acquired for temporary purposes will be reclaimed and rehabilitated.	Project Alignment	During Construction	Project Proponent	
P1- ii	Road formation clearance	Impact due to change of forest area into road formation	Compensatory plantation in every appropriate places at the vicinity of project site	Project Alignment	During Construction and operation	Project Proponent/CFUGs/ Stakeholders	
P2	<b>Impacts on air, noise and water quality degradation due to construction activities</b>						
P2- i	Road formation clearance	Air pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	<ul style="list-style-type: none"> <li>- Contractor will carry out dust protection measures during road construction, such as periodical water spray, covering on construction material, etc.</li> <li>- Contractor will prepare and implement dust control measures, such as periodical water spray, covering on construction material, etc.</li> <li>- Contractor will actively use electrically-powered equipment.</li> <li>- Contractor will maintain their construction equipment in adequate working conditions.</li> <li>- Contractor will keep clean road surfaces.</li> </ul>	Along the alignment, workshops, material storage sites, crusher locations, disposal sites	During Construction phase	Contractor	Rs. 10,000,000 (Refer Table 8.2-4 S.No. 5)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
			- The supervision consultant will monitor dust, exhaust gas and complaint from the local people. If the local residents and pedestrians complain about the dust and gas, the supervision consultant and contractors should reconsider the construction technique and method. - Vehicles washing station will be established in the point like Dhulikhel, Sanga and Bhaktapur.				
P2- ii	Road formation clearance	Noise pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	Preventing noise pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads by using appropriate machine and time management.	Entire alignment	During construction phase	Contractor	Rs. 2,000,000 (Refer Table 8.3-4 S. No. 1)
P2-iii	Operation of crusher plant, concrete batching plant and bitumen mixing plant	Excessive dust production and noise pollution due to operation of crusher plants, concrete batching plant and bitumen mixing plant etc.	Contractor will fit Stone Crushing equipment with approved dust control devices and operated in accordance with manufacturer's specifications. Contractor will establish crusher plant only at the selected and identified sites. Crusher plant Stone Crushing Plant should be operated only during daytime.	Crusher plant sites	During construction phase and operation of crusher plants	Contractor	
P2-iv	Operation of Quarry sites and burrow pits	Physical impact upon air, noise and water due to Quarry site operation	Physical impact upon air, noise and water due to operation of quarry was anticipated to be negligible hence no any mitigation measure has been proposed.	Quarry sites areas	During construction phase and operation of Quarry	Contractor	
P2-v	Road formation clearance and track opening Crushing and concrete batching plant and bitumen mixing plant operation at river banks	Degradation of water volume and/or qualities of existing rivers.	Use water treatment facilities for discharged water from construction related sites. Contaminated water must not be discharged at the site and moved to water purified plants.	Along the alignment where existing river situated close to proposed route	During construction	Contractor	
<b>P3</b>	<b>Impacts / issues due to originating from solid wastes, soil waste &amp; Liquid waste generation</b>						
P3-i	Construction and use of the	Impact due to produced	Undertake necessary institutional	Solid waste	During	Contractor,	Rs. 1,000,000

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
	stock yard, concrete mixing plant, storage, etc., Construction and use of the Workers' Camp.	Solid Wastes	<p>coordination and allocate budget plan for hiring collection and disposal service provider.</p> <p>Workers and camps in charge will be trained for source segregation and Handing of generated solid waste at site.</p> <p>The concerns body that have got contract from contractor will perform the solid waste management work being within the clause of Solid Waste Management Act 2011.</p> <p>Establish solid waste collection and management through incineration, proper landfill and decomposing for degradable wastes in pit at labor camps.</p> <p>Develop and implement waste management "Code of Conduct" and enforce strict penalty to violator of "Code of Conduct".</p> <p>Educate about non-use of bio non-degradable materials such as plastic, metal, glass etc. and separation of such waste material and incineration safely</p>	<p>generated from construction materials like spoil.</p> <p>Solid waste generated from Labor Camps, stock yard, water treatment plant and entire construction site.</p>	construction phase	Supervision Engineer	(Refer Table 8.3-4 S. No. 9)
P3-ii	Construction, widening of the Road Generation of Spoil/Muck/Soil and construction of Spoil Disposal Site Reinstatement of Stock yard, Labor and Contractor camps.	Impact due to production of Spoil/ Soil Waste	<p>Design the Disposal Site so that the impact on the downstream water use is minimized.</p> <p>Only dispose soil waste at designated place.</p> <p>Avoid Soil disposal on:</p> <ul style="list-style-type: none"> <li>- Natural water course posing a threat of or causing choking in its flow and course change.</li> <li>- Over the edge of the excavations and fresh embankments.</li> <li>- Immediately above potential arable land and forest areas.</li> </ul>	Along the entire road.	During construction phase	Contractor, Supervision Engineer	Rs. 1,000,000 (Refer Table 8.3-4 S.No. 9)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
			The concerns body that have got contract from contractor will perform the solid waste management work being within the clause of Solid Waste Management Act 2011.				
P3-iii	Construction and use of the Workers Camp's septic tanks, Construction and operation of the water treatment plant for the turbid water from construction sites. Reinstatement of Bitumen yard and fuel, lubricants storage area	Impact due to production of Liquid Waste	<ul style="list-style-type: none"> <li>- Storing and handling of fuel, lubricants bitumen etc. should be done in a safe manner.</li> <li>- Storing compounds will have fire extinguisher facilities.</li> <li>- Used lubricants will not be discarded in a haphazard manner or disposed in streams and water sources.</li> <li>- Direct cleaning of vehicles or equipment should prohibit in streams, rivers or canals.</li> <li>- Liquid waste must not be discharged at the site and moved to water purified plants. DoR and Contractor will find and contract with authorized treatment plant/facilities which is effective for the wastewater from the sites.</li> <li>- Avoid contamination if Liquid waste with water sources in case of spillage.</li> <li>- Protective clothing, gloves, boots etc. should be provided to the laborers dealing with liquid waste.</li> </ul>	Labor and Contractors camps	During construction phase	Contractor, Supervision Engineer	
<b>P4</b>	<b>Impacts / issues on Top Soil and Soil Contamination</b>						
P4-i	Activities of construction equipment and tools, Construction and use of the stock yard, concrete mixing plant, storage, etc.	Impact due to Soil Contamination	<ul style="list-style-type: none"> <li>Education of the workers about the negative impacts of soil contamination.</li> <li>Training of good handling of the oils and chemicals to avoid soil contamination.</li> <li>Preparation of clear guidelines of handling, recycling and discarding the empty containers or bags of the chemicals.</li> <li>Designation of site managers who</li> </ul>	Equipment's Service Yard, Labor Camps, Stock yard/Storage area Mixing plants area, and entire	During construction phase	Contractor, Supervision Engineer	Rs. 1,000,000 (Refer Table 8.3-4 S.No. 10)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
			monitors condition of stock yards.	road area			
P4-ii	Impact on top soil and its degradation	Impact on top soil and its management	Education to the workers about the importance of top spoil and its use. Training of good handling, collection, storage and management of top soil from field. Preparation of clear guidelines of handling, collection, storage, management and reuse of top soil.	Entire road alignment, Stock yard/Storage area	During construction phase	Contractor, Supervision Engineer	Same as P4-i
<b>P5</b>	<b>Impact of Chemical upon Environment</b>						
P5- i	Mechanical parts/ vehicle maintenance and cleaning and mixing of its discharge into water bodies	Chemical contamination of water bodies due to mechanical parts/ workshop/ vehicle maintenance and cleaning and mixing of its discharge into water bodies	Workshops and chemical storage sites will not be established nearer to the water bodies and river side. Bitumen drums will be stored at designated locations and not scattered along the road. If contaminated; the contaminated runoff from storage areas will be captures in ditches or ponds with an oil trap at the outlet.	Workshops and batch mixing plant sites	During construction phase	Contractor	
P5- ii	From Construction materials for road site	Chemical such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. residues mixing in land and water bodies	During site clearance, all cut and grubbed materials will be kept at a secured location so to maintain environmental safety.	Workshops and batch mixing plant sites	During construction phase	Contractor	
<b>P6</b>	<b>Impacts due to Labor Camp, Contractor's Camp operation</b>						
P6- i	Labor Camp and Contractor's camp operation	Temporary loss of land	Recovering and rehabilitating temporary loss of lands	Along the entire route	Right after the completion of construction	Contractor	
P6- ii	Labor Camp and Contractor's camp operation camp activities	Solid waste disposal issues	Avoiding direct disposal of Solid waste	Labor Camp and Contractor's camp sites	During operation of camps	Contractor	
P6- iii	Labor Camp and Contractor's camp operation camp activities	Surface contamination from unsanitary disposal of toilet waste	Managing safe disposal of toilet waste to prevent surface contamination	Labor Camp and Contractor's	During operation of camps	Contractor	



Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
				camp sites			
<b>P7</b>	<b>Physical Impacts due to slope instability, landslide, erosion of hill slopes along road alignment</b>						
P7- i	Slope cutting for road width formation Excess spoil disposal Construction and excavation activities Disposal of spoils	Slope instability, landslides and erosion of fresh cut hill-side slopes and valley sides slopes	Angle of slope cutting will be maintained for fresh cutting slopes in order to avoid instability, landslide and erosion.	Stretch along the alignment where vertical slope cutting and box cutting is required	During Construction	Contractor	Included In project Cost
P7-ii	Slope cutting for road width formation and clearance of vegetation	Soil erosion, gully formation at new open cut sections	Cut spots and embankments will avoid the creation of angle greater than the natural angle of repose for the local soil type. Re-vegetation of cut slopes will be carried out as soon as possible. Destruction of vegetation in the right of way will be minimal as far as applicable.	Along the fresh cutting slopes vulnerable to landslide after destruction	During Construction	Contractor	Rs. 5,000,000 (Refer Table 8.3-4 S.No. 6)
<b>P8</b>	<b>Physical Impacts due to incorrect disposal of excess excavated earth material</b>						
P8- i	Road formation clearance, slope cutting Direct disposal of spoil into surrounding river and at its banks	Direct disposal and deposition of excavated materials at the valley side of the road affecting river and vegetation cover and its loss	Avoiding direct disposal and stockpiling of excavated materials at the valley side of road	valley side of the proposed road alignment	During Construction	Contractor	
P8- ii	Excavation of the hills and road alignment for track opening. Direct dispose of excavated materials to natural drainages.	Disruption / blockages to natural drainage. (Small drainages and large drainage systems).	Avoiding impact upon natural drainage from disposal	86 natural drainage identified along the alignment	During Construction and operation	Contractor/Proponent	
P8-iii	Road formation clearance	Direct disposal and deposition of excavated materials on valley side affecting land, agriculture land, other lands, and possible triggering of erosion/slides of deposited	Direct disposal of excavated materials and soil affecting top soil of agricultural lands and private lands will be avoided.	Along the entire road alignment	During Construction	Contractor	

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
		soil					
P8-iv	Road formation clearance and track opening	Dangers of future washout during heavy rains, damage to road width	Fresh cutting outer slopes throughout the alignment will be maintained with the angle of cutting slopes.	Stretch along the alignment where vertical slope cutting and box cutting is required as per detail design	During Construction	Contractor	
<b>P9</b>	<b>Impacts on River flow regime and river environment</b>						
P9- i	Diversion of river during construction of bridge foundation	Due to temporary flow diversion during construction of bridges	Excavation of bridge foundation will be carried out only in dry season to avoid concentration of flow.	River crossing locations proposed for bridge	During Construction	Contractor	
P9- ii	Disposal of construction wastes to rivers and water bodies	Impacts due to operation of Crusher Plants, Concrete Batching Plants and storing of material if on river banks.	Such sites will be established and operated at the selected and identified sites only. Proper traffic signals and markings will be provided at the vicinity of such plants in order to avoid accidents and injuries.	Crusher Plants, Concrete Batching Plants and material storage sites	During Construction	Contractor	
P9- iii	Haphazard disposal of excavated materials during construction of highway at upstream areas such as at Rapti river corridor	Siltation and deposition at lower, downstream sections, on agriculture land on river banks	Contractor will select the stockpiling sites that are located away from cultivable lands and settlements, drinking water intakes, public places, school and health centers.	Along the alignment	During Construction	Contractor	
<b>P10</b>	<b>Impact upon existing Physical Structures and Infrastructures</b>						
P10-i	Road formation clearance	Likely damage to existing highway road surface, damage to culverts etc., causing difficulty in local movements.	Minimizing damage to existing highway road surface, damage to culverts etc., avoiding difficulty in local movements	Existing highways and tracks along the proposed Municipalities	Construction Phase	Contractor/Project Proponent	Included in Project Cost
P10-ii	Road formation clearance	Electric poles, pylons are likely to be affected at few locations	Relocation of Electric Poles and Pylons	Along the entire route	Pre-construction phase	Contractor/Project Proponent	Rs. 3,000,000 (Refer Table 8.3-3 S.No. 5)
P10-iii	Road formation clearance	Damage to existing	Relocation of existing water supply	Along the	Pre-	Contractor/Project	Rs. 1,000,000

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
		irrigation canals, water pipelines, local trails, well, spout, etc.	facilities, irrigation canal and water supply pipelines	entire route	construction phase	Proponent	(Refer Table 8.3-4 S.No. 11)
P10- iv	Excavation of road and new section	Impact upon houses and residences due to excavation works	Avoiding impact upon houses and residences due to excavation.	Along the entire route	Pre-construction and construction phase	Contractor/Project Proponent	Rs. 3,000,000 (Refer Table 8.3-3 S.No. 6)
<b>P11</b>	<b>Impact/Issues of OHS due Construction Activities</b>						
P11- i	Track opening, opening of tunnel portals, construction of structures and bridge	Occupational Health and Safety of labors during construction	Working safety measures will be executed by the contractor to workers providing ample numbers but not limited to helmets, boots, rubber gloves, and masks as required. Life of worker will be ensured by maintaining Life insurance of each worker of the project. First aid facilities for the workers will be provided at working sites as well as at labor camp sites.	Along the alignment and labor camp sites	During construction	Contractor/Project Proponent	Rs. 500,000 (Refer Table 8.3-4 S.No. 8)
P11- ii	Track opening and earth excavation works with Vibration, high decibel of noise, dust and air pollution might deteriorate human health of local people.	Health and Safety of the local people	Earth excavation and construction work will not be executed during night hours. Time schedule of such work will be fixed and will be informed to locals as well as dissemination related information through voice media and newspaper. Awareness will be provided to locals about health and safety regarding such activities.	Along the entire alignment	During excavation and construction works	Contractor/Project Proponent	
P11-iii	Road formation clearance and opening of tunnel portal	Safety issues due to handling of explosives, during transporting, storing and use	Handling of explosives, its transportation, storing and use will be other issues of safety during construction. Handling of combustible and explosive will be carried out as per prevalent acts and regulations.	Along the entire alignment	During construction	Contractor/Project Proponent	
P11-iv	Construction vehicles will run on existing roads disturbing other local transportation and	Road safety issues during construction works	Construction Traffic Management Plan will be developed in the detailed design stage that will comply by contractor to maintain flow of construction vehicles	Along the entire alignment	During construction	Contractor/Project Proponent	Rs. 100,000 (Refer Table 8.3-3 S.No. 12)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
	movement of the local		without hampering good flow of passenger vehicles.				
<b>P12</b>	<b>Impact/Issues due to operation of Asphalt concrete plant/hot mix plant</b>						
P12-i	Operation of Asphalt concrete plant/Hot mix plant	Air pollution	Asphalt plant metal crusher activities should be controlled. (E.g. asphalt hot-mix plants should be downwind of close sensitive receptors such as schools, religious places etc.) Sites should be selected for these plants at least 500m away from the sensitive receptors. Temperature of the Hot-mix plant should be controlled at appropriate level in order to control exhaust gasses to comply relevant emission standards				
<b>P13</b>	<b>Impact/Issues due to operation of Crusher plant and Batching plant</b>						
P13-i	Establishment, Operation and Closure of Crusher Plant	Local people, labor force prone to air noise and water pollution	Siting of crusher plants should be done as much as away from the forest and residential areas. Apply, seek and secure approval from engineer prior to establishing and operating plants Identify owner of plants site-local people, Municipality, DCC (former DDC) or others as appropriate. Strike an agreement with the local stakeholders-local people, Municipality, DCC (former DDC) or others as appropriate. Fit and operate Stone crushing equipment with dust control devices				Rs. 10,000,000 (Refer Table 8.3-4 S.No. 5)
<b>Operation Phase</b>							
<b>P14</b>	<b>Obstruction to local movement between adjacent lands and settlement of highway alignment</b>						
P14-i	Operation of alignment without direct accessibility to people between adjacent	Inaccessibility between adjacent settlement and market areas	Significant settlement and market area will not be disturbed with the proposed alignment. Designing of final alignment	Entire the alignment	Operation phase	Contractor/Project Proponent	Rs. 3,500,000 (Refer Table 8.3-4 S.No. 13)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
	lands		will avoid in isolating any dense settlement in two halves requiring massive displacement and resettlement as well as inaccessibility				
<b>P15</b>	<b>Impact due to land fragmentation</b>						
P15-i	Implementation project	Possible fragmentation of agricultural land with the implementation of project and difficulty caused by it to access the land	Optimum design of alignment has been proposed in destructing existing land use pattern as far as possible. The final alignment has been proposed and maintained to construct in-between two types of land use pattern	Along the alignment of cultivated land	During construction and operation	Contractor/Project Proponent	
<b>P16</b>	<b>Impact on air, water and noise during project operation</b>						
P16-i	Operation of the project	Impact due to noise pollution; as large number of vehicles will run through this section of Arniko Highway.	Proper management of the road to avoid unnecessary noise pollution > 80dBA. Restrict to use pressure horns by vehicles users Conduct awareness to vehicles users regarding noise pollution and its impacts Traffic signals will be installed properly where exist sensitive receivers such as forest areas, hospital and school areas to avoid excessive blow of horns.	Along the alignment	After the completion of construction and before the operation	Contractor/Project Proponent	
P16-ii	Plying of vehicles	Impact upon air and water due to plying of vehicles	Prohibition of the old vehicles that do not meet the emission criteria will decrease the amount of emission in the tunnel and road section. Control and minimize the quality and the amount of exhaust gas on the Road with roadside tree plantation Avoiding air and water pollution through regular monitoring.	Along the alignment	Operation phase	Contractor/Project Proponent	
<b>P17</b>	<b>Impact of noise Pollution from the traffic on the Road to nearby local residents</b>						
P17-i	Movement of new road and traffic	Increase in Noise pollution of the road	Proper management of the road to avoid unnecessary noise pollution > 80dBA. Restrict to use pressure horns by vehicles users				Included in Project Cost

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
			Conduct awareness to vehicles users regarding noise pollution and its impacts Proper management of the road to avoid unnecessary noise pollution.				
<b>P 18</b>	<b>Issues related to High Speed Highway</b>						
P18-i	Operation of smooth road and plying of large number of vehicles	Issue of road safety and safe driving	Addressing road safety and safe driving condition in the road	Along the alignment	Operation phase	Contractor/Project Proponent	Rs. 100,000 (Refer Table 8-3 No. 12)
P18-ii	Installation of traffic signals and indicators including separate traffic lane	Issues related to traffic management	Managing local traffic	Along the entire alignment	Operation phase	Contractor/Project Proponent	Rs. 300,000 (Refer Table 8-3 No. 8)
P18-iii	Likely fire hazards due to vehicle accident and evacuation due other contingency activities	Fire hazard and emergency evacuation	Avoiding Fire hazard and promoting emergency evacuation	Inside tunnels	Construction and Operation phase	Contractor/Project Proponent	
<b>Biological Environment (Construction Phase)</b>							
<b>B1</b>	<b>Permanent loss of Forest Areas</b>						
B1-i	Road formation clearance	Loss of mature trees and forest	compensatory re-plantation at the ratio of 1:25 will be done for loss of trees. Re-plantation will be carried out within the barren area of the affected Suryamode Perunge community forest and center median of the road.	Along the forest area of alignment	Pre-construction phase and construction phase	Contractor/Project Proponent/CFUGs	Rs. 6,178,000 (Refer Table 8.3-1 A)
B1-ii	Road formation clearance	Depletion of NTFP resources	Felling of other trees with NTFP value situated at the RoW will be avoided as far as applicable. The Contractor documents must include provisions to restrict work forces with regard to forest product and wildlife collection and trade.	Along the forest area of alignment	Pre-construction phase and construction phase	Contractor/Project Proponent/CFUGs	Rs. 200,000 (Refer Table 8.3-3 S.No. 13)
B1-iii	Road formation clearance	CFUG and LFUGs affected due to acquisition of their forest land	Addressing the impact upon CFUG and LFUGs due to acquisition of their forest land	Along the forest area of alignment	Pre-construction phase	Contractor/Project Proponent	
B1-iv	Road formation clearance	Impact upon shrub land and loss of vegetation	Plantation will be carried out at each and every possible site along the highway	Along the bush and shrub	Pre-construction	Contractor/Project Proponent	

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
			alignment including at reclaimed sites and spoil disposed sites after its closure. It is anticipated that shrubs and bushes will grow naturally within those plantation sites.	vegetation area of the alignment	phase and construction phase		
<b>B2</b>	<b>Possible impact on rare, endemic, endangered, protected and threatened species of flora and fauna</b>						
B2-i	Road formation clearance	Possible depletion of threatened species	Cutting and felling of protected and threatened species will be avoided as far as possible. However, number of protected floral species that are existed within the carriage width and required to cut will be marked properly and volume of those affected trees will be calculated during detail design phase.	Along the forest area of alignment	Pre-construction phase and construction phase	Contractor/Project Proponent	
<b>B3</b>	<b>Impact upon wildlife habitat, biodiversity of forest area due to construction work</b>						
B3-i	Road formation clearance	Fragmentation of wildlife movement / corridor, wildlife loss, breeding area and its loss	Animal crossings will also be used to assist the migration of animals. At important crossing points, animal underpass hydraulic structures will be proposed for protected or endangered species.	Along the forest area of alignment	Construction and operation phase	Contractor/Project Proponent	
B3 –ii	Road formation clearance	Disturbance to wildlife by construction works	Disturbance to wildlife habitat and its habitat by the construction works will be avoided as far as possible. Contractors will ensure to avoid disturbance to wildlife by his construction workers.	Along the forest area of alignment	Construction phase	Contractor/Project Proponent	
B3-iii	Road formation clearance	Impact on Habitat of wildlife and bio-diversity of protected species	The proposed widening and upgrading of the existing road alignment will further be fine-tuned at forest area to reduce habitat fragmentation during construction work.	Along the forest area of alignment	Construction phase	Contractor/Project Proponent	
B3-iv	Labor camp, equipment storage and workshops	Impact due to wildlife poaching, illegal tree felling and fire hazards	The project will closely coordinate with Forest Office and its outlets to control illegal poaching and trapping by the project stakeholders or other outside wildlife poachers, wildlife traders and timber smugglers.	Along the forest area of alignment	Construction phase	Contractor/Project Proponent	

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
<b>B4</b>	<b>Impact on Aquatic Lives and Its Habitat in river systems due to siltation, turbidity and chemical contamination</b>						
B4-i	Construction activities use of bitumen, siltation, landslide and boulders splashing on river surface Road formation clearance	Impact on resident fish species	Destructive fishing technique by the labor-force and technicians, such as use of dynamite, fish poisoning and application of gill and electro-fishing will be strictly prohibited during project implementation period. Contractor will supply meat and fish to the labor force from outside the project area.	Along the forest area of alignment	Construction phase	Contractor/Project Proponent	
<b>B5</b>	<b>Indirect impact of forest area degradation and possible loss of vegetation for timber and fuel wood by construction labors</b>						
B5-i	Contractor's camps operation activities	Pressure on forests for fuel wood in labor camps	Contractor will provide legal sources of energy in labor camps. Contractor will obtain fuel wood from adjacent community forests only if forest user groups willing to sell their extra fire woods.	Along the forest area of alignment, and labor camp vicinities	Construction phase	Contractor	Included in Project Cost
B5-ii	Accessibility of construction workers, smuggling and wood trafficking at the project forest areas	Impact on the forest resources due to increased accessibility	Contractors will be responsible to carry out plantation activities along the vicinity of forest area as corrective measures to mitigate haphazard felling of trees.	Along the forest area of alignment, and labor camp vicinities	Construction phase	Contractor	
B5-iii	Contacto's camps operation activities	Possibility of illegal hunting / trapping / fishing or trading of locally found fauna including endangered species	The project will closely coordinate with Forest Office and its outlets to control illegal poaching and trapping by the project stakeholders or other outside wildlife poachers, wildlife traders and timber smugglers.	Along the forest area of alignment, and camp sites	Construction phase	Contractor	Rs. 3,000,000 (Refer Table 8.3-4 S.No. 7)
<b>Biological Environment (Operation phase)</b>							
<b>B7</b>	<b>Impact upon Forest</b>						
B7-i	Operation of Highway	Impact upon wildlife and Habitat fragmentation	Awareness programs to leasehold and community forest user groups are required to avoid degradation upon existing forest resources.	Along the forest area of alignment, and camp sites	Construction phase and operation phase	Project Proponent/CFUGs	



Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
B7-ii	Implementation project	Fragmentation of Existing Forests	The project management will closely coordinate with Forest Office and forest user groups to control illegal felling of trees, illegal poaching and trappings by other outside wildlife poachers, wildlife traders and timber smugglers.	Along the forest area of alignment, and camp sites	Construction phase and operation phase	Project Proponent/CFUGs	
<b>B8</b>	<b>Gradual encroachment into forest areas, and loss of forest resource due to forest clearance.</b>						
B8-i	Increase in settlement areas along the existing highway road side	Encroachment into forest areas	Environmental Monitoring Unit of the Highway project will be established in order to monitor overall environmental condition and likely impacts due to operation of the project. However, forest user groups will also be responsible for monitoring to avoid such likely impacts.	Along the forest area of alignment	Operation phase	Project Proponent/CFUGs	
<b>Socio-Economic &amp; Cultural Environment (Construction Phase)</b>							
<b>S1</b>	<b>Impact due to Private/Public Property Acquisition for Construction</b>						
S1-i	Road formation clearance	Impact due to Land Acquisition; additional 13.33 ha. of cultivated land (both Khet land and Bari) will be acquired permanently.	Adequate provisions and compensation arrangements will be maintained in the Resettlement and Rehabilitation Action Plan. Further, clear picture and number of PAFs will be depicted in Local Area and Vulnerable Community Development Plan to satisfy and compensate all PAFs in a fair and timely manner before the commencement of construction works.	Along the entire alignment	Pre-construction and construction phase	Contractor/Project Proponent	Rs. 3, 464,621, 000 (Refer Table 8.3-2 S.No. 1)
S1-ii	Road formation clearance	Impact due to acquisition of residential houses	The project will compensate all loss of private land and property. Similarly, the resettlement principles will be adopted providing compensation and resettlement assistance to all affected persons based upon the GON norms and prevalent practices. Acquisition of private land, house and buildings will be executed regarding the prevalent Acts and Regulations.	Along the entire alignment	Pre-construction phase	Contractor/Project Proponent	Rs. 363,121,089(Refer Table 8.3-2 No. 3)

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
S1-iii	Road formation clearance Contractor's camp operation activities	Impact on small landholders due to acquisition of their land	At least one family member of PAF and SPAFs will be provided with income generating training and opportunity will be provided for at least one family member in the construction of project.	Along the entire alignment	Pre-construction and construction phase	Project Proponent/ Local Stakeholders	
S1-iv	Road construction activities	Fragmentation of agricultural land	Minimizing agricultural land from fragmentation	Along the entire alignment	Pre-construction and construction phase	Project Proponent/ Local Stakeholders	Included in Project Cost
S1 -v	Road formation clearance	Decrease in agriculture production due to loss of agricultural land	The project will encourage local people in the involvement of agricultural extension services to increase local crop production and adopt better hill farming techniques.	Along the entire alignment	Construction and operation phase	Project Proponent/ Local Stakeholders	
S1-vii	Road construction and acquisition of private land and property	Likely obstruction by marginal land holding and low income level population upon construction	Locally operating and experienced NGOs and local interested stakeholders will be engaged to assist marginal land holding and low income level population. The project will provide income generation trainings and livelihood trainings to marginal land holdings and low income level population.	Along the entire alignment	Pre-construction and construction phase	Project Proponent/ Local Stakeholders	Rs. 1,200,000 (Refer Table 8.3-3 S.No. 1)
<b>S2</b>	<b>Impact due to Outside Workers</b>						
S2-i	Contractor's camp operation activities	Possible impact on social, cultural and religious practices due to in-migration of people	Security systems will be established to avoid various sorts of conflicts between the local and immigrants during the time of construction.	Along the alignment and explosive material storage sites	Construction phase	Project Proponent/ Local Stakeholders	
S2-ii	Contractor's camp operation activities	Degradation of sanitation and hygiene condition	Contractor and labor workers will be responsible to maintain healthy sanitary and hygiene condition of labor camps and its vicinity.	Along the alignment	Construction phase	Contractor/Project Proponent	Included in Project Cost
S2-iii	Immigration of outside workers, establishment of labor camp, economic activity of labors with	Impacts due to influx of people are anticipated. Pressure upon existing natural resources such as	Contractor will be responsible to manage all the labor workers maintaining their daily schedule of labor camp and working hours of workers.	Along the alignment and labor camp sites	Construction phase	Contractor/Project Proponent	

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
	locals at market and settlement areas	water, existing food availability, existing educational facilities are likely to be affected with the increase in the number of outside workers and the utilization of such resources and increase in the number of student in the existing educational facilities.					
S2-iv	Road construction and acquisition of private land and property	Conflict between workers and local people is likely during the time of construction. Conflict is likely as there could be a struggle between local people and labor workers for same commodity and natural resources.	Security system will be established to avoid conflict between workers and local people. However, contractors will be responsible to control their own labors those are imported from outside the project area.	Along the alignment and labor camp sites	Construction phase	Contractor/Project Proponent	
<b>S3</b>	<b>Depriving locals form continuation of their economic and business activities during the construction of road</b>						
S3-i	Road construction activities	Impact due to deprive from their economic activities during road construction	Locals will be informed in advance to road excavation works. Sufficient time will be given to severely affected population to leave their affected physical structures including residence to resettle into appropriate places identified by the project. Haphazard felling of trees along proposed alignment and side tipping upon private cultivated lands will be prohibited.	Along the road alignment	Road excavation at pre-construction phase	Contractor/Project Proponent	
S3-ii	Road construction activities	Possible impact on people's cultural behavior and local economy due to alter in economic activities	Contractors will strictly instruct workers to stay away from and respect local cultural assets, to avoid any direct harm to those items or to hurt the traditional feelings of local people.	Along the alignment	Construction phase	Project Proponent/Local Stakeholders	Rs. 1,000,000 (Refer Table 8.3-4 S.No. 12)
<b>S4</b>	<b>Health and safety issues during Construction</b>						

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
S4- i	Track opening, opening of tunnel portals, construction of structures and bridge	Occupational Health and Safety of labors during construction	Working safety measures will be executed by the contractor to workers providing ample numbers but not limited to helmets, boots, rubber gloves, and masks as required. Life of worker will be ensured by maintaining Life insurance of each worker of the project. First aid facilities for the workers will be provided at working sites as well as at labor camp sites.	Along the alignment and labor camp sites	During construction	Contractor/Project Proponent	Rs. 5,000,000 (Refer Table 8.3-4 S.No. 8)
S4 – ii	Track opening and earth excavation works with Vibration, high decibel of noise, dust and air pollution might deteriorate human health of local people.	Health and Safety of the local people	Earth excavation and construction work will not be executed during night hours. Time schedule of such work will be fixed and will be informed to locals as well as dissemination related information through voice media and newspaper. Awareness will be provided to locals about health and safety regarding such activities.	Along the entire alignment	During excavation and construction works	Contractor/Project Proponent	Rs. 10,000,000 (Refer Table 8.3-4 S.No. 5 & 4)
S4- iii	Road formation clearance and opening of tunnel portal	Safety issues due to handling of explosives, during transporting, storing and use	Handling of explosives, its transportation, storing and use will be other issues of safety during construction. Handling of combustible and explosive will be carried out as per prevalent acts and regulations.	Along the entire alignment	During construction	Contractor/Project Proponent	Rs. 5,000,000 (Refer Table 8-4 No. 8)
S4- iv	Construction vehicles will run on existing roads disturbing other local transportation and movement of the local	Road safety issues during construction works	Construction Traffic Management Plan will be developed in the detailed design stage that will comply by contractor to maintain flow of construction vehicles without hampering good flow of passenger vehicles.	Along the entire alignment	During construction	Contractor/Project Proponent	Rs. 5,000,000 (Refer Table 8.3-3 S.No. 8)
<b>Socio-Economic &amp; Cultural Environment (Operation Phase)</b>							
<b>S5</b>	<b>Social and cultural impacts due to Road Operation</b>						
S5-i	No direct accessibility to people in road alignment	Possible impact on livelihood based on business of various agricultural products.	Minimizing impact on livelihood based on business of various agricultural products	Along the entire alignment	During construction	Project Proponent/Local Stakeholders	Included in Project Cost

Issue No.	Project Activities	Impacts	Mitigation Measures	Location	Time	Responsible Implementing Agency	Associated Costs & its provision
S5-ii	Increase in Vehicular movement entire the road length	Likely increase in road traffic accidents because of the speed and heavy flow of vehicles	To avoid the accident road traffic signals and road marking and other safety measures will be applied to reduce driving risks and providing enhancements to driving conditions near the intersections of road.	Along the entire alignment	During construction and operation	Project Proponent/Local Stakeholders	Rs. 100,000 (Refer Table 8.3-3 S. No. 12)
S5 –iii	Increasing number of labor workers for other opportunities and increase in outside migrants	Trafficking and prostitution, consumption and import of alcoholic products could increase because of heavy flow of migrants and other people in search of opportunities in the project Municipalities.	Avoiding trafficking and prostitution, minimizing consumption and import of alcoholic products.	Along the entire alignment	During construction and operation	Project Proponent/Local Stakeholders	
S5-vi	Prevention of direct accessibility into the highway	Inaccessible / separation due to fragmentation of public and private land	Locals inhabited adjacent to proposed highway will be provided with passing zones at 6 several locations as appropriate.	At proposed passing zone areas	During construction and operation	Project Proponent/Local Stakeholders	Included in Project Cost

## Chapter 10 MONITORING OF THE PROPOSAL AND ENVIRONMENTAL AUDITING

### 10.1 Monitoring Plan for Implementation of the Mitigation Measures

Monitoring of the implementation of environmental protection measures provides a basis for logical comparison of the predicted and actual impacts of a proposal. Environmental monitoring involves the systematic collection of data to determine the actual environmental effects of the Project, compliance of the Project with regulatory standards, and the degree of implementation and effectiveness of the environmental protection measures. Such monitoring also provides an opportunity to further identify any unpredicted impacts and implement necessary measures to avoid costly mistakes, if any.

In accordance with Rule 13 of the EPR 1997, the concerned agency- the Ministry of Physical Infrastructure and Transport in this case- is the legally responsible monitoring agency. This Rule also empowers MoPIT to issue additional environmental control measures and directives to the Project to adopt measures to reduce or control impacts if the actual impacts are higher than the ones specified in the conditions prescribed at the time of approving the proposal for implementation. Schedule 6 of the EPR, 1997 also provides a framework to include monitoring agency, time-schedule and monitoring indicators in the EIA report. With these considerations, the following sub-sections describe the types of monitoring, parameters, locations, schedules and responsibilities for monitoring.

Implementation bodies of monitoring depends on the phases and monitoring items. Each responsible body is elaborated in Table 10.2-3.

#### 10.1.1 Types of Monitoring

The National EIA Guidelines of 1993, the EIA Guidelines for Forestry Sector of 1995 and the EIA Guidelines for Road Sector propose three types of monitoring. They are baseline monitoring, compliance and impact monitoring.

##### 10.1.1.1 Baseline Monitoring

A baseline monitoring helps to generate baseline condition of the environmental resources. In general, it is carried out if there is a significant time lapse between the preparation of the EIA report and the construction stage or a change on environmental quality is noticeable.

##### 10.1.1.2 Compliance Monitoring

The compliance monitoring is essential in order to ensure that environmental protection measures, other requirement set-forth are complied with, and this monitoring is not concerned with determining actual effects of the Project activities on the environment. While impact-monitoring helps to evaluate the effectiveness of the recommended in the field. Furthermore, this type of monitoring helps to increase understanding of cause-effect relationships between the human activity and environmental changes.

In sum, environmental monitoring approaches to verify the accuracy of EIA prediction and determine the effectiveness of measures to mitigate adverse impacts of Project on the environment. Within this broad framework, this study recommends the compliance with the following requirements. The Project will comply with for the implementation of the proposed mitigation measures.

- Incorporation of environmental protection measures in the detail design, contract document and tender documents;
- Allocation of cost for environmental protection measures in tender bidding;
- Allocation of adequate budget for compensation of land, property, agro-products, tree cutting, transportation and stockpiling of forest products and temporary acquisition of private land.
- Regular supervision of spoil loading, transportation and dumping at designated sites;

- Regular supervision on materials handling at earthworks, and stockpiling of construction materials;
- Provisions for health and sanitation facilities at work camp, labor camps etc.;
- Procedures for safe storage and use of toxic materials;
- Extent of local labors employed and skill training launched;
- Regular water sprinkling to arrest construction related dust pollution and vehicle maintenance to minimize gaseous/smoke emission
- Inquiry on the usage of pressure horn on vehicles in settlements, health, and educational institutions;
- Usage of timber for frames by the Project, and firewood by construction workers;
- Occasional supervision on the possible impacts of labors on adjoining forests and wildlife;
- Drainage management;
- Provision for occupational and safety measures;
- Compensatory plantation of loss tress;
- Launching of skill training and public awareness activities; and other condition set-forth during the approval of the EIA report, if any.

Although, the environmental monitoring is not the responsibility of the Proponent, based on the provision of the existing environmental laws, the Project has planned to monitor the compliance of the technical specification as an in-built practice. In order to guide the compliance monitoring, an inter-ministerial monitoring team is proposed. This monitoring team will comprise of the representative each from MoFE, MoPIT and DoR, this team will make necessary site visit to oversee the compliance monitor.

#### **10.1.1.3 Impact Monitoring**

Impact monitoring is generally carried out to know the effectiveness of the environmental protection measures. Hence, an impact monitoring evaluation study is proposed to carry out at the end of the Project construction phase or within two years of Project implementation. Impact monitoring evaluation will focus each impact predicted and effectiveness of environmental protection measures. This will also emphasize the stability of slopes, spoil disposal sites, work camp and labor camp, use to toxic wastes on local environment, including the utilization of cash compensation, to the extent possible, condition of the local forest, and said plantation etc.

#### **10.1.2 Monitoring Parameters**

Based on the level of site-specific information or existing data series and impacts prediction, efforts are made to make the indicators measurable and diagnostic with loss natural variability and broad applicability. In this context, the following indicators will be monitored during the Project construction and operational stages of this tunnel road Project.

##### **10.1.2.1 Physical Parameters**

During the construction stage, total quantity of filling materials and their spoil bank reclamation activities, disturbance to natural slope and drainage patterns, provision for adequate drainage facility and water diversion through the embankment with its channeling will be monitored as and when necessary. In addition, the monitoring parameters such as the frequency of vehicle maintenance, number of safety equipment provided to the labor force, including mask, helmet, glove and ear plugs, erection of informatory, safety and no noise signs at settlements, education and health institutions, establishment of safety barriers and sound barriers at roads crossing and settlements area. All these parameters will be monitored at alignment area and around its RoW.

During the operational stage, noise and vibration level due to road operation increase in vehicle plying will be monitored, accumulation, blockage of natural drainage patterns due to the embankment will be monitored regularly.

### 10.1.2.2 Biological Parameters

During the construction period, about 950 m<sup>3</sup> of standing wood volume will be extracted as a part of site clearance and 647 trees will fall down. The Project will monitor the actual loss of the number of trees, forest area, and amount of timber extracted and utilization of forest products. The Project will also monitor the number of tea stalls and restaurant constructed along the vicinity of the alignment, which uses firewood as energy source, fuel-wood trade, use of firewood, or kerosene per month by the construction workers, use of LP gas or electricity or other alternative energy for cooking and heating proposes by the Project staffs. Similarly, the Project will monitor the number of construction workers and their dependents visiting the forests for firewood collection and general condition of the community forest.

During operational stage, the Project will monitor the condition of the compensatory plantation site and the survival rate of the planted species twice a year for five years in order to evaluate the effectiveness of the mitigation measures.

### 10.1.2.3 Socio-economic Parameters

This Project will provide employment opportunity to a number of construction workers. However, the Contractor may employ the outside labors to accomplish the assigned work in time, thereby exerting additional pressure on environmental resource. Hence, the Project will monitor the percentage of local construction labors according to the type of work, number of women employed, number of outside district labors and their dependents. The Project will also monitor the number of tea stalls that will be establish and use firewood along the construction site, health and sanitation facilities in the work camp and labor camp. Similarly, the number of children of construction workers enrolled in the local school and physical facilities, number of teachers will be monitored. Number of labor force collecting drinking water from the public tap, type of compensation provided to the affected people, and type and extent of damage to local infrastructures such as drinking water supply, pipes, irrigation schemes, electrical poles, and rehabilitation of such facilities will be monitored. Similarly, the Project will monitor the rate of compensation of acquired or damaged houses, land or other properties, and use of received compensation if possible, in-migration and out-migration along the corridor. The Project will also monitor the events of social disharmony and related disputes, cases of prostitution activities and influence of outside labors on religion and observance of festivals, if any, during the construction stage.

During the operation stages, the Project will monitor intermittently the air, water, noise pollution and vibration effect on the settlement area along the road corridor and change in socio-economic conditions of the local people.

### 10.1.3 Monitoring Locations, Schedules and Responsibilities

Timing for environmental monitoring depends on the nature of parameters. It can be done regularly or intermittently. The project will execute monitoring activities during the time of construction and operation of the project for environmental impacts. Baseline, Compliance and Impact Monitoring will be carried out for specific parameters for physical, biological and socio-economic and cultural environment maintaining appropriate indicators and appropriate methods of monitoring. Compliance monitoring will be done regularly whereas the impact monitoring will be done after the completion of the construction activities, in general, methods such as observation, inspection, interview, counting and/or measurement could be used for monitoring. The monitoring will be location specific or the whole project area, depending upon the nature and coverage of fore-mentioned parameters. Monitoring activities has been proposed to avoid and reduce impacts of the project into acceptable level in appropriate time at appropriate location with appropriate cost.

As per the EPR 1997, the Ministry of Physical Infrastructure and Transport is legally responsible for environmental monitoring works. The Project has planned to develop and in-built monitoring system, as a part of project administration, by establishing a separate Environmental Unit. The Proponent will seek technical assistance, if required, from the Geo-Environment and Social Unit of the Department of Road. In any case, the Project will carefully monitor activities of the contractors and the supervisory consultants. The DoR, MoPIT will evaluate the monitoring result, as and when necessary. The Project



intends to invite independent monitoring team to reposition its environmental image. The project considers that the environmental agencies will have a number of opportunities to visit and monitor the Project activities as a part of compliance monitoring. Hence, environmental monitoring is an additional commitment of the Proponent to best implement the mitigation measures and make the road system environmental-friendly.

## 10.2 Adverse Impacts Monitoring Plan

### 10.2.1 Monitoring Parameters

Among the environmental and socio-economic items studied in the EIA survey, items listed in the following Table 10.2-1 and 10.2-2 are selected for monitoring targets during the planning/construction phase and the operation phase.

Table 10.2-1 Environmental Monitoring Parameters in Planning/Construction Phase

1	Air	NO <sub>2</sub> , SO <sub>2</sub> and PM <sub>10</sub>
2	Water	BOD and TSS
3	Noise	Noise
4	Waste	Soil Waste, Solid Waste and Liquid Waste
5	Water regime	Surface water (Volume, speed, depth)
		Ground water (depth)
		Springs
6	Geology	Slope stability
7	Land use, Local resource use, Communal/ Common resource use rights	
8	Water Use Rights /Water use	
9	Sanitation, Public Health Condition, Infectious diseases such as HIV/AIDS	
10	Occupational Health and Safety, Healthy Working environment	
11	Accidents, crime Traffic accidents	

'Involuntary Resettlement and/or Loss of Properties' will be monitored as the RAP monitoring.

Table 10.2-2 Environmental Monitoring Parameters in Operation Phase

12	Water regime	Surface water (Volume, speed, depth)
		Ground water (depth)
		Springs
13	Geology	Slope stability
14	Water Rights /Water use	

### 10.2.2 Monitoring Form

DOR, as the Project owner, will conduct periodical monitoring at each Project phase, using the following monitoring formats. General monitoring period for some items after operational phase will be considered, for example 5 years. However, if it is observed exceeding impacts much more than expected degrees and is not able to be covered by planned mitigation measures, the monitoring periods will be extended with appropriate additional measures.

#### 10.2.2.1 Planning and Construction Phase

##### (1) Air (Ambient air quality) Monitoring Format

Item (Unit)	Measurement (24 hr.)	Nepal Environmental Standard (24 hr.)	Pre-Project Measurement (24 hr.)	Survey Method
NO <sub>2</sub> (micro gram/m <sup>3</sup> )		150 (WHO) Maximum 80		<b>Location :</b> 1 (Khwopa Engineering College, Bhaktapur), 2 (Jagati, Bhaktapur), 3 (Chadani Chowk, Banepa), 4 (Tunnel Western and Eastern Portal) <b>Interval:</b> 1 measurement in every month
SO <sub>2</sub> (micro gram/m <sup>3</sup> )		150 (WHO) Maximum 70		

PM <sub>10</sub> (micro gram/m <sup>3</sup> )		70 (WHO) Maximum 120	(work day), or upon urgent request/complaint from local residents. <b>Survey method:</b> Continuous measurement for 1 hour to obtain the average concentration of the hour. Then take average of the 24 measurements.
Other (Complaints, Observations)	Date : Location : Problem : Solution measures taken : Follow-up condition observation :		

### Water (Public surface water quality) Monitoring Format

Item (Unit)	Measurement	Nepal Environmental Standard	Pre-Project Measurement	Survey Method
pH				<b>Location :1</b> (Bikateshwor Mahadev Khola, downstream ), <b>2</b> (Punyamata Khola, downstream of the HW), <b>3</b> (Tunnel Western and Eastern Portal) <b>Interval:</b> 1 measurement in every month (work day), or upon urgent request/complaint from local residents.
TSS (mg/l)		30-200 mg/L		
BOD (mg/l)		100 mg/L		
Coliform		MPN/100ml		<b>Survey method:</b> 1 to 3 sampling per measurement. Take average as the survey result.
Other (Complaints, Observations)	Date : Location : Problem : Solution measures taken : Follow-up condition observation :			

For Waste Water monitoring, see Liquid Waste.

### (2) Noise (Ambient noise) Monitoring Format

Item (Unit)	Measurement (dB)	International Environmental Standard (dB)	Pre-Project Measurement (dB)	Survey Method
Noise		WHO Uncomfortable : 120 - Very high : 90 - Medium : 70 - Peace : 50 -	On the existing HWY (expected level):  At the Eastern Portal (peace condition):	<b>Location :1</b> (Khwopa Engineering College, Bhaktapur), <b>2</b> (Jagati, Bhaktapur), <b>3</b> (Chadani Chowk, Banepa), <b>4</b> (Tunnel Western and Eastern Portal) <b>Interval:</b> 1 measurement in every month (work day), or upon urgent request/complaint from local residents. <b>Survey method:</b> 10 minutes continuous measurement in one hour for at least 4 times in day time for all 4 Locations, and another 4 times in night time for Tunnel Locations.
Other (Complaints, Observations)	Date : Location : Problem : Solution measures taken : Follow-up condition observation :			

**(3) Waste Management Monitoring Format**

Items	Sub-items/Location	Monitoring ( once in every month )
1) Soil	Excavation area Disposal to construct the base for the Road	Planned volume : Excavated volume (m3, %): Remaining volume (m3, %): Disposal and/or storage condition : Problems/Concerns : Solution measures taken : Follow-up condition observation :
	Temporal Storage Area Reuse for road embankment Disposal or reuse for public/private purposes	Planned volume : Excavated volume (m3, %): Remaining volume (m3, %): Disposal and/or storage condition : Problems/Concerns : Solution measures taken : Follow-up condition observation :
2) Solid Waste	Construction work areas Labor/contractor camps Road/Bridge	Main types of the waste generated : Total volume for disposal : Date of disposal : Contractor name for disposal : Location of disposal : Cost of disposal : Reused/Recycled waste types :
	Stock yards (West) (East)	Main types of the waste generated : Total volume for disposal : Date of disposal : Contractor name for disposal : Location of disposal : Cost of disposal : Reused/Recycled waste types :
	Water Treatment Plant (Discharge from the Camps)	Main types of the waste generated : Sludge Total volume for disposal : Date of disposal : Contractor name for disposal : Location of disposal : Cost of disposal : Reused/Recycled waste types :
3) Liquid Waste	Water Treatment Plant (Discharge from the labor and contractor camps) Mechanical workshop and fuel storage area	<b>Location :1</b> (West Plant discharge point), <b>2</b> (East Plant discharge point) <b>Interval:</b> 1 measurement in every month (work day), or upon any irregularity or request/complaint from local residents. <b>Survey method:</b> 1 to 3 sampling per measurement. Take average as the survey result.

**(4) Water regime, water use Monitoring Format**

Items	Monitoring (1 measurement in every month, or upon any irregularity or request/complaint from local residents.)
1) Surface water sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water users : Solution measures taken : Follow-up condition observation :
2) Groundwater sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water user : Solution measures taken :

Items	Monitoring (1 measurement in every month, or upon any irregularity or request/complaint from local residents.)
	Follow-up condition observation :
3) Spring water sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water user : Solution measures taken : Follow-up condition observation :

**(5) Slope Stability Monitoring Format**

Items	Monitoring (Every day in morning and evening)
Slope stability	Location : Any abnormality from planned condition : YES / NO If YES, describe : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation :

**(6) Land use, Local resource use Common resource use rights Monitoring Format**

Items	Monitoring ( as occurrence of issues)
Community forest	Date : Communication originated by : Responded by : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation : Communication with Ranger Post / DFO :

**(7) Work Related Issues Monitoring Format**

Items	Monitoring ( as occurrence of issues)
Negative impacts on sanitation and public health condition involving the workers hired by the Project Infectious diseases such as HIV/AIDS involving the workers hired by the Project	Date : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation : Report / Communication with respective public offices :
Industrial safety and health, Working environment among the workers hired by the Project	Date : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation : Report / Communication with respective public offices :
Traffic accidents involving the vehicles hired by the Project	Date : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation :

Items	Monitoring ( as occurrence of issues)
	Report / Communication with respective public offices :
Child Labor Issues	Date : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation : Report / Communication with respective public offices :
Crime involving the workers hired by the Project	Date : Issue : Field observation conducted by (Date) : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation : Report / Communication with respective public offices :

### 10.2.2.2 Operation Phase

#### (1) Water regime, water use Monitoring Format

Items	Monitoring (1 measurement in every month, or upon any irregularity.)
1) Surface water sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water users : Solution measures taken : Follow-up condition observation :
2) Groundwater sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water users : Solution measures taken : Follow-up condition observation :
3) Spring water sources	Location : Any change compared to Pre-Project condition : YES / NO If YES, describe : PHOTO : Related water users : Solution measures taken : Follow-up condition observation :

#### (2) Slope Stability Monitoring Format

Items	Monitoring ( once in every month )
Slope stability	Location : Any abnormality from planned condition : YES / NO If YES, describe : PHOTO : Potential cause : Solution measures taken : Follow-up condition observation :

The Environmental Monitoring Plan for each parameter including indicators for monitoring, together with location, time and frequency of monitoring by responsible agency is summarize in the Table below.

Table 10.2-3 Monitoring Plan and Schedule

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
<b>A. Baseline Monitoring</b>						
<b>Physical Environment</b>						
1	Muck / Spoil Site Management Plan prepared and Materialized	Muck / Spoil Site Management Plan prepared by Contractor	Review of EIA Document, Enquiry with proponent and EIA Team	Proponent office	Weekly/During pre-construction Stage	Project/ EMU/ Consultant
2	Construction Camp Management Plan prepared and Materialized	Construction Camp Management Plan prepared by Contractor	Review of EIA Document, Enquiry with proponent and EIA preparing consultant	Proponent office, EIA preparing consultant office	Weekly/During pre-construction	Project/ EMU/Consultant
3	Site selection of workers and contractor camps	Open space and barren land along the alignment	Verify sites with the identified location presented in EIA	Project sites	Once/Pre-Construction and Preparation Phase	DOR/Project/EMU/ Consultant
	Site selection for asphalt mix plant and Stock yard	Open space and barren land along the alignment	Verify sites with the identified location presented in EIA	Project sites	Monthly/Pre-Construction and Preparation Phase	DOR/Project/EMU/ Consultant
4	Occupational Health and Safety Management Plan prepared and Materialized	Occupational Health and Safety Management Plan prepared by Contractor	Review of EIA Document, Enquiry with proponent, consultant and EIA Team	Proponent office	Daily/During pre-construction	Project/ EMU/Consultant
5	Landslides and vulnerable areas	Identified and mentioned in design and project report	Review of documents and field verification	Proponent office	Weekly/During pre-construction	Project/ EMU/Consultant / Proponent
6	Existing infrastructures	Number and type of affected infrastructures identified	Review of document and field verification	Project area, Proponent & consultant office	Weekly/During pre-construction	Project/ EMU/Consultant / Proponent
7	Identified spoil disposal sites	Sites identified during Design stage	Review of document and field verification	Project area, Proponent & consultant office	Dry and wet Season/During pre-construction	Project/ EMU/Consultant / Proponent
8	Identified labor camp sites.	Sites identified during feasibility	Review of document and field verification	Project area, Proponent & consultant office	Once/During pre-construction	Project/ EMU/Consultant / Proponent
9	Land use	Type of land acquired for the project	Observation	Along the road alignment	Dry and wet Season/Prior to construction and during construction	Project/ EMU/Consultant / Proponent
10	Water shed	Erosion slope stability in the catchment and streams	Observation Measuring water depth/volume	Along the road alignment	Dry and wet Season/Prior to construction and during construction	Project/ EMU/Consultant / Proponent

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
11	Air and water quality parameters	Aforementioned parameters	Measurement	Along the road alignment	Dry and wet Season/Prior to construction and during construction	Project/ EMU/Consultant / Proponent
<b>Biological Environment</b>						
1	Forest Clearing and its Management Plan prepared and Materialized	Forest Clearing and its Management Plan prepared by Contractor	Review of forest act and rules, Enquiry with proponent	Proponent office	Weekly /During pre-construction	Project/ EMU/Consultant / Proponent
2	Compensatory Re-plantation Plan prepared and Materialized	Compensatory Plantation Plan prepared by Contractor	Review of Document, Enquiry with proponent and Consultant	Proponent office, EIA preparing consultant office	Weekly/During pre-construction	Project/ EMU/Consultant / Proponent
3	Existing ecosystem condition	Ecosystem (Fauna and Flora)along the alignment	Review and field Observation and measurement	Along the alignment	Monthly/During pre-construction	Project/ EMU/Consultant / Proponent
4	Number of trees felling	Affected trees identified and marked	Review and field Observation and measurement	Along the alignment	Bi-Weekly/During pre-construction	Project/ EMU/Consultant / Proponent
5	Forest areas and CFUGs	Number of user groups and current utilization practice	Field review & measurement, discussion with CFUGs	Along the alignment	Bi-Weekly/During pre-construction	Project/ EMU/Consultant / Proponent
<b>Socio-Economic and cultural Environment</b>						
1	Procedures of land acquisition and compensation	Land acquisition procedures; Field & HH survey, Inventory of affected infrastructures	Review of Document, RAP Report, Interaction with Locals and proponent	Proponent office, consultant office	Weekly/Before construction/ Project preparation phase	Project/EMU/ Proponent / Consultant / DOR
2	Social management plans as per TOR prepared and placed	Plan prepared by contractor	Review of RAP Document, Enquiry with proponent locals	Proponent office, consultant office	Weekly/During pre-construction	Project/EMU/ Proponent / Consultant / DOR
3	Potential loss of land, properties and business	Land use pattern as per EIA & RAP, affected households	Review of RAP and field verification	Along the alignment	Weekly/During pre-construction	Project/EMU/ Proponent / Consultant / DOR
4	Likely Resettlement	PAFs and SPAFs identified in RAP and EIA	Review of EIA and RAP	Along the alignment	Weekly/ During pre-construction	Project/EMU/ Proponent / Consultant / DOR
5	Number of affected households	Houses existed along the alignment	Review of RAP and field verification	Along the alignment	Weekly/During pre-construction	Project/EMU/ Proponent / Consultant / DOR
6	Number of PAFs and SPAFs	Number of houses and land owner along the alignment	Review of RAP and field verification	Along the alignment	Once/During pre-construction	Project/EMU/ Proponent / Consultant / DOR

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
7	Relocation and resettlement area	Resettlement area identified	Review of detail design and resettlement plan	Proponent office, consultant office	Bi-Weekly/During pre-construction, during detail design phase	Project/EMU/ Proponent / Consultant / DOR
8	Relocation and rehabilitation of affected infrastructures	Status and benefit from the affected infrastructures, such as well, spout, and other water sources	Site observation and discussion with locals, if relocated Measuring water depth/volume	Along the highway alignment	Weekly/During Pre-construction and immediately during construction	Project/EMU/ Proponent / Consultant / DOR
<b>B. Compliance Monitoring</b>						
<b>Physical Environment</b>						
1	Restriction on haphazard disposal of spoil along hill slopes, vegetated areas, water bodies and sensitive areas	Haphazard disposal of spoil	Field visit along alignment corridor	Along highway corridor	Weekly / during site clearance and project construction	Project/EMU/ Proponent / Consultant/Contractor
2	Enforce the use and Regular monitoring of spoil loading, transportation and dumping at recommended disposal site	Status of disposal land, vegetation cover, drainage system, initiated erosion, affected aesthetic value	Observation, Interview, Photographs, Vegetative restoration plan	Designated Sites of spoil disposal	Weekly / during site clearance and project construction	Project/EMU/ Proponent / Consultant /Contractor
3	Regular monitoring on materials handling at earthworks	Stockpiling of excavated and construction materials	Observation, Interview, Photographs	Designated Sites of spoil disposal	Weekly / during site clearance, construction	Project/EMU/ Proponent / Consultant /Contractor
4	Procedures for safe storage and use of explosives and toxic materials	Adoption of explosive & Toxic management/handling plan by contractor, safe transport, storage and use	Site observation and discussion with local residents, workers. Public alert; Contingency planning.	Project alignment	Monthly/ during construction	Project/EMU/ Proponent / Consultant /Contractor
5	Regular water spraying to arrest dust and vehicle maintenance to minimize gaseous emission	Water sprinkling during construction and availability of water sprinkling vehicles	Site observation and discussion with locals	Project construction sites especially near settlement areas	Twice a day during construction and excavation period	Project/EMU/ Proponent / Consultant /Contractor
6	Timely construction of other slope protection measures, such as, retaining walls	Bio-engineering, adoption of slope protection measures	Site observation and discussion with locals	Location where mass cutting is required as per design estimate	Twice a week during construction and excavation period	Project/EMU/ Proponent / Consultant /Contractor
7	Rehabilitation and restoration of work camps and labor camp(s) etc.	Slope stability & drainage, close pits latrines, sanitation and vegetation	Site inspection, discussion with workers and local people.	Proposed camp site locations and along the	Daily/After the completion of construction work	Project/EMU/ Proponent / Consultant /Contractor



S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
		condition	Vegetative restoration plan	highway alignment		
8	Proper reclamation of disposal sites with vegetation and drainage	Status of such sites, erosion, landslide, drainage, disposal into water bodies, vegetation cover, impact adjacent lands	Site observation, discussion with local people, observe spoil disposal practice of contractor. Vegetative restoration plan	Along the highway alignment	Weekly / During site clearance, Construction and excavation	Project/EMU/ Proponent / Consultant /Contractor
9	Integration of local people's environmental concerns	Opinions and suggestion during public consultation and feasibility stage	Review design reports, discussion with local stakeholders.	Proponent office/ EIA preparing consultant	Bi- Weekly/During the study and design process and prior to approval.	Project/EMU/ Proponent / Consultant /Contractor
10	Inquiry on the usage of pressure horn in sensitive area	Blow of pressure horns in immediate sensitive area	site observation, discussion with locals and interview	Settlements, health and educational institutions	Weekly / During operation	Project/EMU/ Proponent / Consultant /Contractor
11	Road safety and accident	Number accidents along highway	Observation of accident records, interview with locals	Project area	Monthly / construction and operation stage	Project/EMU/ Proponent / Consultant /Contractor
<b>Biological Environment</b>						
1	Compensatory plantation in the ratio of 1:25 and its protection	Implementation of plantation program by CFUGs and other responsible body	Site observation, discussion with locals	Sites selected for re-plantation	Monthly/ during construction and operation phase	Project/EMU/ Proponent / Consultant / Contractor/ Forest Officer
2	Care for vegetation in the RoW and immediate vicinity	Vegetation remaining along the RoW during earthwork and excavation	Site observation, Vegetative restoration plan	Along RoW of this road section	Monthly/ during construction and operation phase	Project/EMU/ Proponent / Consultant /Contractor
3	Plantation of vegetation in the cut slope.	Plantation of vegetation	Site observation, Vegetative restoration plan	High cut slopes and box cutting areas	Monthly/ construction and operation phase	Project/EMU/ Consultant /Contractor/ Forest Officer
4	Ecosystem	Status of Ecosystem (Fauna and Flora)	Site observation	Agricultural and Aquatic environment	At least twice a year in the dry and wet season/ construction and operation phase	Project/EMU/ Consultant /Contractor/ Bi0-engineer
5	Bio-engineering application on unstable slope.	Bio-engineering works	Site observation	High cut slopes and road side area	Monthly/ construction and operation phase	Project/EMU/ Consultant /Contractor/ Bi0-engineer

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
<b>Socio-Economic and Cultural Environment</b>						
1	Compensation of land, property and agro-products	Allocation of budget in contract and documents, distribution of compensation	Review of design and project specification, observation and interview with Affected	Proponent and consultant office/ project area/ field	Weekly/Preparation and pre-construction phase and following the completion of detailed design	Project/EMU/ Proponent / Consultant /Contractor
2	Temporary acquisition of private land	Allocation of budget and distribution of compensation	Review of design and project specification, observation and interview with Affected	Proponent and consultant office/ project area/ field		
3	Compensation paid to SPAFs for house, land and their status	Distribution of compensation	Site observation, interaction with affected locals SPAFs	Resettlement area, project vicinity		
4	Extent of local laborers employed and skill training	Employment of local labors during construction	Site observation, discussion and interview with labors	Along the Highway	Weekly / During construction	Project/EMU/ Proponent / Consultant /Contractor
5	Health and sanitation facilities at workers camp and site etc.	Health condition with record of health check Sanitary condition of Labor camps	Site observation, discussion and interview with labors	At camp sites and work camp sites	Weekly / During construction	Project/EMU/ Proponent / Consultant /Contractor
6	Ensure Life Insurance of the labors	Insurance paper of the labors	Review of contractor's document and insurance paper	Project sites, contractor's office	Monthly/Before commencement of construction work	Project/EMU/ Proponent / Consultant /Contractor
7	Wage paid to laborers not less than wage fixed by concerned district to both male and female.	Monthly wage paid to laborers	Review of contractor's documents, interview with laborers	At construction site, labor camps	Monthly / During Construction	Project/EMU/ Proponent / Consultant /Contractor
8	Provision for occupational health and safety measures	Use of safety measures by laborers	Observation, interview with laborers	At construction site, labor camps	Monthly / During Construction	Project/EMU/ Proponent / Consultant /Contractor
9	Occurrence of communicable diseases	Health of construction laborers	Observation, interview with laborers	At construction site, labor camps	Monthly / During Construction	Project/EMU/ Proponent / Consultant /Contractor
10	Compensation for land acquisition	Grievances of land acquisition and compensation	Interview affected people, observe deed transformation	Along the project alignment	Before commencement of construction work	Project/EMU/ Proponent / Consultant /Contractor
11	Resettlement of SPAFs	Resettled with proper compensation and Shelter	Site observation, discussion and interaction with locals	Resettlement areas and along the project sites	Before commencement of construction work	Project/EMU/ Proponent / Consultant /Contractor
12	Living standard and Economic status of the PAFs and locals	Use of household facilities, employment, education and monthly earnings of PAFs	site observation, discussion with locals and interview with PAFs	Resettlement areas and along the project sites	Monthly / During construction and operation stage	Project/EMU/ Proponent / Consultant /Contractor

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
13	Launching of skill training, and public awareness activities	Minutes of trainings, list of participants of trainings	Review of training documents, interview with locals people	Project area		
14	Avoid damage and disturbance historical, cultural sites	Resettlement of affected cultural sites	site observation, discussion with locals	Project area		
<b>C. Impact Monitoring</b>						
<b>Physical Environment</b>						
1	Workers and contractor camps	Sanitation and drainage condition	Observation & interview with locals & camp workers	Camp sites along the alignment	Monthly / construction and operation stage	Project/EMU/ Proponent / Consultant / DOR
2	Asphalt mix plant, Road excavation, Spoil disposal site.	Disposal process, emissions, air, water, land & noise pollution	Observation and air, water, land and noise level measurement	Along the road alignment, Batch mixing & Spoil disposal sites	Monthly, Construction / Bi-monthly, Operation	Project/EMU/ Proponent / Consultant / DOR
3	Construction of road side drainage and location of dispose	Impact upon private land due to dispose of side drain	Observation and interview with locals	Along the alignment	Monthly / during operation	Project/EMU/ Proponent / Consultant / DOR
4	Flow condition of Existing Drainage and watershed	Blockage of natural drainage and erosion of adjacent land	Observation and interview with locals	Along the alignment	Monthly / during operation	Project/EMU/ Proponent / Consultant / DOR
5	Care and safe storage of top soil for later use.	Storage of excavated materials and top soil	Observation and interview with locals	Along the alignment	Monthly/Construction & excavation	Project/EMU/ Proponent / Consultant / DOR
6	Disposal of excavated materials and other construction wastes	Use of identified tipping sites with protection walls	Observation	Along the alignment	Weekly/ construction and excavation	Project/EMU/ Proponent / Consultant / DOR
7	Side tipping of excavated soils and wastes	Impact upon adjacent private lands and infrastructures	Observation	Along the alignment	Weekly / construction and excavation	Project/EMU/ Proponent / Consultant / DOR
8	Landslides, erosion, and unstable slopes	Vulnerable landslide and erosion area, new cut slopes	Observation	Along the alignment	Weekly / construction and excavation	Project/EMU/ Proponent / Consultant / DOR
9	Safeguarding of Community Infrastructures	Status of affected community infrastructures	Observation	Along the alignment	Weekly/construction and excavation	Project/EMU/ Proponent / Consultant / DOR
10	Vibration on Structures	Cracks of structures, health impact during excavation	observation, discussion with locals and interview	Along the alignment	Weekly/construction and excavation	Project/EMU/ Proponent / Consultant / DOR
11	Proper sitting of Camp sanitation facilities	Sanitation along the camp sites	Observation	Along the camp sites	Weekly/construction and excavation	Project/EMU/ Proponent / Consultant / DOR
12	Quality of surface water, and water level changes	River quality and water level	Observation, water quality and water level measurement	Along major river crossings & settlement areas	Monthly/ Construction and operation	Project/EMU/ Proponent / Consultant / DOR

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
				and service sites including, Basuki pond, the locations of baseline data, etc.		
13	Air pollution near settlements.	Air quality	Air quality Measurement	Along the major settlement	Monthly, Construction /Bi-monthly, Operation	Project/EMU/ Proponent / Consultant / DOR
14	Air pollution, vehicular emission, noise, traffic volume	Measure Air quality parameter like NO <sub>x</sub> , Sox, TSP, PM <sub>10</sub> , traffic volume count	Measurement	Along the major settlement	Monthly, Construction /Bi-monthly, Operation	Project/EMU/ Proponent / Consultant / DOR
15	Maintenance of road and road structures.	Status of road and its associated structures	Observation	Along the alignment	Bi-monthly / during operation	Project/EMU/ Proponent / Consultant / DOR
16	Surface flow interruption and its consequences along river.	Direct disposal of spoil into major river, side casting	Observation	Along the highway alignment	Weekly / construction and excavation	Project/EMU/ Proponent / Consultant / DOR
17	Emission gas	Increasing transportation	Relevant agencies will further strengthen the effort for promoting “environmentally sustainable transport” including promotion of use of mass transit such as bus and railroad for both passenger transport and cargo transport.	Along the highway alignment	Campaign once a year	Project/EMU/ Proponent / Consultant / DOR
<b>Biological Environment</b>						
1	Status of Forest adjacent to alignment	Diversity of forest and availability of faunal species	Observation and measurement	Along the highway alignment	Monthly / construction and operation phase	Project/EMU/ Proponent / Consultant / DOR
2	Encroachment/degradation of forest.	Density of forest and its status	Observation and measurement	Along the highway alignment	Monthly / construction and operation phase	Project/EMU/ Proponent / Consultant / DOR
3	Number of trees felled	Volume of wood trade, location of timber depot	Records and observation	Sites, road checkpoints, market &	Monthly / construction and operation phase	Project/EMU/ Proponent / Consultant / DOR

S.N.	Parameters	Indicators	Methods	Locations	Frequency / Time schedule	Responsible Monitoring Agency
				settlement		
<b>Socio-Economic and Cultural Environment</b>						
1	Impacts on agricultural land due to spoil disposal/soil erosion/ due to construction.	Direct disposal of spoil upon private cultivate lands, steep slopes, side tipping	Observation	Along the alignment	Monthly / During construction	Project/EMU/ Proponent / Consultant / DOR
2	Care for local utilities	Relocation of affected local infrastructures and its use	Observation and interview with locals	Project area	Monthly / During operation phase	Project/EMU/ Proponent / Consultant / DOR
3	Encroachment into common property.	Establishment of houses and physical structures and use	Observation and interview with locals	Project area	Monthly / During operation phase	Project/EMU/ Proponent / Consultant / DOR
4	Damage to private properties.	Disposal of spoil, destruction of physical structures during road width formation	Observation and interview with locals	Project area	Monthly / construction and operation phase	Project/EMU/ Proponent / Consultant / DOR
5	Protection of culturally sensitive spots.	Relocation and rehabilitation of cultural sensitive areas	Observation and interview	Project area, relocation sites	Monthly/ Construction and Operation Stage	Project/EMU/ Proponent / Consultant / DOR
6	Landscape aesthetics value	Value of land near to project alignment, number of tourist arrived, restaurant	Interview with locals and land transaction	Project area	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
7	Highway safety and accident	Number and type of accident and deceases	Observation, official records and interview	Entire road alignment	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
8	Impact due to operation of service and facility sites	Involvement of locals in types of livelihoods available at service sites.	Observation and interview	West Portal Area and developed market areas	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
9	Impact due to relocation of affected infrastructures	Status and benefit of relocated infrastructures	Observation and interview	At entire project alignment	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
10	Impact due to deprive of locals from using natural resources	Type and availability of natural resources, source of energy used by locals	Observation and interview	At entire project alignment	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
11	Livelihood and income generation of locals	Available opportunities & Economic activity of the local people	Observation and interview	At entire project alignment	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR
12	Impact upon Socio-economic its change	Change in local economy (changes in living)	Survey and Interview	Entire Project Area	Bi-monthly during operation	Project/EMU/ Proponent / Consultant / DOR

### 10.3 Budgets for Environmental Monitoring

Budgets for the Environmental Monitoring are presented in the Table below.

Table 10.3-1 Environmental Monitoring Cost Estimate

S.N.	Particulars	Input (mm)	Rate in NRs.	Total in NRs.	Remarks
<b>A.</b>	<b>Pre-construction Phase : Baseline Monitoring</b>				
	<b>Manpower Cost</b>				
a.	Environmentalist	1	150,000	<b>150,000</b>	
b.	Sociologist / Socio-economist	1	120,000	<b>120,000</b>	
c.	Biologist / Ecologist and Forest Expert	0.75	100,000	<b>75,000</b>	
d.	Support Staff (5 no. of Research Assistants)	1	30,000	<b>150,000</b>	
e.	Laboratory Analysis Cost	LS		<b>200,000</b>	
f.	Logistics	LS		<b>100,000</b>	
	<b>Total Baseline Monitoring Cost (A)</b>			<b>795,000</b>	<b>1.4%</b>
<b>B1.</b>	<b>Construction Phase : Impact Monitoring by EMU ( Total for 3 Years)</b>				
	Manpower Cost			<b>42,340,000</b>	From Table 9-3 Estimated EMU Cost
	Environment Monitoring Unit/Office/Lab Cost			<b>1,200,000</b>	
	Other Monitoring Cost for Concerned Ministries			<b>1,000,000</b>	
	<b>Total Impact Monitoring for 3 Years (B1)</b>			<b>44,540,000</b>	<b>80.7%</b>
<b>B2.</b>	<b>Field Measurement and Lab tests Costs ( 4 times a year)</b>				
a.	Air quality tests	36*3=108	10,000	1,080,000	
b.	Water quality tests	36*2=72	1,000	72,000	
c.	Noise Level tests	36*3=108	5,000	540,000	
d.	Ground Water Level Monitoring	36*2*45=3240	200	648,000	
2	Miscellaneous				
a.	Transportation	36	75,000	2,700,000	
b.	Report Preparation	L.S.		50,000	
	<b>Total Impact Monitoring Cost (B2)</b>			<b>5,190,000</b>	<b>9.4%</b>
<b>C.</b>	<b>Operation Phase : Compliance Monitoring</b>				
	<b>Impact Monitoring ( for 1 Years)</b>				
	<b>Manpower Cost</b>				
a.	Environmentalist	10	150,000	1,500,000	
b.	Sociologist / Socio-economist	10	120,000	1,200,000	
c.	Biologist / Ecologist	5	120,000	600,000	
d.	Support Staff (5 no. of Research Assistants)	6	30,000	900,000	
e.	Laboratory Analysis Cost	LS		300,000	
f.	Logistics	LS		200,000	
	<b>Total Compliance Monitoring Cost (C)</b>			<b>4,700,000</b>	<b>8.5%</b>
	<b>Total Monitoring Cost (A+B1+B2+C)</b>			<b>55,225,000</b>	<b>100%</b>

### 10.4 Environmental Auditing

The effectiveness of EIA will be successful only when that causes minimal damage to environment with the implementation of project. Environmental aspect of any sort of project will be triumphant only when a project interacts positively with environment with its proper management during the time of implementation. Hence, Environmental Auditing will be carried out to examine and assess performances

of the road project related to environment and its conservation and protection. Audit will be undertaken after the project has been operational for two years duration. Whereas, audit will be carried out by MoFE together with proponent team and project EMU team.

#### **10.4.1 Objective of Auditing**

The main objective of the auditing is to monitor and assess environmental parameters which are most significant with the implementation of this road. Whereas, the specific objectives of auditing are as follows;

- To assess actual environmental impacts
- To evaluate the accuracy of prediction of impacts,
- To assess the effectiveness of environmental impact mitigation and augmentation measures and,
- To evaluate the functioning of monitoring mechanisms

#### **10.4.2 Scope of Auditing**

The scope of auditing will not focus or confirmed only into the 50 meter RoW of the project alignment. Assessment will aim to focus upon the examination of actual environmental impacts that have changed from the baseline conditions in terms of physical, biological and socio-economic and cultural environment. Further the auditing will aim to assess the overall performance of the project upon environmental protection and management.

#### **10.4.3 Framework for Environmental Auditing**

Praxis and legal provision in Nepal require that an Environmental Auditing should be carried out two years after the Project comes into operation. In conjunction with the baseline information, impacts predicted and mitigation proposed records of both the development and operation phase as per requirement are the main documents to be used for the environmental auditing. The Ministry of Forests and Environment is the responsible agency to carry out and prepare a post environmental audit report after two years of the operation as per EPR 1997. The basic objective of Project performance audit reports include a final assessment of the degree to which the Project satisfied the proposed environmental requirements, the effectiveness of mitigation measures and institutional development and whether any unanticipated effects occurred because of Project activities.

The environmental auditing should gather the following information:

- Assessment of the pre-Project baseline information in conjunction with the Project current baseline information
- Assessment of predicted impacts in the EIA report for defined activity in the Project development in relation to the actual impacts;
- Assessment of provided mitigation measures in the EIA report to minimize the impacts of defined activity in the Project cycle and their effectiveness;
- Assessment of implementation status of the mitigation measure in the Project cycle as specified in the EIA report;
- Assessment of the effectiveness of the monitoring works for the implementation of mitigation measures and to evaluate the effectiveness of the mitigation measures;
- Assessment of any corrective action suggested or undertaken to mitigate the impacts of the defined activity and their effectiveness;
- Assessment of compliance and non-compliance with the mitigation and monitoring provisions
- Assessment of compliance and non-compliance with the national environmental standards in the Project development and operational cycle and

- Conclusion and recommendations from the experience learned to strengthen impact prediction in future Projects for the defined activities.

The National EIA Guidelines, 1993 purposes six types of environmental auditing: Decision Point Auditing, Implementation Auditing, Performance Auditing, Project Impact Auditing, Predictive Techniques Auditing and EIA procedure auditing to examine the effectiveness of EIA as decision-making tool, or techniques and overall environmental changes arise from the Project. The Project impact auditing is considered comprehensive and this type has been proposed for this Project.

#### **10.4.4 Auditing Parameter, Methods and Indicators**

The Ministry of Forests and Environment (MoFE) may consider the environmental protection measures and monitoring parameters as the basis for auditing. Hence, the auditing parameters may comprise of land use change; avenue trees along the alignment; protection works; restoration of infrastructure facilities; landscape and drainage treatment; disposal practices of spoils and rehabilitation of embankment; informatory signs; occupational health and safety measures; air, water, noise and vibration quality; tree felling method; utilization of forest products; area and status of compensatory plantation; condition of adjoining forest and wildlife habitat. Furthermore, MoFE audit compensation scheme, public consultation and awareness activities, skill training, counseling service, additional social service facilities, and community involvement during the Project construction stage.

#### **10.4.5 Auditing Location**

The audit locations will be the entire Project area. For the audit purpose, the locations would be as indicated in Tables for the monitoring indicators.

#### **10.4.6 Auditing Schedule**

The Ministry of Forests and Environment, MoFE is legally mandated for the preparation of a post environmental audit report after two years of the completion of construction as per EPR 1997. Besides the above legal auditing obligation of MoFE, additional auditing of the proposal should be done once a year.

#### **10.4.7 Auditing Methods**

MoFE, as a responsible agency for auditing, may hire a team of experts to prepare the auditing report. The study team may employ methods such as literature review, observation and filed study, questionnaire and checklist, measurement of air and water quality parameters, noise and vibration level. However, the method used during the preparation of this study has been recommended to follow, to the extent possible, in order to minimize method-based errors.

#### **10.4.8 Audit Plan**

The front line monitoring as discussed before) will be the responsibility of the proponent. The proposal audit during development and operation will be the responsibility of the Ministry of Physical Infrastructure and Transport, MoPIT and MoFE, whereas post development audit of the proposal will be conducted by MoFE as per the provisions of EPR. The audit planning of the proposal will involve following steps:

- Formation of audit team comprising members from Ministry MoPIT and MoFE with a Team Leader from the MoFE.
- The audit team collects the secondary information with regard to the Project, including EIA reports and regular front line monitoring reports.
- Audit team review the literatures and national environmental requirements for the proposal
- The audit team inform the proponent on the audit of the proposal and any information it requires from the proponent for audit
- The audit team visits the proposal site, records of environmental monitoring (front line monitoring) and observe directly the proposal activities and their impacts
- The audit team interact with the local people, proposal managers, members of proposal Integrated Environmental Management System



- Audit team returns from field visit and prepares audit report and presents the report to the concerned agencies, MoFE and the proponent.

Table 10.4-1 Matrix of Environmental Auditing

S.N.	Parameters	Location	Methods	Indicators
<b>A. Physical Aspect</b>				
1	Land use	Entire project area	Observation, Topographical and Google map study	Change in land use and land use pattern
2	Disposal of Construction Spoils	Designated Sites for spoil disposal	Observation, Interview, Photographs	Status of disposal sites, vegetation cover, drainage system, initiated erosion, affected aesthetic value, forest, and agricultural land
3	Side tipping of excavated soils and wastes	Along the road alignment	Observation and Interview	Initiated Land Erosion, impact upon local drainage
4	Landslides and unstable slopes	Steep slope area along the alignment Natural drainage sites River crossing areas River banks Road side leadoff drain disposal area Spoil Disposal area	Observation and measurement	Landslides and erosion areas along the alignment if any, rock fall areas, unstable slopes identified if any, impact upon adjacent agricultural areas due to land slide and disposal of leadoff drain if any.
5	Natural flow of Existing Drainage and watershed condition	Drainage crossings at the entire project area, along the alignment and surrounding to road RoW	Observation, measurement and photographs	Obstruction in natural flow of drainages
6	Water quality, Air quality, Noise	Along the road alignment and especially at Sites studied during EIA	Inspection, analysis of water samples, measurement of air quality and noise	Water quality parameters studied during EIA, air quality and noise level studied during construction monitoring
7	Vibration on Structures	Construction sites, especially at the vicinity of highway sites, rocky areas and locations where huge cuttings was necessary and proposed in design estimate of the project	Review of design and other project related documents available at the office of consultant and proponent, Interview, observation and photographs	Any case of hearing impairment, crack existed in houses, loss of life and property and compensation
8	Relocation and rehabilitation of affected infrastructures	Along the highway alignment and its adjoining areas	Interview, observation, and photographs	Existing status of relocated infrastructures such as electric poles, irrigation canals, water taps, water collection tanks and pipelines; Its use by local.
<b>B. Biological Aspect</b>				
1	Status of Forest adjacent to alignment	At entire project alignment where forest existed	Measurement and Observation	Volume of fuel wood trade, location of timber depot, fuel wood sale, in project area
2	Number of trees felled	At entire project alignment	Observation and interview	Number of stumps of cut trees in nearby area forest

S.N.	Parameters	Location	Methods	Indicators
3	Compensatory Re-plantation	Areas provided by FUGs of affected community forest and areas where re-plantation carried out	Interview, Measurement, Observation and Photographs	State of plant available in the plantation area,
4	Energy supplied	Project sites and Municipalities	Interview, observation, photographs	Volume and type of fuel used in the project area
<b>C. Socio-Economic and Cultural Aspect</b>				
1	Compensation paid to SPAFs for house and land and their status	Entire project area	Observation and interview	Legal deeds and land ownership certificate, living standard of displaced people, educational status and availability of service facility with each family
2	Resettlement of SPAFs and its success	Outside and adjacent to the highway alignment	Observation and interview, income analyses, grievance records	Land ownership certificate provided to SPAFs, Status and living condition
3	Living standard and Economic status of the SPAFs and other locals	Resettled areas	Observation and interview	Types of facilities and technologies that has been utilizing by the SPAFs. Livelihood status and education
4	Highway safety and accident	At entire project alignment	Observation, official records and interview	Number and type of accident and deceases
5	Impact due to operation of service and facility sites	Interchange areas and developed market areas	Observation and interview	Involvement of locals in types of livelihoods available at service sites, living standard etc.
6	Relocation of affected infrastructures	At entire project alignment	Observation and interview	Status and benefit of relocated infrastructures to locals
7	Relocation of affected cultural and religious sites	Affected cremation sites and other mall sites of worship as mentioned in EIA report	Observation and interview	Status and use of relocated such sites, culture and religion of adjoining sites
8	Deprive locals from using natural resources	At entire project alignment	Observation and interview	Type and availability of natural resources, source and types of energy used by locals
9	Livelihood and income generation of locals	At entire project alignment	Observation and interview	Economic activity of the local people and opportunities available to local people
10	Socio-economic Change	Entire Project Area	Survey and Interview	Change in local economy (changes in standard of living)
11	Local movement through sub-way passing and its affect	At sub-way passing zones; settlements situated close proximity to alignment	Observation and interview	Frequency of use of passing zones by locals and its existing condition
12	Area	Project and adjoining	Records from	Involvement of local people into

S.N.	Parameters	Location	Methods	Indicators
	development works carried out by project proponent	Municipalities	project office and development site inspection	such projects, number of locals benefited from such activity
13	Trade commerce and industry	Along the project area, interchange area, service area, along the local roads that linked to this road section and BP highway via interchanged	Observation, Interview and Photographs	Number of shops, industries, rental houses, involvement of locals in business and commerce, number of freight transportation ply per day, amount of revenue generated per day, increase and decrease in the price of commodity transported through this highway from china and eastern part and Terai at capital city

### 10.5 Estimated Environmental Auditing Cost

The Project will allocate Environmental Auditing cost for the Proponent. The Auditing costs for one time, 2 years after completion of the construction works and again 1 time 1 year after. The breakdown of the estimated cost is summarized in the table below.

Table 10.5-1 Cost Estimation for Environmental Auditing

Specifications	Input	Rate	Amount	Remarks
	(mm)	(per month)	NRs.	
Environmental Management Expert	6	85,000	510,000	Along the main and link alignment lines
Forestry Expert	3	75,000	225,000	
Sociologist	6	70,000	420,000	
Reporting, Logistics, etc.	LS		300,000	
Transport	LS		150,000	
Field Sampling and Lab Tests	LS		150,000	
<b>Sub-Total Costs for Environmental Auditing Works</b>			<b>1,755,000</b>	
<b>Auditing Costs for:</b>				
Ministry of Physical Infrastructure and Transport	LS		300,000	
Ministry of Forests and Environment	LS		300,000	
<b>Sub-Total Costs for Monitoring Agencies</b>			<b>600,000</b>	
<b>Total Estimate</b>			<b>2,355,000</b>	

Source: JICA Survey Team, 2015

### 10.6 Reporting Requirements

The ESMF 7.6.2 requires quarterly reports of Internal Monitoring. Also, External Monitoring agency hired by the Project Implementing Units will conduct bi-annual review of EMP and RAP implementation. Both reports will be sent to the finding agency.

## **Chapter 11 REVIEW OF POLICY, LEGISLATION, GUIDELINES AND INSTITUTIONS**

This EIA has been prepared in accordance with GON requirements for the environmental assessment and management planning of the Highway Project. Within the limit of the scope of works, the Proponent has reviewed the following policies, laws and guidelines and appropriate information has been incorporated in this report. Any other laws attracted besides that mentioned below will also be followed by the Proponent, during Project implementation.

Review of (i) Constitution, (ii) Plans and Policies, (iii) Acts, (iv) Rules and Regulations, (v) Guidelines and (vi) International Conventions, are reviewed in this Section.

### **11.1 Constitution of Nepal, 2015 (2072)**

The Constitution of Nepal, 2072, assures the right to every citizen to live in a clean environment and requires the state to keep the environment clean and to provide priority to the protection of the environment and prevention of further damage to the environment due to development activities and to take special measures for protection of wildlife, vegetation and forests.

Furthermore, the Constitution has safeguarded the property rights of the citizens by entitling them to earn, use, sell and exercise their rights of property under existing rules and regulations. Except for public welfare the state will not acquire or obtain or exercise authority over individual property, but in case the state acquires or establishes its right over individual property for public good, the loss of property will be suitably compensated. The basis of compensation and the procedures for delivering compensation for any property acquired by the State will therefore be as prescribed by the law.

### **11.2 Environment Related Acts**

#### **11.2.1 Environment Protection Act and Environmental Protection Regulation, 1997**

The legal regime on the environment makes every effort to integrate environmental aspects in the Projects and programs. The Environment Protection Act (EPA), 1997 and the Environment Protection Rules (EPR), 1997 (amendment 1999), enforced since June 1997, oblige the proponent to get approval of the IEE report of this level of Project before implementation. The environmental laws contain elaborated provisions on the approval process of the IEE report. Sections 3 to 6 of the EPA, 1997 and Rules 3 to 11 of the EPR, 1997 contain such provisions and this IEE report has been prepared following those legal requirements. Rule 12 of the EPR, obliged the proponent to comply with the matters mentioned in the report and other conditions, if any, prescribed by the approving agency or concerned agency.

The environmental management plan is the heart of the environmental study report. The proponent is obliged to implement the mitigation measures. The environmental monitoring works should be performed by the concerned agency the MOPIT of this Road and auditing by the Ministry of Forests and Environment (MoFE) in accordance with the provisions of the EPR, 1997. Furthermore, the environmental law has made the public consultation a pre-requisite to all the prescribed Projects to provide different stakeholders an opportunity to raise their concerns. Section 18 of the EPA, 1997 empowers the prescribed authority case any person implements a proposal requiring environmental assessment without any approval or carries any act in contrary to the approved proposal. The proponent has duly followed these legal requirements while finalizing this report and will continue to follow them, particularly the implementation of EMP during the Project construction stage and operational phase.

### **11.2.2 Local Self-Governance Act, 2056 (1999)**

The Local Self-Governance Act, 1999 empowers the local bodies for the Conservation of soil, forest and other natural resources and implements environmental conservation activities. Sections 28 and 43 of the Act provide the Village Development Committee a legal mandate to formulate and implement programs related to protection of environment and bio-diversity. Similarly, Sections 189 and 201 of the Act provide that the Districts Development Committees are liable to formulate and implement programs related to protection of environment and give adequate priority for protection of environment during formulation and implementation of districts level plan(s). As this is the national level priority road Project, the respective Municipality and DCC (former DDC) can regulate soil and water conservation activities that support to stabilize the road slopes and minimize likely adverse impacts on the road and by the road.

### **11.2.3 Public Road Act, 2031 (1974)**

The Public Road Act, 1974 has been enacted to ensure the construction and operation of the road Projects smoothly. Section 3 of the Act empowers GON to prohibit the construction of permanent structures (buildings) in the prescribed distance from the road, i.e. the Department of Roads (DoR) has the authority over everything within the boundaries of the road. The DoR may acquire temporarily the land and other property adopting compensatory measures during the construction, rehabilitation and maintenance of the public road (Sections 14 and 15). The Act obliges the DoR to plant trees on both sides of the road and handover it to the local bodies (Municipality) for their management (Section 16). The Act also empowers the DoR to operate quarries and borrow pits and other facilities during the road construction (Section 17). In sum, the Act facilitates the construction of this road by even acquiring land and property including for the execution of construction materials and development of other facilities during road construction through compensation as negotiated and as well as to maintain greenery along the roadside.

### **11.2.4 Ancient Monument Protection Act, 1956**

This act has the objective of protection and conservation of the ancient monuments, temples, arts, paintings, etc. of age older than 100 years. The Act empowers the government to declare any such artifacts, temples, etc. under protection category by giving public notification. The act stipulates that any such artifacts, temples etc. declared under protection lists should not be disturbed or removed from their places without the consent of the government.

### **11.2.5 Land Acquisition Act, 2034 (1977)**

The Land Acquisition Act, 2034 empowers the Government to acquire land for development purposes, by paying compensation for the landowner. The Land Acquisition Guidelines, 1989 have been issued to facilitate the acquisition process under the Act.

The Act clearly empowers the Government to acquire necessary land and fixed property of any owner for development use and welfare, diplomatic mission, international organizations after issuing public notice and completing required procedures. Under this Act, the Government can also acquire land for public and private corporations, organizations, private firms for public use and welfare. However, the Government will not acquire land for corporations, organizations and private firms for agriculture purpose except for research purpose under this Act. The Government will provide compensation to the concerned person and organization as decided by the Compensation Fixation Committee. The compensation rate to be determined may differ for person whose land was wholly acquired or for those whose land was partially acquired. There are different provisions regarding the compensation rate:

- Compensation rate to landowner whose land has been acquired for government-owned institutions, organizations and local bodies;
- Compensation rate to landowner whose land has been acquired for other institutions and organizations; and

- Compensation rate to land owner whose land exceeds land ceiling according to Land Reform Act, 2021 acquired for government-owned institutions, organizations and local bodies.

Land acquisition through negotiation is an important aspect included in Section 27 of this Act which has a provision that the Government can acquire land through direct negotiation with the owner. This will minimize dissatisfaction of landowners regarding compensation and loss. Section 34 of the Act has a provision to return acquired land to the owner if it is not required. Similarly, the Government may also cancel its decision regarding land acquisition.

However, as there is no amendment on this Land Act over the last 35 years, it has many gaps while dealing with problem of involuntary settlement, particularly in the context of international practices and approaches.

#### **11.2.6 Immovable Property Acquisition Act, 2013 (1956)**

The Act enables the GoN to requisition of immovable property for maintaining law and order as well as the convenience and economic interest of general public. The Government can acquire private immovable property by giving a notification in writing to the property owner or any person having possession over the said property. The Act enables the Government to issue an order to the owner of property or any other person in order to impose restriction on sale and size modification of such property and on providing in rent to tenant without the approval of the Government. The Government can make reasonable modification of the building or land requisitioned in its own cost in order to use in easiest manner. In case any property is requisitioned pursuant to this Act the Government will provide compensation and the valuation of such compensation will be calculated as per the principle prescribed in Section 8 of the Act.

#### **11.2.7 Forest Act, 2049 (1993) and its Rules 2053 (1995)**

Forest Act, 1993 and the Forest rules, 1995 is attracted if the road passes through patches of forests and/or privately owned trees. Section 68 of the Forest Act, 1993 empowers GON, in case of no alternatives, to provide parts of any types of forests for the implementation significantly. The competent forestry organization will give consent to fell down trees along the road alignment by enforcing Section 68 of the Act to facilitate road construction. Furthermore, the forestry laws oblige the proponent to conserve the legally protected species (plants and wild animals). If the road pass through the protected areas (National Park, Wildlife Reserve, Conservation Area, Hunting Reserve or strict nature reserve or declared watershed area), the National Parks and Wildlife Conservation Act, 1973 and the Soil and Watershed Conservation Act, 1982 and their rules will also be attracted.

#### **11.2.8 Soil and Watershed Conservation Act, 1982**

In order to properly manage the watersheds of Nepal, the Soil and Watershed Conservation Act 1982 was enacted. Section 3 of the Act empowers GoN to declare any area as a protected watershed area. Section 4 of the Act provides that a watershed conservation officer has the authority to implement the following works in protected watershed areas.

Construct and maintain dam, embankment, terrace improvements, diversion channels and retaining walls. Protect vegetation in landslide-prone areas and undertake afforestation programs, and Regulate agricultural practices pertinent to soil and watershed conservation.

Under Section 10 of the Act, power is extended to the Watershed Conservation Officer to grant permission to construct dams, drainage ditches, canals, cut privately owned trees, excavate sand, boulders and soil, discharge solid waste, and establish industry or residential areas within any protected watershed. The Act outlines the essential parameters necessary for proper watershed management (including rivers and lakes). The Act is applicable to protected watersheds.

### **11.2.9 Labor Act, 2048 (1992)**

According to the Labor Act 1992, section 4 on Employment of workers and employees, and sub-section 3 on workers or employees engaged in any contract work of a permanent nature in any enterprise will also be made permanent under subsection (2).

Workers or employees engaged in any work as mentioned in subsection (3) will be paid benefits provided for in this Act according to their post and scale. Notwithstanding anything contained under subsections (2) and (3), in the event that any establishment is required to increase production or service for a short period of time, it may appoint workers or employees according to need for a certain period by specifying such a period.

Under section 5, no child will be employed. Except in prescribed circumstances, minors and women may ordinarily be employed for the period from 6 a.m. to 6 p.m. Women may be employed like men after making appropriate arrangements on the basis of mutual agreements between the general manager and the employees or workers in question. All labors should be provided safety equipment such as helmets, gloves etc. during works. The Labor Act will be followed in all the works carried out under the Project.

### **11.2.10 Children's Act, 2048 and Child Labor (Prohibition and Regularization) Act, 2056 (2000)**

Child Labor Prohibition and Regularization Act, 2000 was enacted in favor of the welfare of the Children's right. The section 3 of these acts facilitates the children to inborn rights. Hence the Act prohibits the organizations to involve the children less than 16 years of age to employ in the works. The Child Labor Prohibition Act and Regularization will be followed in all the works carried out under the Project.

Child related Act, 2048 (1993) and Child Labor (abolition and regulation) Act, 2056 (2001) are the major acts related to child labor in Nepal. The Child Labor (Abolition and Regulation) Act, 2056 (2001), Article 3, Clause 1 prohibited for labor employment any child below the age of 14 years. Clause 2 prohibit child below 16 years to work in risk-prone sectors such as public transportation and construction related works.

### **11.2.11 Explosive Material Act, 2018 (1961)**

The Explosive Material Act, 2018 has made a legal provision on how to use explosive material during the construction stage of the Project. The provisions on the category of explosives and the handling procedures and the necessary approvals required are stipulated in the Act. Article 4 of the Act requires license for procurement, storage, use and transportation of explosives, including for any development Projects.

If construction activities require the use of explosive, in accordance with the Explosive Material Act, 1961, prior approval of the Chief District Officer (CDO) is needed to purchase explosives. Article 4 of the Act is relevant.

### **11.2.12 Motor Vehicle and Transport Management Act, 2049 (1993)**

The Act defines and prescribes necessary standards for vehicles emission and mechanical condition for vehicle registration by the Transport Management Office (TMO) and the TMO can deny a permit based on environmental factor. Standards are set for petrol and diesel engine under the Nepal Vehicle Mass Emission Standard 1999.

### **11.2.13 Solid Waste Management Act, 2068 (2011)**

It is expedient to make the management of the solid waste in a systematic and effective way by reducing at its source, re-use, processing or discharge and for maintaining a clean and healthy environment through the reduction of adverse effects that may be caused to the public health and

environment by amending and consolidating the law relating to the management of solid waste like most essential services laws.

### 11.3 Review of Environment Related Rules

#### 11.3.1 Environmental Protection Rules (EPR), 2054 (1997) (First amendment 1999)

The EPR obliges the proponent to inform the public on the contents of the proposal in order to ensure the participation of stakeholders. EPR contains the elaborative provisions on the process to be followed during the preparation and approval of Projects requiring IEE and EIA including scoping document, terms of reference, information dissemination, public consultation and hearing and environmental monitoring and auditing. Article 12 of the EPR, requires the proponent to comply with the matters mentioned in the report and other conditions, if any, prescribed by the approving agency or concerned agency, while Rule 13 and 14 are related to environmental monitoring and environmental auditing.

#### 11.3.2 Forest Rules, 2051 (1995)

The Forest Rules 2051 elaborates legal measures for the conservation of forests and wildlife. Based on forest legislation, thirteen plant species are included in the level protection list. Of them, GoN has banned the felling, transportation and export of Champ (*Michelia champacta*), Khayer (*Acacia catechu*) and Sal (*Shorea robusta*).

Rule 65 stipulates that in case the execution of any Project having national priority in any forest area causes any loss or harm to any local individual or community, the proponent of the Project itself will bear the amount of compensation to be paid. The Rule also stipulates that the entire expenses for cutting and transporting the forest products in a forest area to be used by the approved Project will be borne by the proponents of the Project.

#### 11.3.3 Solid Waste (Management and Resource Mobilization) Rule, 2047 (1990)

This rule authorizes SWMRMC to make all arrangements in regard to solid waste storage, collection, transfer, disposal and resource recovery activities. It authorizes to collect feed from beneficiaries of its services. Also, SWMRMC is allowed to sell resources from the solid waste collected. SWMRMC is authorized to impose and collect fines in cases of the breach of listed prohibitions. SWMRMC is authorized to collect service charges and other fines in the manner prescribed by law for recovery of other Government dues.

In addition, the Solid Waste Management National Policy, 1996 stipulates,

- A separate unit concerning sanitation works should be established in each municipality and Municipality responsible for collection, site management, transportation, and final disposal of solid waste.
- Need for improving capacity of local governments to manage solid waste.
- Promote privatization and involvement of NGOs and social organizations.
- Mobilize solid waste as a resource through recycling and processing.

Government create a new central institution and that local authorities are to manage the waste in coordination with this central agency responsible for: (i) select site for final disposal of the solid waste, conduct EIA and assist local bodies in the final disposal works of solid waste as per necessity (ii) develop concept of minimization of waste (iii) develop skilled manpower to carryout solid waste management works (iv) prepare appropriate criteria for the management of solid wastes on the basis of quantity of and waste quality (v) develop solid waste management technology suitable to local conditions and (vi) monitoring and evaluation of various solid waste management activities.



## **11.4 Review of Plans and Policies**

### **11.4.1 20 Years Road Master Plan**

Based on the National Transport Policy 2001, a long-term (20-year) road development Master Plan is in the process of finalization. It is proposed to construct 4,014 km of road in the coming twenty years (by the end of Thirteenth Plan) and will require an investment of at least Rs.32.4 billion tentatively. Some of the roads are also identified as potential Projects for the private sector financing and participation under Built – Operate – Transfer (BOT) concept. This plan will give a definite course of future actions and will assist in setting priorities for future development and the investment requirements.

### **11.4.2 Fourteenth Three Year Plan, 2016-2019**

The Fourteen Three Year Plan has adopted following major policies and policy actions for the sector of environment management:

The emphasis will be given to the construction of road reinforcement and flyover roads within Kathmandu Valley. Road safety checks will be made in all the steps, such as design, construction and promotion for acceleration of accident in highway and auxiliary highways. The tunnel will be adopted to make the roads safe and short. Due to the construction of road network, agriculture, energy, tourism and employment programs will be promoted as well. Necessary measures will be taken for reducing the negative impact of social and environment aspects in the construction and maintenance of roads and bridges. Road asset protection, maintenance charges, rebuilding and management will be made more effective. Suryabinayak - Dhulikhel road upgrade to four lanes.

### **11.4.3 Environmental Assessment in the Road Sector: A Policy Document, GEU/ DoR, 2000**

The purpose of this Policy Document is to explain, basically the DoR Engineers on what environmental assessment procedures are involved and to propose a straightforward set of procedures which make it workable and useful.

The document lists Screening, IEE, Scoping, EIA and Monitoring as the five main types of environmental assessment activities during different Project phases. The document lists the category of environmental adverse impacts, the problems and their general mitigation measures. The document then guides the various steps to be taken while carrying out an EA.

### **11.4.4 Forest Policy, 1993**

The forest policy is attracted when a development project directly or indirectly impacts on the forest resources. The forest policy is directed, inter alia, to contribute food production through effective interaction between forestry and farming system, to protect land against degradation by soil erosion, landslide, and other effects of ecological disturbances, and to conserve ecosystem and genetic resources. However, the forest policy re-emphasizes to avoid forest destruction or tree cutting while constructing infrastructures during implementation of project other than forest sector. The policy has prioritized the protection of Siwalik, the geologically vulnerable area, with a view to ensure watershed conservation, and maintenance of water recharge. The policy also stresses conservation of endangered species. It has reiterated that forest area will not be used for any activities other than prescribed in Operational Forest Management Plan. The forest policy emphasizes the implementation of community and private forestry development programs, national parks and conservation areas management programs, soil and watershed conservation program, management and development of medicinal plants, and conservation of biological diversity.

### **11.4.5 Land Acquisition, Resettlement and Rehabilitation Policy, 2015**

The Policy contributes to overall development of the nation and its citizens by creating conducive environment for implementation of infrastructure development projects.

The Policy supports timely execution (Completion) of development project, minimizing adverse impacts on economic, social and cultural aspects of affected families/people and the project area.

The Policy aims to improve social and economic status of project affects families by providing fair and adequate compensation, appropriate resettlement and rehabilitation assistance/allowances while acquiring land for infrastructure development projects and projects of public interests.

The Policy's objectives are:

1. To avoid displacement wherever possible and if not, explore alternative to minimize adverse impacts as far as possible.
2. To provide adequate compensation, rehabilitation assistance, and opportunities of social and economic benefit to the affected person, family, and the community
3. To create conducive environment for timely completion of project by making land acquisition, valuation, compensation, resettlement, and rehabilitation process simple, easy, transparent and fair.

## **11.5 Review of Environment Related Guidelines**

### **11.5.1 National EIA Guidelines, 1993**

The guideline states clear directions about the process of conducting EIA. This guideline makes EIA in Nepal legally mandatory and contains process for ensuring public involvement during the preparation of EIA report. It calls for information regarding identification of physical, biological, socio-economic and cultural impacts. Impacts ranking method also suggested in this guideline. It stresses the inclusion of mitigation measures to avoid, minimize and mitigate adverse impacts and maximize beneficial impacts resulting from the development Project and monitoring & environmental auditing in the EIA report. Its revision in 1997 calls for the ensuring local people's participation , collection of relevant information, identifying major issues of public concerns, evaluate them and establishing priorities for EIA study.

### **11.5.2 Environmental Management Guidelines, GESU / DoR, July, 1997**

The Guideline, prepared by the Geo-Environment & Social Unit (GESU) of DoR, stipulates the integration of environmental mitigation measures in surveying, design, tender document preparation, contract document preparation, construction, maintenance, rehabilitation and operation of road Projects. The guideline results from a program undertaken jointly by GoN and the World Bank under the Road Maintenance and Rehabilitation Project (RMDP). The Guideline has been formally approved by Minister level decision in 1997.

The Guideline is the part of operational practices for all road maintenance, rehabilitation and construction activities under DoR schemes. The environmental mitigation measures are broken down into twelve categories including (i) Quarries; (ii) Borrow Pits; (iii) Spoil and Construction Waste Disposal; (iv) Work Camp Location and Operation; (v) Labor 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.

The Guideline suggests methods for determining how and when the public should be included in the environmental analysis. Apart from providing a comprehensive list for mitigation measures to be incorporated into DoR Projects, it describes the procedures for public participation, and other socio-economic safeguard considerations. It gives advice on assessing socio-economic impacts and strategies for reducing or avoiding potential adverse impacts, and for maximizing the positive ones for the benefit of local residents. The Socio-economic impacts include important issues of land acquisition and

compensation and other economic impacts related with markets for agriculture production, agriculture inputs, nutrition, extraction of natural resources beyond replenishment, migration and influx of migrants, land speculation, illegal logging and mining, carrying goods by porters etc. It also includes the handling of impacts on cultural heritage.

### **11.5.3 Environmental and Social Management Framework, DOR, 2007**

This Environmental and Social Management Framework report (ESMF) intends to provide technical and managerial inputs and guidance into the design of the strategic roads (both designated for rehabilitation and, to lesser extent, to new construction), through identification of key environmental and social issues related to the foreseen Projects, mitigate potential impacts and concerns and, devise opportunities to enhance the benefits. The framework integrates in a step-wise approach the most important environmental and social considerations into all stages of Project preparation, implementation, monitoring and operation and is applicable to all future Projects.

The ESMF is applicable to all proposed subproject activities and through all stages of the subproject cycle, i.e. from pre-planning, planning and design, implementation to post-implementation. The design flow of ESMF activities will be coordinated and integrated into the Project cycle.

### **11.5.4 Land Acquisition Guidelines, 1989**

Two sets of guidelines related to land acquisition are significant for DoR Sector Wide use. They are the Land Acquisition Guidelines of 1989 and guidelines pursuant to section 16 and 17 of the Land Acquisition Act 2034. These guidelines specify two categories of affected families, Project Affected Families (PAF) and Seriously Project Affected Family (SPAF).

The Guidelines specify the establishment of an Acquisition and Rehabilitation Committee (also known as Compensation Fixation Committee, "CFC") consisting of the concerned Chief District Officer (Chair), Land Revenue Officer, representative of the DCC (former DDC) and the Project Manager and others as deemed necessary. The Committee is responsible for acquiring land and paying compensation. In 1993, a second set of guidelines reduced the Acquisition and Rehabilitation Committee to a four-member Compensation Fixation and Rehabilitation Management Committee by dropping the Land Revenue Officer and other governmental appointees. The functions and powers of the committee were clarified, as were methods of payment and means of ensuring fair valuation of land quality.

### **11.5.5 Environmental Management Guidelines for Roads and Bridges, GESU/DoR, 1999**

The Guidelines ensures that environmental considerations are integrated into the Project survey and design, tender document, contract document, and Project supervision and monitoring. The guideline is intended to minimize environmental impacts resulting from road and bridge construction, operation, maintenance and rehabilitation. The guideline intends to improve road performance and reliability, increase benefits to local residents and maximize cost effectiveness.

### **11.5.6 Public Road Management and Land Acquisition Directives, DoR, 2002**

The DOR has published a directive for Public Road Management and Land Acquisition in 2002 for the use in road management and land acquisition in DoR's Sector Wide use. This Directive specifies two categories of affected families, Project Affected Families (PAF) and Seriously Project Affected Family (SPAF). A PAF consists of the members of a household including elderly dependents and minor children (under 18 years) residing under one roof and operating as a single economic unit, who are adversely affected by the Project. SPAF is defined as a family who loses over 25% of its total land holdings or whose land is reduced to an uneconomic holding (less than 5 katha) or who is being displaced.

Under this Directive the concerned officials, with the assistance of the Project team, are to carry out assessments of Project affected families to identify their standard of living and types of assets. Valuation of land and asset lost were to be based on comparative market values of similar assets in the vicinity. The

Directive also included arrangements for rehabilitation of Project-affected families. For PAF's, the compensation package includes cash for assets acquired or damaged by the Project and a rehabilitation grant (assistance allowance) to cover any suffering and hardship. For SPAF's, the compensation additionally include employment for one family member and provision of skill training.

#### **11.5.7 Manual for Environmental and Social Aspects of Integrated Road Development, MoPIT/DoR, 2003**

This Manual is designed to help integrate social and environmental considerations, including public involvement strategies, with technical road construction practices. It suggests stepwise process of addressing Environmental and Social issues alongside the technical, financial and others. The Manual is a suggestive, and not exhaustive, and advise and recommends various environmental and social approaches, actions and strategies to assist developers in following mandatory requirements of the law and improving public involvement. The Manual is based on the experiences of Nepal, as well as incorporates the national (EPA, 1996; EPR, 1997/1999) and international 'best practices'. It suggests process of environmental and social assessment process, roles and responsibilities of stakeholders at various stages of the Project, advice on impact mitigation action plans, and process for involving the public.

#### **11.5.8 EIA Guidelines for the Forestry Sector, 1995**

EIA Guidelines for the Forestry Sector has given focus to make proposals which have forest components socio-culturally acceptable, economically feasible and environmentally sustainable, thereby to conserve genetic resources and biodiversity, and minimize environmental damage in forest areas and facilitate in identification of positive and adverse impacts of proposal implementation.

#### **11.5.9 Forest Produce Collection and Sales Distribution Guidelines, 2058 (2001)**

The guideline's clauses 3 to 10 have specified various procedure and formats for getting approval for vegetation clearance, delineation of lands for vegetation clearance, evaluation of wood volume etc. and government offices and officials responsible for the approval, delineation and evaluation. These provisions have a direct relevance to the development of the Project and need compliance to these provisions.

#### **11.5.10 Guidelines on Use of Forest Area for Other Purposes, 2063 (2006)**

The guideline has stipulated that forest areas will not be allowed to be used for other purposes for Project other than those listed as Projects of national importance. Only national Projects of non-profit natures will be allowed in the forest area, which does not have any other alternatives. If other alternatives are not present, then the proponent will develop equal areas as forest area and make arrange to conserve it for five years. All trees cleared need to be compensated by replantation at the ratio of 25 trees for each tree cut.

#### **11.5.11 Roadside Bio-Engineering, DoR, GoN, 2002**

This reference manual on bio-engineering works along roads, gives comprehensive information on the use of vegetation in engineering. In addition to covering the principles underlying techniques of slope stabilization, the manual also outlines those aspects of the ecology, geology, geography and law of Nepal that would be of relevance. The manual provides standard specifications for bio-engineering works, profiles of the main bio-engineering species and rate analysis norms of bio-engineering approved by the Government. The manual provides the information needed to design, plan, implement and maintain roadside bio-engineering works and is intended for use in the site.

### **11.6 Review of International Environmental Related Guidelines and Conventions**

#### **11.6.1 JICA Guidelines for Environmental and Social Considerations**

The objectives of the JICA guidelines are to encourage Project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for and

examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for Project proponents etc., in order to facilitate the achievement of these objectives. In doing so, JICA endeavors to ensure transparency, predictability, and accountability in its support for examination of environmental and social considerations.

In this guideline, JICA has created clear requirements regarding environmental and social considerations, which Project proponents etc. must meet. JICA provides Project proponents etc. with support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation Projects. JICA examines undertakings by Project proponents etc. in accordance with the requirements, and makes adequate decisions regarding environmental and social considerations on the basis of examination results.

JICA recognizes the following seven principles to be very important.

1. A wide range of impacts must be addressed.  
The types of impacts addressed by JICA cover a wide range of environmental and social issues.
2. Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage.  
JICA applies a Strategic Environmental Assessment (SEA) when conducting Master Plan Studies etc., and encourages Project proponents etc. to ensure environmental and social considerations from an early stage to a monitoring stage.
3. JICA is responsible for accountability when implementing cooperation Projects.  
JICA ensures accountability and transparency when implementing cooperation Projects.
4. JICA asks stakeholders for their participation.  
JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus accordingly. JICA replies to stakeholders' questions. Stakeholders who participate in meetings are responsible for what they say.
5. JICA discloses information.  
JICA itself discloses information on environmental and social considerations, namely approved EIA report and RAP report, in collaboration with Project proponents etc., in order to ensure accountability and to promote the participation of various stakeholders. Public disclosure of EIA report in English with Nepali summary will be done at MoFE, DoR, local government (Municipalities), libraries where the residents along the project sites are accessible (for 30 Days). Monitoring reports are also submitted to JICA and disclose at the same places as mentioned above for request from public, if any.
6. JICA enhances organizational capacity.  
JICA makes efforts to enhance the comprehensive capacity of organizations and operations in order for Project proponents etc., to have consideration for environmental and social factors, appropriately and effectively, at all times.
7. JICA makes serious attempts at promptness.  
JICA addresses request of acceleration for the prompt implementation of Projects while undertaking environmental and social considerations.

#### **11.6.2 ADB Safeguard Policy Statement, 2009**

All investments are subject to categorization using ADB's Project classification system to determine the environmental assessment requirements. Categorization is to be undertaken using

Rapid Environmental Assessment (REA), consisting of questions relating to: (i) the sensitivity and vulnerability of environmental resources in the Project area, and (ii) the potential for the Project to cause significant adverse environmental impacts. Projects are then classified into one of the following categories:

- **Category A.** Projects with potential for significant adverse environmental impacts. An Environmental Impact Assessment (EIA) is required to address significant impacts.
- **Category B.** Projects judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for category A Projects. An IEE is required to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- **Category C.** Projects unlikely to have adverse environmental impacts. No EIA or IEE is needed although environmental implications are still reviewed.

Significant features of the new SPS are the need to include impact assessments on: i) Biodiversity conservation and sustainable natural resource management; (ii) Pollution prevention and abatement, health and safety, (iii) Physical cultural resources and (iv) Grievance Redress Mechanism.

### 11.6.3 ADB Environmental Assessment Guidelines, 2003

These Guidelines describe how to fulfill the requirements outlined in ADB's Environment Policy and the Operations Manual on Environmental considerations in ADB's Operations. Information on ADB's policies and procedures for conducting and reporting on the environmental assessment is also provided for all types of Projects. Strategic tools such as country environmental analysis and strategic environmental assessment are also included.

### 11.6.4 World Bank Guidelines for Environmental Assessment (EA)

The objectives of EAs are to (i) ensure that the Projects proposed for Bank financing are environmentally and socially sound and sustainable; (ii) inform decision makers of the nature of environmental and social risks; and (iii) increase transparency and participation of decision makers in the decision-making process. To satisfy the Bank's Environmental Assessment requirements, there are various instruments suggested including EIA, Environmental Audit, and Environmental Management Plan etc. Any World Bank Project, which is likely to have potential adverse environmental risks and impacts in its area of influence, requires an Environmental Analysis, indicating the potential risks, mitigation measures and environmental management framework or plan. For ascertaining which extent and type of environmental assessment is required, the Bank undertakes environmental screening of each proposed Project. The Bank classifies the Project in to one of the four categories depending upon the type (Project or specific components have inherent environmental risks), location (proximity to environmentally, socially and culturally important areas), sensitivity (potential impacts may be irreversible or environment sensitive to changes, and scale (extent of environmental and social issues) of the Project and the nature and magnitude of its potential environmental impacts:

- **Category A:** if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. This is where EIA is level study is needed.
- **Category B:** if potential adverse impacts are less adverse than those of Category A Projects; these impacts are site specific; few in any of them are irreversible; and in most cases mitigation measures are readily designed. An IEE level study is needed here.
- **Category C:** If it is likely to cause minimal or no adverse environmental impacts. Here, no additional environmental assessment is needed beyond environmental screening.
- **Category F:** if it involves investment of Bank funds through a financial intermediary, in sub-Projects that may result in adverse environmental impact. It requires appropriate environmental review for each sub-Project.

### **11.6.5 ILO 169**

As per the ILO 169 the government should develop coordinated action to protect the right of indigenous peoples. The right on the lands and natural resources should ensure during development of any development project. The indigenous peoples should get the right to participate to manage, utilization and development works. After all this convention has given the right to endorse the mechanism to implement convention for the state.

## **11.7 Relevant Conventions**

### **11.7.1 Convention on Biological Diversity, (CBD) 1992**

Nepal signed the convention on biological diversity in 1992, ratified in 1993 and formally became state party to the CBD in 1994. The CBD linked PAs to larger issues of public concern like sustainable development, traditional knowledge, access to genetic resources, and equitable sharing of benefits. The main purpose of CBD is to integration of plan, policies, and programs in sectorial and cross-sectorial agencies to conserve biological component.

### **11.7.2 Convention on International Trade in Endangered Species (CITES), 1975**

Since 1975, Nepal has been working as a party to the CITES. This has facilitated international cooperation to stop or control international trade in endangered wild fauna and flora. The aim of CITES is to reduce or eliminate trade in species whose numbers or conditions suggest that further removal would cause extinction of that species. The Agreement classifies species according to criteria where access for control is important e.g. First – species threatened with extinction, Second – species, which could become endangered and Third – species that are protected.

### **11.7.3 Plant Protection Agreement for South East Asia and the Pacific (amended), 1956**

This agreement on Plant Protection obliges all signatory countries of the South East Asia and the Pacific to protect and preserve plants that are enlisted as endangered and are indigenous to the area.

### **11.7.4 ILO Convention, 1969**

ILO Convention No.169 is a legally binding international instrument, which deals specifically with the rights of indigenous and tribal peoples. Article 4 of the Convention calls for special measures to be adopted to safeguard the persons, institutions, property, labor, cultures and environment of these peoples. In addition, the Convention stipulates that these special measures should not go against the free wishes of indigenous peoples. The Convention recognizes these differences, and aims to ensure that they are protected and taken into account when any measures are being undertaken that are likely to have an impact on these peoples. The Convention requires that indigenous and tribal peoples are consulted on issues that affect them. It also requires that these peoples are able to engage in free, prior and informed participation in policy and development processes that affect them. Article 7 of Convention No. 169 states that indigenous and tribal peoples have the right to “decide their own priorities for the process of development as it affects their lives, beliefs, institutions and spiritual well-being and the lands they occupy or otherwise use, and to exercise control over their economic, social and cultural development”.

### **11.7.5 National Biodiversity Strategy, 2002.**

The Nepal Biodiversity Strategy (NBS) is a commitment by the GoN for the protection and wise use of the biologically diverse resources of the country, the protection of ecological processes and systems, and the equitable sharing of all ensuring benefits on a sustainable basis, for the benefit of the people and to honor obligations under the Convention on Biological Diversity. Biological diversity in Nepal is closely linked to the livelihoods and economic development of most of the people, and relates to agricultural productivity and sustainability, human health and nutrition, indigenous knowledge, gender equality, building materials, water resources, and the aesthetic and cultural wellbeing of the society. NBS has the objective for the protection of biological diversity in Nepal and identifies or restates Government policy on natural resources and their diversity.

The outcomes of the NBS has lead towards stronger political commitment, an information management system, enhanced human and institutional capacity, clear policies and legislation, detailed Action Plans, heightened public awareness and an effective monitoring and evaluation process. The strategic plan highlights the existing weaknesses, gaps, difficulties and other problems that threaten Nepal's Biodiversity. It provides the implementation mechanisms, roles and responsibilities of various government agencies, the private sector and people of the country to overcome the challenges related to biodiversity threats. The implementation mechanism of NBS is based accountability and transparency approach.

## **11.8 Relevant institutions and their responsibilities**

A number of institutions will be directly or indirectly involved during the construction and operation of this road Project as a stakeholder of the proposed Project.

### **11.8.1 Central Level Institutions**

#### **11.8.1.1 Ministry of Physical Infrastructure and Transport (MOPIT)**

The Ministry of Physical Infrastructure and Transport is the concerned agency responsible for environmental monitoring and it should provide necessary guidance to the Proponent in accordance with the EPA, 1997 and EPR, 1997. The ministry as a policy making body is also responsible for the overall guidance and policy formulation for the development of transport sector in Nepal. Hence, the Ministry will review the final EIA report and approved. It can also co-ordinate other institutions for necessary arrangement for land acquisition and conflict resolutions, if any, for the smooth construction of this Project. However, the Ministry can entrust and/or instruct the DoR for environmental monitoring works by providing necessary policy guidance, as the DoR is its technical arm. The DoR can perform its responsibility through its GESU in environmental monitoring during the construction and operation of the Project on behalf of the Ministry. According to the provisions of EPR, the Proponent is not obliged to carry out environmental monitoring works.

#### **11.8.1.2 Department of Roads (DOR)**

The Department of Roads (DoR) is facilitating the integration of environmental aspects in the road construction, rehabilitation and maintenance Project by developing policies and guidelines. Once the Project submits this EIA report, it will be review by Geo-Environmental and Social Unit (GESU) and forward to the Ministry of Physical Infrastructure and Transport for necessary approval. Furthermore, the DoR can also be involved in environmental monitoring works and instruct the Project to comply with the environmental monitoring works and instruct the Project to comply with the environmental requirements during its constructions. The GESU can also provide technical guidance to the Project, particularly in the application of bioengineering treatments methods.

#### **11.8.1.3 Ministry of Forests and Environment (MOFE)**

The MOFE is involved in environmental monitoring works. The Ministry has also the legal mandate to prepare the environmental auditing report after two years of Project operation or commencement of the service from this proposal. It is clear that spirit of the environmental laws is to ensure the involvement of the environmental agency in environmental auditing works. This review on policy, laws, guidelines and related institutions clearly indicates that there is no problem to construct this Project on environmental ground and these instruments further facilitate to integrate the environmental aspects and make the Project environmentally sound and sustainable.

#### **11.8.1.4 Local Level Institutions**

Services such as educational and health institutions, irrigation and drinking water facilitates, which may have likely impact by the Project activities.



### 11.8.1.5 Districts Coordination Committees

The Districts Coordination Committee of Bhaktapur and Kavrepalanchowk could facilitate in obtaining local people's support and educating the local people on the importance of this tunnel road. These Committees can also coordinate with districts level development activities/agencies and advise the concerned municipalities in assisting Project activities.

### 11.8.1.6 Districts Level Development Agencies

The Districts Administration Office will be directly involved in land and property acquisition and compensation issues, if such issues arise. The Chief Districts Office (CDO) can facilitate this process as a chairperson of the Compensation Determination Committee. The CDO can also instruct the districts level organizations to assist the Project activities. The Districts Forest Office (DFO) can assist the Project in felling down the trees to clear the west tunnel portal area, and to stockpile and sell the forest products, if required. The Districts Land Revenue Office can facilitate in transferring the land ownership if needed, once the proponent compensates the privately owned land and properties.

### 11.8.1.7 Non-Governmental and Community-Based Organizations

Numbers of local clubs, Non-Governmental Organizations (NGOs) are actively involved in the area for the development activities. These NGOs and Community Based Organizations (CBOs) can assist the Project particularly by creating awareness on the importance of road for local area development and sustainability during operation phase.

## 11.9 Review of other related documents

The following Relevant Standards are reviewed and relevant Standards.

### 11.9.1.1 National Ambient Air Quality Standards for Nepal, 2012, GoN

The new National Ambient Air Quality Standard (NAAQS) 2012 that came into effect requires effective monitoring and collection of eight-hour and 24-hour samples of air pollutants like Total Suspended Particulates (TSP), Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>), carbon monoxide, lead and ozone levels for at least 347 days out of a 365-day year. The NAAQS further states that no particular place should fail to monitor air samples for two consecutive days. TSP consist of solid and liquid particles in the air that are harmful to health while PM<sub>10</sub> is an air particle with a volume less than 10 micron that can easily enter into the end of the respiratory tract and cause serious health impacts. Both TSP and PM<sub>10</sub> are considered major air pollutants.

Table 11.9-1 National Ambient Air Quality Standards for Nepal

Parameters	Units	Averaging time	Concentration Max.	Test Method	WHO Air Quality Guidelines (2005)
TSP	(µg/m <sup>3</sup> )	24-Hours*	230	High Volume Sampling and Gravimetric Analysis	-
		Annual			20
PM <sub>10</sub>	(µg/m <sup>3</sup> )	24-Hours*	120	High Volume Sampling and Gravimetric Analysis, TOEM, Beta Attenuation	50
		Annual**			50
SO <sub>2</sub>	(µg/m <sup>3</sup> )	24-Hours*	70	Ultraviolet Fluorescence West and Gaeke Method	20
		Annual	40		40
Nitrogen Dioxide	(µg/m <sup>3</sup> )	24-Hours*	80	Same as Annual	-
		8-Hours*	10,000	Non Dispersive Infra-Red Spectrophotometer NDIR	-
Lead	(µg/m <sup>3</sup> )	Annual**	0.5	High Volume Sampling, Atomic Absorption Spectrometry	-
Benzene	(µg/m <sup>3</sup> )	Annual**	5	Gas Chromatographic	-

Parameters	Units	Averaging time	Concentration Max.	Test Method	WHO Air Quality Guidelines (2005)
				Technique	
PM2.5	(µg/m <sup>3</sup> )	24-Hours*	40	PM2.5 Sampling Gravimetric Analysis	
Ozone	(µg/m <sup>3</sup> )	8-Hours*	157	UV Spectrophotometer	100

\*Note: 24 hourly values will be met 95% of the time in a year. 18 days per calendar year the standard may be exceeded but not on two consecutive days.

\*\*Note: 24 hourly standards for NO<sub>2</sub> and SO<sub>2</sub> and 8 hours standard for CO are not to be controlled before MoFE has recommended appropriate test methodologies.

### 11.9.1.2 National Drinking Water Quality Standards, 2005

Major tasks during monitoring to be performed by water supplier are cited as follows:

1. Controlling regularly the quality to ascertain that the water supplied complies with the NDWQS.
2. Periodic monitoring of all the components of the water supply system from the perspective of sanitation and risk to health.
3. Proper supervision, inspection and maintenance as part of operation of the water supply systems.
4. Development of necessary infrastructure like water quality testing laboratory and quality control.

Following factors should be considered while monitoring:

1. Type and quality of water sources i.e. surface water, springs, dug-wells, shallow wells, deep wells
2. Type and size of the water supply system (pipe system, treatment facilities)
3. Local environmental settings (physical infrastructure, geography, etc.)
4. Sanitation and hygienic condition surrounding the water supply system.
5. Socio-economic environment at the local level.
6. Site specific conditions for complying with the standards
7. User's opinion and suggestions regarding water quality
8. Health and Hygiene Information (information on water related diseases)

Table 11.9-2 Minimum Frequency of Sampling and Analysis

Source and mode of supply	Minimum frequency of sampling and analysis		Remarks
	Bacteriological	Physical/Chemical	
Open wells for community supply	Sanitary protection measures; bacterial testing only if situation demands	Once initially for community wells	Pollution usually expected to occur
Covered dug wells and shallow tube wells with hand pumps	Sanitary protection measures; bacterial testing only if situation demands	Once initially, thereafter as situation demands	Situations requiring testing: change in environmental conditions, outbreak of waterborne diseases or increase in incidence of waterborne diseases
Deep tube wells with hand pumps	Once initially, thereafter as situation demands	Once initially, thereafter as situation demands	Situations requiring testing: change in environmental conditions, outbreak of waterborne diseases or increase in incidence of waterborne diseases
Protected springs	Once initially, thereafter as situation demands	Periodically for residual chlorine if water was contaminated and has been disinfected	Situations requiring testing: change in environmental conditions, outbreak of waterborne diseases or increase in incidence of waterborne diseases

### 11.9.1.3 National Noise Standards, 2012, GoN

The National Noise Standard 2012 that came into effect as per the rule 15 of Nepal Government Environmental Protection Regulation 1997 that requires effective monitoring and collection of Day-time and Night-time noise level permitted limits as in the following table.

Table 11.9-3 National Noise Level Standards for Nepal

Area	Permitted Noise Level (Leq dBA)	
	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Rural Residential Area	45	40
Urban Residential Area	55	50
Mix Residential Area	63	55
Protected Area	50	40

Table 11.9-4 National Noise Level Standards for Nepal

Maximum Noise level permission by Residential Equipment		
S.N	Equipment	Max. Noise Level (Leq dBA)
1	Water Pump	65
2	Diesel Generator	90
3	Entertainment Equipment	70

## Chapter 12 CONSULTATION AND PUBLIC HEARING

### 12.1 Consultations with local communities and stakeholders

Public consultation and involvement is important part of the EIA process. At the stage of field studies, the meetings, consultations, interviews and workshops were organized to collect opinions of various stakeholders about upgrading of existing road with Tunnel option. At each meeting, an introduction of the project was briefed, making stakeholders fully aware of the purpose of the project implementation. While preparing the EIA Study and according to Rule 7 of EPR, the concern people and institutions has been informed regarding the proposal, the EIA Study has been conducted and on possible impacts of implementation of the proposal on the socio-economic and cultural, physical, chemical and biological environment. Matters included in the Recommendation Letters from affected municipalities

- Impacts on local schools, Health posts, community infrastructures due to project and proposed mitigation measures;
- Other impacts on local environment due to the project and mitigation measures proposed;
- Impact on Community Forests and its users, and mitigation measures proposed. Any subject matter that is not concerned with the project has been clearly indicated.

#### Interaction Meetings:

Several meeting were held as a part of the study. The objective was to a) inform interested stakeholders about the project and b) acquire information on available forest biology and discuss issues on the potential impact in the result of project implementation on the forest biology and user/local lifestyle during construction and operations of the road. The various stakeholders were invited to participate in the meetings, including Member of Parliament, DoR/CTI Representative, Mayor/Ward Chairperson of the related municipalities, Community Forest User Groups member, local elites, local representatives from political parties and other stakeholders.

At those meetings, anticipated environmental impacts that likely may occur during construction and operation phases were shared and discussed. Alignment maps, project materials and other information were also shared and presented during the meetings. Consultant and relevant experts delivered all aspects of forest biology and its interrelation to the project, proposed actions and their potential negative and positive impacts in an open and transparent manner actions and their potential negative and positive impacts in an open and transparent manner and without any pressure. Through these meetings, concerned participants were requested to provide their comments and suggestions, foreseen impact on the forests resources and their own lifestyles and issues on the development.

During the field study, study team contacted the local people to solicit their concerns and opinions on physical, biological, socio-economic, cultural and historical aspects. The public input has been documented in this Report. A brief report on the stakeholder meetings defined by JICA Guidelines and public consultation meetings defined by Nepalese EIA procedures are given below and also attached in **Annex IV-M**.

#### 1. First Stakeholder (consultation) Meeting

Stakeholder meetings defined by the JICA Guidelines were carried out in three places to disseminate project information and likely environmental impacts as the stage of draft scoping. These meetings had been accomplished with the participation of local public very effectively. Local people, Municipality

secretary, local elite groups, CFUG, local representatives from political parties and other stakeholders from affected areas of Bhaktapur, and Kavrepalanchowk districts were participated in the stakeholder meetings and provided their valuable suggestion, opinion and recommendation regarding the proposed project.

Stakeholder meetings were carried out aiming to disseminate overall project information to the interested stakeholders and locals of project affected Municipalities. The meeting had further aiming to provide brief description of the EIA together with its anticipated environmental impacts that are likely during construction and operation phases. The meetings were executed formally chaired by local chair-persons and chief guests.

Maps, figures and information leaflets were presented during the meetings displaying road alignment with its alternatives in the topographical map. Similarly, power point presentations and a short visual of Model Highway Project had also been presented during meeting. The relevant experts had also presented a good understanding of all aspects of the proposal, proposed actions and their potential negative and positive impacts.

Stakeholder meetings were carried out in three different locations at Chitapol of Bhaktapur District, Banepa of Kavrepalanchowk district, and Sanga. Stakeholder meeting had been carried out right after the publication of a public notice; hence the concerned people/participants were also requested to provide their comments and suggestions, issues and alternatives in the written form. The list of all participants has been provided in the **Annex-IV-M**.

The participants involved in the stakeholder meetings had shown tremendous interest and curiosity towards the Project. The people have shown their keen interest and are willing to support the Project. The consultation and participation with stakeholders and participants by the team has carried out in an open and transparent manner and without any pressure, direct or indirect, by project authorities as well.

### **(1) Chitapol Meeting**

The stakeholder meeting of proposed Suryabinayak – Dhulikhel Road Project was organized in Jorpati Higher Secondary School Old Building of Chitapol Municipality of Bhaktapur district, 9 November 2014. The meeting was chaired by Mr. Manjul Manandhar, Team Leader / Environmental Expert for EIA. Other participants were from the JICA project, Full Bright Consultants, Municipality officials, representative from political parties and the local. Altogether 80 people have participated. The participation of the women was not seen at this place. The main purpose of the consultation meeting was to aware the local people of Bhaktapur, Nakhel, Sipadol, Chitapol about the proposed upgrading and widening of Suryabinayak – Dhulikhel Road project, to disseminate the project related information and to help to identify the possible environmental and social impacts, information and opinions of the local public and stakeholders regarding the project. The major issues raised by the participants during the meeting were:

- They were more concerned was the compensation for their lost land and properties.
- They have strong assertion for compensation demand on land and built houses since they are economically vulnerable.
- People are still paying land revenue tax and cultivating /utilizing of the land which the government declared ROW.
- More than 50% of the participants said that their land and other assets (which are to be acquired by the project) should be compensated based on the existing market rate and the RoW should be uniform through the road section

The summary of the interaction meetings is presented in **Annex IV-M**.

### **(2) Banepa Meeting**

The stakeholder meeting of Suryabinayak – Dhulikhel Road Project was organized in Municipality Hall at Banepa of Kavrepalanchowk district on 9 November 2014. The meeting was chaired by Mr. Manjul Manandhar, Team Leader / Environmental Expert for EIA. Participants were from the JICA, Full Bright Consultancy, Municipality officials, Representatives from political parties, businessmen and the local from Banepa, Janagal, Nasikasthan, Sanga, and Dhulikhel. Altogether 86 people have participated in the consultation meeting. Most of the participants in the project site area are positive about this Road Improvement Project. The summary of the interaction meetings is presented in Table 4I of Annex IV. The major issues raised by the participants during the meeting were:

- Number of participants also mentioned that land acquisition and compensation can be the main issue in the Project area if not handles in appropriate way.
- Around 25% of the participants said that, the government of Nepal has made partial decision in 2058 through publishing Gazette, where the ROW between Sanga Chowk to Chandeshwori River (Banepa Municipality) was declared in which ward No. 11 was excluded in this decision.
- Compensation of all affected land inside 25 meter each side from center line beyond the existing road should be paid before construction work starts.
- People are still paying land revenue tax and cultivating /utilizing of the land which the government declared ROW.
- Project should be rehabilitate all historical and cultural monuments such as Temple, resting road side house (Chautara) etc. in an appropriate places.

### (3) Sanga Meeting

The public consultation meeting at Sanga was organized in Ward office-14 hall of Nasikasthan of Sanga on 14 Oct. 2017 A.D (28/06/2074 B.S). The meeting was conducted in the presence of three ward chairperson (9, 10 and 14) who were remarked as respective guiding person (Upendra Raj KC, Shivaram Raut and Shivaram Raut). Other participants were from the DoR/GESU, Full Bright Consultancy, Ward Chairperson, representative from political parties and the local. Altogether 49 people have participated. The list of the participants is presented in the Attendant sheet. The participation of the women was also seen in good numbers.

The main purpose of the consultation meeting was to aware the local people of Palanse and Sanga about the proposed tunnel project, to disseminate the project related information and to help to identify the possible environmental and social impacts, information and opinions of the local public and stakeholders regarding the project.

Table 12.1-1 Outline of the First Stakeholders Consultation Meeting

Date	Interaction Location	Number of Participants		
		Male	Female	Total
9 Nov. 2014	Palanse Meeting	34	6	75
9 Nov. 2014	Banepa Meeting	81	5	86
14 Oct. 2017	Sanga Meeting at Nasikasthan	44	5	49

The major issues raised by the participants during the meeting were:

- Why the project is not implementing the previously designed open road section through Sanga pass?
- If the Tunnel road option comes into implementation, what will be the status of the existing road and its improvement?
- There is the high possibility of Sanga to falls behind in its development and economic activities with the tunnel option.

- Will there be any impact on the structure and housed located above the Tunnel section and will there be compensation for the effected land and structure around and above the tunnel section

## 2. Second Stakeholder Consultation Meeting (Bhaktapur and Banepa)

The second Stakeholder consultation meeting was conducted at City Gaon Resort, Bhaktapur and at Banepa Municipality of 10 No ward Office Janagal on 21 Feb. 2018.

The meeting was conducted by Foreign Section of DoR while coordination made by Consultant (FBC). In the meeting, authority of local bodies were invited and Member of Parliament was also presented in this programme. The meeting was chaired by DDG Mr. Sanjay Kumar Shrestha the Mayor of Suryabinayak Municipality and the chief guest as the Member of Parliament.

Brief introduction of the main participants were made after welcoming them by Mr. Manjul Krishna Manandhar, the Team Leader of EIA study team of consultant. He facilitated the program by delivering the objective of the Stakeholder meeting and the general introduction of the Suryabinayak- Dhulikhel road section. The requirement of the stakeholder meeting was also explained by Deputy Director General Mr. Sanjay Kumar Shrestha. He basically introduce the Suryabinayak- Dhulikhel road project, its nature and the tunnel alternative at Sanga area which will be integral part of this project. After briefing of the project activities, participants were requested to give their views about the proposed 6 Lane SD road which are as per the attached **Annex IV-N**. The major issues raised by the participants during the meeting were:

- How the voice of the PAPs will be addressed while the Supreme Court had decided the RoW and compensation of the affected properties. Road should be constructed with due consider of the people's problem living along the side in terms of loss of their land and properties.
- The road design have been done being within the verdict given by Supreme Court on the year 2068 regarding RoW with 75feets.
- Safety in Tunnel section should be maintain which can be challenging for us due to low experience on it. Road side vehicular workshop has made congested and traffic problem that should be stopped.
- The Asian standard road width is varied like 9 meter in Raxaul, 7 meters in Khasa and 25 meters along the Nepal which is not rational here for us.

Table 12.1-2Outline of the Second Stakeholders Consultation

Date	Interaction Location	Number of Participants		
		Male	Female	Total
21 February 2018	City Gaon Resort, Bhaktapur	44	0	44
21 February 2018	Ward no.10 Office, Banepa	59	4	63

## 12.2 Focus Group Discussion

Focus Group Discussions were carried out at Bhaisepati, Jagati and Sanga to understand the existing socio-economic and cultural situation and identify issues and concerns of the local people regarding the project. During discussion, information about existing roads within the Municipality, public utilities and their rehabilitation, health facilities, educational situation, energy consumption pattern, agricultural practice and related infrastructures, market status, existing market value of land and houses has been discussed.

Similarly, focus Group Discussions were carried out during the identification of candidate site for Quarry and Soil Disposal area to find out the surrounding public view and concerned regarding the establishment of quarry and spoil disposal site around the area and their concerned suggestion.

Table 12.2-1 Outline of the Focus Group Discussions

Date	Interaction Location	Number of Participants		
		Male	Female	Total
24 March 2015	Bhaisepati, Kavrepalanchowk	7	5	12
24 March 2015	Jagati, Bhaktapur	9	7	16
28 October 2017	Quarry Sites	7	3	10
22 January 2018	Soil Disposal Site	9	2	11

### 12.3 Public Notice and Public Hearing

Public Notice one week in advance seeking the written opinions from the concerned stakeholders has been also published in a national newspaper in 24 May 2018. Similarly, Public Notice has been affixed at the offices of Municipality and other local bodies as far as possible of the concerned district. Any comments or suggestions from the concerned stakeholders and affected peoples has been collected. Public hearing has been carried out at Suryabinayak-10, Basghari-Bhaktapur along the entire stretch of the road alignment, covering all project affected Municipalities. Public hearing have been carried out after preparing the draft of EIA. For Public Hearing, a leaflet has been prepared in Nepali language with major findings, potential impacts and suggestions as well as suggested mitigation measures and has been distributed to all concerned stakeholders during Public Hearing Programme. The programme has been conducted with participation of representatives of Member of Parliament, Mayor/ward chairpersons of respective municipalities, DoR/CTI, Political Parties and public representatives. Further, the recommendation letters have been collected from all project affected municipalities and has been attached to the final EIA report. The summary of the interaction meetings is presented in Table 2 of **Annex IV-O**.

Table 12.3-1 Outline of the Public Hearing

Date	Interaction Location	Number of Participants		
		Male	Female	Total
30 May 2018	Arniko Party Palace, Suryabinayak-10, Bhaktapur	100	5	105

### 12.4 Public Consultation and Disclosure Plan

#### Disclosure of Project

The scoping process for this project has been carried out publishing public notice and affixing notice on the notice board of local bodies under Environmental Protection Rules 1997 (EPR 1997) and the ToR for the EIA were approved on 6/12/2015 MoSTE during the scoping process. Public Hearing have been conducted (as required under EPR 1997) on 05/30/2018 based on the designs prepared by the detail design consultant. The environmental clearances which will be required from MoFE and MoFSC have also been identified and obtained. It is common for the alignment major highway projects to undergo some or fine tuning during the detailed design phase.

There were no major objections to the alignment during the public hearing phase of public disclosure.





## Chapter 13 CONCLUSION

### 13.1 Conclusion

GoN has requested the Japanese Government to carry out the Detail Design Study for the upgrading and widening of 14.91 km Suryabinayak – Dhulikhel Road, to ease the difficulties within the Suryabinayak – Dhulikhel section of Arniko Highway as the continuation of Tinkune- Suryabinayak section. After the final agreement with DOR, the JICA study team will commence the Detail Design works.

The upgrading works include widening of the existing two lanes to four lanes as fast lanes, with provision of new construction of bridges and culverts, sidewalks and junction improvements. The two lanes on either side of fast lanes are also proposed as a service road. The Right-of-Way (RoW) of the road is 25m from the road's center line.

The Suryabinayak - Dhulikhel Section of Arniko Highway passes through the built-up areas of Bhaktapur and Suryabinayak Municipality of Bhaktapur District, and similarly Sanga, Janagal, Banepa Municipality, Dhulikhel Municipality of Kavrepalanchowk district.

Arniko Highway at Dhulikhel is to be connected with BP Highway in near future which will increase the number of traffic in this section. With the increasing trade volume between neighboring between India and China, the construction of the dry ports at the Indian and Chinese borders as well as the forthcoming Kathmandu -Terai Fast Track will increase the traffic volume in coming years. Moreover to settle the present traffic situation in this section the widening of road is felt to be necessary. The upgrading work will provide better transportation facilities to the road users, enhance the socio economic activity of number of villages within Bhaktapur and Kavrepalanchowk Districts, enhancement of tourism in the project influenced area, employment generation etc.

At present, after the completion of upgrading of Kathmandu – Suryabinayak road, the travel time from Kathmandu to Suryabinayak is approximately 15 minutes. At present the travel time from Suryabinayak to Dhulikhel is approximately 30 min. After the upgrading of the Highway, the travel time is expected to reduce by half. So, the travel time from Kathmandu to Dhulikhel will be approximately 30 minutes, after completion of upgrading of Suryabinayak to Dhulikhel section. Importantly, the journey will be comfortable, wear and tear of the vehicles will be less along with fuel consumption and maintenance cost of the vehicles will also be less which results in increase in private savings. This reduction in travel time, and costs will be beneficial mainly to the people from Banepa, Dhulikhel and people using Arniko Highway and BP Highway to enter and exit from Kathmandu Valley

As per this MOU, a Detail Design Survey is being conducted by the JICA Study Team for improving, upgrading and widening the existing road alignment, reducing travel time and enhancing traffic safety by providing a six lanes wider road, so that it will contribute in enhancing smooth flow of trade transport in Kathmandu and other major cities in eastern side.

#### 13.1.1 Beneficial and Adverse Impacts

During Project construction and operation stage general beneficial impacts are likely to occur in the Project area. During construction stage beneficial impacts like generation of employment opportunities and Increase in Income, Increase in income of local people through opportunity to work and income generation activities and Enhancement in Technical Skills of local people are likely to occur.

During operation stage the benefits of the Widening and Upgrading Suryabinayak – Dhulikhel Road Project can be summarized as:

- Shortening of Travel Time : by 20 minutes

- Saving of Vehicle Running Cost : Fuel consumption by up to 25%
- Reduction of Traffic Accidents : more safer route
- Access improvement for people
- Control Air Pollution
- Economic benefit
- Industrial, Trade and Business Development
- Tourism Development

#### **13.1.1.1 Adverse impacts on the Physical Environment are:**

Some of the minor impacts on physical environment are likely to occur during Project construction stage. During construction, the operation of construction vehicles in the work area will generate NO<sub>2</sub> and SO<sub>2</sub> which will degrade the air quality of the ambient air to some extent. Also the dust emission in the excavated area of the approach road and at the portals will increase the PM<sub>10</sub> values of the surrounding areas to some levels.

The existing streams are likely to be affected due to the construction of culvert and bridges at the approach road due to which the TSS value of the existing streams slightly increase. Also at the west and east portal the BOD value of the Stream will be degraded due to the operation of the Workers' camp.

During construction, the operation of construction equipment in the work areas will generate sound and vibration which will increase the sound level in the area than the present level.

The existing district road will be affected during the construction and other facilities. Also the existing agricultural land will be affected due to the construction activities taken place in between the agricultural land.

Generation of solid waste from the Workers' camp, Liquid or chemical waste generated from the road construction area and soil waste from the tunnel will have an impact on the environment.

#### **13.1.1.2 Adverse impacts on the Biological Environment are:**

Some portion of the alignment (about 50 m length) passes through the community forest area at the Sanga pass area which require cutting of 163 trees. In addition the nearly 127 private trees need to be cut in Sanga area. A total of 484 road-side trees will have to cut, which lies on both sides of the existing Suryabinayak – Dhulikhel road.

#### **13.1.1.3 Adverse impacts on the Social, Economic and Cultural Environment are:**

Loss of about 13.33 ha of agricultural land along with 234 houses structure area likely to be affected. Temples and religious sites fall within the RoW of the road which possibly affected will need due protection during construction of the road. Disruption on the public utilities such as irrigation canal, water supply pipes, temples, chautaris etc. Pressure on local service, commodities, food supply for external workforce and in-migrants. Increase in unsocial activities including prostitution, crime, and gambling and alcohol consumption due to outside labors. Possible issues due to labor and construction camp operation and management along with Occupation Health and Safety issue

There are 1280 family members who are Project affected people, whose 234 House structure along with land will be used and acquired by the Project to construct its components. In Addition to that, there are additional 40 HHs whose only land will be affected by this project with household's population of 284. Hence, in total there are 1488 family members who are Project affected people, whose land and structure will be used and acquired by the Project to construct its components. Beside these, there are no other impacts which are of serious nature.

Among which, 284 households are Severally Project Affected Families with Effect on their house structures and land. Beside these, there are no other impacts which are of serious nature.

#### **13.1.1.4 Adverse impacts during Operation of this road Project are:**

During operation of the road minor impacts on physical, biological and social environment are likely to occur. On physical environment, during operation the operating vehicles on the new highway will emit NO<sub>2</sub> and SO<sub>2</sub> which will degrade the air quality of the ambient air.

The east and west portal will be equipped with the toilet and kitchen facilities for the workers', the sewage from these facilities will degrade the river water quality of the existing rivers.

The increment of traffic volume on the new highway will increase the sound level in the area than the present level.

During operation the artificial slopes constructed in the embankment and at the soil disposal area will need to be monitored. The collapse of these structures due to catastrophic events will destruct the road facilities at the approach road and at the soil disposal area.

During Operation phase, although total of five culverts and bridges will be designed to accommodate sufficient volume of water, those structures may cause obstruction when the area suffers unusual scale of flood, and overflow in the surrounding area.

During Operation phase existence road after upgrading and widening may cause increase of self-inflicted accidents and accidental encounters between people and cars.

#### **13.1.2 Mitigation Measures**

The mitigation measures to avoid or reduce above-mentioned adverse impacts are

##### **13.1.2.1 Mitigation Measures during Construction Stage**

###### **(1) Physical Environment**

Preventive mitigation measures, such as selection of equipment and proper maintenance, will be proposed for mitigating the impact due to NO<sub>2</sub> and SO<sub>2</sub>. Preventive mitigation measures, such as spraying water three time a day at the work areas and washing the vehicles before they leave the construction sites, will be proposed for mitigating the impact due to dust in the work area.

Turbid water discharged from the labor and contractor's camp site will be appropriately treated before discharge into the river to mitigate the impact on water bodies.

Selection of low-noise type equipment and providing noise barriers at necessary locations and control of work hours and days, i.e. stopping at night and weekends, near the vulnerable facilities and settlements will be proposed for mitigating the impact due to noise.

For mitigating the impact on the existing infrastructure the temporary road trail/passage, water supply and drain mitigation will be provided on the existing district road during construction so that the daily activities in the area will not be affected due to the commencement of the Project.

Alternative facilities will be provided as a part of the Project to any water supply facilities destroyed by the Project. If the planned water intake affects significantly to the existing water use, alternative water source(s) will be provided to minimize the impact to acceptable level.

Respect the social value and provide the access to important and popular water use spots by providing road crossings and other facilities that will benefit the water users. Establish/Construct the deep Tube well for the communal use at the affected area.

The flow of river and culverts will not be disturbed during construction so that the dependent irrigation canal at downstream will be continue by pipe system.

The direct disposal of side surface lead off drains upon private cultivated lands and properties will be avoided. Surface runoff and side lead off drains will be managed properly in order to prevent significant

adverse impacts upon public and property. To prevent water logging, 3 cross drainage structure have been proposed for continuation natural drainage system.

Drainage improvement works will be carried in order to control volume and speed of water flows in water courses in the vicinity of exposed soils and slopes.

Cut spots and embankments will avoid the creation of angle greater than the natural angle of repose for the local soil type. New embankments should be properly compacted and exposed surfaces should be covered with vegetation to avoid slope washout and soil erosion. On cut slopes, landscaping should be carried out with bio-engineering works, prior to rainy season, with the application of top soils.

Use of personal protective equipment will be made compulsory to workers while working. Precaution will be taken while using the machines and equipment, especially nearby public and private infrastructures.

Construction Traffic Management Plan will be developed in S-EMAP stage that will comply by contractor to maintain flow of construction vehicles without hampering good flow of vehicles. Road safety of the highway will be ensured by managing existing traffic properly. Strictly enforce speed limits and traffic rules to all the operators. Conduct Traffic Safety Campaign and Media coverage / informatory announcements to public several times a year. Educate road side people not to allow their children to play on the roads and to allow their cattle to enter in the roads.

## **(2) Biological Environment**

Mitigation measures to counter possible adverse impacts on local biological environment are as follows:

Project will carry out compensatory plantation at the rate of 25 saplings for each felled tree in available locations within the affected Suryamode Perunge Community Forest and within the central Median of the Road and their management until the age of 5 years. The Project requires to plant 16,175 numbers of tree saplings of locally affected plant species within the forest area.

Control hunting and poaching of wildlife enforcing acts and regulations. Illegal felling of trees from forest area, unnecessary destruction of forest during construction will be avoided.

Encourage and support local community for controlling illegal harvesting of forest resources and encroaching the forest area for settlement. Strict rules and regulation will be enforced in and around the forest area from the illegal harvesting of the vegetation and wild life.

Obtain prior approval on clearance procedural from department of Forest and coordinate with district forest officer.

Avoid unnecessary falling of tree from the required area and minimize unnecessary disturbance in forest area.

Take all legal procedures, appropriate communication and coordination with the Community Forest User's Group and the DFO.

## **(3) Social, Economic and Cultural Environment**

Mitigation measures to control possible adverse impacts on socio-economic and cultural aspects are as follows:

Timely disbursement of adequate compensation for private lands and other properties will be made. Adequate compensation to affected families for agricultural land on prevailing local rate will be provided. Enough budgets will be allocated for acquisition and compensation during the Project construction. Adequate provisions and compensation arrangements will be maintained in the Resettlement and Rehabilitation Action Plan.

At least one family member of PAF and SPAFs will be provided with income generating training and opportunity in the construction and operation of Project.

The Project will encourage local people in the involvement of agricultural extension services to increase local crop production and adopt better farming techniques. Further the Project will encourage locals in community development programs to increase product diversification and development of alternative livelihood activities.

Budget for social enhancement measures will be allocated. Project will ensure occupational health and safety measures and community involvement. Awareness raising program will be delivered through local organizations to plan proper usage and management of the social service facilities. Security systems will be established to avoid various sorts of conflicts between the local and immigrants during the time of construction and operation.

#### **(4) Mitigation Measures during Operation Stage**

For mitigating the impact due to NO<sub>2</sub> and SO<sub>2</sub> during operation the prohibition of the old vehicles that do not meet the emission criteria will be regulated that will decrease the amount of emission in the new highway than the present level.

For mitigating the impact due to sewage at the road facilities the sewage from these facilities at the approach road will be treated and brought back to the discharged level.

For mitigating the impact on the stability of the artificial slopes regular maintenance and monitoring of these artificial slopes is proposed.

For mitigating the impacts due to the surface water flow design the bridges and culverts with consideration of potential climate change effects, to allow maximum - feasible capacity of water flow.

For mitigating the impact on gender if obstruction is not avoidable, information dissemination to the community regarding the timing of start and finish of the obstruction will be carefully and thoroughly conducted in the manner that as many local women as possible has access to the information.

Appropriate preventive mitigation measures will be applied to reduce and avoid accident. Road marking will be installed & its timely re-marking when it's worn out & invisible by drivers. Danger & precautionary signs and signals will be erected at potential danger areas. Street lights and reflectors will be provided to avoid night-time accidents.

For mitigating the impact due to criminal activities appropriate preventive mitigation measures will be proposed to reduce and avoid unsocial activities in the construction area, such as awareness raising education.

#### **13.1.3 Environmental Management Plan**

In order to ensure the implementation of these environmental protection measures, an Environmental Management Plan (EMP) has been prepared and based on that the site specific Environmental Management Action Plan should be prepared during contractor materialization during construction stage, which should include plan for the implementation of the mitigation measures, environmental monitoring, and proposal for environmental auditing. The plan includes details on environmental monitoring, compliance and impact monitoring, organization and staffing, directives and co-ordination aspects, reporting requirements and estimation cost plan implementation.

In total, the Project will invest NRs. 6,001,170,189 for environmental enhancement and mitigation measures.

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# **ANNEXES**

**ANNEX – I: MAPS**

**ANNEX – II: PHYSICAL DATA**

**ANNEX – III: BIOLOGICAL DATA**

**ANNEX – IV: SOCIAL DATA**

**ANNEX – V: PROJECT INFORMATION LEAFLET**

**ANNEX – VI: PUBLIC NOTICES, MINUTES AND LETTERS FROM  
STAKEHOLDERS**

**ANNEX – VII: LIST OF EIA STUDY TEAM MEMBERS**

**ANNEX – VIII: QUESTIONNAIRES & CHECKLIST**

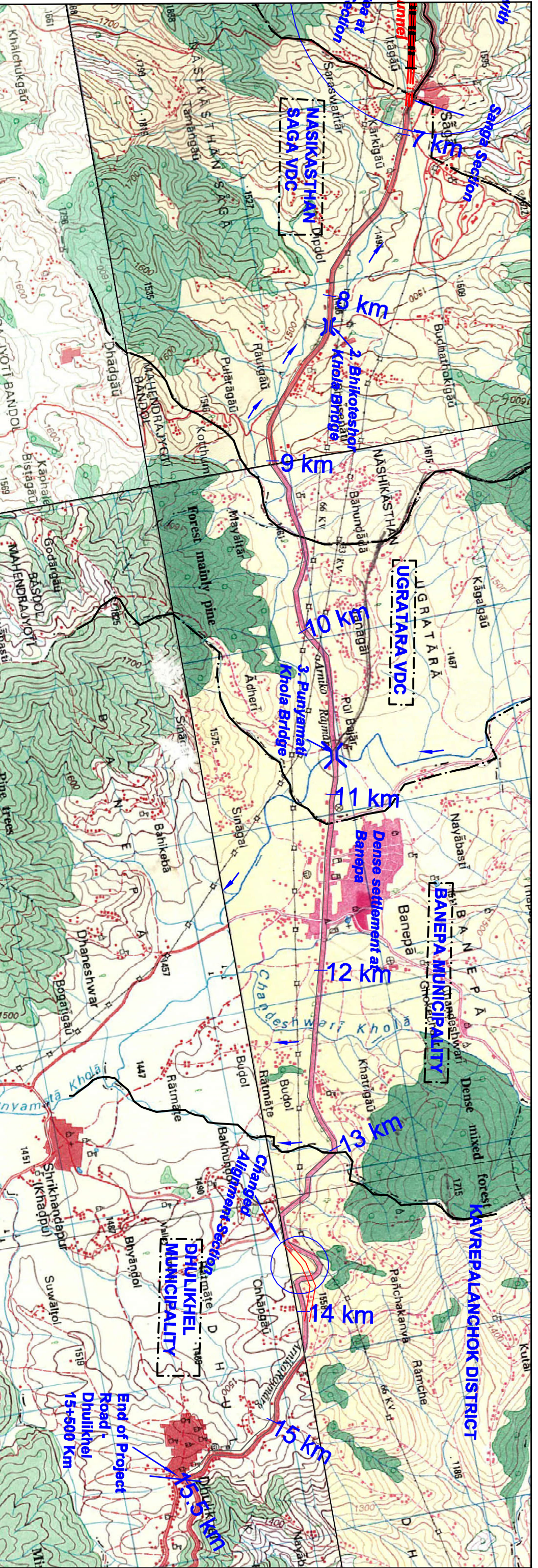
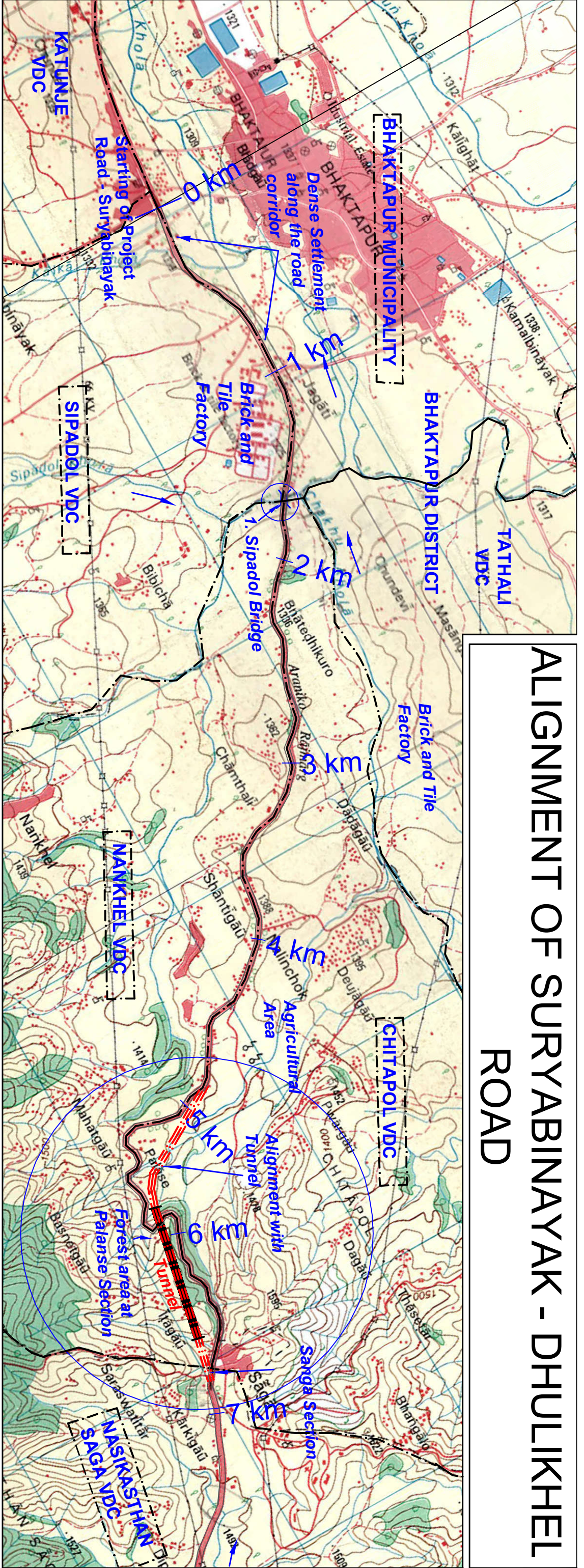
**ANNEX – IX: PHOTOGRAPHS**

**ANNEX – X: APPROVED TERMS OF REFERENCE (TOR)**

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# ALIGNMENT OF SURYABINAYAK - DHULIKHEL ROAD





**ANNEX-I: LOCATION MAPS**



## ANNEX-II: PHYSICAL DATA

### A. Present Land-Use Pattern along Highway Corridor

Chainage	Length (Km)	Location	Land use pattern	
			Adjacent to Highway	Beyond Highway corridor
0+000 – 1+250	1.25	Suryabinayak Area	Built-up area, Road-side houses	Built-up Area, Bhaktapur core city towards south
1+250 – 1+500	0.25	Jagati Area	Built-up area, Road-side houses	Vacant lands,dense settlement ,towards south; Machine made Bhaktapur Brick and Tile Factory towards north
1+500 – 2+500	1.00	Jagati, Bhatadhikoro Area	Cultivated	Cultivated, Brick factories
2+500 – 3+200	0.70	Bhasghari Area	Built-up area, Road side houses	Cultivated, Brick factories
3+200 – 4+200	1.00	Nalinchowk Area	Cultivated	Cultivated, Scattered settlements
4+200 – 4+500	0.30	Nalinchowk Area	Built-up area, Road side houses	Cultivated, Scattered settlements
4+500 – 5+500	1.00	Nalinchowk Area	Cultivated	Cultivated, Scattered settlement
5+500 – 6+800	1.30	Palase Area	Community Forest	Cultivated, Scattered settlements
6+800 – 7+100	0.30	Sanga Area	Built-up area, Road side houses	Cultivated, Scattered Settlements and Forest area
7+100 – 8+300	1.20	Sanga Area	Cultivated	Cultivated, Scattered Settlements
8+300 – 9+000	0.70	Janagal Area	Built-up area, Road side houses	Cultivated, Scattered Settlements
9+000 – 10+400	1.40	Janagal Area	Cultivated	Cultivated, Scattered Settlements
10+400 – 13+100	2.70	Banepa Area	Built-up area, Road side houses	Dense settlement towards north, Cultivated and Scattered settlement towards south
13+100 – 14+800	1.70	Dhulikhel Area	Cultivated	Cultivated and scattered settlement
14+800 – 15+862	1.06	Dhulikhel Area	Built-up area, Road side houses	Scattered Settlement

Source: Field Survey, 2017

### B. Bridges and Cross drainages along Suryabinayak – Dhulikhel section

Type / Location	Chainage	Length	Breadth
Sipadol Khola Bridge – Jagati	1+780	16.00 m	7.00 m
Slab Culvert	5+900	1.50 m	8.00 m
Slab Culvert	6+900	4.00 m	8.00 m
Bikoteshore Khola Bridge – Baisepati	8+360	16.00 m	7.00 m
Slab Culvert	9+000	1.00 m	7.00 m
Slab Culvert	9+900	2.50 m	8.00 m
Punyamati Khola Bridge - Banepa	11+050	32.00 m	7.00 m

Source: Field Survey, 2017

### C1. Average traffic Suryabinayak – Banepa

Indicators	Truck	Mini Truck	Bus	Mini Bus	Car/ Jeep	Utility Vehicle	Motor cycle	Total
AADT	1000	1000	373	1500	1124	1623	5870	12490
Composition (%)	8	8	3	12	9	13	47	100

Source: Feasibility Design Report, DOR, 2015

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### C2. Average traffic Banepa - Dhulikhel

Indicators	Truck	Mini Truck	Bus	Mini Bus	Car/ Jeep	Utility Vehicle	Motor cycle	Total
AADT	655	655	246	982	737	1065	3850	8190
Composition (%)	8	8	3	12	9	13	47	100

Source: Feasibility Design Report, DOR, 2015

### C3. Base Year 2016 Traffic Projection (Peak Hour Traffic)

AH Section	AADT (vpd)
Suryabinayak - Jagati Jn	10,512
Jagati Jn - Bhatedhikuro Y Jn	10,512
Bhatedhikuro Y Jn - Shantigaon/Nalinchowk Jn	9,461
Nalinchowk Jn - Chitapol Jn	8,515
Chitapol - Palanse	7,663
Palanse - Palanse Forest Edge	7,280
Sanga	7,280
Janagal - Pul Bazar	6,552
Banepa Municipality	6,224
Banepa Chandeshwari Khola - Khawa (Km 28)	4,980
Dhulikhel Municipality - DSBH Jn	4,740

Source: Feasibility Design Report, DOR, 2015

### C4. Future Traffic Forecast -Build Condition (2026 & 2036)

AH Section	AADT in vpd		
	Base Year 2016	Year 2026	Year 2036
Suryabinayak - Jagati Jn	17,713	53,170	72,846
Jagati Jn - Bhatedhikuro Y Jn	17,713	50,205	66,863
Bhatedhikuro Y Jn - Shantigaon/Nalinchowk Jn	15,942	45,799	61,461
Nalinchowk Jn - Chitapol Jn	14,348	41,244	55,371
Chitapol - Palanse	12,913	37,609	50,903
Palanse - Palanse Forest Edge	12,267	35,999	48,927
Sanga	12,267	35,992	48,913
Janagal - Pul Bazar	11,041	32,651	44,513
Banepa Municipality	10,489	31,456	43,075
Banepa Chandeshwari Khola - Khawa (Km 28)	8,391	24,828	34,682
Dhulikhel Municipality - DSBH Jn	7,987	23,893	33,599

Source: Detail Design Report, DOR, 2015

### C5: Water Resource and Use Survey around Proposed Tunnel Area of Sanga Pass

**Annex-A: Water use survey of the farmers and general people around the West Portal of Proposed Tunnel**

S.N	Respondent's Name	Address / Location	Family members	Occupation	Crops cycle	Water for Drinking & Availability	Water for Farming & Availability	Alternative Water source if any	Comments/Feedbacks
1	Kumar Ranamagar	Bhaktapur, Palanse/ Western tunnel portal	7	Farming	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from about 700 m since 8 years. Available all seasons	Water from BagarKhola and almost available all the year round	None	Project may not affect water resources but need to conserve water from BagarKhola during project implementation
2	Sarita Thapa magar	Bhaktapur, Palanse/ Western tunnel portal	4	Farming	3 cycle comprising Paddy, mustard and Seasonal Vegetable	Piped water from about 700 m since 18 years. Available all seasons	Water from BagarKhola and almost available all the year round	None	Project may not affect water resources but need to conserve water from BagarKhola during project implementation
3	Radha Ranamagar	Bhaktapur, Palanse/ Western tunnel portal	8	Farming	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from about 500 m since 8 years. Available all seasons	Water from Bagar and KhoriyaKhola and almost available all the year round	None	Project may not affect water resources but need to conserve water from Kholas during project implementation
4	Raju Bhujel	Bhaktapur, Palanse/ Western tunnel portal	5	Resort staff of Palanse Tower Resort	–	Piped water from about 600 m since 14 years. Available all seasons	–	None	Project may not affect water resource but care should be taken to Resort infrastructure during construction.

Source: Field Survey, 2017

**Annex-B: Water use survey of the farmers and general people around the East Portal of Proposed Tunnel**

S.N	Respondent's Name	Address / Location	Family members	Occupation	Crops cycle	Water for Drinking & Availability	Water for Farming & Availability	Alternative Water source if any	Comments/Feedbacks
5	Dev Narayan Shrestha	Kavre, Nashikasthan / Eastern tunnel portal	7	Farming	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from about 700m since 6 years	Water from NashikaKhola and almost available all the year round	Seasonal Kuwa, stone tap nearby	Drinking and irrigation water should be managed properly during project implementation
6	Bishnu Dulal	Kavre, Nashikasthan / Eastern tunnel portal	15	Farming and service	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from about 700m since 8 years	Water from NashikaKhola and almost available all the year round	Seasonal Kuwastone tap nearby	Drinking and irrigation water should be managed properly during project implementation
7	Niranjan Shrestha	Kavre, Nashikasthan / Eastern tunnel portal	4	Agriculture	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from about 700m since 8 years	Water from NashikaKhola and almost available all the year round	Ring well of 17 ft. depth since 2012 and kuwa nearby	Asked to manage alternative source of water if ring well will dry during tunnel construction
8	Narayan Prasad Sapkota	Kavre, Nashikasthan / Eastern tunnel portal	9	Farming	2 cycle comprising Paddy and Potatoes	Piped water from about 700m since 14 years	Water from NashikaKhola and almost available all the year round	Seasonal Kuwastone tap nearby	Drinking water is a private spring so project may not effect, but irrigation water must be conserved
9	Badri Prasad Wagle	Kavre, Karkigau / Eastern tunnel portal	7	Farming	Only Seasonal vegetables	Piped water from about a km since 15 years	None	Stone tap	Drinking water supply system should not be disturbed by the tunnel project
10	ShivahariKarki	Kavre, Karkigau / Eastern tunnel portal	8	Farming	3 cycle comprising Paddy, maize and Potatoes	Piped water from spring of about 800m but not sufficient	Water from NashikaKhola and almost available all the year round	None	Insurance for homes in case of damage from construction activities



S.N	Respondent's Name	Address / Location	Family members	Occupation	Crops cycle	Water for Drinking & Availability	Water for Farming & Availability	Alternative Water source if any	Comments/Feedbacks
11	Dinesh Pandit	Kavre, Karkigau / Eastern tunnel portal	3	Farming	Seasonal vegetables as food and cash crops	Piped water from spring of about 800m but not sufficient	Water from NashikaKhola and almost available all the year round	None	Conserve water resources and infrastructures from project activities
12	Krishna Bahadur Thapa	Kavre, Karkigau / Eastern tunnel portal	11	Farming and service	2 cycle comprising Paddy and vegetables	Piped water from spring of about 800m but not sufficient	None	None	Insurance and reconstruction of infrastructures in case of damage during tunnel construction

Source: Field Survey, 2017

**Annex-C: Water use survey of the farmers and general people above mid-section of proposed tunnel**

S.N	Respondent's Name	Address / Location	Family members	Occupation	Crops cycle	Water for Drinking & Availability	Water for Farming & Availability	Alternative Water source if any	Comments/Feedbacks
13	Dipesh Thapamagar	Kavre, Namunabastii / Mid section of tunnel	2	Farming	3 cycle comprising Paddy, mustard and Seasonal Vegetable	Piped water from Ashapuri and available all season	Water from NashikaKhola and almost available all the year round	None	Construction of irrigation canal is necessary
14	Nirmaya Alemagar	Kavre, Namunabastii / Mid section of tunnel	4	Agriculture	3 cycle comprising Paddy, mustard and Seasonal Vegetable	Piped water from Ashapuri and available all season	Water from NashikaKhola and almost available all the year round	None	Project must take care of water resources and infrastructures
15	Janak Ranamagar	Kavre, Namunabastii / Mid section of tunnel	7	Agriculture and service	Seasonal vegetables as food and cash crops	Piped water from Ashapuri and available all season	None	None	No other option for living except present infrastructures, so project need to adjust family if any damage
16	Badri K.C	Kavre, SangaIttacha / Mid section of tunnel	4	Nepal Army	Seasonal vegetables as food and cash crops	Piped water from hillside of about 800 m	Some water from nearby Kholsi and seasonal	None	Concern regarding damage to houses during tunnel boring. Project need to take care of this.
17	Chittra Kumar Khattri	Kavre, SangaIttacha / Mid section of tunnel	12	Farming and Foreign Employment	Seasonal vegetables and Maize	Piped water from hillside of about 800 m	Some water from nearby Kholsi and seasonal	None	If damage to houses then project should compensate and insure for possible damage
18	Goma K.C	Kavre, SangaIttacha / Mid section of tunnel	4	Agriculture	Maize and seasonal vegetables	Piped water from hillside of about 800 m	Some water from nearby Kholsi and seasonal	None	Water and houses should not be damaged by the project activities

S.N	Respondent's Name	Address / Location	Family members	Occupation	Crops cycle	Water for Drinking & Availability	Water for Farming & Availability	Alternative Water source if any	Comments/Feedbacks
19	Deep Bahadur K.C	Kavre, SangaIttacha / Mid section of tunnel	6	Farming	3 cycle comprising Paddy, Wheat and Seasonal Vegetable	Piped water from hillside of about 800 m	Water from ChatureKhola and is seasonal	None	Manage water in useable form
20	Birinchi Raj Sharma	Kavre, SangaIttacha / Mid section of tunnel	6	Agriculture and service	Seasonal vegetables and Maize	Community managed piped water since 1976	None	None	Insurance to infrastructures is needed for possible damage due to project activities
21	Kamal Prasad Sharma	Kavre, SangaIttacha / Mid section of tunnel	4	Retired Army and Astrologist	Only Seasonal vegetables	Community managed piped water since 1976	None	None	Mass awareness and insurance for constructed infrastructures

Source: Field Survey, 2017

**D. Air Quality Monitoring Data of the Project Site**

**Along the Existing Road Alignment (Suryabinayak – Dhulikhel Road)**



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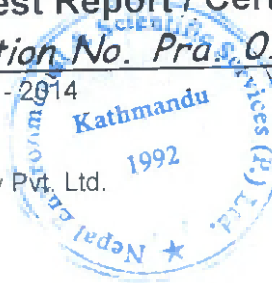
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Page 1 of 6

## QS Test Report / Certificate

**NS Accreditation No. Pr. 01 / 053 - 54**

Entry No. : NCL - 225 (A) (3) - 11 - 2014 Date Received : 25 - 11 - 2014  
 Sample : Air (PM<sub>10</sub>) Date Completed : 30 - 11 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Sampled By : NESS  
 Location : Bhaktapur



### Ambient Air Quality Monitoring Result

Sampling Point : Site 1 (Khowpa Engineering College, Bhaktapur)  
 Monitoring Date : 17 - 11 - 2014  
 Longitude : 85°26'20" E  
 Latitude : 27°39'56" N  
 Elevation : 1276m  
 Altitude Accuracy : 43m  
 Distance from road : 100m  
 Starting Time : 10:15 hr  
 Ending Time : 10:15hr  
 Monitoring Duration : 1340min  
 Flow Rate : 28.3l/min  
 Total Air Volume : 37.92m<sup>3</sup>

Particulate Size, (µm)	Wt. of Dust, (mg)	Wt. Percentage	Cumulative Fraction
PM > 10µm	0.7	2.97	100
7.0µm to 11µm	0.5	2.12	97.03
4.7µm to 7.0µm	1.0	4.24	94.91
3.3µm to 4.7µm	1.2	5.08	90.67
2.1µm to 3.3µm	4.0	16.95	85.59
1.1µm to 2.1µm	7.3	30.93	68.64
0.65µm to 1.1µm	6.2	26.27	37.71
0.43µm to 0.65µm	1.9	8.05	11.44
<0.43µm	0.8	3.39	3.39
<b>Total</b>	<b>23.6</b>	<b>100</b>	<b>000</b>

Notes: The monitoring and analysis was based on Gravimetric (LVAS), JIS Z 8814 (1981) method. The sampling site was surrounded by tall building structures at three faces. The Bhaktapur brick factory (about 500m south from monitoring site) was in operation.

Total Suspended Particulate Matter (TSP) = 622.36µg/m<sup>3</sup>

Respirable Particulate Matter (PM<sub>10</sub>) = 97.03% of TSP = 603.87µg/m<sup>3</sup>

Remarks: The observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN (TSP: 230 µg/m<sup>3</sup>; PM<sub>10</sub>: 120µg/m<sup>3</sup>) for twenty-four hours duration. The major air pollution sources were piling and unloading of construction material (iron rod, etc.), re-suspended dust due to playing game (football) at the sampling point and occasional light vehicles.

(Analyzed By)

(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 225 (A) (3) - 11 - 2014  
Sample : Air (SO<sub>2</sub> & NO<sub>2</sub>)  
Client : Fullbright Consultancy Pvt. Ltd.  
Location : Bhaktapur

Date Received : 25 - 11 - 2014  
Date Completed : 30 - 11 - 2014  
Sampled By : NESS

### Ambient Air Quality Monitoring Result

Sampling Point : Site 1 (Kwopa Engineering College, Bhaktapur)  
Monitoring Date : 17 - 11 - 2014  
Longitude : 85°26'20" E  
Latitude : 27°39'56" N  
Elevation : 1276m  
Altitude Accuracy : 43m  
Distance from road : 100m  
Starting Time : 10:15 hr  
Ending Time : 10:15hr  
Monitoring Duration : 1340min

Parameter	Flow Rate, ( l/min)	Total Air Volume, (m <sup>3</sup> )	Observed Concentration, (µg/m <sup>3</sup> )	NAAQS, 2012 (GoN)
Oxides of Nitrogen, (NO+ NO <sub>2</sub> )	0.3	0.40	18.80	80 for 24 hour
Oxides of Sulphur, (SO <sub>2</sub> )			4.37	70 for 24 hour

Note: The oxides of nitrogen and sulphur dioxide were determined by following Griess - Saltzman Reaction (ASTM - D 1607 - 91) and West - Gaeke (ASTM D 2914 - 91) methods respectively.

Remarks: The observed concentration for both gases complied the prescribed NAAQS - 2012 of GoN. The occasional vehicles and brick kiln smoke were the major sources for gaseous emission.

  
(Analyzed By)

  
(Checked By)

  
(Authorized Signature)

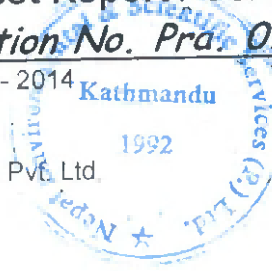
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## QS Test Report / Certificate

**NS Accreditation No. Prd: 01 / 053 - 54**

Entry No. : NCL - 225 (A) (3) - 11 - 2014  
 Sample : Air (PM<sub>10</sub>)  
 Client : Fullbright Consultancy Pvt. Ltd.  
 Location : Bhaktapur

Date Received : 25 - 11 - 2014  
 Date Completed : 30 - 11 - 2014  
 Sampled By : NESS



### Ambient Air Quality Monitoring Result

Sampling Point : Site 2 (Jagati, Bhaktapur)  
 Monitoring Date : 19 - 11 - 2014  
 Longitude : 85°26'21" E  
 Latitude : 27°39'46" N  
 Elevation : 1277m  
 Altitude Accuracy : 22m  
 Distance from road : 5m  
 Starting Time : 9:40 hr  
 Ending Time : 9:40hr  
 Monitoring Duration : 1340min  
 Flow Rate : 28.3l/min  
 Total Air Volume : 37.92m<sup>3</sup>

Particulate Size, (µm)	Wt. of Dust, (mg)	Wt. Percentage	Cumulative Fraction
PM > 10µm	1.4	4.83	100
7.0µm to 11µm	0.8	2.76	95.17
4.7µm to 7.0µm	1.4	4.83	92.41
3.3µm to 4.7µm	2.6	8.97	87.58
2.1µm to 3.3µm	4.4	15.17	78.61
1.1µm to 2.1µm	6.7	23.10	63.44
0.65µm to 1.1µm	7.3	25.17	40.34
0.43µm to 0.65µm	2.5	8.62	15.17
<0.43µm	1.9	6.55	6.55
<b>Total</b>	<b>29.0</b>	<b>100</b>	<b>000</b>


Notes: The monitoring and analysis was based on Gravimetric (LVAS), JIS Z 8814 (1981) method.

Total Suspended Particulate Matter (TSP) = 764.77µg/m<sup>3</sup>

Respirable Particulate Matter (PM<sub>10</sub>) = 95.17% of TSP = 727.83µg/m<sup>3</sup>

Remarks: The observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN (TSP: 230 µg/m<sup>3</sup>; PM<sub>10</sub>: 120µg/m<sup>3</sup>) for twenty-four hours duration. The major dust pollution sources were the re-suspended brick kiln dust, highway and wind blow smokes / particles. The intermittent traffic jam was observed nearby the sampling site.

  
 (Analyzed By)

  
 (Checked By)

  
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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 225 (A) (3) - 11 - 2014 Date Received : 25 - 11 - 2014  
 Sample : Air (SO<sub>2</sub> & NO<sub>2</sub>) Date Completed : 30 - 11 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Sampled By : NESS  
 Location : Bhaktapur


### Ambient Air Quality Monitoring Result

Sampling Point : Site 2 (Jagati, Bhaktapur)  
 Monitoring Date : 19 - 11 - 2014  
 Longitude : 85°26'21" E  
 Latitude : 27°39'46" N  
 Elevation : 1277m  
 Altitude Accuracy : 22m  
 Distance from road : 5m  
 Starting Time : 9:40 hr  
 Ending Time : 9:40hr  
 Monitoring Duration : 1340min


Parameter	Flow Rate, (l/min)	Total Air Volume, (m <sup>3</sup> )	Observed Concentration, (µg/m <sup>3</sup> )	NAAQS, 2012 (GoN)
Oxides of Nitrogen, (NO+ NO <sub>2</sub> )	0.3	0.40	16.0	80 for 24 hour
Oxides of Sulphur, (SO <sub>2</sub> )			6.6	70 for 24 hour

Note: The oxides of nitrogen and sulphur dioxide were determined by following Griess - Saltzman Reaction (ASTM - D 1607 - 91) and West - Gaeke (ASTM D 2914 - 91) methods respectively. Burning of plant and waste materials were observed for about an hour at the evening time.

Remarks: The observed concentration for both gases complied the prescribed NAAQS - 2012 of GoN. The vehicles and brick kiln smoke were the major sources for gaseous emission.

  
 (Analyzed By)

  
 (Checked By)

  
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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 225 (A) (3) - 11 - 2014  
 Sample : Air (PM<sub>10</sub>)  
 Client : Fullbright Consultancy Pvt. Ltd.  
 Location : Banepa

Date Received : 25 - 11 - 2014  
 Date Completed : 30 - 11 - 2014  
 Sampled By : NESS

### Ambient Air Quality Monitoring Result

Sampling Point : Site 3 (Chadani Chowk, Banepa - 6)  
 Monitoring Date : 21 - 11 - 2014  
 Longitude : 85°31'18" E  
 Latitude : 27°37'50" N  
 Elevation : 1429m  
 Altitude Accuracy : 18m  
 Distance from road : 10m  
 Starting Time : 9:50 hr  
 Ending Time : 9:50hr  
 Monitoring Duration : 1390min  
 Flow Rate : 28.3l/min  
 Total Air Volume : 39.34m<sup>3</sup>

Particulate Size, (µm)	Wt. of Dust, (mg)	Wt. Percentage	Cumulative Fraction
PM > 10µm	9.4	31.02	100
7.0µm to 11µm	2.8	9.24	68.98
4.7µm to 7.0µm	3.3	10.90	59.74
3.3µm to 4.7µm	2.4	7.92	48.84
2.1µm to 3.3µm	2.6	8.58	40.92
1.1µm to 2.1µm	3.7	12.21	32.34
0.65µm to 1.1µm	3.6	11.88	20.13
0.43µm to 0.65µm	1.6	5.28	8.25
<0.43µm	0.9	2.97	2.97
<b>Total</b>	<b>30.3</b>	<b>100</b>	<b>000</b>

Notes: The monitoring and analysis was based on Gravimetric (LVAS), JIS Z 8814 (1981) method. The sampling site was located at the parking zone near bus park area (50m opposite)

Total Suspended Particulate Matter (TSP) = 770.21µg/m<sup>3</sup>

Respirable Particulate Matter (PM<sub>10</sub>) = 68.98% of TSP = 531.29µg/m<sup>3</sup>

Remarks: The observed TSP and PM<sub>10</sub> values did not comply the prescribed NAAQS of GoN (TSP: 230 µg/m<sup>3</sup>; PM<sub>10</sub>: 120µg/m<sup>3</sup>) for twenty-four hours duration. The dust due to pavement sweeping, street dogs playing and high traffic were responsible for release of particulate matters in the sampling point. The particulate size of aerodynamic size 10 micrometer was found to be dominated over other sized particles.

(Analyzed By)

(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

### NS Accreditation No. Pra. 01 / 053 - 54

Entry No. : NCL - 225 (A) (3) - 11 - 2014 Date Received : 25 - 11 - 2014  
 Sample : Air (SO<sub>2</sub> & NO<sub>2</sub>) Date Completed : 30 - 11 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Kathmandu Sampled By : NESS  
 Location : Banepa



### Ambient Air Quality Monitoring Result

Sampling Point : Site 3 (Chadani Chowk, Banepa - 6)  
 Monitoring Date : 21 - 11 - 2014  
 Longitude : 85°31'18" E  
 Latitude : 27°37'50" N  
 Elevation : 1429m  
 Altitude Accuracy : 18m  
 Distance from road : 10m  
 Starting Time : 9:50 hr  
 Ending Time : 9:50hr  
 Monitoring Duration : 1390min

Parameter	Flow Rate, (l/min)	Total Air Volume, (m <sup>3</sup> )	Observed Concentration, (µg/m <sup>3</sup> )	NAAQS, 2012 (GoN)
Oxides of Nitrogen, (NO+ NO <sub>2</sub> )	0.3	0.42	21.60	80 for 24 hour
Oxides of Sulphur, (SO <sub>2</sub> )			4.16	70 for 24 hour

Note: The oxides of nitrogen and sulphur dioxide were determined by following Griess - Saltzman Reaction (ASTM - D 1607 - 91) and West - Gaeke (ASTM D 2914 - 91) methods respectively.

Remarks: The observed concentration for both gases complied the prescribed NAAQS - 2012 of GoN. The vehicles smoke was the major source for gaseous emission.

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(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

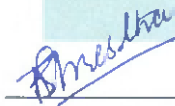
Entry No. : NCL - 217(W) (3) - 11 - 2014 Date Received : 17 - 11 - 2014  
Sample : River Water (Chakka Khola) Date Completed : 28 - 11 - 2014  
Client : Fullbright Consultancy Pvt. Ltd. Sampling Date : 17 - 11 - 2014  
Sampled By : NESS Location : Bhaktapur

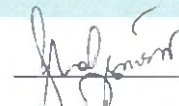
S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 17°C	Electromeric, 4500 - H <sup>+</sup> B., APHA	7.2	5.5 - 9
2.	Total Suspended Solids, (mg/l)	Oven Drying, 2540 D APHA	8	200, max
3.	Biological Oxygen Demand, (mg/l)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 - 1989	6.8	100, max
4.	Coliform, (MPN Index / 100ml)	Multiple Tube Fermentation, 9221 E, APHA	>1100	-

**Note:**

APHA: American Public Health Association; MPN: Most Probable Number; GoN: Government of Nepal.

**Remarks:** The river water was highly contaminated with coliform bacteria.

  
(Analyzed By)

  
(Checked By)

- Note:**
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Page 2 of 3

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**


Entry No. : NCL - 217(W) (3) - 11-2014 Date Received : 17 - 11 - 2014  
Sample : River Water Date Completed : 28 - 11 - 2014  
(Bikateshwor Mahadev Khola) Sampling Date : 17 - 11 - 2014  
Client : Fullbright Consultancy Pvt. Ltd. Location : Kavre  
Sampled By : NESS

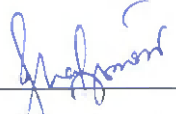
S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 17°C	Electromeric, 4500 - H <sup>+</sup> B.; APHA	7.2	5.5 - 9
2.	Total Suspended Solids, (mg/l)	Oven Drying, 2540 D APHA	15	200, max
3.	Biological Oxygen Demand, (mg/l)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 - 1989	7.8	100, max
4.	Coliform, (MPN Index / 100ml)	Multiple Tube Fermentation, 9221 E, APHA	>1100	-

**Note:**

APHA: American Public Health Association; MPN: Most Probable Number; GoN: Government of Nepal.

**Remarks:** The river water was highly contaminated with coliform bacteria.

  
(Analyzed By)

  
(Checked By)

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## QS Test Report / Certificate

NS Accreditation No. Pra. 01/053-54


Entry No. : NCL - 217(W) (3) - 11-2014 Date Received : 17 - 11 - 2014  
Sample : River Water (Punyamata Khola) Date Completed : 28 - 11 - 2014  
Client : Fullbright Consultancy Pvt. Ltd. Sampling Date : 17 - 11 - 2014  
Sampled By : NESS Location : Kavre

S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 17°C	Electromeric, 4500 - H <sup>+</sup> B.; APHA	7.3	5.5 - 9
2.	Total Suspended Solids, (mg/l)	Oven Drying, 2540 D APHA	22	200, max
3.	Biological Oxygen Demand, (mg/l)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 - 1989	30	100, max
4.	Coliform, (MPN Index / 100ml)	Multiple Tube Fermentation, 9221 E, APHA	>1100	-

**Note:**

APHA: American Public Health Association; MPN: Most Probable Number; GoN: Government of Nepal.

**Remarks:** The river water was highly contaminated with coliform bacteria.

  
(Analyzed By)

  
(Checked By)

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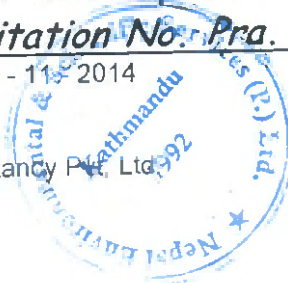
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Page 1 of 3

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 226 (O) (3) - 11-2014 Date Received : 25 - 11 - 2014  
 Sample : Noise Date Completed : 01 - 12 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Sampled By : NESS  
 Location : Bhaktapur



### A. Sampling Site

Sampling Point : Site 1 (Khowpa Engineering College)  
 Monitoring Date : 17 - 11 - 2014  
 Longitude : 85°26'20" E  
 Latitude : 27°39'56"N  
 Elevation : 1276 ± 43m  
 Distance from road : 100m

### B. Instrumental Specification


Instrument Name : Digital Sound Level Meter  
 Manufacturer : Lutron, Taiwan  
 Measuring Range : 35 to 130 dBA  
 Service Temperature Range : 0 to 40 degree Celsius.  
 Model No. : SL 4010  
 Serial No. : B 33990  
 Calibrated at : 94dB(A)


### C. Sound Pressure Level, Bhaktapur

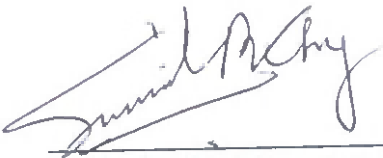
Noise Descriptors	Monitoring Hours											
	07:00	10:00	11:00	13:00	15:00	17:00	19:00	21:00	23:00	01:00	03:00	05:00
L <sub>eq</sub>	64	73	69	66	71	66	58	65	57	51	49	54
L <sub>d</sub>	68											
L <sub>n</sub>	53											
L <sub>dn</sub>	67											

Notes: The noise descriptors were calculated from the ten minutes interval monitoring data for each time zone. The dominating noise sources in the monitoring site were sounds from the leisure activities, unloading metal contact, human voice pitches, window and door panes opening / closing, bird chirrups, dog barking and occasional aircraft and helicopter. The general weather was ranged from calm, cloudy to fine.

Remarks: The observed daytime sound pressure level in the monitoring site exceeded the prescribed national noise standard, 2012 of GoN for mixed settlement area [L<sub>d</sub>: 63dB(A); L<sub>n</sub>: 55dB(A)].

  
(Analyzed By)

  
(Checked By)

  
(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 226 (O) (3) - 11 - 2014 Date Received : 25 - 11 - 2014  
 Sample : Noise Date Completed : 01 - 12 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Sampled By : NESS  
 Location : Bhaktapur



### A. Sampling Site

Sampling Point : Site 2 (Jagati Nearby Police Check Post, Bhaktapur)  
 Monitoring Date : 19 - 11 - 2014  
 Longitude : 85°26'21" E  
 Latitude : 27°39'46" N  
 Elevation : 1277±22m  
 Distance from road : 5m

### B. Instrumental Specification

Instrument Name : Digital Sound Level Meter  
 Manufacturer : Lutron, Taiwan  
 Measuring Range : 35 to 130 dBA  
 Service Temperature Range : 0 to 40 degree Celsius.  
 Model No. : SL 4010  
 Serial No. : B 33990  
 Calibrated at : 94dB(A)

### C. Sound Pressure Level, Bhaktapur

dB(A)

Noise Descriptors	Monitoring Hours											
	08:30	09:30	11:30	14:30	16:30	18:30	20:30	22:30	24:30	02:30	04:30	06:30
L <sub>eq</sub>	80	79	76	81	78	78	75	69	67	57	76	77
L <sub>d</sub>	79											
L <sub>n</sub>	73											
L <sub>dn</sub>	81											

Notes: The noise descriptors were calculated from the ten minutes interval monitoring data for each time zone. The dominating noise sources in the monitoring site were the engine noises, brake drums and honking horns generated from highway vehicles. The general weather was ranged from cool to fine.

Remarks: The observed daytime and nighttime sound pressure levels in the monitoring site exceeded the prescribed national noise standards, 2012 of GoN for mixed area [L<sub>d</sub>: 63dB(A); L<sub>n</sub>: 55dB(A)].

(Analyzed By)

(Checked By)

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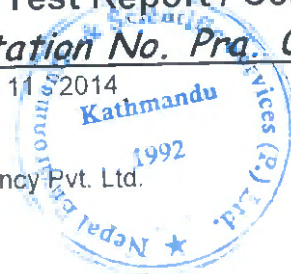
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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01 / 053 - 54**

Entry No. : NCL - 226 (O) (3) - 11/2014 Date Received : 25 - 11 - 2014  
 Sample : Noise Date Completed : 01 - 12 - 2014  
 Client : Fullbright Consultancy Pvt. Ltd. Sampled By : NESS  
 Location : Banepa



### A. Sampling Site

Sampling Point : Site 3 (Chadani Chowk, Banepa - 6)  
 Monitoring Date : 21 - 11 - 2014  
 Longitude : 85°31'18" E  
 Latitude : 27°37'50" N  
 Elevation : 1429±18m  
 Distance from road : 10m

### B. Instrumental Specification

Instrument Name : Digital Sound Level Meter  
 Manufacturer : Lutron, Taiwan  
 Measuring Range : 35 to 130 dBA  
 Service Temperature Range : 0 to 40 degree Celsius.  
 Model No. : SL 4010  
 Serial No. : B 33990  
 Calibrated at : 94dB(A)

### C. Sound Pressure Level, Banepa

dB(A)

Noise Descriptors	Monitoring Hours											
	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00	24:00	02:00	04:00	06:00
L <sub>eq</sub>	81	80	80	79	81	80	77	72	68	63	70	79
L <sub>d</sub>	79											
L <sub>n</sub>	74											
L <sub>dn</sub>	82											

Notes: The noise descriptors were calculated from the ten minutes interval monitoring data for each time zone. The dominating noise sources in the monitoring site were the engine noises, brake drums and honking horns generated from highway vehicles. The general weather was ranged from cool, partially cloudy to fine.

Remarks: The observed daytime and nighttime sound pressure levels in the monitoring site exceeded the prescribed national noise standards, 2012 of GoN for mixed area [L<sub>d</sub>: 63dB(A); L<sub>n</sub>: 55dB(A)].

(Analyzed By)

(Checked By)

(Authorized Signature)

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 243(A) (2) - 12 - 2017	Date Received : 18 - 12 - 2017
Sample : Air	Date Completed : 05 - 01 - 2018
Client : Full Bright Consultancy	Monitored By : NESS

### Ambient Air Quality, West Portal

Sampling Point	: West Portal (Tunnel 1), Palase-9, Suryabinayak Municipality
Monitoring Date	: 15/16 - 12 - 2017
Distance from Road	: ~100m
Elevation	: 1432m
Latitude	: 27° 38' 37.38"N
Longitude	: 85° 28' 4.66"E
Starting Time	: 10:00
Ending Time	: 10:00
Monitoring Duration	: 1290 minutes
Monitoring Instrument	: Low Volume Air Sampler (Anderson Type)
Flow Rate	: 28.3L/min
Total Air Volume	: 36.51m <sup>3</sup>

Particulate Size, (µm)	Wt. of Dust, (mg)	Percentage Weight Fraction	Cumulative Weight Percentage
PM > 10µm	0.7	11.29	100
7.0µm to 10µm	0.9	14.52	88.71
4.7µm to 7.0µm	1.4	22.58	74.19
3.3µm to 4.7µm	0.8	12.90	51.61
2.1µm to 3.3µm	0.7	11.29	38.71
1.1µm to 2.1µm	0.4	6.45	27.42
0.65µm to 1.1µm	0.2	3.23	20.97
0.43µm to 0.65µm	0.4	6.45	17.74
<0.43µm	0.7	11.29	11.29
<b>Total</b>	<b>6.2</b>	<b>100</b>	<b>0</b>

Total Suspended Particles	=	169.82µg/m <sup>3</sup>	
Respirable Particulate Matter (PM <sub>10</sub> )	=	87.71 % of TSP =	150.64µg/m <sup>3</sup>
Respirable Fine Particles (PM <sub>2.5</sub> )	=	38.71% of TSP =	65.74µg/m <sup>3</sup>

Notes: The monitoring area lies in the agriculture field. The dominating dust emission sources were primarily windblown dust from the land. Additionally, the secondary air pollution sources were contributed by the highway moving vehicles emitted smokes and dust.

Remarks: The observed twenty four hours average values for TSP complied the prescribed NAAQS, 2012 limits (TSP=230µg/m<sup>3</sup>). But the observed values for PM<sub>10</sub> and PM<sub>2.5</sub> was greater than 120 µg/m<sup>3</sup> and 40µg/m<sup>3</sup> (NAAQS, 2012) respectively. The observed PM<sub>10</sub>: TSP and PM<sub>2.5</sub>: PM<sub>10</sub> were found to be 0.88 and 0.44 respectively.

(Monitored By)

(Checked By)

(Authorized Signature)

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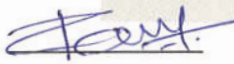
NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

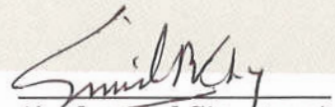
### Metrological Parameters, West Portal

Sampling Point : West Portal (Tunnel 1), Palase-9, Suryabinayak Municipality  
 Monitoring Date : 15/16 - 12 - 2017  
 Distance from Road : ~100m

Time, (Hr)	General Weather	Air Temperature, (°C)	Wind Speed, (m/s)	Wind Direction, (Bearing)
11:00	Slightly Warm	21	2.4	90
12:00	Slightly Warm	21	2.2	130
13:00	Warm	22	2.4	132
14:00	Warm	22	2.4	62
15:00	Warm	20	2.2	24
16:00	Moderate	16	2	68
17:00	Moderate	13	1.6	180
18:00	Moderate	10	1.4	160
19:00	Moderate	10	1.6	334
20:00	Cool	9	0.8	240
21:00	Cool	9	0.6	70
22:00	Cool	8	0.4	142
23:00	Cool	7	0.2	90
24:00	Cool	6	0.1	230
1:00	Cool	6	0.4	270
2:00	Cold	5	0.4	140
3:00	Cold	4	0.9	74
4:00	Cold	3	0.6	130
5:00	Cold	4	0.8	270
6:00	Cold	4	0.6	310
7:00	Cold	5	0.8	290
8:00	Cool	6	1	308
9:00	Cool	9	1.2	70
10:00	Slightly Warm	14	1.4	146

  
 (Monitored By)

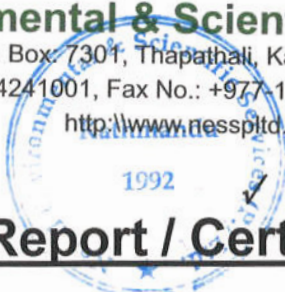
  
 (Checked By)

  
 (Authorized Signature)

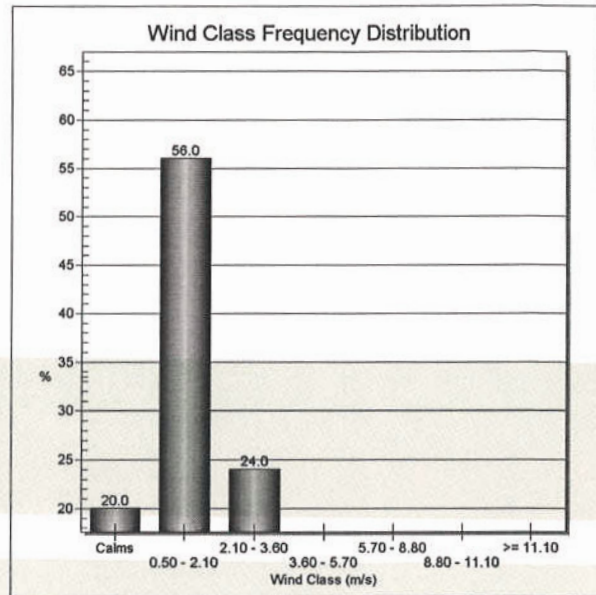
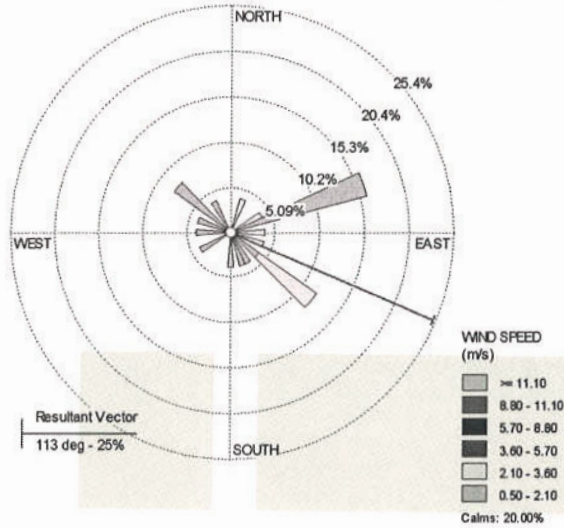
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NESS/Lab, M-03/R1.1



## QS Test Report / Certificate



Windrose

Wind Class Frequency Distribution

**Remarks:** The observed average air temperature and wind speed were 11°C and 1.18m/s respectively. The windrose diagram entailed that about 25% of the monitoring time, the resultant wind vector was divergent towards 113 degree, and calm wind frequency was about 20%. The dominant wind was light breeze (56%) type (Beaufort wind scale: 1). The smokes moved slightly with the breeze and showed the direction of wind at the observed wind class.

(Monitored By)

(Checked By)

(Authorized Signature)

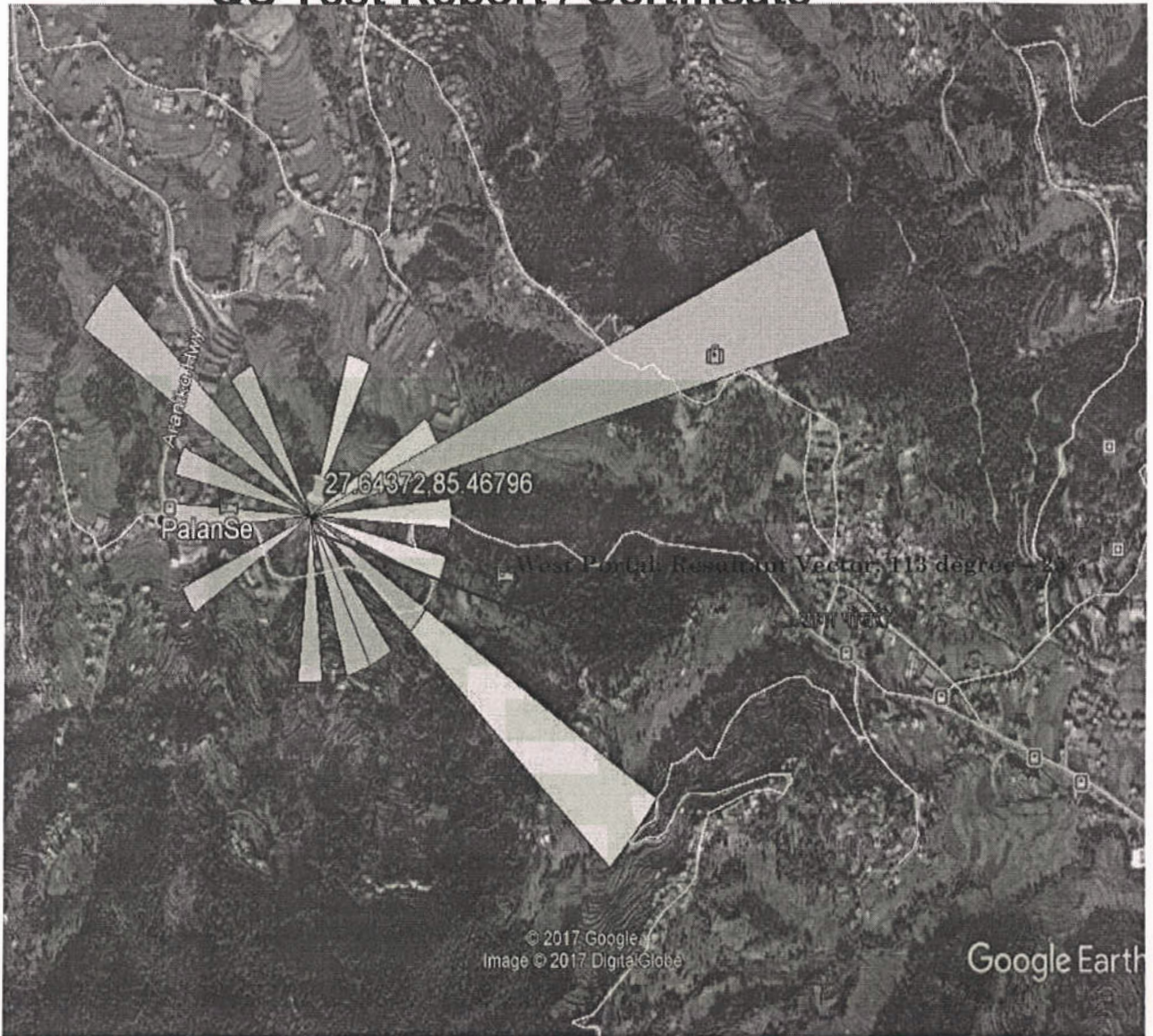
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## QS Test Report / Certificate



*Handwritten signature*

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 243(A) (2) - 12 - 2017

Date Received : 12 - 12 - 2017

Sample : Air

Date Completed : 05 - 01 - 2018

Client : Full Bright Consultancy

Monitored By : NESS

### Gaseous Pollutants, West Portal

Sampling Point : West Portal (Tunnel 1), Palase-9, Suryabinayak Municipality  
Monitoring Date : 15/16 - 12 - 2017  
Distance from Road : ~100m  
Elevation : 1432m  
Latitude : 27° 38' 37.38"N  
Longitude : 85° 28' 4.66"E

S. N.	Parameters	Test Methods	Observed Values
1.	Sulfur Dioxide (SO <sub>2</sub> ), (µg/m <sup>3</sup> )	West - Gaeke Method, ASTM D 2914 - 91	13.96
2.	Nitrogen Dioxide (NO <sub>2</sub> ), (µg/m <sup>3</sup> )	Griess - Saltzman Reaction ASTM D D3608 - 91	0.15

Note:

ASTM: American Society for Testing Materials.

**Remarks: The observed twenty four hours values for sulfur dioxide and nitrogen dioxide complied the prescribed NAAQS, 2012 limits ( SO<sub>2</sub> = 70µg/m<sup>3</sup>; NO<sub>2</sub> = 80µg/m<sup>3</sup>).**

(Monitored By)

(Checked By)

(Authorized Signature)

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No.	: NCL - 243(A) (2) - 12 - 2017	Date Received	: 12 - 12 - 2017
Sample	: Air	Date Completed	: 05 - 01 - 2018
Client	: Full Bright Consultancy	Monitored By	: NESS

### Ambient Air Quality, East Portal

Sampling Point	: East Portal (Tunnel 2), Sanga -14, Banepa Municipality
Monitoring Date	: 17/18 - 12 - 2017
Distance from Road	: ~150m
Elevation	: 1497m
Latitude	: 27° 38' 22.24"N
Longitude	: 85° 28' 52.00"E
Starting Time	: 11:00
Ending Time	: 11:00
Monitoring Duration	: 1345 minutes
Monitoring Instrument	: Low Volume Air Sampler (Anderson Type)
Flow Rate	: 28.3L/min
Total Air Volume	: 38.06m <sup>3</sup>

Particulate Size, (µm)	Wt. of Dust, (mg)	Percentage Weight Fraction	Cumulative Weight Percentage
PM > 10µm	0.2	5.88	100
7.0µm to 10µm	0.2	5.88	94.12
4.7µm to 7.0µm	0.4	11.76	88.24
3.3µm to 4.7µm	0.3	8.82	76.47
2.1µm to 3.3µm	0.1	2.94	67.65
1.1µm to 2.1µm	0.8	23.53	64.71
0.65µm to 1.1µm	0.5	14.71	41.18
0.43µm to 0.65µm	0.5	14.71	26.47
<0.43µm	0.4	11.76	11.76
<b>Total</b>	<b>3.4</b>	<b>100</b>	<b>0</b>

Total Suspended Particles	=	89.33µg/m <sup>3</sup>	
Respirable Particulate Matter (PM <sub>10</sub> )	=	94.12 % of TSP =	84.08µg/m <sup>3</sup>
Respirable Fine Particles (PM <sub>2.5</sub> )	=	67.65% of TSP =	60.43µg/m <sup>3</sup>

Notes: The monitoring area lies in the agricultural land above the road level where the green dry bricks were stacked. The primary air pollution sources were the windblown dust either from the agricultural land or from the highway. During the monitoring hours, no brick making activities or loose soil was deposited.

Remarks: The observed twenty four hours average values for TSP complied the prescribed NAAQS, 2012 limits (TSP=230µg/m<sup>3</sup>). The observed value for PM<sub>10</sub> was found lesser than 120 µg/m<sup>3</sup> and PM<sub>2.5</sub> was found greater than 40µg/m<sup>3</sup> (NAAQS, 2012) respectively. The observed PM<sub>10</sub>: TSP and PM<sub>2.5</sub>: PM<sub>10</sub> were found to be 0.94 and 0.72 respectively.

(Monitored By)

(Checked By)

(Authorized Signature)

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

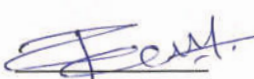
**NS Accreditation No. Pra: 01/053-54**

Entry No.	: NCL - 243(A) (2) - 12 - 2017	Date Received	: 12 - 12 - 2017
Sample	: Air	Date Completed	: 05 - 01 - 2018
Client	: Full Bright Consultancy	Monitored By	: NESS

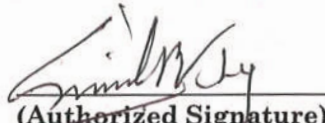
### Metrolological Parameters, East Portal

Sampling Point	: East Portal (Tunnel 2), Sanga -14, Banepa Municipality
Monitoring Date	: 17/18 - 12 - 2017
Distance from Road	: ~150m
Elevation	: 1497m
Latitude	: 27° 38' 22.24"N
Longitude	: 85° 28' 52.00"E

Time, (Hr)	General Weather	Air Temperature, (°C)	Wind Speed, (m/s)	Wind Direction, (Bearing)
11:00	Warm	18	2	144
12:00	Warm	19	3.6	310
13:00	Warm	20	2.2	100
14:00	Warm	20	2	90
15:00	Warm	19	2	60
16:00	Warm	18	2.2	64
17:00	Slightly Cool	12	1.4	76
18:00	Slightly Cool	11	1.2	80
19:00	Cool	9	0.8	140
20:00	Cool	8	1	240
21:00	Cool	8	0.8	170
22:00	Cool	8	0.6	88
23:00	Cool	7	0.8	74
24:00	Cool	6	0.4	160
1:00	Cool	6	0.6	280
2:00	Cool	6	1	310
3:00	Cold	5	0.4	210
4:00	Cold	4	0.6	92
5:00	Cold	4	1	84
6:00	Cold	3	0.8	60
7:00	Cold	3	1	22
8:00	Cold	3	1.2	280
9:00	Cool	7	1.4	300
10:00	Slightly Cool	11	1.1	120
11:00	Slightly Cool	12	2.5	209

  
(Monitored By)

  
(Checked By)

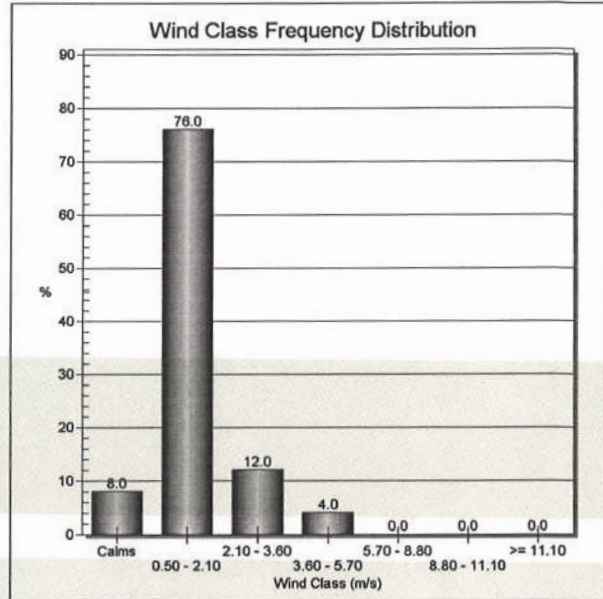
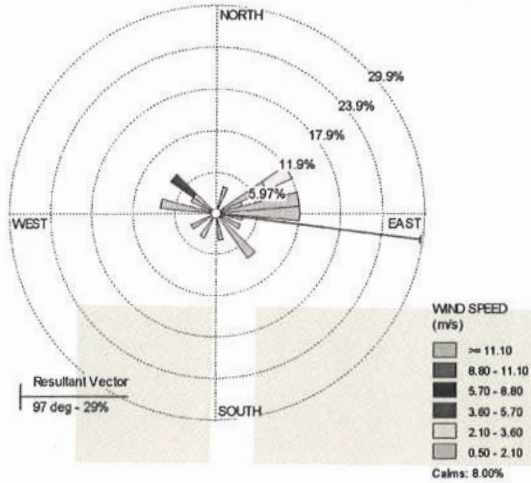
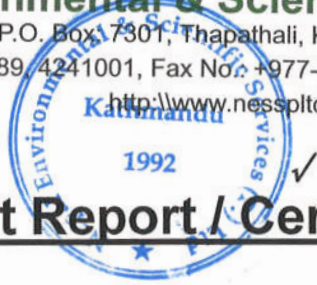
  
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# QS Test Report / Certificate



Windrose

Wind Class Frequency Distribution

**Remarks:** The observed average air temperature and wind speed were 10°C and 1.3 m/s respectively. The windrose diagram entailed that about 29% of the monitoring time, the resultant wind vector was divergent towards 97degree, and calm wind frequency was about 8%. The dominant wind was light breeze (76%) type (Beaufort wind scale: 1). The smokes moved slightly with the breeze and showed the direction of wind at the observed wind class.

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(Checked By)

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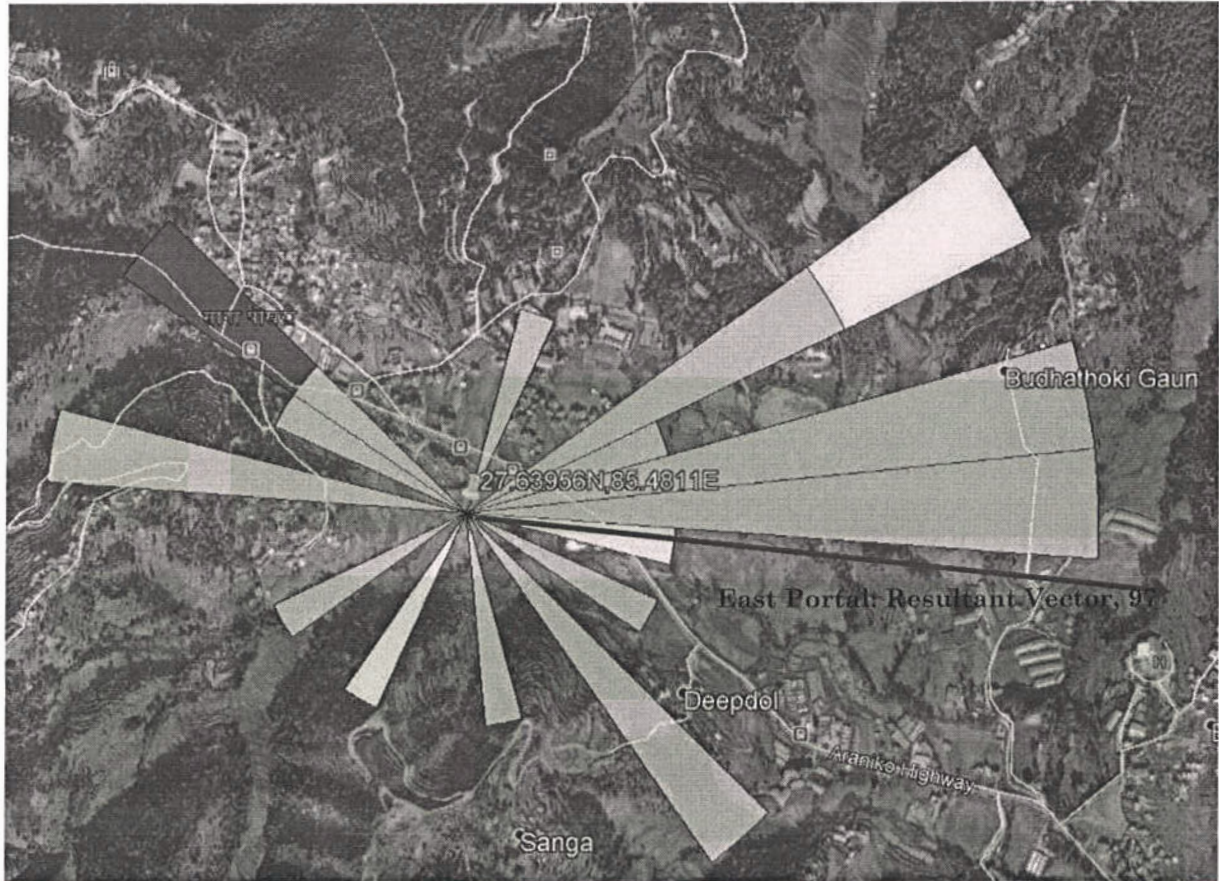
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## QS Test Report / Certificate

**NS Accreditation No. 19 Pra. 01/053-54**

Entry No. : NCL - 243(A) (2) - 12 - 2017 Date Received : 12 - 12 - 2017  
Sample : Air Date Completed : 04 - 01 - 2018  
Client : Full Bright Consultancy Monitored By : NESS

### Gaseous Pollutants, East Portal

Sampling Point : East Portal (Tunnel 2), Sanga -14, Banepa Municipality  
Monitoring Date : 17/18 - 12 - 2017  
Distance from Road : ~150m  
Elevation : 1497m  
Latitude : 27° 38' 22.24"N  
Longitude : 85° 28' 52.00"E

S. N.	Parameters	Test Methods	Observed Values
1.	Sulfur Dioxide (SO <sub>2</sub> ), (µg/m <sup>3</sup> )	West - Gaeke Method, ASTM D 2914 - 91	<2.7
2.	Nitrogen Dioxide (NO <sub>2</sub> ), (µg/m <sup>3</sup> )	Griess - Saltzman Reaction ASTM D D3608 - 91	0.26

Note:

ASTM: American Society for Testing Materials.

**Remarks: The observed twenty four hours values for sulfur dioxide and nitrogen dioxide complied the prescribed NAAQS, 2012 limits ( SO<sub>2</sub> = 70µg/m<sup>3</sup>; NO<sub>2</sub> = 80µg/m<sup>3</sup>).**

(Monitored By)

(Checked By)

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 242 (W) (3) - 12 - 2017 Date Received : 18 - 12 - 2017  
Sample : Well Water (East Portal/Tunnel- 2) Date Completed : 05 - 01 - 2018  
Client : Full Bright Consultancy Sampled By : NESS  
Latitude : 27° 38' 22"N Source : 1  
Longitude : 85° 28' 55"E Elevation : 1510m  
Location : Banepa Municipality, Kavre, Sanga, Ward No. 14

S. N.	Parameters	Test Methods	Observed Values
1.	pH @ 17°C	Electromeric, 4500 - H+ B.; APHA	6.6
2.	Total Suspended Solids, (mg/L)	Oven Drying, 2540 D APHA	2
3.	Biological Oxygen Demand, (mg/L)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 - 1989	2
4.	<i>E. coli</i> Count, (MPN Index /100 mL)	Multiple Tube Fermentation, 9221 E, APHA	75

**Note:**

APHA: American Public Health Association; ISO: International Organization for Standardization; MPN: Most Probable Number.

**Remarks:** The tested water sample was found to be contaminated with *E. coli* bacteria.

(Analyzed By)

(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 242 (W) (3) - 12 - 2017 Date Received : 18 - 12 - 2017  
Sample : Rivulet Stream Water (East Portal/  
Tunnel-2) Date Completed : 05 - 01 - 2018  
Client : Full Bright Consultancy Source : 2  
Latitude : 27° 38' 22"N Elevation : 1500m  
Longitude : 85° 28' 55"E  
Location : Banepa Municipality, Kavre, Sanga, Ward No. 14

S. N.	Parameters	Test Methods	Observed Values
1.	pH @ 17°C	Electromeric, 4500 - H+ B, : APHA	7.5
2.	Total Suspended Solids, (mg/L)	Oven Drying, 2540 D APHA	<1
3.	Biological Oxygen Demand, (mg/L)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 – 1989	3
4.	E. coli Count, (MPN Index /100 mL)	Multiple Tube Fermentation, 9221 E, APHA	>1100

**Note:**

APHA: American Public Health Association; ISO: International Organization for Standardization; MPN: Most Probable Number.

**Remarks: The tested water sample was found to be contaminated with E. coli bacteria.**

(Analyzed By)

(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 242 (W) (3) - 12 - 2017 Date Received : 18 - 12 - 2017  
Sample : Water (West Portal/ Tunnel-1) Date Completed : 05 - 01 - 2018  
Client : Full Bright Consultancy Sampled By : NESS  
Latitude : 27° 38' 39"N Source : 3  
Longitude : 85° 28' 03"E Elevation : 1430m  
Location : Suryabinayak Municipality, Bhaktapur, Palase, Ward No. 9

S. N.	Parameters	Test Methods	Observed Values
1.	pH @ 17°C	Electromeric, 4500 - H+ B.; APHA	7.4
2.	Total Suspended Solids, (mg/L)	Oven Drying, 2540 D APHA	32
3.	Biological Oxygen Demand, (mg/L)	Winkler Azide Modification (Dilution & Seeding), 5210 B, APHA, ISO 5815 - 1989	19
4.	<i>E. coli</i> Count, (MPN Index /100 mL)	Multiple Tube Fermentation, 9221 E, APHA	>1100

**Note:**

APHA: American Public Health Association; ISO: International Organization for Standardization; MPN: Most Probable Number.

**Remarks:** The tested water sample was found to be contaminated with *E. coli* bacteria.

(Analyzed By)

(Checked By)

(Authorized Signature)

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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 244 (Oth) (2) - 12 - 2017 Date Received : 18 - 12 - 2017  
 Sample : Sound Pressure Level Date Completed : 05 - 01 - 2018  
 Client : Full Bright Consultancy Monitored By : NESS

### Sound Pressure Level, East Portal

Monitoring Site : East Portal (Tunnel 2)  
 Location : Opposite of Nasika Bus Stop, Sanga, Ward No 14, Banepa Municipality, Kavre  
 Distance from road : about 200m south  
 Height from ground surface : 1.5m  
 Equipment Use : Digital Sound Level Meter  
 Latitude : 27°38'21.86"N  
 Longitude : 85°28'51.31"E  
 Elevation : 1504m  
 Starting Monitoring Date : 17/12/2017  
 Ending Monitoring Date : 18/12/2017  
 Monitored By : Pramod KC & Jit Bahadur Khatri

### Instrument Name **Digital Sound Level Meter**

Manufacturer : Lutron, Taiwan  
 Measuring Range : 35 to 130 dBA  
 Service Temperature Range : 0 to 40 degree Celsius.  
 Model No. : SL 4010  
 Serial No. : B 33990  
 Calibrated at : 94dB(A)

dB(A)

Noise Descriptors	Monitoring Hours							
	11:00	14:00	17:30	20:00	23:00	02:00	05:00	08:00
$L_{eq}$	43	42	48	48	42	40	44	49
$L_d$	48							
$L_n$	42							
$L_{dn}$	56							

Notes: The calculation was based on the recorded 10 minutes data set. The method applied for monitoring and calculation was based on equal energy partition JIS Z 8731(1983);  $L_{eq}$ : Average sound pressure level;  $L_d$ : Average day time sound pressure level;  $L_n$ : Average night time sound pressure level;  $L_{dn}$ : 24 hour average sound pressure level

Remarks: The observed equivalent sound pressure ranged from 40dB (A) to 49dB (A). The observed day time and night time average sound pressure level at the monitoring site complied the sound pressure level of 63dB (A) and 55dB (A) for mixed residential area respectively (GoN, 2012). Similarly, the observed 24 hour average equivalent sound pressure level was lesser than 70dB (A).

(Monitored By)

(Checked By)

(Authorized Signature)

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NESS/Lab, M-03/R1.1

## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 244 (Oth) (2) - 12 - 2017 Date Received : 18 - 12 - 2017  
 Sample : Sound Pressure Level Date Completed : 05 - 01 - 2018  
 Client : Full Bright Consultancy Monitored By : NESS

### General Monitoring Conditions and Major Noise Sources

Monitoring Site : East Portal (Tunnel 2)  
 Location : Opposite of Nasika Bus Stop, Sanga, Ward No 14, Banepa Municipality, Kavre  
 Distance from road : about 200m south  
 Height from ground surface : 1.5m  
 Latitude : 27°38'21.86"N  
 Longitude : 85°28'51.31"E

S. N.	Monitoring Time Zone	Monitoring Time	General Weather Conditions	Recorded Sound Sources	Remarks
1.	10:00 ~ 12:00	11:30	Fine	Highway vehicular engine noise; horn	<ul style="list-style-type: none"> <li>• Single time honking horn: 56dB(A)</li> <li>• Minimum Sound Pressure Level: 36dB(A)</li> <li>• Maximum Sound pressure Level: 56dB(A)</li> </ul> The background sound pressure level was raised by the highway vehicular emitted noise.
2.	13:00 ~ 15:00	14:00	Fine	Highway vehicular engine noise; horn	<ul style="list-style-type: none"> <li>• Single time honking horn: 52dB(A)</li> <li>• Minimum Sound Pressure Level: 34dB(A)</li> <li>• Maximum Sound pressure Level: 53dB(A)</li> </ul>
3.	16:00 ~ 18:00	17:00	Slightly cool wind	Highway vehicular engine noise	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 42dB(A)</li> <li>• Maximum Sound pressure Level: 55dB(A)</li> </ul>
4.	19:00 ~ 21:00	20:00	Cool	Occasional highway vehicular engine noise and nocturnal insects pitches	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 39dB(A)</li> <li>• Maximum Sound pressure Level: 59dB(A)</li> </ul>
5.	22:00 ~ 24:00	23:00	Cool	Occasional highway vehicular engine noise, horns and nocturnal insects pitches	<ul style="list-style-type: none"> <li>• Two times honking horn: 58dB(A)</li> <li>• Minimum Sound Pressure Level: 32dB(A)</li> <li>• Maximum Sound pressure Level: 58dB(A)</li> </ul>
6.	01:00~04:00	02:00	Very Cold	Occasional highway vehicular noise and nocturnal insects pitches	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 32dB(A)</li> <li>• Maximum Sound pressure Level: 52dB(A)</li> </ul>
7.	05:00 ~ 07:00	05:00	Very Cold	Occasional highway vehicular noise and few dog barking and birds chirrup	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 37dB(A)</li> <li>• Maximum Sound pressure Level: 54dB(A)</li> </ul>
8.	07:00 ~ 10:00	08:00	Cold	Highway vehicular noise, birds chirrup, human voice pitch and honking horn noise	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 42dB(A)</li> <li>• Maximum Sound pressure Level: 58dB(A)</li> <li>• Rate of honking horns: 6</li> </ul>

  
 (Monitored By)

  
 (Checked By)

  
 (Authorized Signature)

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## QS Test Report / Certificate

### NS Accreditation No. Pra. 01/053-54

Entry No.	: NCL - 244 (Oth) (2) - 12 - 2017	Date Received	: 18 - 12 - 2017
Sample	: Sound Pressure Level	Date Completed	: 05 - 01 - 2018
Client	: Full Bright Consultancy	Monitored By	: NESS

#### Sound Pressure Level, West Portal

Monitoring Site	: West Portal (Tunnel 1)
Location	: Palase, Ward No. 9, Suryabinayak Municipality, Bhaktapur
Distance from road	: about 120m North
Height from ground surface	: 1.5m
Equipment Use	: Digital Sound Level Meter
Latitude	: 27°38'37.74"N
Longitude	: 85°28'05.70"E
Elevation	: 1427m
Starting Monitoring Date	: 15/12/2017
Ending Monitoring Date	: 16/12/2017
Monitored By	: Pramod KC & Jit Bahadur Khattry

#### Instrument Name Digital Sound Level Meter

Manufacturer	: Lutron, Taiwan
Measuring Range	: 35 to 130 dBA
Service Temperature Range	: 0 to 40 degree Celsius.
Model No.	: SL 4010
Serial No.	: B 33990
Calibrated at	: 94dB(A)

dB(A)

Noise Descriptors	Monitoring Hours							
	11:00	14:00	17:30	20:00	23:00	02:00	05:00	08:00
$L_{eq}$	52	50	51	49	39	39	52	55
$L_d$	53							
$L_n$	48							
$L_{dn}$	56							

Notes: The calculation was based on the recorded 10 minutes data set. The method applied for monitoring and calculation was based on equal energy partition JIS Z 8731(1983);  $L_{eq}$ : Average sound pressure level;  $L_d$ : Average day time sound pressure level;  $L_n$ : Average night time sound pressure level;  $L_{dn}$ : 24 hour average sound pressure level

Remarks: The observed equivalent sound pressure ranged from 39dB (A) to 55dB (A). The observed day time and night time average sound pressure level at the monitoring site complied the sound pressure level of 63dB (A) and 55dB (A) for mixed residential area respectively (GoN, 2012). Similarly, the observed 24 hour average equivalent sound pressure level was lesser than 70dB(A).

(Monitored By)

(Checked By)

(Authorized Signature)

- Note:
1. This report/certificate is in reference to Laboratory Quality Control Manual, QS (017).
  2. The result of parameters refers only to the tested samples. Endorsement of products is neither inferred nor implied.
  3. Liability of our institute is limited to the invoiced test parameters & amount only.
  4. Samples will be destroyed after three months from the date of issue of test certificate unless otherwise specified.
  5. This report is not to be reproduced wholly / partially & cannot be used as an evidence in the Court of Law & should not be used in any advertizing media without our permission in writing.
  6. The clients are requested to take back their hazardous samples along with the report/certificate.





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## QS Test Report / Certificate

**NS Accreditation No. Pra. 01/053-54**

Entry No. : NCL - 244 (Oth) (2) - 12 - 2017 Date Received : 18 - 12 - 2017  
 Sample : Sound Pressure Level Date Completed : 05 - 01 - 2018  
 Client : Full Bright Consultancy Monitored By : NESS

### General Monitoring Conditions and Major Noise Sources

Monitoring Site : West Portal (Tunnel 1)  
 Location : Palase, Ward No. 9, Suryabinayak Municipality, Bhaktapur  
 Distance from road : about 120m North  
 Height from ground surface : 1.5m  
 Latitude : 27°38'37.74"N  
 Longitude : 85°28'05.70"E

S. N.	Monitoring Time Zone	Monitoring Time	General Weather Conditions	Recorded Sound Sources	Remarks
1.	10:00 ~ 12:00	11:30	Slightly Sunny with cold air flow	Highway vehicular engine noise; Occasional domestic animal voice; horn	<ul style="list-style-type: none"> <li>• Single time honking horn: 56dB(A)</li> <li>• Minimum Sound Pressure Level: 42dB(A)</li> <li>• Maximum Sound pressure Level: 69dB(A)</li> </ul> The background sound pressure level was raised by the highway vehicular emitted noise.
2.	13:00 ~ 15:00	14:00	Sunny / Fine	Highway vehicular engine noise inclusive of motorbike; Occasional domestic animal voice	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 41dB(A)</li> <li>• Maximum Sound pressure Level: 62dB(A)</li> </ul>
3.	16:00 ~ 18:00	17:00	Cold	Highway vehicular engine noise; Occasional domestic animal voice	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 44dB(A)</li> <li>• Maximum Sound pressure Level: 61dB(A)</li> <li>• Single time honking horn: 61dB(A)</li> </ul> The background sound pressure level was raised by the highway vehicular emitted noise.
4.	19:00 ~ 21:00	20:00	Cold	Occasional vehicles noise, horns, nocturnal insects pitches, dog barking	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 44dB(A)</li> <li>• Maximum Sound pressure Level: 59dB(A)</li> <li>• Honking horn: 2 times 59dB(A)</li> </ul>
5.	22:00 ~ 24:00	23:00	Cold	Occasional vehicle, nocturnal insects pitches, dog barking noise	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 32dB(A)</li> <li>• Maximum Sound pressure Level: 48dB(A)</li> </ul>
6.	01:00~04:00	02:00	Cold	Few vehicles; Nocturnal insects pitches	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 32dB(A)</li> <li>• Maximum Sound pressure Level: 48dB(A)</li> </ul>
7.	05:00 ~ 07:00	05:00	Cold	Highway vehicular noise; animal voice; Horns	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 45dB(A)</li> <li>• Maximum Sound pressure Level: 61dB(A)</li> <li>• Honking horn: 2 times 61dB(A), max</li> </ul>
8.	07:00 ~ 10:00	08:00	Cold	Highway vehicular engine noise inclusive of motorbike	<ul style="list-style-type: none"> <li>• Minimum Sound Pressure Level: 46dB(A)</li> <li>• Maximum Sound pressure Level: 64dB(A)</li> <li>• The background sound pressure level was raised by the highway vehicular emitted noise.</li> </ul>

(Monitored By)

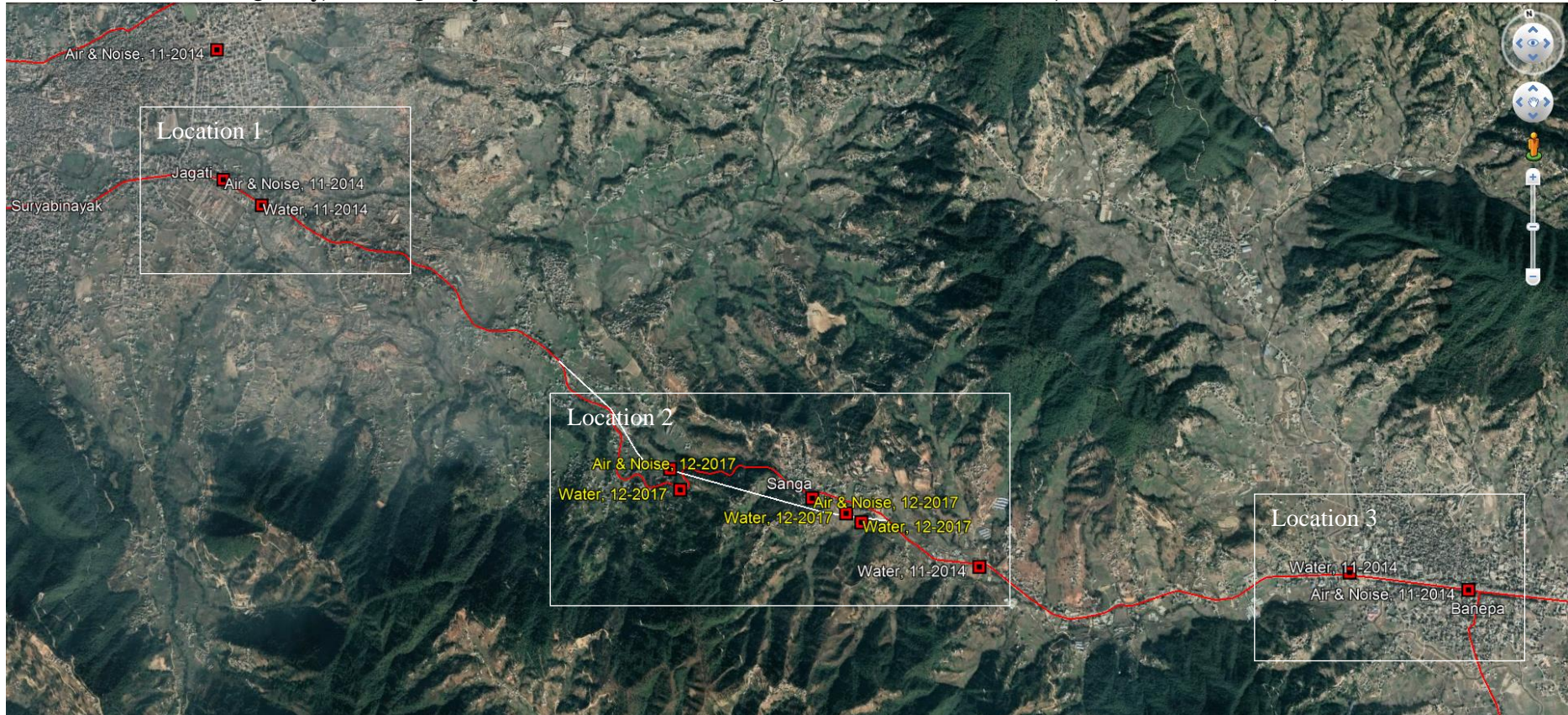
(Checked By)

(Authorized Signature)

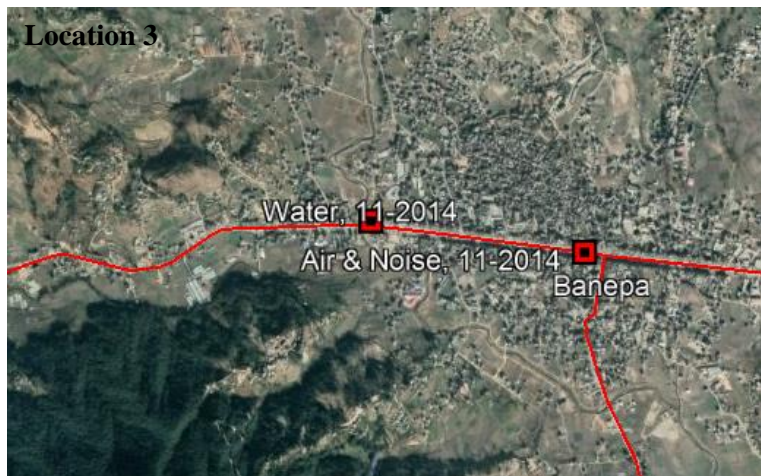
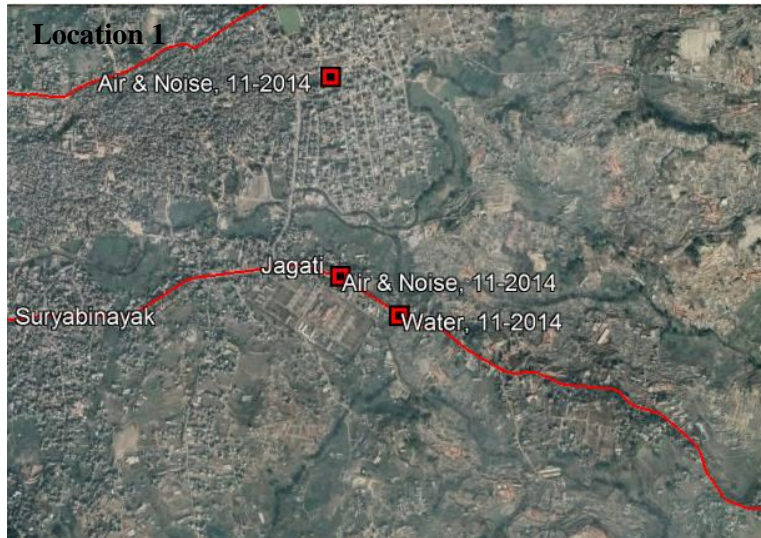
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**Location Points of Air Quality, Water Quality and Noise Level Monitoring Points (Dated: November, 2014 and December, 2017)**







### E. Baseline Information along the Proposed Alignment

S.N.	Section chainage	Length	Elevation range (m)	Aspect	Geology	Topography	Soil type	Land use Pattern
1.	0+000-1+400	1.4 km	1319-1322	Flat Terrain	Tistung formation bed rock of Lesser Himalaya	Flat land	Residual soil & Lacustrine deposits	Built Up area
2.	1+400-2+500	1.1 km	1322-1342	Mild & Flat Terrain	Tistung formation bed rock of Lesser Himalaya	Hill side with Steep slope	Residual soil & Lacustrine deposits	Agricultural land
3.	2+500-5+000	2.5 km	1342-1420	Mild & Flat Terrain	Tistung formation bed rock of Lesser Himalaya	Mild slope with flat land	Residual soil & Lacustrine deposits	Built Up area with Agricultural land
4.	5+000-5+400	0.4 Km	1420-1453	Mild Hilly Terrain	Tistung formation bed rock of Lesser Himalaya	Hill side with Steep slope	Residual soil & Lacustrine deposits	Agricultural and barren land
5.	5+400-6+300	0.9 Km	1453-1522	Hilly Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Hill side with Steep slope	Residual soil & Lacustrine deposits	Forest Area
6.	6+300-7+050	0.75 Km	1522-1495	Mild Hilly Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Hill side with Steep slope	Residual soil & Lacustrine deposits	Built Up area
7.	7+050-8+000	0.95 Km	1495-1483	Mild & Flat Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Mild slope with flat land	Residual soil & alluvial deposits	Agricultural land
8.	8+000-8+600	0.6 Km	1483-1487	Mild & Flat Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Mild slope Hill with flat land	Residual soil & alluvial deposits	Built Up area
9.	8+600-10+100	1.5 Km	1487-1464	Mild Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Mild slope Hill with flat land	Residual soil & alluvial deposits	Agricultural land
10.	10+100-13+000	2.9 Km	1464-1485	Mild & Flat Terrain	Tistung formation bed rock lies in Bhimphedi Group of	Mild slope Hill with flat land	Residual soil & alluvial deposits	Built Up area

S.N.	Section chainage	Length	Elevation range (m)	Aspect	Geology	Topography	Soil type	Land use Pattern
					Lesser Himalaya of Central Nepal			
11.	13+000-14+500	1.5 Km	1464-1529	Hilly Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Hill side with Steep slope	Residual soil & alluvial deposits	Agricultural land
12.	14+500-15+500	1.0 Km	1529-1545	Mild Terrain	Tistung formation bed rock lies in Bhimphedi Group of Lesser Himalaya of Central Nepal	Hill side with Steep slope	Residual soil & alluvial deposits	Built Up area

Source: Field Survey, 2017

## ANNEX-III: BIOLOGICAL DATA

### A. LIST OF MAJOR PLANT, WILD AND AQUATIC LIFE AND THEIR STATUS

Species	Species Names		Remarks
	Local	Scientific	
Trees(Natural Forests)	Adhchal	<i>Antidesma bunius</i>	
	Ank	<i>Calotropis gigantea</i>	
	Bains	<i>Salix Sp.</i>	
	Bakaino,	<i>Melia azederach</i>	
	Banjh	<i>Quarcus longifolia</i>	
	Banji	<i>Salix sp.</i>	
	Betlauri	<i>Costus specious</i>	
	Bhalayo	<i>Rhus nepalensis</i>	
	Bhui amala	<i>Phyllanthus urinaria</i>	
	Chilaune	<i>Schima wallichii</i>	
	Dabdabe	<i>Garuga pinnata</i>	
	Jamun-(sano)	<i>Syzygium cumini</i>	
	Kadam	<i>Anthocephalus chinensis</i>	
	Kaiyo	<i>Gravillea robusta</i>	
	Karam	<i>Adina cordifolia</i>	
	Kari	<i>Celtis asutralis</i>	
	Katus	<i>Castanopsis indica</i>	
	Kaulo	<i>Kaunia longipetiolata</i>	Protected Species
	Khanyu	<i>Ficus semicordata</i>	
	Khirra	<i>Sapium insigne</i>	
	Kote Salla	<i>Pinus roxburghii</i>	
	Kutmero	<i>Litsea monopetala</i>	
	Lahare pipal	<i>Populus deltoidis</i>	
	Lankuri	<i>Fraxinus floribunda</i>	
	Lapsi	<i>Choerospondia axillaris</i>	
	Mauwa	<i>Engelhardia spicata</i>	
	Okhar	<i>Juglans regia</i>	Protected Species
	Paiyu	<i>Prunus cecidois</i>	
	Salima	<i>Chrysopogon gryllus</i>	
	Simal	<i>Bombax ceiba</i>	Protected Species
Syal Phusre	<i>Grewia oppositifolia</i>		
Tanki	<i>Bauhinia malabarica</i>		
Utis	<i>Alnus Nepalensis</i>		
NTFP	Aiselu	<i>Rubus ellipticus</i>	
	Amala	<i>Phyllanthus emblica</i>	
	Asuro	<i>Adhatoda vesica</i>	
	Bakal pate	<i>Cleyera ochracea</i>	
	Banmara (Black)	<i>Eupatorium adenophorum</i>	
	Barro	<i>Terminalia bellirica</i>	
	Betlauri	<i>Costus specious</i>	
	Bhogate	<i>Maesa macrophylla</i>	
	Bhui amala	<i>Phyllanthus urinaria</i>	
	Bisphej	<i>Polypodium vulgare</i>	
	Charahare Lahara	<i>Cissus repens</i>	
	Chhattiwan	<i>Alstonia scholaris</i>	
	Choya/Tama Bans	<i>Bambusa nepalensis</i>	
	Dattiwan	<i>Achyranthes aspera</i>	
	Dhasingre	<i>Gultheria fragrantissima</i>	
	Dubo	<i>Cynodon dactylon</i>	
	Gandhe	<i>Ageratum conyzoides</i>	
	Gurjo	<i>Tinospora cordifolia</i>	
	Hade Bayer	<i>Zizyphus incurve</i>	
	Harro	<i>Terminalia chebula</i>	
	Kaiyo (seto)	<i>Wetlandia sp.</i>	
	Kande Phool	<i>Lantena camera</i>	
	Kans	<i>Saccharum spontaneum</i>	
	Khareto	<i>Hypericum uralum</i>	



Species	Species Names		Remarks
	Local	Scientific	
	Kharuki	<i>Arundinella nepalensis</i>	
	Khasreto	<i>Ficus hispida</i>	
	Khirra	<i>Sapium insigne</i>	
	Kurilo	<i>Asparagus racemosus</i>	
	Kuro	<i>Bidens pilosa</i>	
	Lampate	<i>Duabanga grandiflora</i>	
	Mal Bans	<i>Bambusa nutans subsp. cupulata</i>	
	Narkat	<i>Phragmites maxima</i>	
	Negalo	<i>Drepanostachyum khasianum</i>	
	Nundhiki	<i>Osyris wightiana</i>	
	Padke	<i>Albizia julibrissin</i>	
	Pakhanbed	<i>Saxifrage ligulata</i>	
	Pani Amala	<i>Nephrolepsis cordifolia</i>	
	Rudilo	<i>Pogostemon glaber</i>	
	Sajiwan	<i>Origanum vulgare</i>	
	Simali	<i>Vitex negundo</i>	
	Siru	<i>Imperata cylindrica</i>	
	Sisno	<i>Urtico dioca</i>	
	Tantari	<i>Dillenia pentagyna</i>	
	Tapre	<i>Cassia tora</i>	
	Tapre Tapre	<i>Cassia tora</i>	
	Taru Bans	<i>Bambusa nutans sub-species nutans</i>	
	Titepati	<i>Artemisia vulgaris</i>	
	Unyu	<i>Dryopteris sp.</i>	
<b>Wildlife</b>	Assamese monkey	<i>Macaca assamensis</i>	
	Barking deer	<i>Muntiacus muntjak</i>	
	Common langur	<i>Presbytis entellus</i>	
	Common leopard	<i>Panthera pardus</i>	
	Dumsi	<i>Hystrix indica</i>	
	Flying Squirrel	<i>Glaucomys volans</i>	
	Hog deer	<i>Axis porcinus</i>	
	Jackal	<i>Canis aureus</i>	
	Rhesus monkey	<i>Macaca mulata</i>	
	Salak	<i>Manis crassicaudata</i>	
	Spotted deer	<i>Axis axis</i>	
	Syal	<i>Canis aurehs</i>	
	Wild boar	<i>Sus scrofa</i>	
<b>Birds</b>	Black kite	<i>Milvus migrans</i>	
	Cattle Egret	<i>Bubulcus ibis</i>	
	Common crane	<i>Grus grus</i>	
	Grey tree pie	<i>Dendrocitta formosae</i>	
	Grey wag tail	<i>Motacilla cinerea</i>	
	Hair-crested drongo	<i>Dicrurus hottentottus</i>	
	Himalayan bul bul	<i>Pycnonotus leucogenys</i>	
	Indian tree pie	<i>Dendrocitta vagabunda</i>	
	Kaag	<i>Corvus monedula</i>	
	Kalij pheasant	<i>Lophura leucomelana</i>	
	Peafowl	<i>Pavo cristatus</i>	
	Red jungle fawl	<i>Gallus gallus</i>	
	Red-billed blue magpie	<i>Urocissa erythrorhyncha</i>	
	Red-vented bulbul	<i>Phycnonotus cafer</i>	
	Scarlet minivet	<i>Perocrocotus flammeus</i>	
	Spotted dove	<i>Streptopelia trnquebarica</i>	
<b>Aquatic Life</b>	Asala	<i>Schizothoraichthys progastus</i>	
	Budhuna	<i>Garra sp.</i>	
	Hile	<i>Channa sp.</i>	
	Katle	<i>Neolissocheilus hexagonolepis</i>	
	Singe	<i>Heteropneustes sp.</i>	
<b>Amphibians / Reptiles</b>	Black-spined toad	<i>Bufo sp.</i>	
	Cobra	<i>Naja naja</i>	
	Common garden lizard	<i>Calotes versicolor</i>	
	Criquet frog	<i>Acris crepitans</i>	

Species	Species Names		Remarks
	Local	Scientific	
	Dhaman	<i>Phyas mucosus</i>	
	Indian bull frog	<i>Rana tigrina</i>	
	Kali paha	<i>Rana sp.</i>	
	Kobra sarpa	<i>Naja naja</i>	
	Mana paha	<i>Rana sp.</i>	
	Pahele paha	<i>Rana sp.</i>	
	Pani sarpa	<i>Xenochrophis piscator</i>	

Source: Field survey, 2014

### B. Road-side Trees

No.	Local Name	Scientific Name	Nos. of Trees		Total Trees
			Pole Size	Tree Size	
1	Utish	<i>Alnus nepalensis</i>	59	-	59
2	Kangiyo	<i>Grevillea robusta</i>	32	320	352
3	Bakaino	<i>Melia azederach</i>	-	4	4
4	Masala	<i>Eucalyptus spp</i>	-	8	8
5	Pipal	<i>Ficus religiosa</i>	2	2	4
6	Rudraksha	<i>Elaeocarpus ganitrus</i>	0	1	1
7	Bel	<i>Aegle marmelos</i>	0	1	1
<b>Sub- Total</b>			<b>93</b>	<b>336</b>	<b>429</b>
<b>Total</b>			<b>429</b>		

Source: Field Survey, 2017

### C. Trees in Suryamode Community Forest

S.N	Location	Owner	Species	Botanical name	Nos. of Trees		Total Trees
					Pole Size	Pole Size	
1	West portal of tunnel	Suryamode Perunge Community Forest	Lapsi	<i>Choerospondiasaxillaris</i>	0	9	9
			Mauwa	<i>Engelhardtiaspicata</i>	0	70	70
			Sallo	<i>Pinusroxburghii</i>	54	18	72
			Uttis	<i>Alnusnepalensis</i>	7	3	10
			Chilaune	<i>Schimawallichii</i>	0	2	2
<b>Total</b>					<b>61</b>	<b>102</b>	<b>163</b>

Source: Field Survey, 2017

### Persons Met

Chairperson of SuryamodePerunge Community Forest: Mr. Arjun Ranamagar

Chairperson of Bandeshwori Community Forest: Mrs. JayantiMahat

DFO of Bhaktapur: Mr. Phadindra Prasad Pokharel

**ANNEX-IV: SOCIAL DATA**

**A. Demographic Characteristics of the Project Area**

District	VDC / Municipality	Affected Wards in DIA	Households within ZOI		Population within ZOI							
			Total		Total	Male	Female					
Bhaktapur	Bhaktapur Municipality	8	1456	4410	6694	21326	3440	3254				
		7	1564		7563		3790	3773				
		5	629		3287		1606	1681				
		4	761		3782		1876	1906				
	Suryabinayak Municipality	6	1096	2834	4683	12390	2337	2346				
		8	611		2701		1361	1340				
		11	316		1412		669	743				
		10	200		889		444	445				
		9	221		993		515	478				
		12	390		1712		880	832				
		Kavrepalanchok	Banepa Municipality		13		760	5198	3332	23294	1597	1735
					14		310		1500		736	764
10	954			3888	1672	1916						
8	1407			6189	3132	3057						
7	981			4877	2446	2431						
6	786			3508	1767	1741						
Dhulikhel Municipality	8		386	2247	1816	9546	874	942				
	7		296		1287		607	680				
	6		187		847		404	443				
	3		558		2401		1214	1187				
		4	820			3195	1715	1480				
<b>Total</b>			<b>14689</b>		<b>66556</b>		<b>33382</b>	<b>33174</b>				

*Source: Central Bureau of Statics (CBS), 2011*

**B. Demographic Characteristics of the Project Area VDC and Municipality Wise**

1 District : Bhaktapur VDC/Municipality : Bhaktapur Municipality

Ward	Household	Population		
		Total	Male	Female
1	972	4805	2379	2426
2	1456	6694	3440	3254
3	697	3427	1698	1729
4	2632	11011	5625	5386
5	1124	5141	2601	2540
6	604	3126	1573	1553
7	960	4437	2217	2220
8	620	3138	1555	1583
9	405	2071	1033	1038
10	899	4509	2240	2269
11	629	3287	1606	1681
12	761	3782	1876	1906
13	417	2225	1084	1141
14	954	4466	2238	2228
15	1374	6044	3031	3013
16	793	3684	1834	1850
17	2342	9901	5051	4850
<b>Total</b>	<b>17,639</b>	<b>81748</b>	<b>41081</b>	<b>40667</b>

*Source: Central Bureau of Statics (CBS), 2011*

2 District : Bhaktapur VDC/Municipality : Sipadol

Ward	Household	Population		
		Total	Male	Female
1	831	3503	1746	1757
2	265	1180	591	589
3	83	369	175	194
4	200	884	394	490
5	107	470	223	247
6	110	459	227	232
7	71	310	145	165
8	358	1606	822	784
9	253	1095	539	556
<b>Total</b>	<b>2,278</b>	<b>9876</b>	<b>4862</b>	<b>5014</b>

Source: Central Bureau of Statics (CBS), 2011

3 District : Bhaktapur VDC/Municipality : Nankhel

Ward	Household	Population		
		Total	Male	Female
1	134	610	286	324
2	190	893	444	449
3	60	273	127	146
4	75	322	157	165
5	163	727	347	380
6	182	802	383	419
7	80	349	178	171
8	120	540	266	274
9	221	993	515	478
<b>Total</b>	<b>1,225</b>	<b>5509</b>	<b>2703</b>	<b>2806</b>

Central Bureau of Statics (CBS), 2011

4 District : Bhaktapur VDC/Municipality : Chitapol

Ward	Household	Population		
		Total	Male	Female
1	216	948	495	453
2	174	764	385	379
3	131	621	304	317
4	117	514	254	260
5	169	697	326	371
6	116	559	276	283
7	108	491	241	250
8	140	567	253	314
9	103	458	224	234
<b>Total</b>	<b>1,274</b>	<b>5619</b>	<b>2758</b>	<b>2861</b>

**District: Kavrepalanchok**1 **District : Kavrepalanchok VDC/Municipality : Nasikasthan Sanga**

Ward	Household	Population		
		Total	Male	Female
1	321	1277	610	667
2	168	808	402	406
3	180	814	383	431
4	91	433	202	231
5	76	393	189	204
6	234	1107	547	560
7	111	631	298	333
8	91	488	230	258
9	33	170	74	96
<b>Total</b>	<b>1,305</b>	<b>6121</b>	<b>2935</b>	<b>3186</b>

2 **District : Kavrepalanchok VDC/Municipality : Ugratara Janagal**

Ward	Household	Population		
		Total	Male	Female
1	562	2193	1126	1067
2	90	416	207	209
3	102	454	211	243
4	131	557	273	284
5	80	391	190	201
6	250	1021	509	512
7	75	375	177	198
8	261	1138	573	565
9	83	408	198	210
<b>Total</b>	<b>1,634</b>	<b>6953</b>	<b>3464</b>	<b>3489</b>

3 **District : Kavrepalanchok VDC/Municipality : Banepa Municipality**

Ward	Household	Population		
		Total	Male	Female
1	629	2731	1295	1436
2	173	838	400	438
3	503	2215	1104	1111
4	782	3038	1491	1547
5	676	2904	1462	1442
6	731	3285	1670	1615
7	177	812	409	403
8	131	730	354	376
9	102	556	281	275
10	850	4147	2092	2055
11	786	3508	1767	1741
<b>Total</b>	<b>5,540</b>	<b>24764</b>	<b>12325</b>	<b>12439</b>

4 District : Kavrepalanchok VDC/Municipality : Dhulikhel Municipality

Ward	Household	Population		
		Total	Male	Female
1	386	1816	874	942
2	296	1287	607	680
3	426	1831	880	951
4	187	847	404	443
5	252	1155	572	583
6	558	2401	1214	1187
7	820	3195	1715	1480
8	143	785	383	402
9	211	966	473	493
<b>Total</b>	<b>3,279</b>	<b>14283</b>	<b>7122</b>	<b>7161</b>

Source: Central Bureau of Statics (CBS), 2011

**C. Major ethnic/Caste composition of the affected VDCs**

VDCs/Municipalities	Brahmin	Chhetri	Newar	Janajati	Dalit	Others	Total
Bhaktapur	3.48	4.41	79.27	8.17	0.64	4.03	100
Sipadol	3.16	25.60	36.31	27.17	2.46	5.31	100
Nakhel	1.60	52.01	22.24	5.65	2.32	16.19	100
Chitapol	5.32	53.07	24.58	10.23	3.72	3.17	100
Nasikasthan Sanga	5.36	23.97	31.25	33.18	3.43	2.81	100
Ugratara Janagal	18.29	43.82	13.55	11.64	2.50	10.20	100
Banepa	21.38	10.71	49.65	11.40	2.27	4.59	100
Dhulikhel	15.77	15.03	35.52	23.94	3.86	5.87	100
Total Average	9.30	28.58	36.55	16.42	2.65	6.52	100

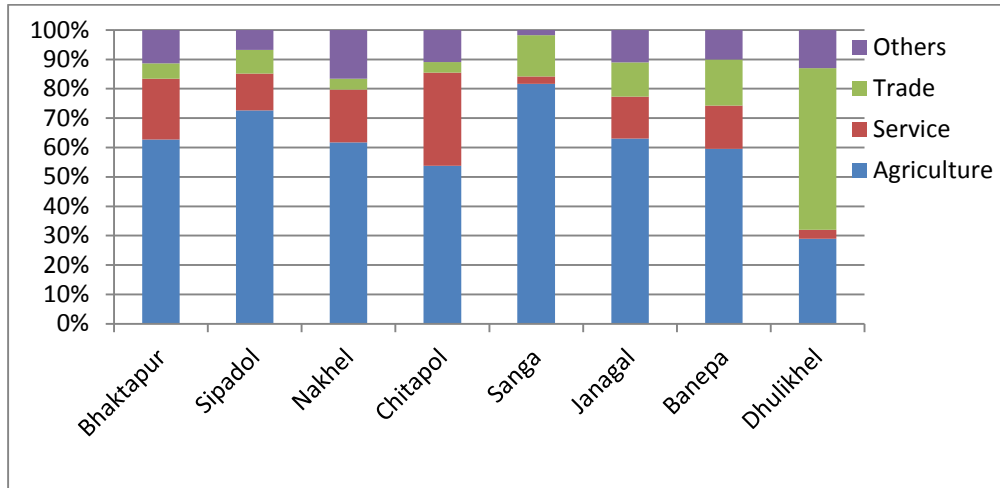
Source: CBS, 2011

**D. Occupational Status of the Project affected VDCs and Municipalities**

VDCs/Municipalities	Agriculture	Service	Trade	Others	Total
Bhaktapur	62.73	20.72	5.14	11.41	100
Sipadol	72.67	12.51	8.07	6.75	100
Nakhel	61.72	17.99	3.71	16.58	100
Chitapol	53.8	31.66	3.64	10.9	100
Sanga	81.72	2.42	14.04	1.82	100
Janagal	63.09	14.18	11.67	11.06	100
Banepa	59.18	14.6	15.58	9.94	100
Dhulikhel	29	3	55	13	100
Total Average	60.49	14.64	14.69	10.18	100

Source: CBS, 2011





Source: Field Survey, 2017

### E. Temple and Shrines within ROW

S.N.	Location Name	Chainage	Temple Name	Side	Distance from CL (m)	Temple Area(m <sup>2</sup> )	Type of Temple
1.	Nalinchowk	3+625	Ganesh Shrine	Right	9	35	Brick Masonry
2.	Nalinchowk	4+420	Shiva Shrine	Left	10	15	Brick Masonry
3.	Sanga	7+250	Shiva Shrine	Right	10	5	Brick Masonry
4.	Sanga	7+405	Nasikasthan Temple	Right	22	500	Brick Masonry
5.	Janagal	9+640	Ganesh Shrine	Left	10	1.2	Brick Masonry

Source: Field Survey, 2017

### F. Public water stands along the ROW

S.N	Chainage	Location	Side (Right/Left)	Distance from Center Line	Type	Remarks
1.	1+890	Bhatedhikuro	Right	10 m	Dhunge Dhara	Not Functioning
2.	7+255	Sanga	Right	9 m	<i>Dhunge Dhara</i>	Functioning
3.	7+895	Sanga	Right	9 m	<i>Dhunge Dhara</i>	Functioning
4.	8+860	Sanga	Left	12 m	<i>Dhunge Dhara</i>	Functioning

Source: Field Study, 2017

**G. Detailed of Surveyed affected Households within Project Area**

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
<b>BHAKTAPUR NEW CURVE IMPROVEMENT</b>																		
1	Bhaktapur	Bhaktapur-7	Mira Shrestha	8	4	4			1				1	220	50,000			
2		Bhaktapur-7	Mira Shrestha	0	0	0			1				3	850	0			
<b>BHAKTAPUR RoW (OLD)</b>																		
3	Bhaktapur	Bhaktapur-7	Baburam Machamasi	10	6	4			1				2	560	130,000			
4		Bhaktapur-7	Baburam Machamasi	0	0	0			1				2	500	0		1	
5		Bhaktapur-7	Ganga Sarukarmi	3	2	1			1				2	490	180,000	1		
6		Bhaktapur-7	Gopikrishna Manikarmi	13	8	5				1			2	470	200,000			
7		Bhaktapur-7	Indra Raj Shrestha	3	2	1			1				3	650	150,000		1	
8		Bhaktapur-7	Jagat Bahadur Lawaju	2	1	1			1				2	600	210,000			
9		Bhaktapur-7	Kedar Bhakta Faju	11	5	6				1			2	360	200,000			
10		Bhaktapur-7	Krishna Maya Nyichai	8	4	4			1				2	430	120,000			
11		Bhaktapur-7	Purna Bhakta Joshi	5	3	2			1				2	490	180,000			
12		Bhaktapur-7	Shivalal Bahadur Shrestha	9	4	5			1				2	580	220,000			
13		Bhaktapur-7	Sitaram Khayitu	5	2	3			1				2	630	200,000			
14		Bhaktapur-7	Sushil Manikarmi	7	4	3			1				2	660	180,000			
<b>SURYABINAYAK NEW IMPROVEMENT</b>																		
15	Suryabinayak	Suryabinayak-7	Madhav Khayitu	6	3	3				1			2	380	200,000			
16		Suryabinayak-7	Sitaram Khayitu	7	3	4				1			4	760	40,000		1	
17		Suryabinayak-7	Hari Khayitu	6	4	2				1			4	680	380,000			
18		Suryabinayak-4	Shree Prasad Gosard	7	3	4				1			2	460	190,000			
19		Suryabinayak-4	Chakana Beti Gosard	3	1	2					1		3	630	280,000			
20		Suryabinayak	Shiva Bhakta Sakupaya	6	3	3				1			2	480	160,000			
21		Suryabinayak- 8	Krishna Bhakta Kusma	11	6	5				1			1	200	250,000			
22		Suryabinayak- 8	Ramesh Bhaju	4	2	2				1			1	210	250,000			
23		Suryabinayak- 8	Ramesh Bhaju	0	0	0				1			1	230	200,000			
24		Suryabinayak- 8	Ram Gopal Kawang	7	4	3					1		3.5	490	230,000			
25		Suryabinayak- 8	Bhimsen Joshi	6	3	3				1			1	160	210,000			
26		Suryabinayak- 8	Laxmi Prasad Toinabasu	8	5	3					1		3	390	220,000			
27		Suryabinayak- 8	Kedar Toinabasu	6	4	2					1		4	400	220,000			
28		Suryabinayak- 8	Ash Bahadur Machamasi	7	4	3					1		4	440	250,000			

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
29		Suryabinayak- 8	Mithu Thapa/ Maiya KC	7	5	2				1			3	360	250,000			
30		Suryabinayak-4	Kanchha Bharat Pati	8	3	5			1				1	230	170,000			
31		Suryabinayak-4	Kalpana Kawa	6	4	2				1			2	280	190,000			
32		Suryabinayak-4	Ram Chandra Totabasu	10	4	6		1					2	250	180,000			
33		Suryabinayak-4	Prakash Tajal	9	4	5		1					2	240	180,000			
34		Suryabinayak-4	Priti Kawad	7	4	3		1					2	310	190,000			
35		Suryabinayak	Narayan Bhakta Hangju	14	8	6			1				2	500	190,000			
36		Suryabinayak-9	Kham Prasad Ghimire	0	0	0				1			2	270	150,000		1	
37		Suryabinayak-9	Pralhad Khatri	7	4	3		1					2	170	150,000		1	
38		Suryabinayak-9	Gokul Khatri	15	9	6			1				1	250	200,000			
39		Suryabinayak-9	Sabin Khatri	4	3	1			1				2	570	180,000			
40		Suryabinayak	Pradeep Jung KC	5	3	2			1				1	230	250,000			
41		Suryabinayak	Dwarika karki	0	0	0					1		2	2100	400,000			
42		Suryabinayak	Shyam Bahadur Khatri	11	6	5					1		2	1650	220,000			
43		Suryabinayak	Pralhad Khatri	2	1	1					1		3	2250	200,000			
44		Suryabinayak	Pashupati Khatri-Toilet	0	0	0			1				1	160	190,000			
45		Suryabinayak	Pashupati Khatri	7	2	5			1				2	510	170,000			
46		Suryabinayak	Ram Bahadur Pariyar	5	3	2		1					1	260	150,000		1	
47		Suryabinayak	Sudarshan Khatri	6	4	2		1					1	188	170,000			
48		Suryabinayak	Ramesh Bista	8	5	3		1					1	190	190,000			
49		Suryabinayak	Sadhuram Rana Magar	0	0	0				1			3	450	500,000			
50		Suryabinayak	Rajkumar Khatri(Hachery)	0	0	0		1					2	380	300,000			
51		Suryabinayak	Shree Ram Mahat	5	3	2				1			3	420	250,000			
52		Suryabinayak	Sarita Thapa Magar	4	2	2			1				1	210	180,000	1		
53		Suryabinayak	Kumar Rana Magar	7	4	3				1			1	110	190,000			
54		Suryabinayak	Sadhuram Rana Magar	9	5	4				1			3	430	400,000			
55		Suryabinayak	Sadhuram Rana Magar	0	0	0			1				1	150	0			
56		Suryabinayak	Krishna Maya Thapa Magar	8	1	7				1			2	340	170,000			
<b>SURYABINAYAK RoW (OLD)</b>																		
57	Surya binayak	Suryabinayak-7	Ajaya Kawang	8	5	3			1				1	290	180,000			
58		Suryabinayak-7	Santumaya Chachatu	5	3	2			1				1	280	190,000	1		

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
59		Suryabinayak-7	Santumaya Chachatu	0	0	0			1				1	270	0			
60		Suryabinayak-7	Ashash Bd. Chikambanjar	8	5	3			1				1	300	190,000			
61		Suryabinayak-7	Ashash Bd. Chikambanjar	0	0	0			1				1	320	300,000			
62		Suryabinayak-4	Vishwanath Awal	7	4	3				1			2	250	180,000			
63		Suryabinayak-4	vishwa Gothe	4	2	2			1				1	220	210,000			
64		Suryabinayak-5	Ravi Shahi	4	2	2	1						1	200	190,000			
65		Suryabinayak-9	Chitra Kumari Khagi	10	4	6			1				1	240	170,000			
66		Suryabinayak-9	Chitra Kumari Khagi	0	0	0			1				1	200	0	1		
67		Suryabinayak-9	Kedar Bhakta Fajju	7	2	5				1			3	315	170,000			
68		Suryabinayak-9	Sanu Bhai Fajju	6	1	5				1			2	210	300,000			
69		Suryabinayak-9	Unknown	5	2	3			1				1	180	0			
70		Suryabinayak-4	Satya Bahadur Ranjitkar	9	5	4			1				1	190	170,000			
71		Suryabinayak-9	Krishna Bhakta/Govinda Bhaju	4	3	1			1				1	160	190,000			
72		Suryabinayak-9	Nuchu Kapali	5	2	3			1				2	240	180,000			
73		Suryabinayak-9	DAMAGE BRICK HOUSE (Empty)	0	0	0			1				1	200	0			
74		Suryabinayak-9	Krishna Bhakta Dhoj (STORE)	6	4	2				1			2	350	150,000	1		
75		Suryabinayak-9	Ram Saran Bhujel	6	3	3				1			2	380	300,000			
76		Suryabinayak	Shiva Bhakta Gateju Shrestha	8	4	4				1			2	340	28,000		1	
77		Suryabinayak	Goma Khatri	9	5	4			1				2	280	29,000	1		
78		Suryabinayak	putali Khatri	9	4	5			1				1	425	260,000	1		
79		Suryabinayak	Sanu Raja Fajju	6	3	3			1				2	500	180,000			
80		Suryabinayak	Janak Khatri	5	2	3			1				2	440	170,000			
81		Suryabinayak	Dilip Khatri	5	3	2			1				2	490	190,000			
82		Suryabinayak	Saraswati Budhathoki	4	2	2			1				1	210	180,000	1		
83		Suryabinayak	Rajesh Budhathoki	4	2	2			1				1	180	190,000			
84		Suryabinayak	Keshav Karki	5	2	3			1				2	400	180,000			
85		Suryabinayak	Bal Kumari Bhujel	3	2	1			1				1	190	190,000			
86		Suryabinayak	Bal Krishna Bhujel	6	3	3			1				1	210	20,000			
87		Suryabinayak	Madhushudhan Bhujel	8	3	5	1						1	240	180,000			

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
88		Suryabinayak	Chandra Bhakta Chulyaju	8	3	5			1				2	480	190,000			
89		Suryabinayak	Unknown	4	2	2			1				1	230	0			
90		Suryabinayak	Dor Bahadur Khatri	5	3	2			1				1	260	210,000			
91		Suryabinayak	Moti Thapa	6	3	3			1				2	510	180,000			
92		Suryabinayak	Uddhav Raj KC	6	3	3					1		2	1500	190,000			
93		Suryabinayak	Keshar Kumari Khatri	6	3	3					1		2	1350	180,000			
94		Suryabinayak	Dhan Bahadur Khatri	5	2	3					1		2	1450	180,000			
95		Suryabinayak	Rabindra khatri KC	6	2	4					1		2	900	170,000			
96		Suryabinayak	Bachhu Karki	6	3	3					1		5	3250	190,000			
97		Suryabinayak	Ambika Khatri	6	2	4					1		3	2250	170,000			
98		Suryabinayak	Dwarika Karki	6	3	3					1		3	2150	180,000			
99		Suryabinayak	Bhaikaji Khatri	4	3	1				1			2	440	190,000			
100		Suryabinayak	Gagan Bahadur Khatri	8	5	3			1				2	490	210,000			
101		Suryabinayak	Bhawani Khatri	12	7	5			1				2	460	180,000			
102		Suryabinayak	Nawaraj Khatri	0	0	0			1				2	440	160,000			
103		Suryabinayak	Binod Thapa Magar	5	3	2				1			1	160	180,000			
104		Suryabinayak	Mahahari Pariyar	0	0	0			1				1	250	150,000		1	
105		Suryabinayak	Nirmala Pariyar	5	3	2				1			1	160	140,000	1		
106		Suryabinayak	Rupendra Khatri	4	2	2			1				2	510	150,000		1	
107		Suryabinayak-9	Keshar Lal B.K	8	4	4			1				1	206	270,000			
108		Suryabinayak-9	Mala Gahatraj	3	2	1			1				1	200	190,000	1		
109		Suryabinayak	Unknown	5	2	3			1				2	150	0			
110		Suryabinayak	Ganesh Khatri	9	4	5					1		2	1150	190,000			
111		Suryabinayak	Bhawani Khatri	5	2	3			1				2	520	100,000	1		
112		Suryabinayak	Amrit Pariyar	7	4	3				1			1	340	140,000		1	
113		Suryabinayak	Hari Khatri	5	3	2					1		2	1280	180,000			
<b>BANEPA NEW CURVE</b>																		
114	Banepa	Banepa-14	Angad Khadka	0	0	0	1						1	325	150,000			
115		Banepa-14	Tulimaya Tamang (Iman Tamang)	3	2	1			1				1	160	300,000			
116		Banepa-14	Prakash Joshi (Ganesh Manandhar)	5	2	3			1				1	180	100,000		1	
117		Banepa	Surya Bhakta Shrestha	13	6	7					1		4	2840	290,000			

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
118		Banepa	Sher Bahadur Thapa	8	5	3		1					1	200	120,000		1	
119		Banepa-11	Urmila Thapa	7	3	4			1				2	480	150,000	1		
120		Banepa- 6	Pradip Shrestha	6	3	3			1				2	510	180,000			
121		Banepa- 6	Pradip Shrestha	0	0	0					1		3	2280	150,000			
<b>BANEPA RoW( OLD)</b>																		
122	Banepa	Banepa-14	Ramhari Dhakal	7	4	3			1				1	210	500,000			
123		Banepa-14	Ramhari Dhakal	0	0	0			1				1	200	0			
124		Banepa-14	Dil Kumari Shrestha	7	4	3			1				2	490	100,000		1	
125		Banepa-14	Dhan Chandi	9	4	5			1				1	260	150,000		1	
126		Banepa-14	Krishna Khatri	6	4	2			1				2	510	180,000			
127		Banepa	Jyoti Bista	4	2	2			1				1	190	120,000		1	
128		Banepa-14	Unknown	4	2	2			1				1	160	0			
129		Banepa	Krishna Mudkarmi	4	2	2			1				3	660	180,000			
130		Banepa-13	Krisna Gopal Manikarmi	0	0	0			1				1	220	200,000			
131		Banepa	Bhakta Lal Shrestha	10	4	6			1				1	240	150,000		1	
132		Banepa	Champa Manikarmi	7	4	3			1				1	230	150,000		1	
133		Banepa	Champa Manikarmi	0	0	0			1				1	190	0			
134		Banepa	Ishwor Dhagauda	5	2	3			1				1	230	140,000		1	
135		Banepa	Krishna Maya Dhagauda	3	1	2			1				1	180	10,000		1	
136		Banepa	Lahar Maya Dhagauda	6	4	2			1				1	220	150,000		1	
137		Banepa	Krishna Gopal Manikarmi	6	3	3			1				1	250	140,000		1	
138		Banepa	Laxmi Raj Bhandari	9	4	5			1				1	210	120,000		1	
139		Banepa	Vishwor Raj Nath RajBhandari	12	6	6			1				2	510	160,000			
140		Banepa	Satya Narayan Shrestha	6	3	3			1				2	580	160,000			
141		Banepa	Bhakta Lal Shrestha	6	4	2				1			2	440	120,000		1	
142		Banepa	Bhakta Lal Shrestha	0	0	0	1						1	362	140,000		1	
143		Banepa	Jagat Bahadur Shrestha	2	1	1			1				1	260	120,000		1	
144		Banepa	Rup Bahadur Bista	7	4	3			1				1	190	100,000		1	
145		Banepa	Shiva Lal Shrestha	3	2	1				1			2	480	120,000		1	
146		Banepa	Anil Shrestha	6	4	2				1			1	230	120,000		1	
147		Banepa	Sanu Bhai Bista	4	2	2			1				1	200	120,000		1	
148		Banepa	Rakesh Shah	5	3	2			1				1	210	150,000		1	



S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
149		Banepa	Bijula Shrestha	5	2	3			1				1	190	108,000	1		
150		Banepa	Bharat KC	6	4	2			1				1	250	100,000		1	
151		Banepa	Atma Ram Acharya	6	3	3			1				1	230	120,000		1	
152		Banepa	Krishna Shrestha	3	2	1				1			1	240	90,000		1	
153		Banepa	UNKNOWN	2	1	1			1				1	160	90,000		1	
154		Banepa	Gobardhan Shrestha	6	3	3			1				1	260	120,000		1	
155		Banepa	Ran Bahadur Bista	1	1	0			1				1	210	120,000		1	
156		Banepa	Ran Bahadur Bista	0	0					1			1	230	120,000		1	
157		Banepa	Surya Shrestha	5	2	3				1			1	190	130,000		1	
158		Banepa	Raj Kumar Yonjan	3	1	2			1				1	210	150,000		1	
159		Banepa	Punima Shrestha	1	0	1			1				1	200	120,000		1	
160		Banepa-11	Ravi Thapa	6	4	2			1				2	260	120,000		1	
161		Banepa	Amul Petrol Pump Toilet	0	0	0			1				1	180	0			
162		Banepa-11	Shyam Sundar Kunwar	5	2	3			1				1	260	150,000		1	
163		Banepa-11	Kumak Lal Ranjit	6	3	3			1				1	310	120,000		1	
164		Banepa-11	Nati Babu Kunwar	6	3	3			1				2	540	150,000		1	
165		Banepa-11	Mo. Faruk	6	4	2			1				1	330	150,000		1	
166		Banepa-11	Gurung Electronic Workshop	0	0	0			1				1	265	150,000		1	
167		Banepa-11	Maila Kasai	6	3	3			1				1	110	120,000		1	
168		Banepa- 9	Sanumaya Shrestha	5	4	1				1			1	220	130,000		1	
169		Banepa- 9	Rajendra Shrestha	6	2	4			1				2	285	130,000		1	
170		Banepa- 9	Narayan Bhakta Shrestha	5	2	3					1		3	1550	26,000		1	
171		Banepa- 9	Raju Ratna Shakya	3	1	2					1		4	1600	28,000		1	
172		Banepa- 9	Arvind Chaudhary	6	2	4					1		4	2200	280,000			
173		Banepa-11	Bislal Manandhar	5	4	1			1				2	295	120,000		1	
174		Banepa-8	Daya Laxmi Shrestha	6	3	3					1		3	2050	260,000			
175		Banepa-8	Nyuchhe Bahadur Suwal	6	4	2					1		3	1560	250,000			
176		Banepa-8	Rahar Man Kapali	5	3	2					1		1	580	270,000			
177		Banepa-8	Mohomad Kadir	6	3	3			1				1	250	170,000			
178		Banepa-8	Hari Shrestha	8	5	3			1				1	210	140,000		1	
179		Banepa-8	Sabin Shakya	7	2	5					1		3	1740	240,000			
180		Banepa-8	Ganga Lal Shahi	5	3	2			1				1	230	240,000			

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
181		Banepa-8	Ganga Lal Shahi	0	0	0					1		3	1860	0			
182		Banepa-8	Kedar Man Yochhiwaya	4	2	2					1		2	1280	220,000			
183		Banepa-8	Juju Bhai Shrestha	10	4	6					1		4	2400	230,000			
184		Banepa-8	Sundari Maya Bade	7	2	5					1		4.5	2590	230,000	1		
185		Banepa-8	Laxmi Raj Bhandari	6	3	3					1		4	2440	220,000			
186		Banepa-8	Rajendra Bade	7	4	3					1		2	1500	240,000			
187		Banepa-8	Bhakti Maya Joshi	10	5	5					1		3	1950	210,000			
188		Banepa-7	Rajesh Bhail	3	2	1			1				2	520	200,000			
189		Banepa-6	Nimtempa Sherpa	7	3	4				1			2	440	280,000			
190		Banepa-6	Sandesh Shrestha	8	5	3				1			1	230	210,000			
191		Banepa-6	Sudarshan Napit	7	3	4				1			1	225	190,000			
<b>DHULIKHEL NEW CURVE</b>																		
192	Dhulikhel	Dhulikhel -4	Phanindra Adhikari	5	3	2			1				2	560	200,000			
193		Dhulikhel -4	Rajkumar Bista	9	5	4					1		4.5	2600	160,000			
194		Dhulikhel -4	...UnKnown..	5	3	2			1				2	520	0			
195		Dhulikhel -4	Hari Adhikari	7	4	3					1		3	1920	300,000			
196		Dhulikhel -4	Phanindra Adhikari	7	4	3					1		1	750	150,000	1		
197		Dhulikhel -4	Prem Bahadur Karki	10	4	6					1		3	1950	200,000			
198		Dhulikhel -3	Hom Bahadur Thapa Magar	5	3	2					1		1	630	330,000			
199		Dhulikhel -4	Ramila Tamang	3	2	1			1				1	203	150,000	1		
200		Dhulikhel -4	Hom Nath Acharya	5	3	2					1		3	1725	180,000			
201		Dhulikhel -4	Nirmala Chandi Shrestha	5	3	2					1		4	2300	260,000			
202		Dhulikhel -4	UNKNOWN	5	2	3					1		2	620	0			
203		Dhulikhel -4	Prem Shrestha	6	4	2					1		4	2500	240,000			
204		Dhulikhel -4	Prem Shrestha	0	0						1		2	800	400,000			
205		Dhulikhel -4	Prem Shrestha	0	0						1		2	740	0			
206		Dhulikhel -4	Shree Krishna Pasachhe	8	4	4					1		4	2400	260,000			
207		Dhulikhel -4	Man Kaji Shrestha	7	4	3					1		4	3200	190,000			
208		Dhulikhel -4	Ram Mani Kuikel	6	3	3					1		3.5	2440	200,000			
209		Dhulikhel -3	Kot Bahadur Thapa Magar	4	2	2					1		3	1710	270,000			
210		Dhulikhel -4	Raj Kumar Shrestha	6	3	3					1		2	1160	300,000			
211		Dhulikhel -4	Baldev Thapa	7	3	4				1			4	880	180,000			

S.N.	District	Municipality (Ward)	Name of Owner (HHs)	HHs Population			Structure Type						Floors	Plinth Area (Sq.ft)	Yearly Income	Women Headed	Below Poverty Level	Disable Headed
				Total	Male	Female	1	2	3	4	5	6						
212		Dhulikhel -4	Phanindra Adhikari	8	3	5				1			2	520	140,000			
<b>DHULIKHEL RoW( OLD)</b>																		
213	Dhulikhel	Dhulikhel -4	Bishnu Prasad Kuikel	5	3	2			1				1	250	160,000			
214		Dhulikhel -4	Bidur Karki	4	2	2					1		4	2520	250,000			
215		Dhulikhel -4	Mohan Ghishing	3	2	1			1				1	260	140,000		1	
216		Dhulikhel -4	Uddhav Kuikel	5	4	1			1				2	520	120,000		1	
217		Dhulikhel -4	Bashanta Khanal	6	2	4			1				3	750	260,000			
218		Dhulikhel -4	Hom Bahadur Thapa Magar	6	4	2				1			1	220	0			
219		Dhulikhel -4	Hom Bahadur Thapa Magar	0	0	0				1			3	570	700,000			
220		Dhulikhel -4	Hom Bahadur Thapa Magar	0	0	0				1			2	480	0			
221		Dhulikhel -4	Hom Bahadur Thapa Magar	0	0	0				1			2	450	0			
222		Dhulikhel -4	Chandra Dahal	4	2	2			1				1	260	200,000			
223		Dhulikhel -4	Padam Kumari Adhikari	6	4	2			1				1	280	190,000			1
224		Dhulikhel -4	Shiva prasad Parajuli	5	2	3					1		2	1050	170,000			
225		Dhulikhel -4	Bed Prasad Benju	6	2	4					1		3	900	170,000			
226		Dhulikhel -4	Jivnatha Sainju	7	3	4				1			3	580	190,000			
227		Dhulikhel -4	Bindayal Makaju	14	4	10			1				2	510	140,000		1	
228		Dhulikhel -4	Indra Dahal	8	5	3				1			1	216	500,000			
229		Dhulikhel -4	Khamaya BK	11	4	7				1			1	210	130,000		1	
230		Dhulikhel -4	Punya Rijal	6	3	3				1			2	480	190,000			
231		Dhulikhel -3	Mamu Shrestha	6	2	4					1		2	1000	130,000		1	
232		Dhulikhel -3	Kot Bahadur Thapa Magar	5	3	2				1			1	230	300,000			
233		Dhulikhel -4	Bhetal Shrestha	6	3	3			1				2	560	210,000			
234		Dhulikhel -3	Shree Om Shrestha	12	7	5			1				2	620	160,000			
<b>Sub Total</b>							<b>3</b>	<b>10</b>	<b>126</b>	<b>47</b>	<b>48</b>	<b>0</b>				<b>12</b>	<b>62</b>	<b>1</b>

Source: RAP Report, 2018

## H. Detailed list of Project Affected Land Parcels

Bhaktapur District				Kavrepalanchowk District		
S.N.	Name of Cadastral	No. of Cadastral	Numbers of Plots	S.N.	Coordinate Maps No.	Number of Plots
1	Sipadol	1 Ka	63	1	1281	206
2	Sipadol	2	48	2	1321	105
3	Sipadol	9	59	3	1322	224
4	Sipadol	9 Kha	39	4	1323	240
5	Nangkhel	1 Ka	60	5	1224	316
6	Nangkhel	9 Ka	29	6	1225	80
7	Nangkhel	9 Kha-1	60	7	1365	109
8	Nangkhel	9 Kha-2	26	8	1366	240
9	Nangkhel	8	19	9	1367	7
10	Nangkhel	7	31	0	0	0
11	Chitapol	1 Ka	36	0	0	0
12	Chitapol	1Kha	29	0	0	0
13	Chitapol	1 Ga-1	33	0	0	0
14	Chitapol	1 Ga-2	32	0	0	0
15	Chitapol	1-Feb	12	0	0	0
16	Chitapol	6 Gha-1	51	0	0	0
17	Chitapol	6 Ga -1	2	0	0	0
18	Chitapol	6 Gha-2	27	0	0	0
19	Chitapol	6 Ga-2	24	0	0	0
	<b>Total</b>	<b>19</b>	<b>680</b>	<b>9</b>		<b>1527</b>

Source: RAP Report, 2018

**I. Summary of Households to be Acquired by Project**

<b>Location</b>	<b>Households Nos.</b>	<b>Remarks</b>
<b>A. Curve Improvement Works and RoW maintenance</b>		
1. RoW maintenance in Eixsting Road	161	
2. New Curve Improvement in Eixsting Road	57	
<b>Sub Total of A</b>	<b>218</b>	
<b>B. New Approach Road to Sanga Tunnel</b>		
1. West Portal side (Palanse Area)	10	
2. East Portal side (Nashika Area)	6	
<b>Sub Total of B</b>	<b>16</b>	
<b>Total including Sanga Tunnel (A+B)</b>	<b>234</b>	

Source: RAP Report, 2018

**J. Summary of Types of Households to be Acquired**

<b>No.</b>	<b>House Type</b>	<b>Number of House Structures</b>
1	Simple Hut/Sheds	3
2	Thatched roof, walls constructed with bamboo and mud/stone	10
3	Tile/iron roof, walls constructed with brick/ mud/stone	126
4	Iron sheet/roofing with stone/ brick wall/cemented plaster	47
5	RCC Building	48
6	Movable kiosk /wall/fence etc.	0
<b>Total</b>		<b>234</b>

Source: RAP Report, 2018

**K. Additional Land Required (Suryabinayak - Dhulikhel Road)**

Location No.	Side (When going from)	Additional Area		Remarks
		in sq.m.	in Ropanis	
1	L	663.69	1.30	Curve improvement
2	R	379.10	0.75	Curve improvement
3	R	1,592.53	3.13	Curve improvement
4	R	8,969.71	17.63	Curve improvement
5	L	310.62	0.61	Curve improvement
6	R	3,118.67	6.13	Curve improvement
7	L	403.34	0.79	Curve improvement
8	R	615.21	1.21	Curve improvement
9	L	3,690.74	7.25	Curve improvement
10	R	899.61	1.77	Curve improvement
11	L	191.46	0.38	Curve improvement
12	R	632.75	1.24	Curve improvement
13	L	634.66	1.25	Curve improvement
14	R	255.78	0.50	Curve improvement
15	L	139.55	0.27	Curve improvement
16	R	239.60	0.47	Curve improvement
17	L	534.92	1.05	Curve improvement
18	R	499.41	0.98	Curve improvement
19	L	710.41	1.40	Curve improvement
20	R	3,841.82	7.55	Curve improvement
21	L	181.05	0.36	Curve improvement
22	R	117.48	0.23	Curve improvement
23	L	648.28	1.27	Curve improvement
24	R	2,340.63	4.60	Curve improvement
25	R	1,000.68	1.97	Curve improvement
26	L	654.06	1.29	Curve improvement
27	R	1,670.35	3.28	Curve improvement
28	R	581.52	1.14	Curve improvement
29	L	146.26	0.29	Curve improvement
30	R	1,553.50	3.05	Curve improvement
31	L	951.73	1.87	Curve improvement
32	R	562.07	1.10	Curve improvement
33	L	1,703.80	3.35	Curve improvement
34	R	1,069.96	2.10	Curve improvement
35	L	67.92	0.13	Curve improvement
36	R	3,730.40	7.33	Curve improvement
37	L	405.02	0.80	Curve improvement
38	R	7,520.16	14.78	Curve improvement at KU Chowk
39	R	3,624.89	7.13	Curve improvement at KU Chowk
40	L	4,533.20	8.91	Curve improvement at KU Chowk
41	R	4,583.75	9.01	Curve improvement
42	L	866.59	1.70	Curve improvement
43	R	3,904.53	7.67	Curve improvement
S-1		44,000.00	86.49	New Approach Road to Sanga Tunnel (West Portal, Palanse Side)
S-2		18,648.00	36.66	New Approach Road to Sanga Tunnel (East Portal, Nashika Side)
	<b>Total</b>	<b>133,389.41</b>	<b>262.20</b>	

Source: RAP Report, 2018



## L. Summary of Additional Land to be Acquired by Project

Location	Area (in m <sup>2</sup> )	Area (in Ropanis)	Remarks
<b>A. Curve Improvement Works</b>			
1.Land Improvement for Curves Improvement	55,063.16	108.24	40 locations in 14.91 km
2.Land for Curve Improvement at KU Chowk	15,678.25	30.82	3 locations near KU Chowk
<b>Sub Total</b>	<b>70,741.41</b>	<b>139.06</b>	
<b>B. New Approach Road to Sanga Tunnel</b>			
1.West Portal side (Palanse Area)	44,000.00	86.49	West Portal side road = 580 m
2.East Portal side (Nashika Area)	18,648.00	36.66	East Portal side road = 370m
<b>Sub Total</b>	<b>62,648.00</b>	<b>123.15</b>	
<b>Total including Sanga Tunnel</b>	<b>133389.41</b>	<b>262.21</b>	

Source: RAP Report, 2018

## M. First Stakeholder (consultation) Meeting

### Issues Raised during Consultative Meetings

Formal Public consultation and interaction meetings were carried out in three different locations at Chitapol of Bhaktapur District, at Banepa and Sanga of Karvrepalanchowk district. The following is the brief report of the public interactions.

#### (1) Chittapol Meeting

The first public consultation meeting of Proposed Suryabinayak – Dhulikhel Road Project was organized in Jorpati Higher secondary school Old Building of Chitapol VDC of Bhaktapur district, 9 November 2014. The meeting was chaired by Mr. Manjul Manandhar, Team Leader / Environmental Expert for EIA and the director of Full Bright Consultancy. Other participants were from the JICA project, FBC consultants, VDC officials, representative from political parties and the local. Altogether 80 people have participated. The participation of the women was not seen at this place. The main purpose of the consultation meeting was to aware the local people of Bhaktapur, Nakhel, Sipadol, Chitapol about the proposed upgrading and widening of Suryabinayak – Dhulikhel Road project, to disseminate the project related information and to help to identify the possible environmental and social impacts, information and opinions of the local public and stakeholders regarding the project.

Mr. Manjul Manandhar, Team Leader / Environmental Expert welcomed to all participants and highlighted on the background of the project. He also highlighted and further elaborated the characteristics of the proposed project, the EIA process, the socio-economic and environmental information required, the potential impact (beneficial and adverse) during project implementation and minimization of the adverse impacts. Thereafter the floor was opened for the further discussion followed by question and answer.

All the participants (99%) were really positive about upgrading and widening of Suryabinayak – Dhulikhel Road project but only thing they were more concerned was the compensation for their lost land and properties. The affected people have shown a firm commitment for co-operation for the road widening and upgrading works. However, they have strong assertion for compensation demand on land and built houses since they are economically vulnerable. The land owners are still paying land revenue taxes to its concerned departments, and they proclaimed their legal status cannot be ignored. Thus the road widening project need to deal these issues and reach to a mutual agreement with these affected people.

Through the public consultation and meetings it was found that various scenario was in existence in the width of ROW at different sections of the road. “Lagatkatta” of the road

corridor was done without following the laws of land Acquisition coded in article 4 of Public Road Act, 2031.

Some (More than 50%) of the participants said that their land and other assets (which are to be acquired by the project) should be compensated based on the existing market rate and the RoW should be uniform through the road section. Some even enquire what will happen to the existing road if the project builds the new section of the road at some areas.

Closing remarks was given by Mr. Manandhar. He expressed the importance of the present consultation meeting. He said that the suggestions provided during the consultation are genuine and will be incorporated in the EIA report.

## **(2) Banepa Meeting**

The Second public consultation meeting of Suryabinayak – Dhulikhel Road Project was organized in Municipality Hall at Banepa of Karve on 9 November 2014. The meeting was chaired by Mr. Manjul Manandhar, Team Leader / Environmental Expert for EIA and the director of Fulbright Consultan. Participants were from the JICA, FBC, VDC officials and representative from political parties, businessmen and the local from Banepa, Janagal, Nasikasthan, Sangha, and Dhulikhe. Altogether 86 people have participated in the consultation meeting.

Mr. Manjul Manandhar, Team Leader / Environmental Expert welcomed to all participants and highlighted on the background of the project. He also highlighted and further elaborated the characteristics of the proposed project, the EIA process, the socio-economic and environmental information required, the potential impact (beneficial and adverse) during project implementation and minimization of the adverse impacts. Thereafter the floor was opened for the further discussion followed by question and answer.

Thereafter the floor was opened for the further discussion followed by question and answer session by Mr. Manjul Manandhar, Team Leader / Environmental Expert for EIA. Most of the participants expressed their positive remarks about road upgrading and extension project. The local people expressed their positive response about land and other assets to be acquired by the project but that some issues were raised such as compensation value of the land, protection of the area and natural resource etc.

Around 25% of the participants said that, the government of Nepal has made partial decision in 2058 through publishing Gazette, where the ROW between Sanga Chowk to Chandeshwori River (Banepa Municipality) was declared in which ward No. 11 was excluded in this decision. They express the decision should be implemented up to the Dhulikhel Municipality as well. 25% of the participants express that the Project should be rehabilitate all historical and cultural monuments such as Temple, public resting place (Chautara) etc. in an appropriate places. 25% of the participant sheared that if the government wants to improve the Araniko Highway, the design engineers should prepare integrated urban development plan considering upcoming 50 years perspective plan, where the drinking water, electricity, sewerage, fire line, fountain, footpath etc. has to be considered. Closing remarks was given by Mr. Manandhar. He expressed the importance of the present consultation meeting. He said that the suggestions provided during the consultation are genuine and will be incorporated in the EIA report.

## **Summary of Participants' Queries and Project Implementer's Explanation**

During the public consultation, the Consultant and the Developers were present to provide answers to queries raised by the participants. The explanation provided during the meetings are summarized hereunder.

**Table 1: Summary of Participants' Queries and Developer's Explanation at Benepa**

S.N.	Issues Raised by the Public	Project Consultant Team's Explanation
1	DOR should clear about Legal provision of road ROW of Arniko Highway	To be requested to DOR to address the people issues.
2	Compensation of all affected land inside 25 meter each side from center line beyond the existing road should be paid before construction work starts.	The government has published 25 meter ROW each side from center line of the road so, government will pay no compensation within the area of ROW.
3	People are still paying land revenue tax and cultivating /utilizing of the land which the government declared ROW.	The concerning government authorities will make clear about its provision.
4	Government has issued double Land Holding Certificate without consensus of related road side people	The concerning government agencies will make clear about its deed.
5	If DOR constructs new roads in some section then what will be the existing road?	The existing road also operates as usual as alternative road.
6	What is mean of improvement of bent? Explain its process.	In some section of existing road, there are sharp bends which needs to make possible straight for safety and maintain the road speed.
7	Demanded all related official from DOR, Survey Office and Land Revenue Office should clarify the all related issues to local people	Being the preliminary consultation meeting, all related government authorities could not success to attain the meeting however in the next round consultation related government authorities will definitely attend to address the issue.
8	The 75 fit ROW should declare along the Highway.	-It requires government decision
9	Compensation should pay for all project affected land, structures and business eateries etc. It should be pay as according to the market price.	Resettlement Action Plan will suggest to provide compensation of the project affected assets according to the market price
10	The government of Nepal has made partial decision in 2058 through publishing Gazette, where the ROW between Sanga Chowk to Chandeshwori river (Banepa Municipality) was declared in which ward No. 11 was excluded in this decision. The decision should implement up to the Dhulikhel Municipality as well.	The team will relay the existing situation to the DOR
11	Project should be rehabilitate all historical and cultural monuments such as Temple, resting road side house (Chautara) etc. in an appropriate places	This should be genuinely consider while implement the project
12	If the government wants to improve the Araniko Highway, the design engineers should prepare integrated urban development plan considering upcoming 50 years perspective plan, where the drinking water, electricity, sewerage, fire line, fountain, footpath etc. has to be	Design team will consider to make integrated plan for the urban development accordingly

S.N.	Issues Raised by the Public	Project Consultant Team's Explanation
	considered.	
13	Six lane roads are possible within the 75' width area.	-
14	The road improvement project should consider the nature of running business along the Highway corridor from Bhaktapur to Dhulikhel, that should be mitigate the adverse impacts by design	It should be address into the design period cooperating with concerning stakeholders
15	Wider road has higher chances of accident therefore road safety measure, design speed, visibility, signboard, and bend maintenance and driver's consciousness should be essential.	The new road project will consider the safety or the road.
16	Project should consider to the Severely Project Affected Families (SPAFs) while providing compensation	This is general practice the SPAFs will consider as much as possible
17	Verities of Land Related Acts such as 2011, 2034 and 2058 have different provision to acquisition land which is controversial and insufficient; nobody have deserved any right (with political leaders and bureaucratic authority) to take unwanted decision against people.	

### Attendance Sheet of Meetings for Suryabinayak – Dhulikhel Road

Date: 9<sup>th</sup> November 2014

Place: Jorpati Higher Secondary School, Old Building, Chitapol, Kathmandu

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
1.	Shiblal Bahala Shrestha	Bhaktapur Municipality-7	Buisness	9741021782				×	
2.	Nil Naryan Koju	Bhaktapur Municipality-7	Buisness	9851003254				×	
3.	Shivnaryan Mahat	Bhaktapur Municipality-7	Buisness					×	
4.	Rajpratap Gwachha	Bhaktapur Municipality-7	Buisness	9843351518				×	
5.	Praka Khatri	Nakhel-1	Agriculture	9868481149				×	
6.	Rajendra Khatri	Nakhel-1	Agriculture	9843099647				×	
7.	Sabin Khatri	Nakhel-8	Agriculture	9841621999				×	
8.	Achutam Khatri	Nakhel-8	Government Service, Nakhel VDC	9841704470		×			
9.	Sudarshan Khatri	Nakhel-7	Job	9841628696				×	
10.	Dhan Bdr. Khatri	Nakhel-7	Agriculture	6540034				×	
11.	Parshuram Ghale	Nakhel-6	Agriculture	6540611				×	
12.	Kedar Bdr. Khatri	Nakhel-9	Exserviceman	6540172				×	
13.	Dhan Bdr. Khatri	Nakhel-8	Agriculture	6540155				×	
14.	Saroj Khatri	Nakhel	Job	9841516233				×	
15.	Prabhuram Khatri	Nakhel-6	Agriculture	9843069548				×	
16.	Kul Bdr. khatri	Nakhel	Agriculture					×	
17.	Bharat Bdr.Khatri	Nakhel	job	016540569				×	
18.	Bhairav Bdr.Khatri	Nakhel	Agriculture	9841977611				×	
19.	Bishnu Bdr.Khatri	Nakhel	Agriculture	6540475				×	
20.	Rahim Bdr.Khatri	Nakhel	Agriculture	6540147				×	
21.	Rajendra Bhandri	Nakhel	Buisness	6540885				×	
22.	Indra Bdr Khatri	Nakhel	Agriculture					×	
23.	Nabaraj Ranamagar	Nakhel	Agriculture	9849171291				×	

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
24.	Uttam Thapa	Nakhel	Exserviceman	9818042675				×	
25.	Bishnu Khatri	Nakhel	Agriculture	9841119957				×	
26.	Shivaji Mahat	Nakhel	Agriculture	981338203				×	
27.	Rajaram Khatri	Nakhel	Agriculture	9841849163				×	
28.	Saddan Mahat	Nakhel-6	Agriculture	9741154016				×	
29.	Kumar	Nakhel-6	Agriculture	9849425009				×	
30.	Rajendra Mahat	Nakhel-6	Agriculture	9818121530				×	
31.	Krishna Bdr. Mahat	Nakhel-6	Agriculture	9841394891				×	
32.	Bishnu Khatri	Nakhel-8	Agriculture	9841478543				×	
33.	Bimal Khatri	Nakhel	Student					×	
34.	Uddav Raj K.C	Nakhel-8	Farmer	9841403490				×	
35.	Lakshman Khatri	Nakhel	Student	9841238650				×	
36.	Keshar Bdr. Khatri	Nakhel-8	Job	9841354605				×	
37.	Bal Bdr. Mahat	Nakhel-6	Agriculture					×	
38.	Love Khatri	Nakhel-7	Job	9849533643				×	
39.	Rabind Khatri	Nakhel-8	Buisness	9840065577				×	
40.	Ishwar Khatri	Nakhel-7	Buisness	9841516201				×	
41.	Achut Khatri	Nakhel-8	Govt Service	9841300506				×	
42.	Suman Bagle	Nakhel-6	Job	9841956631				×	
43.	Dilip K. C	Nakhel-8	Agriculture	9841303511				×	
44.	Kumar Bhandari	Nakhel-1	Agriculture	9841366230				×	
45.	Sagar Khatri	Nakhel	Agriculture					×	
46.	Ramkaji Mahat	Nakhel-6	Agriculture	98577599				×	
47.	Bhairam Mahat	Nakhel-6	Agriculture	9841987426				×	
48.	Shailendra Mahat	Nakhel-6	Household	9841555793				×	
49.	Rajendra Mahat	Nakhel-6	Farmer	6540492				×	
50.	Rajis Mahat	Nakhel-6	Job					×	
51.	Ramkaji Khatri	Nakhel-7	Serviceman					×	
52.	Bishnu Bdr. Bhandri	Nakhel-1	Agriculture	9843351514				×	
53.	Suhar Khatri	Nakhel-7	Buisness	9843351514				×	

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
54.	Sunil Khatri	Nakhel-7	Buisness	9803641358				×	
55.	Durga Bdr. Tamang	Sipadol	Agriculture	9808383369				×	
56.	Suklab Khatri	Chitapol-2	Agriculture	9841769203				×	
57.	Shivmadan Shrestha	Chitapol-1	Buisness	5540334				×	
58.	Ram Bdr. Bhujel	Chitapol-1	Household	6540823				×	
59.	Arjun Khatri	Chitapol-8	Agriculture	6540615				×	
60.	Hari	Chitapol-1	Buisness	9851169944				×	
61.	Kumar Rauat	Chitapol	Government service, Chitapol VDC	9841543613		×			
62.	Gagera Man Khatri	Chitapol	Buisness	9851086483				×	
63.	Pashupati Khatri	Chitapol-2	Job	9841222120				×	
64.	Surendra Bdr. Khatri	Chitapol	Agriculture	9840458				×	
65.	Deepak Raut	Chitapol	Agriculture	981062171				×	
66.	Barun Thapa	Chitapol	Agriculture					×	
67.	Kumar Gwachha	Chitapol	Farmer	98491706891				×	
68.	Suman Karki	Chitapol-5	Buisness	9849175775				×	
69.	Jeth Bahadur	Chitapol-5	Agriculture					×	
70.	Nakul Karki	Chitapol-4	Agriculture					×	
71.	Sharan Thapa	Chitapol	Farmer	9849178077				×	
72.	Suresh Khatri	Chitapol	Jorpati school Teacher	9849301796				×	
73.	Krishan Kant	Full Bright Consultancy	Field Coordinator	9841901180			×		
74.	Rishi Koirala	Full Bright Consultancy	Officer	9841589491			×		
75.	Dipendra Pant	Full Bright Consultancy	Officer	9851164338			×		
76.	Devi Prasad Dotel	Bhaktapur	Social Expert/FBC	9841348356			×		
77.	Robin Bhandari	Full Bright Consultancy	Resettlement Expert/FBC	9741001250			×		



S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
78.	Ashish Datt Bhatt	Full Bright Consultancy	Environment Engineer	9841702058			×		
79.	Arun Acharya	Chabhel	Environmental/FBC	9841235404			×		
80.	Manjul Krishna Manandhar	Full Bright Consultancy	Team leader/FBC	9841410364			×		
<b>Total</b>					<b>80</b>				

### Attendance Sheet of Meetings for Suryabinayak – Dhulikhel Road

**Date:** 9<sup>th</sup> November 2014

**Place:** Banepa Municipality Hall, Kavre

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
1.	Bhuwan Manandhar	Banepa-6	Engineer	9851039808		×		×	
2.	Bhola KC	Banepa-11	Professor at TU	9841519287				×	
3.	Bhagwan KC	Banepa	Agriculture	661119				×	
4.	Shyam Manandhar	Banepa	Business	9841878857				×	
5.	Krishna Gopal Bhail	Banepa-10	Co-moderator Arniko Highway Stakeholder Committee	9841452578				×	
6.	Dev Manandhar	Banepa-10	Arniko Highway stakeholder committee- Member	9851027192				×	
7.	Siddhigopal Manandhar	Banepa-6	Arniko Highway stakeholder committee- Member	9841280493				×	
8.	Bhuwan Manandhar	Banepa-10	Business	9841751460				×	
9.	Deepak Ratna Shakhya	Banepa-8	Engineer	9841215557				×	
10.	Krishna Budda Bajgain	Banepa-11	Social work	9841551172				×	

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
11.	Saroj Bade	Banepa-5	Business	9841488319				×	
12.	Chavi lal Kuikel	Banepa-11	Agriculture					×	
13.	Sudersan Napasi	Banepa-11	Agriculture	9741089723				×	
14.	Uttam kaji Manandhar	Banepa-6	Agriculture	9814000332				×	
15.	Hirdya Bade	Banepa-5	Business	9851049245				×	
16.	Dinesh Vaidya	Banepa-10	Business	9851060743				×	
17.	Susma Manandhar	Banepa	Student	9841472519				×	
18.	LaxmilalRaj Bhandari	Banepa-10	Business	9851042745				×	
19.	Hitlar Shakya	Banepa-10	Business	9841760112				×	
20.	Purn Man Shrestha	Banepa-1	Farmer	9843372800				×	
21.	Harshman	Banepa	Business	9849794022				×	
22.	Meg Lal Manandhar	Banepa-6	Sikarmi	9741138999				×	
23.	Asav Kuikel	Banepa-11	Agriculture	9841692869				×	
24.	Kamal Kuikel	Banepa-11	Agriculture					×	
25.	Bal Mukund Prajuli	Banepa-11	Agriculture					×	
26.	Ram Kafle	Banepa	Agriculture					×	
27.	Prem Dedar	Banepa	Politics					×	
28.	Sourav Rajman	Banepa-3	Politics	9841446667				×	
29.	Laker Kyastha	Banepa-10	Politics	9841536630				×	
30.	Bhairav KC	Banepa-11	Politics	9841616413				×	
31.	Laxmi Bade Shrestha	Banepa-5	Politics	9851056875				×	
32.	Thran KC	Janagal-1	Agriculture	9841497453				×	
33.	Harish Chandra Manandhar	Jnagal-1	Teacher	9841508112				×	
34.	Pandav Bista	Jangal-8	Agriculture	9849200858				×	
35.	Biswa Khadaka	Jangal-8	Agriculture	660282				×	
36.	Deepak Bista	Jangal	Agriculture	9841590199				×	
37.	Navraj Bista	Jangal	Business	9841581772				×	
38.	Santosh Timilsina	Jangal-8	Business	9841900279				×	
39.	Sano Bhai Bista	Jangal-4	Social work	9841353626				×	
40.	Triran Ranjitkar	Jangal,pulbazar-1	Business	9851047061				×	
41.	Ram	Jangal,pulbazar-1	Farmer	9843185940				×	

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
42.	Bishnu Karmcharya	Jangal,pulbazar-1	Agriculture					×	
43.	Gautam Kaji Manandhar	Sangha	Business	663511				×	
44.	Gunas Manandhar	Sangha-5	Teaching	9841300969				×	
45.	Badri Bista	Sangha-1	Agriculture	9841603577				×	
46.	Laxmi Narayan Joshi	Sangha-6	Agriculture	9841411663				×	
47.	Hari Datta Shrestha	Bhasipati-1, Sanga	Business	9851066426				×	
48.	Suresh Mdhikarmi	Bhasipati-1,Sanga	Business	9841621654				×	
49.	Kancha K Mdhikarmi	Bhasipati-1,Sanga	Business	66406				×	
50.	Binod Raj Pradhan	Sangha VDC	Business	9849317399				×	
51.	Bigyan Dhaugada	Nasikasthan-1,Sanga	Business	9851192600				×	
52.	Badri	Sangha-5	Business					×	
53.	Hari B Shrestha	Sangha-1	Business	9841414556				×	
54.	Ramesh Dhaugada	Sangha, Bhasipatti	Business	9849170219				×	
55.	Raju Shrestha	Sangha, Bhasipatti	Business	9841285899				×	
56.	Mani Raj Chandi	Sangha, Bhasipatti	Farmer	9841102760				×	
57.	Rajendra Shrestha	Sangha	Student					×	
58.	Aayush Dulal	Sangha	Student	9860145885				×	
59.	Kusma Devi	Sangha-4	Agriculture						×
60.	Dhram P Shrestha	Sangha-2	Agriculture	9741103070				×	
61.	Jagat lal Shrestha	Sangha-1	Agriculture	9849317419				×	
62.	Purn Dhaugada	Sangha-1	Agriculture					×	
63.	Rajan K Acharya	Sangha	VDC Secretary, Nasikasthan VDC	9841592501		×			
64.	Ishworraj Dhaugada	Sanga	Agriculture					×	
65.	Jiwan Shrestha	Sangha	Business	9841430232				×	
66.	Suresh Chucho Pradhan	Sangha	Business	9801002063				×	
67.	Bhai Kaji Shrestha	Sangha	Business	9841432853				×	
68.	Kishor Manandhar	Sangha	Business	9841615666				×	
69.	Yugdip Luitel	Dhulikhel,KU	Student	9842412502				×	
70.	Nisesh Poudel	Dhulikhel,KU	Student	9841834849				×	

S.N	Name	Address	Main Occupation	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
71.	Prof Dr Subodh Sharma	Dhulikhe-7	Teaching	9841254129				×	
72.	Durga Prasad Shrestha	Dhulikhel-7	Farmer					×	
73.	Nivesh Dugad	Kamaladi, Kathmandu	Student	9841834947				×	
74.	Sobha Shrestha	Balkot, Bhaktapur	Student	9841078552				×	
75.	Bibhu Gautam	KU Girls Hostel	Student	9849036703					×
76.	Juna Katel	KU Girls Hostel	Student	9843004124					×
77.	Kriti Bajracharya	KU Girls Hostel	Student	9843069701					×
78.	Sakar Shrestha	Dilibazar Kathmandu	Student	9841645688				×	
79.	Rishiram Koirala	FBC	Officer at FBC	9841589491			×		
80.	Krishan Kant	FBC	Field Coordinator	9841901180			×		
81.	Dipendra Panta	FBC	Field Coordinator	9851164338			×		
82.	Devi Prasad Dattel	FBC	Social Expert	9841348565			×		
83.	Ravin Bhandari	FBC	Resettlement Expert	9741001250			×		
84.	Ashis Datt Bhatta	FBC	Environmental Engineer	9841702058			×		
85.	Arun Acharya	FBC	Environmentalist	9841235405			×		
86.	Manjul Krishna Manandhar	FBC	Team Leader	9841410364			×		
	<b>Total</b>				86				

### **(3) Sanga Meeting (First Stakeholders Consultation Meeting)**

The public consultation meeting at Sanga was organized in Ward office-14 hall of Naisikaisthan of Sanga on 14/Oct/2017 A.D (28/06/2074 B.S). The meeting was conducted in the presence of three ward chairperson (9, 10 and 14) were remarked as respective guiding person (Upendra Raj KC, Shivaram Raut and Shivaram Raut. Other participants were from the DoR/GESU, FBC consultants, Ward Chairperson, representative from political parties and the local. Altogether 49 people have participated. The list of the participants is presented in the Attendant sheet. The participation of the women was also seen in good numbers.

The main purpose of the consultation meeting was to aware the local people of Palanse and Sanga about the proposed tunnel project, to disseminate the project related information and to help to identify the possible environmental and social impacts, information and opinions of the local public and stakeholders regarding the project.

The program was started at 9:00 am onwards. Mr. Devi Prasad Dotel Sociologist of FBC welcomed to all participants and highlighted on the background of the project, status of Nepal's current transportation, the rapidly growing traffic volume and the problem in overall traffic management system in Nepal. He also highlighted the beneficial impact of the proposed tunnel project.

Mr. Arun Acharya, Environmentalist, FBC presented and further elaborated the characteristics of the proposed project, the EIA process, the socio-economic and environmental information required, the potential impact (beneficial and adverse) during project implementation and minimization of the adverse impacts. Thereafter the floor was opened for the further discussion followed by question answer. All the participants were very positive about Sanga tunnel construction project. The local people expressed their positive response about land and other assets to be acquired by the project but that should be compensated and evaluation should be made based on the existing market value not as per government rate. Project should concentrate on the protection of natural resources, forest resources and existing water supply and irrigation facilities. The soil from the tunnel should be managed in the proper way. The employment opportunity should be provided to the local people during construction and implementation. Some participants expressed bit doubt for the construction of the Tunnel.

In response of the queries of the local DoR/GESU representative and FBC consultants said that the possible mitigation measures will be adapted and for the extreme circumstances the appropriate compensation of the disturbed private property of the local (in case it is acquired by the project) will be done as per government and donors guidelines. The project will try to avoid such natural and forest resources, if not possible will do the best to minimize the likely occurring adverse impact on such resources and existing facilities. About 90% of people are positive about the Tunnel option alternative and they are happy that their cultural, aesthetic value, temple and their private structure falling in the existing road will be protected by the Tunnel option alternative. Whereas some people are not happy about this Tunnel option alternative because they are afraid about commercial and cultural activities will be decrease of the Sanga.

Closing remarks was given by the Ward Chairpersons. They also expressed the importance of the tunnel in the present context and gave the positive views for the proposed tunnel. They assured the full cooperation from them during the construction and implementation in the future.

The major queries raise by the participants and response during the consultation meeting are summarized below:

**Table 2: Summary of Participants' Queries and Developer's Explanation at Sanga**

S.N	Participants' Questions/Opinion/Suggestion	Project Implementer's Explanations Presente
1	Why the project is not implementing the previously designed open road section through Sanga pass?	It is perceived to avoid various social and cultural impacts at the Sanga Pass area.
2	If the Tunnel road option comes into implementation, what will be the status of the existing road and its improvement?	If the existing road will remains there then the improvement and maintaining of the road will be done through local road division office. And the Status of the existing road will be decided by the DoR.
3	Please provide the final design of the Tunnel section so that the possible discussion can be done on the Tunnel option.	It is just like feasibility level of tentative tunnel alignment and discussion. It may be possible to manage deliver designs of Tunnel in the next phase discussion once the detail information and design is viable.
4	Is there any adverse impact upon the only available source of water resource inside the Sanga Hill and the building structures of the portal areas and others?	In such case, mitigation measures will be apply considering the geology of the ground over there. Advance knowledge that practice to avoid adverse impact in Tunnel construction should also be apply as much as possible.
5	Restaurants and the other existing business of Sanga thought the existing road alignment will deteriorate and shifted towards the Tunnel Portal side.	The New Tunnel road gives access to long route vehicles and the directly valley entrance non-passengers vehicles. Local vehicle movement will not stop, the existing congestion will reduces that helps to promote local business in this historic Sanga pass Area.
6	The new land should be acquired for the access road which shall be acquired with good some of compensation cost.	Only a small section of new land should be needed, which can require to advance the design speed.
7	Most of the business structures that located at the Sanga roadside are within the ROW area therefore these should be sifted as per the Road Act.	However, beyond the existing RoW area, it may require further new are to maintain design speed in sharp bends area.
8	There is the high possibility of Sanga to falls behind in its development and economic activities with the tunnel option.	With the tunnel option and diversion, the present economic hub with various ongoing economic activates will not be hamper as this area is one section of long road route from eastern side of the country.
9	Will there be any impact on the structure and housed located above the Tunnel section and will there be compensation for the effected land and structure around and above the tunnel section.	There will not be any adverse impact on the structure and housed located above the Tunnel section. Compensation will be paid for the access road area to the tunnel section and on the portal area of the tunnel.

## First Stakeholders Consultation for upgrading of Suryabinayak - Dhulikhel Road with Tunnel option participation of Ward 9,10 and 14

**Date: October 14, 2017**

**Time: 9:00am – 11:00am**

**Venue: Ward No.14 Office Nasikaisthan, Sanga - Banepa Municipality**

### Attendance Sheet

S.N	Name	Designation	Organization	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
1.	Gauri Raut	Ward Chairperson-14	Banepa Municipality-14	9841525297		×			
2.	Ramhari Shrestha		Banepa Municipality-13	9851164464				×	
3.	Ram Bahadur Karki		Suryabinayak Municipality-9	9841585005				×	
4.	Shailendra Khatri		Suryabinayak Municipality-9	9841452888				×	
5.	Upendra KC	Ward Chairperson-09	Suryabinayak Municipality-9	9851149050		×			
6.	Rama Kumari Shrestha	<b>Sociologist</b>	DoR/GESU	9841293143	×				×
7.	Meera Joshi	Environmentalist	DoR/GESU	9741059057	×				×
8.	Binaya Mahat	Ward Member	Suryabinayak Municipality-9	9841382560		×			
9.	Shivaram Raut	Ward Chairperson-10	Suryabinayak Municipality-10	9841339746		×			
10.	Bhaikaji Shrestha		Banepa Municipality-14	9841432853				×	
11.	Anjani Kumar Joshi		Banepa Municipality-13	9851051064				×	
12.	Jayanti Budhathoki	Community forest Chairperson	Suryabinayak Municipality-9	9841435240		×			×
13.	Satyajeet Bhaila	Ward Secretary-14	Banepa-7	9851091029		×			
14.	Jeevan Shrestha		Banepa Municipality-14	9841430232				×	
15.	Kishor Manandhar		Banepa Municipality-13	9841615666				×	
16.	Suban Shrestha	Engineer	Banepa Municipality-13,Sanga	9841580090				×	
17.	Manoj Shrestha		Banepa Municipality-14,Sanga	9841615662				×	
18.	Janakraj Karki		Residence-10	6540125				×	
19.	Hari Gopal Pradhan			9841432760				×	
20.	Jayandra Shrestha		Banepa Municipality-14,Sanga	9841488424				×	
21.	Ram Lal Duwal							×	
22.	Laxmi Narayan Joshi		Sanga	9841411663				×	
23.	Jayadesh Shrestha		Sanga-14	9841693028				×	
24.	Ram Bahadur karki		Sanga-14	9849316001				×	
25.	Pursotam Karmacharya		Sanga-14	984143035				×	
26.	Shyam Bahadur Karki		Sanga-14	9841007893				×	



S.N	Name	Designation	Organization	Phone number	National government	Local government	JICA/Local Consultant	Other	Female
27.	Diwas Shrestha		Sanga-14	9843403837				×	
28.	Shivahari Thapa		Sanga-14	9841302678				×	
29.	Ganesh Bahadur Shrestha		Sanga-14	9841477393				×	
30.	Ram Shrestha		Sanga-14					×	
31.	Bishnu Dulal		Sanga-14	9741051339				×	
32.	Rajaram Dulal		Banepa-14	9841446736				×	
33.	Sanubabu Dulal	Banepa-13						×	
34.	Rajendra Shrestha	Sanga		9841543318				×	
35.	Ram Kumar Karki		Suryabinayak Municipality-9	9860180770				×	
36.	Surendra Bhujel	Sanga-13		9841757165				×	
37.	Laxmiram Nihuche Pradhan	Sanga-13		9843426333				×	
38.	Hari Parasad Timalsina	Sanga-14		9849012689				×	
39.	Ambika Karki	Sanga-14		9843020686				×	×
40.	Shanta Karki	Sanga-14						×	×
41.	Manoj Shrestha	Sanga-13		9843188050				×	
42.	Dhurba Karki	Sanga-13		9841430084				×	
43.	Raju Mahat		Suryabinayak Municipality-9	9841848409				×	
44.	Prana Shrestha	Sanga-14		9849262663				×	
45.	Bhagwan Khatri	Suryabinayak Municipality-10		9841518242				×	
46.	Madan Shrestha	Facilitator	CTI	9841294004			×		
47.	Devi Prasad Dotel	Sociologist	Full Bright Consultancy	9841348356			×		
48.	Arun Acharya	Environmental Exert	Full Bright Consultancy	9841235404			×		
49.	Suman Pariyar	Environmental Officer	Full Bright Consultancy	9813686228			×		
<b>TOTAL</b>				<b>49</b>					

**Table: Summary of First Public Consultations Conducted**

<b>Dates, Time</b>	<b>Saturday,14/Oct/2017 A.D (28/06/2074 B.S), 9:00am onwards</b>
<b>Venue</b>	<b>Ward No.14 Office Nasikaisthan,Sanga - Banepa Municipality</b>
<b>Main Target</b>	Local government, residents, businesses and other stakeholders in Suryabinayak and Banepa Municipalities.
<b>Number of Attendants</b>	
DOR	2
Ward Chairperson/Member	6
Residents, Other	36
JICA	-
Women	5
<b>Total</b>	<b>49</b>
<b>Participants From</b>	<b>Suryabinayak Municipality ward no.9-Nangkhel,Suryabinayak Municipality ward no.10-Chitapole,Banepa Municipality Ward no.14-Nasikaisthan Sanga</b>

## **N. Second Stakeholders Consultation Meetings**

### **Stakeholder Consultation Meeting at City Gaon Resort, Bhaktapur**

The second Stakeholder consultation meeting was conducted at City Gaon Resort, Bhaktapur on 21 February 2017.

The meeting was conducted by Foreign Section of DoR while coordination made by Consultant (FBC). In the meeting, authority of local bodies were invited and Member of Parliament was also presented in this programme. The meeting was chaired by DDG Mr. Sanjay Kumar Shrestha the Mayor of Suryabinayak Municipality and the chief guest as the Member of Parliament.

Brief introduction of the main participants were made after welcoming them by Mr. Manjul Krishna Manandha, the team leader of EIA study team of consultant. He facilitated the programme by delivering the objective of the Stakeholder meeting and the general introduction of the Suryabinayak- Dhulikhel road section. He.

The requirement of the stakeholder meeting was also explained by Deputy Director General Mr. Sanjays Kumar Shrestha. He basically introduce the Suryabinayak- Dhulikhel road project, its nature and the tunnel alternative at Sanga area which will be integral part of this project.

Participants were requested to give their views about the proposed 6 Lane SD road which are as follows.

Mr. Pashupati Khatri the resident of Nalinchowk said the project do not have any consideration about Project Affected People (PAPs) regarding the impact to them with road widening. He questioned how the voice of the PAPs will be addressed while the Supreme Court had decided the RoW and compensation of the affected properties. Road should be constructed with due consider of the people's problem living along the side in terms of loss of their land and properties. Our only demand is to implement the project according to the Laws of Nepal. According to the Highway Act 2021 the ownership deed has not been transferred to GoN till now. Likewise he stated that the clause 3 and clause 4 of Road Act 2031 should also be applied while dealing with land acquisition. He further stressed that the verdict of Supreme Court declared regarding RoW with 75 fits should be maintained by the DoR and the any extra land required should be acquired with paying compensation.

Mr. Sanjeev Khatri raised question about current design of the road and requested to have an open discussion on. He further asked either the road design have been done being within the verdict given by Supreme Court on the year 2068 regarding RoW with 75fits. RoW of road is different in built up area for example at Koteshower area which should also be applied in built up area in this road section as well. This issue should be consider by DoR. Bypass can be very helpful in such buildup area to minimize the social impacts.

Mr. Shivalal Bala Shrestha said the proposed road improvement issues had been made since long but not bring clear thought about the road RoW, roadside shelters and compensation of their properties. There are many people encroaching the RoW for vehicles parking purpose, stockpiling of materials but government has not taken any initiation regarding it which had caused frequent accidental problems. He said the road development should take place but with appropriate compensation and maintaining the uniform RoW width throughout the section.

Mr. Manindra Giri as Chairman of Dibyenagar Tole Improvement Committee said, Development also brings destruction of the place therefore project should be considered about the project affected people in high priority and should go hear with this plan program

Media person Mr. Pushkar Raj raised concerns that while road development into 6 lane road safety issues

should be in cooperated in its design by learning the lesson from our pass mistake and seeing the accidental records in koteshower – Suryabinayak section. Some design mistakes I noticed in koteshower – Suryabinayak section is at Flyover Bridge which does not includes the service lane on either side which have been accidental hazard for road crosser, placing Flyover Bridge in appropriate junction of road not sufficient traffic Light as well as street light and Taxi parking yards.

Mr. Ukesh Kawa Chairperson of 7 No. Ward of Bhaktapur said, the 6 lane road might cause high accident that should be minimized with right design. Might raise environmental problems like loss of tress with road extension work which should be compensated in some other area, induced dust problem with high mobility of the vehicles should be addressed while coming in main highway. Safety in Tunnel section should be maintain which can be challenging for us due to low experience on it. Road side vehicular workshop has made congested and traffic problem that should be stopped. The road design should in cooperate separated track for Cycle and motorcycle to reduce risk of accident. Overhead and under pass will be required along the road section for pedestrian.

Mr. Bashudev Thapa, Mayor of Suryabinayak Municipality said that the project should be implemented by following the verdict of Supreme Court and justice should be given to people accordingly. About the verdict, RoW of 75 fits has also been determined that should be followed and compensate to land beside 75fits and all the affected properties should be compensated based on current market rate and everyone should obey it. Compensation should be rational for low land holders and vulnerable people. The setback area will not implement beyond RoW in this section because it adversely affect to poor and marginalized groups of people.

The Member of Parliament, Mr. Mahesh Basnet spoke about the importance of the Suryabinayak-Dhulikhel road. The design should be revised and lane should be consider determined as less accidental basis. Appropriate and sufficient overhead bridges and under pass in required place should be provisioned. The Taxi Parking area in every intercrossing section should be maintained. Appropriate footpath also be required in this road. There should be provision to wash vehicles at Sanga area so that the vehicle will not be made dust pollution as approach to the city area. Some additional structure above the Manahara river corridor can utilized as vehicles parking such as public bus coming from eastern part of Nepal. Compensation of the affected properties should be made appropriately. The SD road project should be develop as National Pride Project and act accordingly.

Lastly, Mr. Sanjay Shrestha as DDG of RoD gave closing remarks and assured to involvement of Mayor as a member of Compensation Determination Committee (CDC) that will be rational for solving compensation issue.

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**Stakeholder Meeting at Banepa Municipality of 10 No ward Office Janagal,**

Mr. Manjul Manandhar gave a brief introduction of all the respected invitees and participants. Then he gave the introduction about Suryabinayak- Dhulikhel road. The chief guest of meeting was Mayor of Banepa Mr. Laxmi Narshing Bade Shrestha.

Mr. Ajaya Mul the Senior Division Engineer of DoR introduce about the requirement of the road improvement and inadequacy of existing Suryabinayak-Dhulikhel road for the enormously growing vehicles pressure. The discussion that was held in morning at Suryabinayak was fruitful to identify issues regarding it so he also requested the present participants to actively give their concerns, comments and suggestion for the betterment of this road section.

Later the participants were requested to give their views about the proposed 6 Lane SD road which are as follows.

Mr. Krishna Bahadur Khadka said the RoW of the Suryabinayak- Dhulikhel road was determined 75 feet either sides. So it should be do accordingly.

Mr. Nati Babu Kunwar said recently there are increasing accidents therefore the road improvement is essential as soon as possible addressing such issues.

Mr. Jeevan Shrestha said if the Tunnel option be implemented there will be chances to destroy water resource coming from that area. Sanga people are dependent on only water resource coming from that area so that we hope it will not be decline. Likewise, Sanga area will be fallen behind with their economical transection. The RoW of the road is not clear after the implementation of tunnel option around Sanga area.

Mr. Rajaram Dulal raised question about requirement of Tunnel at Sanga section. There were examples about the difficulties of not getting compensation. If tunnel is essential better to expose nearby Sanga pass so the local business will not be hampered adversely.

Mr. Jaya Narayan Shrestha said, it is your responsibility to make well design of road however our issue should be hear by concern authority or not? What criteria of RoW (75 feet or 82 feet) will be followed in this road section? There should be consideration about the business of Sanga. There are nearly 150 housing structures which were built before 2021BS should be compensated. By which date, compensation of road side structures will received by people. What kinds of vehicles will be getting permission to run under the tunnel? Likewise, what will be the maintenance of the existing road?

Mr. Shudarshan Napit raised question why the deed transfer has not been done while the Department of road established in 2018 BS and Land Survey office in 2035 BS? The land under the RoW should be deducted and also determined the RoW whether 82 feet or 75 feet either side. Compensation of the affected properties should be given.

Mr. Devendra Bista asked about the category of SD road.

Mr. Bhagawan KC asked that, some of the people are still paying Tax levy of the RoW land. Is government provide compensation of land such tax payer or not? RoW is also not fix whether 25 meter or Guj?

Bhagawan KC asked the Asian standard road width is varied like 9 meter in Raxaul, 7 meters in Khasa and 25 meters along the Nepal which is not rational here for us.

Mr. Ajay Mul answered the questions of raised basically. He explained that this Araniko Highway falls under Asian Highway termed as Asian Highway-42. Some section of this road has fixed RoW as 75 fit in 2058 BS. At present this road does not have pedestrian trail but improved road will have it. The tunnel option in Sanga has been determined by various different possible option study based on its geometry and gradient etc. The tunnel will be used with due for safety where vehicles carrying fuels and gas, cycle and motorcycle will not be permitted because of possible accident inside the tunnel. At present this road have pressure by 10,000 to 12,000 vehicles per day which will not resist without proper improvement and widening.

Mr. Laxmi Narshing Bade Shrestha as Mayor of Banepa Municipality remarked various issue raised by concern stakeholders. He said no one will get compensation of land that falls under RoW. 25 Guj is the RoW of this section (Sanga to Chandeshwori Khola of Banepa as published in Gazette in 2058 BS) road between Sanga to Chandeshwori Banepa. Compensation of structures that built before construction of road or execution of Road Act 2021 will get however structure constructed later then that date will not get compensation. If division of road initiate to road expansion, the list of detail about required compensation will be provided by Municipality. There is not any information about construction of tunnel in Sanga

section received by Municipality yet. If the tunnel will construct at Sanga pass, 75 feet RoW will be maintained at Sanga section.

**Summary of Attendants Public Consultation**

**Table: Summary of Public Consultation Conducted**

<b>Dates, Time</b>	<b>Wednesday 2/22/2018 A.D (09/11/2074 B.S)- 9:00 am Onwards</b>
<b>Venue</b>	City Gaon Resort, Bhaktapur
<b>Main Target</b>	Local government, residents, businesses and other stakeholders of Bhaktapur and Suryabinayak Municipality
<b>Number of Attendants</b>	
<b>Member of Parliament</b>	1
<b>Mayor/Ward Chairperson/Member</b>	13
<b>DoR/CTI</b>	7
<b>Residents, Other</b>	23
<b>Women</b>	0
<b>Total</b>	44
<b>Participants From</b>	Bhaktapur and Suryabinayak Municipality

<b>Dates, Time</b>	<b>Wednesday 2/22/2018 A.D (09/11/2074 B.S)- 2:00 pm Onwards</b>
<b>Venue</b>	Ward No.10 Office, Banepa Municipality
<b>Main Target</b>	Local government, Residents, Businesses and other stakeholders of Banepa and Dhulikhel Municipality
<b>Number of Attendants</b>	
<b>Mayor/Ward Chairperson/Member</b>	11
<b>DoR/CTI</b>	8
<b>Residents, Other</b>	40
<b>Women</b>	4
<b>Total</b>	63
<b>Participants From</b>	Banepa and Dhulikhel Municipality

## Stakeholders Consultation for upgrading of Suryabinayak - Dhulikhel Road with Tunnel option with Community People and Ward Members

Date: 2/22/2018 A.D (09/11/2074 B.S)

Venue: City Gaon Resort, Bhaktapur

Time: 9:00 am

S.N	Name	Designation/Organization/Occupation	Phone number	Government		Roadside Residents		Female	Remarks
				National	Local	Yes	No		
1	Mahesh Basnet	Member of Parliament, Bhaktapur-2	9851147987	√					
2	Sanjay Kumar Shrestha	DoR- Deputy General Director	9851234146	√					
3	Basudev Thapa	Mayor- Suryabinayak Municipality	9851095646		√				
4	Kiran Thapa Magar	Ward Chairperson-8, Suryabinayak	9851081876		√				
5	Upendra KC	Ward Chairperson-9, Suryabinayak	9851149050		√				
6	Shivaram Raut	Ward Chairperson-10, Suryabinayak	9841339746		√				
7	Kumar Chawal	Ward Chairperson-4, Bhaktapur	9841430535		√				
8	Prem Gopal Karmacharya	Ward Chairperson-5, Bhaktapur	9851197992		√				
9	Ukesh Kawaa	Ward Chairperson-7, Bhaktapur	9841431141		√				
10	Gyanendra Khatri	C.P.N Ward Committee Chairperson-9 Bhaktapur	9843212358			√			
11	Binaya Mahat	Ward Member-9, Suryabinayak Municipality	9841382560		√	√			
12	Shreeram Bhyanju	Member of District Coordination Committee Bhaktapur	9841637395		√				
13	Mahendra Giri	Chairperson of Deepnagar reform Society- Suryabinayak-9	9840280079			√			
14	Pushkar Raj Budhathoki	Chairperson of Journalist Federation	9841582983						
15	Dinesh Thapa	Secretary of Honorable Mahesh Basnet	9841119599						
16	Birun Chaulagain	Editor of everestmission.com	9851221496			√			
17	Shyam Bahadur Khatri	Suryabinayak Municipality-9	9841536664						
18	Ramkaji Khatri	Suryabinayak Municipality-9	9841358345			√			
19	Achut Khatri	Suryabinayak Municipality-9	9851220506			√			
20	Santosh Khatri	Suryabinayak Municipality-9	9851121286			√			
21	Lalri Tamang	Suryabinayak Municipality-8	9843351663						
22	Bir Bahadur Tamang	Suryabinayak Municipality-8							



23	Tulku Lama	Aashapuri Mahadev	9851002808						
24	Sonam Lama	Aashapuri Mahadev	9843531996						
25	Ajay Tamang	Suryabinayak Municipality-8	9843351272						
26	Kamal Bahadur Tamang	Suryabinayak Municipality-8	9860245231						
27	Dhulo kancha Tamang	Suryabinayak Municipality-8	9843559075						
28	Shivalal Bahal Shrestha	Bhaktapur Municipality-7	9840228666						
29	Pashupati Khatri	Local Resident, Jagati	9841222120						
30	Narayan Prasad Kawaa	Local Resident, Jagati	984137324						
31	Kumar Bhandari	Local Resident, Jagati	9851069176						
32	Krishna Bhakta Kawaa	Local Resident, Jagati	9841495078						
33	Krishna Prasad Sapkota	Suryabinayak Municipality-8							
34	Ajay Kumar Mul	S.D.E, Foreign Co-operation Branch DoR	9841284479						
35	Madan Kumar Shrestha	CTI, Project Coordinator	9841294104						
36	Shila Shrestha	DoR-SDDSDR	9841537837						
37	Rama Shrestha	DoR/GESU-Sociologist	9841293143						
38	Manoj Aryal	DoR- Environment Inspector	9851177117						
39	Chhabi Lal Poudel	DoR/FCB- Engineer	9851141181						
40	Meera Joshi	DoR/GESU-Environment Expert	9841059057						
41	Manjul Krishna Manandhar	FBC- Environment Specialist	9841410364						
42	Arun Acharya	FBC- Environmentalist	9841235404						
43	Devi Prasad Dotel	FBC- Sociologist	9841348356						
44	Suman Pariyar	FBC- Environment Officer	9813686228						

जापान सरकारको सहयोगमा निर्माण हुने सूर्यविनायक - धुलिखेल सडक खण्ड र साँगा सुरंग मार्गको समेत निर्माण सम्बन्धी छलफल तथा EIA

प्रतिवेदनमा सरोकारवालासंग परामर्श तथा छलफल कार्यक्रम

उपस्थिति

मिति: २०७४/११/०९ (बुधबार)










स्थान: सिटी गाउँ रिसोर्ट, भक्तपुर

समय: बिहान ९:०० बजे

क्र.स	नाम, थर	सम्बद्ध निकाय / पेशा / पद	सम्पर्क नं	सरकार		यस सडक आसपास बसोबास गर्ने		महिला	कैफियत
				राष्ट्रिय	स्थानीय	हो	होइन		
१	महेशा कल्लोत	प्रतिनिधि सभा सदस्य अक्षा १०३ क्र-२	९८५११५७९८७ <del>९८५११५७९८७</del>						
२	रत्नप्र कुमार श्रेष्ठ	सदर विचार/उ.म.प्रि.	९८५१२३५१५६						
३	बाणदेव थापा	मेयर सु.न.पा.	९८२९०९६४६						
४	उपेन्द्र क.श्री.	सदस्य-९ वडा पुतपा.	९८५११४०५०						
५	शिवराम खात्रा	" ९० " "	९८५१३३३६४६						
६	विनाय महत	वडा सदस्य ल.पा -९, भक्तपुर	९८५१३८२५६०				✓		

क्र.स	नाम, धर	सम्बद्ध निकाय / पेशा / पद	सम्पर्क नं	सरकार		यस सडक आसपास बसोबास गर्ने		महिला	कैफियत
				राष्ट्रिय	स्थानीय	हो	होइन		
96	बालेन्द्र सुब्बा	डि.डि.पा. ए.पा.ल ड वडा निकाय अखण्ड	9843212358			✓			
98	नातिकाजी के.सि	उ.न.स.स.	८८८९८२४६६६			✓			
9	श्याम जेठल	"	९८९९९६६६६						
90	रामकाजी सुब्बा	उ.न.पा.स	९८९९-२८८२४८			✓			
99	अच्युत (१०७)	डि.न.पा.स	९८८९९२२०५४६			✓			
92	श्रीराम ज्ञानेश्वर	जि.स.स.स.स.स.स.स.स.	९८९९९२२३३३		✓				
93	सन्धी सुब्बा	डि.न.पा.स	९८९९९२२३३३		✓				
94	सहदेव गिरी	डि.न.पा.स डि.न.पा.स डि.न.पा.स	९८९९९२२३३३			✓			
92	राजेश्वर राय	डि.न.पा.स	९८९९९२२३३३		✓				



क्र.स	नाम, थर	सम्बद्ध निकाय / पेशा / पद	सम्पर्क नं	सरकार		यस सडक आसपास बसोबास गर्ने		महिला	कैफियत
				राष्ट्रिय	स्थानीय	हो	होइन		
१६	डुल्क लामा	आशापुरी सहरक	९५४१००२८०८				✓		
१७	बिर बहादुर तामा	सु. नं. पार	५८४१८७१०६४				✓		
१८	सोनीम लामा	आशापुरी महोदय	९८४३४३१९९६				✓		
१९	बिजय तामा	सु. वि. नि. र. न. पार	१८५३३५१२४२				✓		
२०	महादेव तामा	सु. न. पार	९८५३३५१२४२				✓		
२१	बिजय तामा	सु. न. पार	९८५३३५१२४२				✓		
२२	बिजय तामा	CTI project Co-coordinator	१८५३३५१२४२				✓		
२३	Shila Shrestha	SDDSR, DOR	९८५३३५१२४२				✓		
२४	Chhabi Lal Paudel	FCB / DOR	९८५३३५१२४२				✓		

क्र.स	नाम, थर	सम्बद्ध निकाय / पेशा / पद	सम्पर्क नं	सरकार		यस सडक आसपास बसोबास गर्ने		महिला	केफियत
				राष्ट्रिय	स्थानीय	हो	होइन		
१२	Meena Jorje	Environmental Sabogor Expert / DOR/GESU	97410 55057						
१६	Rana Shrestha	Sociologist DOR/GESU	9841293143						
१७	Manoj Aryal	Environment Inspector DOR/GESU	9851177117						
१८	दिनेश थापा	मानवसि प्रहरी बलेनत डोर/लाम्बि लाम्बि	984119599						
१९	Bijun Chamling	Editor	9851221496						
२०	शिवराज काट्टेल	म.न.पा.सी.७	९८४२२८६६६						
२१	पञ्चपति राय	स्थानिय	९८९२२२१२०						
२२	पुष्कराज बुढाथोकी	अध्यक्ष, पञ्चास्रिकांश	९८५८२९८९८३						
२३	प्रेस गोपालकुमार	मकपुर १३।अध्यक्ष	९८४११६६६२						
२४	डकिरा क्वी	अध्यक्ष मकपुर १३।वडा ७	९८४१६३११४१						
२५	कुमार चण्डा	म.न.पा.सी. ४	९८४१४६०५३५						





**Public Stakeholders Consultation for upgrading of Suryabinayak - Dhulikhel Road with Tunnel option with Community People and Ward Members**

**Date: 2/22/2018 A.D (09/11/2074 B.S)**

**Venue: Ward No.10 Office, Banepa Municipality**

**Time: 2:00 pm**

S.N	Name	Designation/Organization/Occupation	Phone number	Government		Roadside Residents		Female	Remarks
				National	Local	Yes	No		
1	Laxmi Narsingh Bade Shrestha	Mayor, Banepa Municipality	9851056975		√	√			
2	Bardna Shakya	Ward Chairperson-7, Banepa Municipality	9841290362		√	√			
3	Chandra Bahadur Khadka	Ward Chairperson-10, Banepa Municipality	9841795722		√	√			
4	Shiva Kumar Thapa	Ward Chairperson-11, Banepa Municipality	9851061815		√	√			
5	Surya Narayan Napit	Ward Chairperson-13, Banepa Municipality	9841285523		√	√			
6	Gauri Raut	Ward Chairperson-14, Banepa Municipality	9841525297		√	√			
7	Rabinrda Karmacharya	Ward Chairperson-4, Dhulikhel Municipality	9843343106		√	√			
8	Gunaram Bhujel	Ward Member-7, Banepa Municipality	9841604049		√		√		
9	Sarita Shrestha	Ward Member , Banepa Municipality	9841795013			√			
10	Hari Krishna Budhathoki	Ward Member-13, Banepa Municipality	9841013646			√		√	
11	Hari Shrestha	Ward Member-10, Banepa Municipality	9841297714			√			
12	Jagatlal	Banepa, Janakal				√			
13	Rajesh Shrestha	Business, Banepa-10	9841956084			√			
14	Bachuram Acharya	Business, Banepa-10	9841431240			√			
15	Yadav Thapa	Business, Banepa-11	9841495896			√			
16	Keshav Thapa	Banepa-10	663973			√			
17	Laharman Kapali	Local Resident	9843852737			√			
18	Nanibabu Kuwar	Business, Banepa-10	9851005848			√			
19	Sudarsan Napit	Agriculture, Banepa-13	9741105470			√			
20	Kabir Kumar Ranjitkar	Business, Banepa-10	9851057886			√			
21	Bhaikaji Shrestha	Business				√			
22	Jiwan Shrestha	Business	9841430252			√			
23	Makar lal Manandhar	Business	9841100977			√			
24	Kishor Manandhar	Business	9841615666			√			
25	Rajaram Dulal	Business, Banepa-13, Sanga	9841446736			√			



26	Binod Raj Pradhan	Business	9849317399			√			
27	Shyam Krishna Shrestha	Business	9841358541			√			
28	Bhagwan K.C	Banepa-10	9841472736			√			
29	Yogendra Bista	Banepa-10	9840477812						
30	Shiva Prasad Timalsina	Business, Banepa-10	9851135361			√			
31	Sabitra Acharya	Banepa-10	9843574299			√		√	
32	Narayan Khadka	Banepa-10	9841599881						
33	Ram Krishna Dhakal	Mahendra Sec. School, Sanga-14	9841316544						
34	Laxmi Mizar	Banepa-13				√		√	
35	Sewak Shrestha	Banepa-10	9841412050			√			
36	Kabindra Bista	Banepa-10	9843780005			√			
37	Jay Desh Shrestha	Banepa-14	9841693028			√			
38	Mina Shrestha	Banepa-6	9851182400			√		√	
39	Juju Bhai Ranjitkar	Banepa-10	9841495787			√			
40	Minraj K.C	Banepa, Social Worker	9841488662			√			
41	Krishna Bahadur Khadka	Banepa-13, Janakal				√			
42	Haridaya Bade	Banepa-10	9851049245			√			
43	Suman Khadka	Local Resident, Banepa-10	9751063971			√			
44	Shyam Krishna Lamsal	Local Resident, Banepa-10	9851142777			√			
45	Saraswoti Timlasina	Banepa-10 Office Assistant	9841098297		√				
46	Rajendra	Banepa-9	661203		√				
47	Ramhari Shrestha	Banepa-13	9851164464		√				
48	Shyam Bajracharya	Banepa	9841008495						
49	Nati Bhai Manandhar	Agriculture, Banepa-13	9841775578			√			
50	Buddha kaji Manandhar	Agriculture, Banepa-13				√			
51	Surmaan Tamang	Worker	9841848737			√			
52	Guru Prasad Adhikari	Chief of Division, Bhaktapur Division Office	9851212274	√					
53	Ajay Kumar Mul	S.D.E, Foreign Co-operation Branch DoR	9841284479						
54	Madan Kumar Shrestha	CTI, Project Coordinator	9841294104						
55	Shila Shrestha	DoR-SDDSB	9841537837						
56	Rama Shrestha	DoR/GESU-Sociologist	9841293143						
57	Manoj Aryal	DoR- Environment Inspector	9851177117						
58	Chhabi Lal Poudel	DoR/FCB- Engineer	9851141181						

59	Meera Joshi	DoR/GESU-Environment Expert	9841059057						
60	Manjul Krishna Manandhar	FBC- Environment Specialist	9841410364						
61	Arun Acharya	FBC- Environmentalist	9841235404						
62	Devi Prasad Dotel	FBC- Sociologist	9841348356						
63	Suman Pariyar	FBC- Environment Officer	9813686228						

**O. Public Hearing of EIA**

**Public Hearing Notice Letter issued by FCB/ DOR to local stakeholders**

**Public Notice published in National Daily Newspaper, on 24 May, 2018**



नेपाल सरकार

भौतिक पूर्वाधार तथा यातायात मन्त्रालय

सडक विभाग

बैदेशिक समन्वय महाशाखा

फोन नं. : ९७७-०१५५४१६८६  
: ९७७-०१५५४१६८७  
फ्याक्स : ९७७-०१५५४२५३२  
ईमेल : dorfcbb@dor.gov.np

कृपण्डोल-१०  
ललितपुर, नेपाल

मिति : २०७५/०२/०८

पत्र संख्या:-

वै.स.म. ९/१४/०७४-७५

चलानी नं.:-

६९१

श्री .....

.....

बिषय : EIA प्रतिवेदनको सार्वजनिक सुनवाई गर्ने बारे ।

प्रस्तुत बिषयमा अरनिको राजमार्गको सूर्यबिनायक - धुलिखेल सडक खण्डको स्तरोन्नति/ चौडा गर्ने कार्यको लागि जापान अन्तर्राष्ट्रिय सहयोग नियोग (जाईका) को सहयोगमा सम्भाव्यता अध्ययन कार्य भैरहेको छ ।

उक्त सडक खण्डको पलाँसे देखी साँगा क्षेत्रमा सुरुड मार्गको अध्ययन र सो खण्डको EIA प्रतिवेदन गर्ने कार्य भैरहेको छ । सो सम्बन्धमा स्थानिय बासिन्दा लगायत अन्य सरोकारवालाहरूसँग EIA प्रतिवेदनको सार्वजनिक सुनवाई गर्ने कार्यक्रम रहेकोले तपसिल बमोजिमको समय र स्थानमा यहाँको उपस्थितिको लागि अनुरोध छ ।

तपसिल :

स्थान : अरनिको हाईवे पार्टिप्यालेस

मिती : २०७५/०२/ १६ (बुधवार)

समय : बिहान ८:०० बजे

बोधार्थ :

श्री सडक विभाग, GESU, चाकुपाट

(संजय कुमार श्रेष्ठ)

उप-महानिर्देशक

कृपया जाईका अध्ययन टिम परामर्शदाता श्री सि.टि.आई. इंजिनियरिङ्ग इंटरनेशनल/ श्री फुलब्राईट कन्सल्टैन्सी प्रा.लि. सँग समन्वय गरि आवश्यक कार्यार्थ

नेपाल सरकार

भौतिक पूर्वाधार तथा यातायात मन्त्रालय

सडक विभाग

कृष्णहोल, ललितपुर

अरनिको राजमार्गको सूर्यबिनायक-पुलिखेल  
सडक खण्डको स्तरोन्नति/सडक चौडा गर्ने  
कार्यको वातावरणीय प्रभाव मूल्यांकन (EIA)  
को मस्यौदा प्रतिवेदन उपर सार्वजनिक सुनुवाई

(प्रकाशन मिति २०७५/०२/१०)

सडक विभाग, वैदेशिक समन्वय महाशाखा प्रस्तावक रहेको अरनिको राजमार्गको सूर्यबिनायक-पुलिखेल सडक खण्डको स्तरोन्नति/सडक चौडा गर्ने कार्य सम्बन्धी छलफल तथा वातावरणीय प्रभाव मूल्यांकन (EIA) प्रतिवेदनमा सार्वजनिक सुनुवाई गरिने हुँदा सरोवरवाला सबैलाई निम्न स्थान र मितिमा उपस्थित हुन सूचित गरिन्छ ।

**सार्वजनिक सुनुवाई कार्यक्रम**

स्थान : अरनिको हाईवे पार्टिप्यालेस, बाँसघारी, भक्तपुर

मिति : २०७५ जेठ १६ गते बुधवार

समय : बिहान ८ :०० बजे

**प्रस्तावक:-**

सडक विभाग

वैदेशिक समन्वय महाशाखा

**कार्यक्रम आयोजक:-**

श्री सि.टि.आई. इंजिनियरिङ इंटरनेशनल

श्री फूल ब्राइट कन्सलटेन्सी (प्रा.) लि.

## **Proceedings of Public Hearing Meeting for Suryabinayak - Dhulikhel Road Improvement Project Conducted on 30 May, 2018**

The Public Hearing meeting was conducted by Foreign Cooperation Branch of DoR in coordination with Full Bright Consultancy Pvt. Ltd. (FBC). The information about the meeting was given to the stakeholders and local people, through a letter issued by the DOR, and a public notice in a national daily newspaper (*Rajdhani Daily*, on 24 May 2018).

In the meeting, authority of local bodies were invited and Member of Parliament Mr. Mahesh Basnet presided as a chief guest in this programme. The meeting was chaired by DOR/DDG Mr. Sanjay Kumar Shrestha, and special guests were the Mayors of Suryabinayak, Banepa and Dhulikhel Municipalities and the Ward chairperson of Bhaktapur Municipality and other representatives of the local government.

A brief introduction of the objective of the meeting was presented by Mr. Manjul Krishna Manandhar, Project Coordinator/ FBC of the project.

And the guests were welcomed and facilitated by DOR/DDG Mr. Sanjay Kumar Shrestha. In his opening remarks, he reiterated the Government's strong desire to commence this Project, at the earliest. He also gave a brief information about the Suryabinayak-Dhulikhel Road Project.

Mr. Arun Acharya, Environmental Expert of the Project, presented the Project's envisaged activities and the associated environmental implications, their mitigative measures proposed in the Draft EIA document. The option of Tunnel construction at Sanga, was also elaborated in detail.

### **Opinions expressed by the Participants**

**Mr. Pashupati Khatri** expressed that the road should be constructed with due consideration of the people's problem living along the side. He expressed that the people's demand is to implement the project according to the Laws of Nepal. He further expressed that while acquiring the land both the Clause 3 and 4 of Road Act 2031 has to be applied. He expressed that the Court decision on land related issues should be abided by the DOR.

**Mr. Shivalal Bala Shrestha** said the proposal of road improvement and construction has been made since long, but compensation to the road side shelters for their properties has not been clarified. Furthermore, the expressed that government agencies has not been able to clear out those encroaching the RoW land for private use. The accident issue in this road has also been alarmingly high.

**Mr. Ram Krishna Khatri** said that existing road is dangerous to travel and people cannot walk along the roadside due to the narrow road and increasing number of the vehicles. He also expressed that the government should provide the proper compensation to the affected people of the road project.

**Mr. Srawan Kumar Acharya** is positive with this project's activities. He expressed that, the government will provide fair compensation to the affected people, while upgrading of the road.

**Mr. Teka Narayan Khoju** said RoW of road is different in different built-up areas. This issue should be considered by DoR. Bypass will also be needed to minimize the impacts. The

improved road can make life easy and improve safety of its users.

**Mr. Ukesh Kawa**, Chairperson of 7 No. Ward of Bhaktapur, said the present road is causing high numbers of traffic accidents. Dust problem is severe that should be controlled. Safety in Tunnel section should be carefully designed.

At present road-side parking and garages has made congested. Cycle and motorcycle track should be designed to reduce risk of accident. Over-head and under-pass crossings will be required along the road section where farmer can carry farm production to opposite side. Drainage system be maintain in a good way so that it will not affect the household nearby the road. Alternative highway should be made before implementing this project.

**Laxmi Narsingh Bade, Mayor, Banepa Municipality** – expressed that the people want to know when the Project will start. He expressed that the ROW, from Sanga to Banepa is only 22.5m and it cannot be increased to 25m, since a huge destruction of private buildings will be required in Banepa, to enforce 25m ROW, which is not practical. For local safety, there is need of Flyover Bridges, and coordination with Banepa Municipality is required during detailed design of road, especially at the municipality area of Banepa.

**Basudev Thapa, Mayor- Suryabinayak Municipality** expressed that the government should abide by the verdict of Supreme Court and justice should be given to people accordingly. Regarding RoW it should be uniform all the section of the road. Compensation of the affected land and other properties should be equal to replacement cost. Compensation should be rational for poor and vulnerable people specifically. The setback area will not implement in this section because it adversely affect to poor and marginalized groups of people.

**Bimala Sharma, Deputy Mayor- Dhulikhel Municipality**, expressed that the location where the improvement of curves should be informed to the local government, as soon as possible, so that it can be circulated to the general public.

**Mr. Mahesh Basnet, Member of Parliament**, gave a concluding remarks and expressed the importance of the Suryabinayak- Dhulikhel Improvement Project. He expressed that the design team shall consider optimum safety in road design. Sufficient numbers overhead bridges and under-passes at appropriate locations shall be designed. Others requirements such as, taxi parking areas, appropriate footpaths, provision to wash vehicles at Sanga area etc. should be provided.

He expressed that the present Project should be developed as a National Pride Project. He expressed that he will take initiative for providing appropriate compensation of the Project affected people and their properties.

**Concluding Remarks by the Project Chief DOR/DDG Mr. Sanjay Kumar Shrestha**, as the Project Chief, express his opinions on the issues raised during the meeting. He assured that all the activities carried out by the DOR will be according to the mandates given by the Nepalese Acts, rules and regulations only.

He also expressed that compensation will be determined by the Compensation Determination Committee (CDC) and the representation of the local people will be done by the Mayors of the respective municipalities. The compensation will be distributed in a fair manner to all identified Project Affected People (PAP) of the Project Area. He thanked all the participants of the meeting and adjourned the meeting.



**Table: Summary of Public Consultation Conducted**

<b>Dates, Time</b>	<b>Wednesday 05/30/2018 A.D (16/02/2074 B.S)- 8:00 am Onwards</b>
<b>Venue</b>	Araniko Highway Party Palace Basghari-10, Bhaktapur
<b>Main Target</b>	Local government, residents, businesses and other stakeholders of Suryabinayak, Banepa and Dhulikhel Municipality
<b>Number of Attendants</b>	
<b>Member of Parliament</b>	1
<b>Mayor/Ward Chairperson/Member</b>	17
<b>DoR/CTI</b>	9
<b>Residents, Other</b>	73
<b>Women</b>	5
<b>Total</b>	<b>105</b>
<b>Participants From</b>	Suryabinayak, Banepa and Dhulikhel Municipalities

**Participant List during Public Hearing Meeting for Suryabinayak - Dhulikhel Road Improvement Project****Date: 30/05/2018 A.D (16/02/2075 B.S)****Venue: Araniko Highway Party Palace Suryabinayak-10,Bhaktapur****Time: 8:00 am****Participation Attendance Sheet**

SN	Name	Designation/Organization/Occupation	Contact Nos.
1.	Mahesh Basnet	Member of Parliament, Bhaktapur-2	9851147987
2.	Sanjay Kumar Shrestha	Deputy General Director, DoR	9851234146
3.	Ajay Kumar Mul	S.D.E, Foreign Co-operation Branch, DoR	9841284479
4.	Laxmi Narsingh Bade	Mayor- Banepa Municipality	9851056975
5.	Basudev Thapa	Mayor- Suryabinayak Municipality	9851095646
6.	Juna Basnet	Deputy Mayor- Suryabinayak Municipality	9841553979
7.	Bimala Sharma	Deputy Mayor- Dhulikhel Municipality	
8.	Kiran Thapa Magar	Ward Chairperson-8, Suryabinayak Municipality	9851081876
9.	Upendra KC	Ward Chairperson-9, Suryabinayak Municipality	9851149050
10.	Shivaram Raut	Ward Chairperson-10, Suryabinayak Municipality	9841339746
11.	Tara Basnet	Executive Member - Suryabinayak Municipality	9860678554
12.	Santa B.K	Ward Member - Suryabinayak Municipality	9849042362
13.	Dharma Raj Basnet	Ward Member 8- Suryabinayak Municipality	9841579361
14.	Dinesh Thapa	Suryabinayak Municipality-7	9841119599
15.	Binaya Mahat	Ward Member 9 - Suryabinayak Municipality	9841382560
16.	Sher Kaji Suwal	Suryabinayak Municipality-9	9851092432
17.	Indra Prasad Bhyanju	Suryabinayak Municipality-9	9851092432
18.	Nakul Rana Magar	Suryabinayak Municipality-9	9849424558
19.	Nabin Khadki	Suryabinayak Municipality-9	9841426646
20.	Govinda Bhuju	Suryabinayak Municipality-9	9841623798
21.	Gyanendra Khatri	Suryabinayak Municipality-9	984321358
22.	Sanjev Khatri	Suryabinayak Municipality-9	9851121286
23.	Manak ram Thapa	Suryabinayak Municipality-7	
24.	Binesh Manandhar	Suryabinayak Municipality-7	9841475118
25.	Hari B.K	Suryabinayak Municipality-7	9851194976
26.	Kapil Khadka	Business - Suryabinayak Municipality-9	9801013581
27.	Bharat Khatri	Suryabinayak Municipality-9	9841469321
28.	Dipak Khadka	Suryabinayak Municipality-9	9851052640
29.	Usha Khadka	Suryabinayak Municipality-9	9841394019
30.	Mandira Khadka	Suryabinayak Municipality-9	9841848897
31.	Pashupati Khatri	Suryabinayak Municipality-10, Jorpati	9841222120
32.	Rohan Khatri	Suryabinayak Municipality-9, Nalinchowk	9843453684
33.	Bigayan Rai	Suryabinayak Municipality-2	9851085585
34.	Sidhid ram Tyata	Suryabinayak Municipality-8, Jagati	9841245133
35.	Roll Kisari Karmacharya	Suryabinayak Municipality-8, Jagati	9841654499
36.	Kabita Dhachu	Suryabinayak Municipality-8, Jagati	9841112134
37.	Kumar Bhandari	Suryabinayak Municipality-9	9851069176
38.	Bal Chandra Ale Magar	Suryabinayak Municipality-10	9851180882
39.	Kishor Basnet	Suryabinayak Municipality-10, Basghari	9861796293
40.	Bikram Tamang	Suryabinayak Municipality	9843509322
41.	Jagdis Chandra Karki	Engineer-Suryabinayak Municipality-9	9851146819

SN	Name	Designation/Organization/Occupation	Contact Nos.
42.	Ukesh Kawaa	Ward Chairperson-7, Bhaktapur Municipality	9841431141
43.	Shiva lal bahala Shrestha	Bhaktapur Municipality-7	9840228666
44.	Maheshwor Banepali	Bhaktapur Municipality-9	9851011995
45.	Shiva Narayan Gyocha	Bhaktapur	9841975164
46.	Nabin Prajapati	Bhaktapur	9851039057
47.	Tulsi Narayan Lakhemaru	Bhaktapur	9841403050
48.	Hari Krishna Khayabu	Bhaktapur	9841692411
49.	Keshav Thapa	Farmer	01663973
50.	Rajendra khaitu	Bhaktapur Municipality-4	
51.	Rajesh Bhuju	Bhaktapur Municipality-1	9841394267
52.	Narayan Sundar Silwal	Bhaktapur Municipality-1	9841884838
53.	Shreeram Byanju	Ji.Sa.Sa Member Bhaktapur	9841637395
54.	Pushkar Basnet	Bhaktapur	9851194875
55.	Dilli Ram Bhattarai	Bhaktapur	9862209553
56.	Prabin Kushma	Bhaktapur Municipality-6	9851034951
57.	Raman Silakar	Bhaktapur Municipality-3	9800697769
58.	Binod Khatri	Bhaktapur Municipality-3	985107849
59.	Gokul Regmi	Thimi Municipality	9851091774
60.	Laxmi Narsingh Badesha Shrestha	Mayor, Banepa Municipality	9851056975
61.	Chandra bahadur Khadka	Ward Chairperson-10, Banepa Municipality	9841795722
62.	Surya Narayan Napit	Ward Chairperson-13, Banepa Municipality	9841285523
63.	Gauri Raut	Ward Chairperson-14, Banepa Municipality	9841525297
64.	Gunaram Bhujel	Ward Member-10, Banepa Municipality	9841604049
65.	Sukadev Joshi	Ward Member-13, Banepa Municipality	9851031912
66.	Mukti Bista	Banepa Municipality-10	9841353601
67.	Ishwor Bista	Banepa Municipality-11	9841754973
68.	Sagar Chaugoda	Banepa Municipality-13	9869720644
69.	Ramlal Duwal	Banepa Municipality 13, Sanga	9841488424
70.	Birochan Shrestha	Banepa Municipality 13, Sanga	9851192170
71.	Kailash Kuwar	Business - Banepa Municipality-10	9801051753
72.	Surendra Kumar Shrestha	Banepa Municipality-9	9860658800
73.	Ram Narayan Mahat	Banepa Municipality-9	9841443627
74.	Keshar Bahadur Mahat	Banepa Municipality-9	9841308001
75.	Shiva hari Timalina	Banepa Municipality-10	9841791940
76.	Shrawan Kumar Acharya	Banepa Municipality-10	9851143148
77.	Gangaram Karmacharya	Banepa Municipality-10	9851054330
78.	Hari Shrestha	Banepa Municipality-10	9841297714
79.	Bikram Khadka	Banepa Municipality-10	9841642380
80.	Udhab Thapa	Banepa Municipality-10	9841442798
81.	Kiran Shrestha	Banepa Municipality-10	9851214660
82.	Rajaram Duwal	Banepa Municipality-13 Sanga	9851090963
83.	Nil Narayan Khoju	Road Upgrading Victim	9851043254
84.	Ram kaji Khatri	Road Upgrading Victim	9841358345

<b>SN</b>	<b>Name</b>	<b>Designation/Organization/Occupation</b>	<b>Contact Nos.</b>
85.	Yadav Thapa	REAL, Kavre	9841495896
86.	Ramesh Maharajan	Service	9851080388
87.	Sajal Shrestha	Engineer	9866893042
88.	Jivan Bikram Adhikari	Consultant	9841281972
89.	Rajendra Man Shrestha	KVDA Consultant, Urban Planner	9841236480
90.	Hari om Saukhadbe	Valley Development Authorization	9851277996
91.	Suman Thapa Magar	Community Reconciliation Center, Sanga	9813121911
92.	Nawaraj Pyakurel	Deputy Commissioner, K.V.D.C	9841449987
93.	Bimala Sharma	Deputy Mayor- Dhulikhel Municipality	9842578064
94.	Rabinrda Karmacharya	Ward Chairperson-4, Dhulikhel Municipality	9843343106
95.	Surya Lal Suwal	Dhulikhel Municipality	9860856236
96.	Hareram Humagai	Engineer-Dhulikhel Municipality	9851119718
97.	Shiva Raj Adhikari	DoR	9841466494
98.	Chhabi Lal Poudel	DoR/FCB- Engineer	9851141181
99.	Meera Joshi	DoR/GESU-Environment Expert	9841059057
100.	Shila Shrestha	DoR-SDDSB	9841537837
101.	Rama Shrestha	DoR/GESU-Sociologist	9841293143
102.	Madan Kumar Shrestha	CTI, Project Coordinator	9841294104
103.	Guru Prasad Adhikari	Chief of Division, Bhaktapur Division Office (DoR)	9851212274
104.	Manjul Krishna Manandhar	FBC- Environment Specialist	9841410364
105.	Arun Acharya	FBC- Environmentalist	9841235404
106.	Devi Prasad Dotel	FBC- Sociologist	9841348356
107.	Suman Pariyar	FBC- Environment Officer	9813686228

**Public Hearing Meeting for upgrading of Suryabinayak - Dhulikhel Road with Tunnel option**

**Date: 30/05/2018 A.D (16/02/2074 B.S)**

**Venue: Araniko Highway Party Palace Suryabinayak-10,Bhaktapur**

**Time: 8:00 am**

**Participation Attendance Sheet**



आज मिति २०७५।१।१६ गते सूर्यविनायक-दुलिखेल सडक सधार आयोजना अन्तर्गत वातावरणिय प्रभाव मुल्याङ्कन (EIA) सम्बन्धी सार्वजनिक सुनुवाई (Public Hearing) कार्यक्रम यस सूर्यविनायक नगरपालिका कार्ड नं-१० स्थित अरनिको हाइवे पारी प्यालेसमा आयोजना गरियो। उक्त कार्यक्रममा स्थानिय जनप्रतिनिधिहरू सडक विभाग तथा नगर विकास समितिका प्रतिनिधिहरू रिपोर्ट तथागी तथा पुस्तोता फलवाङ्क कन्सल्टेन्सी का प्रतिनिधिहरू तथा सरोकार र्थक र्थकहरू र आयोजना- र्थक प्रभावित जनसमुहहरूको उपस्थिति भएको थियो।

उपस्थिति:

क्र.सं.	नाम	संस्थाको नाम	सम्पर्क नं.	हस्ताक्षर
१	मा.सौ. महेश बस्नेत	प्रतिनिधि सभा	९८५११४७९८७	
२	ड.प्र.नि. रत्नप्र कुमार शीखर	सडक विभाग	९८५१२८५१५६	
३	ना.वि.आ. नवराज प्याकुर्ला	का.उ.वि.प्रा.	९८४१४४९९८७	
४	प्रमुख लक्ष्मी पुरासिंहवादे	व.न.पा.०	९८५९०४६५६५	
५	प्रमुख पासुदेव थापा	सु.न.पा.	९८५९०३५६५६	
६	उपप्रमुख सुना बस्नेत	" "	९८५९५२३५६५	
७	उप-प्रमुख विष्णुशर्मा दुलिखेल न.पा.	दुलिखेल न.पा.	९८५२५७८०६५	
८	उप-प्रमुख सुना बस्नेत	क.न.पा. ७	९८५१५३११५	
९	शिवाशम राउत वडा अध्यक्ष	सु.न.पा. १०	९८५९३३३६५६	
१०	विष्णु शर्मा अधिकारी	क.स.पा.२	९८५९२६९५६२	
११	राजेश्वर मानन्धर	KVDA	९८४१२३६५८०	
१२	उपेन्द्र डे.ए.सी.	सु.न.पा. - ९	९८५११५९०५०	
१३	किरण थापा	सु.न.पा. - ९	९८५९०८५८०९	
१४	दिनेश थापा	माननीय सेवि	९८४१११९५९९	
१५	हरि शर्मा शर्मा	सवि	९८५१२७७९९६	
१६	सुजिन जोशी	KVDA	९८५११७८२५१	
१७	पुष्पक पौडेल	सवि	९८५११५४८७५	
१८	सुहेकर वल्लभ	शासक सचिव	९८५१०-११९९५	



क्र.सं.	नाम	संस्थाको नाम	संपर्क नम्बर	हस्ताक्षर
१९	नकुलमान शर्मा	सु.नं.पा.२	९८४२४५५	
२०	इन्द्र उताद थापा	सु.नं.पा. ३	९८४९०३२४३२	
२१	शेखर शर्मा	सु.नं.पा. ५	९८४९९५५४०६	
२२	नील बरामबाजे शर्मा	अरुण रा.पिडिलसक्ति	९८४९०३२४३२	
२३	प्रकाश शर्मा	मापदण्ड पिडित	९८४९-३२८३४२	
२४	सूर्य नारायण शर्मा	वनेपा नं.पा. १३	९८४९२८२२२३	
२५	राधेश्वर शर्मा	धोलीबेग - ४	९८४३३५५१०३	
२६	नवल शर्मा	वनेपा - १०	९८४९६५५६२२	
२७	शिवलाल शर्मा	म.नं.पा ६	९८४०२२५६६६	शिवलाल
२८	गुणशम शर्मा	वनेपा १०	९८४९६५५६०६	गुणशम
२९	यादव थापा	REAN, Kavre	९८४१४९५८९६	यादव
३०	राधा शर्मा	सु.नं.पा. २	९८६०६७८५५५	राधा
३१	शान्ता शर्मा	सु.नं.पा. २	९८४९५४२३६२	शान्ता
३२	शुक्रदेव शर्मा	काठे-३	९८५१०३१९१२	शुक्रदेव
३३	राम लाल शर्मा	वनेपा नं.पा १३	९८४९४८८४२४	रामलाल
३४	गौरी शर्मा	वनेपा नं.पा १३	९८४९५४२३६६	गौरी
३५	विश्वम शर्मा	वनेपा नं.पा. - १३, सागाँ	९८५११३२१७०	विश्वम
३६	सागर शर्मा	सागाँ नं.पा १३	९८६९९२०६९५	सागर
३७	गोविन्द शर्मा	वनेपा नं.पा १३	९८४९६२३६६५	गोविन्द
३८	श्री शर्मा	सु.नं.पा ५	९८५१५९९५०३	श्री
३९	इश्वर शर्मा	वनेपा - १०	९८४९६५५६३३	इश्वर
४०	मुक्ति शर्मा	वनेपा - १०	९८४९३५३६०९	मुक्ति
४१	राजेश शर्मा	म.नं.पा - ९	९८४९३५५६६६	राजेश
४२	श्याम शर्मा	म.नं.पा ९	९८४९२८४२३८	श्याम
४३	राजेश शर्मा	म.नं.पा ८		राजेश
४४	श्याम शर्मा	वनेपा नं.पा १०	९८४९६५५६३३	श्याम
४५	कपिल शर्मा	सु.नं.पा. ५	९८९९०९३५८९	कपिल
४६	श्याम शर्मा	सु.नं.पा. ८	९८४९६५५६३३	श्याम
४७	हरि शर्मा	सु.नं.पा ८	९८४९६५५६३३	हरि
४८	नकुल शर्मा	सु.नं.पा - ८	९८४९६५५६३३	नकुल



	नाम	कार्यालय संकेत	संकेत नंबर	हस्ताक्षर
१९	नवित प्रजापति	मकपुर	५८६९०३३०५६	
२०	शिवनाथ प्रजापति	मकपुर	५८६९५६५५३६	
२१	गंगाधर आर्य	कनेरा - १०	८८६९०६४३३०	
२२	विष्णु लखन	"	५८६९६४२३८०	
२३	हरि शर्मा	"	५८६९२५७०९४	
२४	सिद्धे राम ल्याल (कादी)	मकपुर (मकपुर)	५८६९२४२९३३	
२५	श्रीलाल शर्मा (कादी)	" "	५८६९६४५५५५	
२६	काकिल देवा लु	" "	५८६९९९२९३४	
२७	दीपक खडका	मकपुर (पूर्व विभाग)	९८५१०५२६४०	
२८	राजेश खत्री	" "	९८५१०१९०१६	
२९	राजेश खत्री	" " "	९८५१५३११८५	
३०	शुभा २ मंडार	" " "	९८५१०६९१७६	
३१	रमेश खडका	" " "	" " "	
३२	राजेश खत्री (आ.प्र.)	" "	९८५११४०८८२	
३३	श्रीलाल शर्मा	५१११०४९०	५८६९६६२७५८	
३४	जय राम खत्री	श्री.न.पा. ५	५८६९६६४५५५	
३५	मकुर देवी	श्री.न.पा. ५	५८६९०६५३२९	
३६	(डि.सी) राम शर्मा	जी.म. मकपुर	९८५२२०५४५३	
३७	निकेतन शर्मा	श्री. वि. न. पा.	९८५३५०९३२२	
३८	सुमन धापा मकुर	सामुदायिक मकुर	९८५३२१९११	
३९	श्रीराम ल्याल	जि.स.स. मकपुर	९८५१६३७३९५	
४०	सुरेश कु. शर्मा	कनेरा - ५	५८६०६४८८००	
४१	मिशन शर्मा	कनेरा - १०	९८५१२१४६६०	
४२	शशिलाल सुवाल	श्री.न.पा.	५८६०१५६२३६	
४३	कैलाश कुंवा	कनेरा - १०	९८५१०५१७५३	
४४	विजय शर्मा	श्री.न.पा. ५ वडा मकुर	९८५१३८२५६०	
४५	शशिलाल सुवाल	" " "	९८५११२१२८६	
४६	शशिलाल सुवाल	जी.म. मकपुर - २	९८६०१४७७९५	
४७	शशिलाल सुवाल	श्री.न.पा. ८	९८६३६३५०९०	
४८	विजय शर्मा	श्री.न.पा.	९८५१०७४५३५	
४९	शशिलाल सुवाल	डि.स.स. मकुर	९८५१२१२२७४	
५०	शशिलाल सुवाल	मकुर मकुर	९८५१४६६५३४	



नाम	अभिलेख संख्या	संपर्क नं.	हस्ताक्षर
८१ अमर कुमार गुल	बडक विभाग, वें १०	९८४१२८४६८	अमर
८२ सानिकेडा महर्जन.	सं. दु. ६३. १६. व. सायोजना	९८८१०८६३४४	
८३ शिला कोठ	बु. दु. दु. अ. व. आशोक	९८४१५३७४३७	
८४ देवी प्रसाद डोटेल	पुन कांडा कलबेरी शिवाजी	९८४१३४८३५६	
८५ रमा कुमारी शेट्ट	रास विभागाच्या कार्यालय	९८४१२९३१५३	Rama
८६ मीरा शिर्गे	सडक विभागाच्या कार्यालय	९७६१०९९०९७	Mira
८७ दानिलानु चौडे	सडक विभाग, वें. स. न.	९८५११४११८१	
८८ सख्त मोठ	Liana Construction	९८६६९३०४२	
८९ मदन सुगाव	CTI Engineering	९८४१२९४००४	
९० अरुण भायाय	FBC. Eng. Spt	९८४१२३५४०५	
९१ नारपुल कृष्ण शिर्गे	FBC, Eng. Sp.	९८४१४१०३६५	
९२ सुमन पारमार	FBC, Eng. Officer	९८१३६८६२२९	
९३			

अरनिको लोकमार्ग (सूर्यविनायक - धुलिखेल खण्ड) सडक स्तरोन्नती तथा  
विस्तार कार्य सम्बन्धी संक्षिप्त जानकारी

प्रस्ताव सम्बन्धी जानकारी :

नेपाल सरकारको अनुरोधमा, जापान सरकारको जापानी सहयोग नियोग, जाइका (JICA) को प्राविधिक सहयोगमा, अरनिको लोकमार्ग (सूर्यविनायक - धुलिखेल खण्ड) सडकको स्तरोन्नती तथा विस्तार कार्य प्रस्ताव गरिएको छ ।

विद्यमान सूर्यविनायक - धुलिखेल सडकको स्तर दुई लेनको भएको र ६ मिटर देखि ६.५ मीटर गाडी गुड्ने भाग पीच गरिएको अवस्थामा छ । राजमार्ग स्तरको सडक भएको कारण, यस सडकको विद्यमान सडक अधिकार क्षेत्र, सडकको केन्द्र रेखाबाट दुवै तिर २५/२५ मीटर रहेको छ र सडकको स्तरोन्नती तथा विस्तार कार्य यसै भागमा गरिने छ ।

भक्तपुर र काभ्रेपलाञ्चोक जिल्लामा पर्ने सूर्यविनायक देखि धुलिखेल सम्मको करिव १५.५ कि.मी. सडक खण्डलाई चौडा गर्ने कार्य भए पछि काठमाण्डौंको तीनकुने देखि सूर्यविनायक हुदै धुलिखेल सम्म एउटै स्तरको सडक हुने छ र काठमाण्डौं देखि धुलिखेल सम्मको यातायातमा ठुलो सुविधा हुने छ र साथै धुलिखेल सम्मको क्षेत्रलाई काठमाण्डौं सँग नजिक बनाउने छ ।

यसै सन्दर्भमा यस सडक स्तरोन्नती तथा विस्तार कार्यको विस्तृत अध्ययन तथा डिजाइन गर्ने कार्य जाइको प्राविधिक टोलीबाट भैरहेको छ र साथसाथै यस प्रस्तावित आयोजनाको वातावरणीय प्रभाव मुल्यांकन (Environmental Impact Assessment) को कार्य पनि भैरहेको छ ।

प्रस्तावकको व्यहोरा : अरनिको लोकमार्ग (सूर्यविनायक-धुलिखेल) सडक स्तरोन्नती तथा विस्तार कार्य  
प्रस्तावकको नाम र ठेगाना: सडक विभाग, भू-वातावरण तथा सामाजिक शाखा, बबरमहल, काठमाण्डौ

प्रभाव पर्न सक्ने जिल्ला तथा गा.वि.स./नगरपालिकाहरु :

भक्तपुर जिल्ला : भक्तपुर नगरपालिका, सिपाडोल, न:खेल र चितापोल ।

काभ्रेपलाञ्चोक जिल्ला : नासिकास्थान साँगा, जनागल, बनेपा नगरपालिका र धुलिखेल नगरपालिका ।

यस प्रस्तावित सडक निम्न बमोजिमको हुने छ :

१. कामको संक्षिप्त विवरण : ४ लेन मुख्य सडक तथा दुवै तर्फ १, १ लेनको सहायक सडक
२. सम्भावित नयाँ सडक निर्माण लम्बाई : करिब २.५ किलो मिटर ।
३. विद्यमान सडकको घुम्ती सुधारको लागी केही स्थानहरुमा सडकको केन्द्र रेखा (centerline)केही परिवर्तन हुने सम्भावना रहेको छ ।
४. सडक अधिकार क्षेत्र (Right-of-way) : सडक केन्द्रबाट दाँया बाँया २५ / २५ मिटर । तथा, साँगा चोक देखि वनेपा चण्डेश्वरी सम्म (५.७ कि.मी.) भागमा २२.८ मिटर सडक अधिकार क्षेत्र कायम भएको अवस्था रहेको छ ।

घुम्ती सुधार र नयाँ सडक निर्माणको भागहरुको अन्तिम रेखान्कन तय भैसकेको छैन र हाल प्राविधिक टोलीले विभिन्न सर्वेक्षण जारी रहेको छ र यी समाप्त भैसकेपछि रेखान्कन तय हुनेछ ।

### **वातावरणीय प्रभाव मूल्याङ्कन (EIA)अध्ययन सम्बन्धी जानकारी**

यस सूर्यविनायक - धुलिखेल सडक खण्डको स्तरोन्नती तथा विस्तार कार्य कार्यान्वयनको सिलसिलामा वातावरण संरक्षण ऐन २०५३ तथा वातावरण संरक्षण नियमावली २०५४ को (संशोधन २०६५) को नियम ३ को अनुसूची २ बमोजिम वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदन तयार गरि सो प्रतिवेदनमा यस आयोजनाको निर्माण अवधि भर र संचालनमा आए पश्चात स्थानिय क्षेत्रका भौतिक, जैविक, सामाजिक आर्थिक तथा सास्कृतिक प्रणालीहरु र यिनका अवयवहरु तथा यी अवयवहरुबीचको अन्तरक्रिया र अन्तरसम्बन्धमा पर्नसक्ने असरहरु अध्ययन तथा यकिन गरी, प्रभावहरुको न्यनिकरण गर्ने उपायहरुका साथ वातावरणीय प्रभाव मुल्यान्कन प्रतिवेदन तयार तथा स्वीकृत गर्नु पर्ने प्रवधान रहेको छ ।

यसप्रस्ताव कार्यान्वयन गर्नु अघि यस प्रस्तावकोवातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययनको लागी क्षेत्र निर्धारण (Scoping) गर्नु पर्ने भएकोले सोही नियमावलीको नियम ४ उपनियम २ बमोजिम प्रभाव पर्न सक्ने क्षेत्रको बासिन्दाहरु सँग अन्तरक्रिया तथा वातावरणीय प्रभाव मूल्याङ्कन अध्ययनको सिलसिलामा समावेश गर्नु पर्ने विषयहरुको पहिचान सरोकारवाला सबै महानुभावहरुलाई अनुरोध गरिन्छ ।

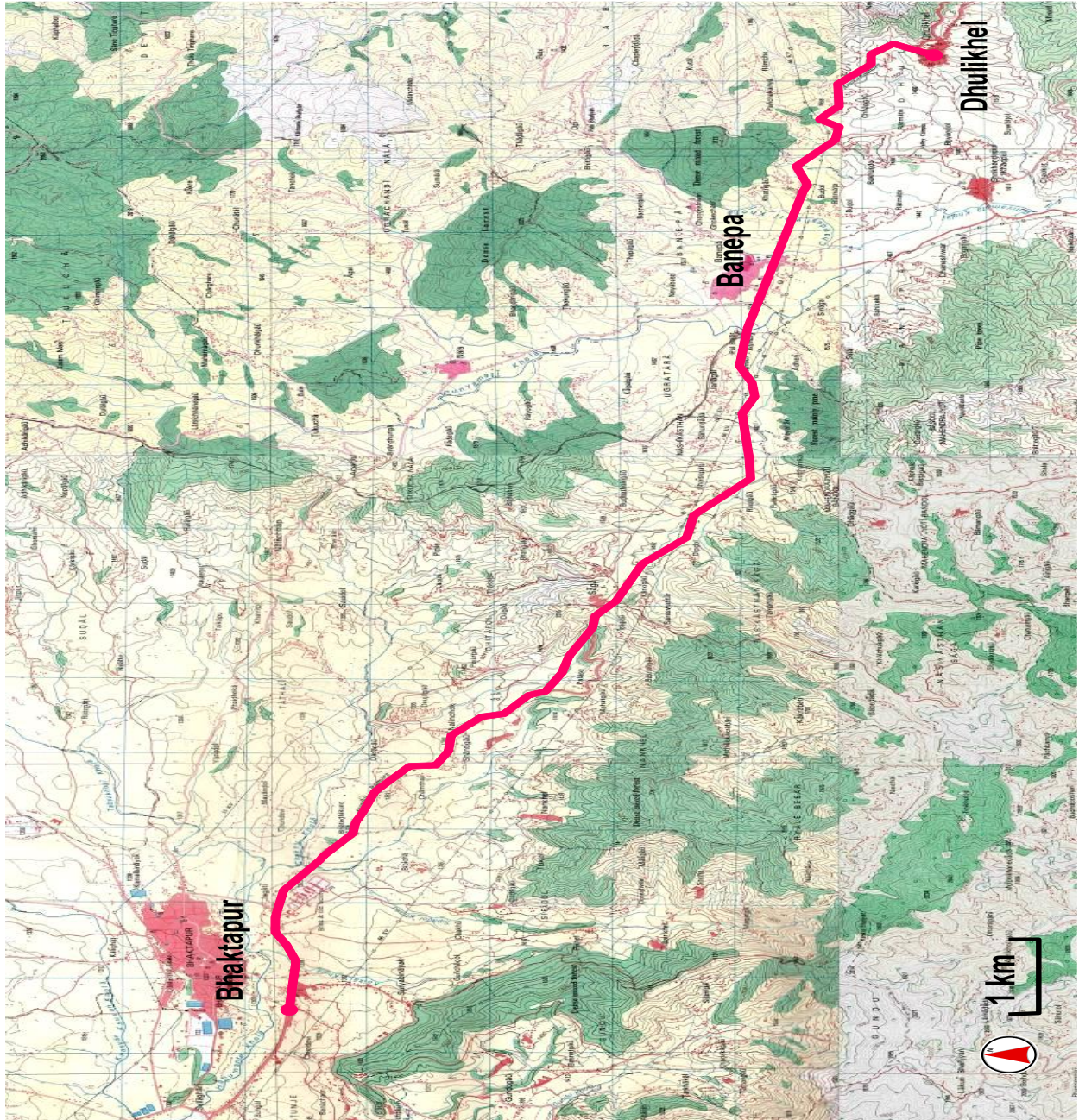
यसै व्यहोराको जानकारी दैनिक पत्रिका मार्फत सार्वजनिक सूचनाको रुपमा प्रकाशित भएको छ र यस प्रस्तावित सम्बन्धि कुनै राय सुझावहरु भएमा उपलब्ध गराइ सहयोग गरि दिन हुन सम्बन्धित सबै सरोकारवाला व्यक्तिहरु वा गा.वि.स.लगायतका संस्थाहरुलाई अनुरोध गरिन्छ ।

**राय सुझावको लागि पत्राचार गर्ने ठेगाना :**



सडक विभाग  
भू-वातावरण तथा सामाजिक शाखा,  
ववरमहल, काठमाण्डौ ।  
फोन : ०१-४२६२९९६  
फ्याक्स नं. ०१-४२६२९९३

फुल ब्राइट कन्सलटेन्सी (प्रा.) लि.  
पो.व.नं. ४९७०, सिनामंगल, काठमाण्डौ  
फोन नं. ०१-४४६८७४९, ४४८६११८  
फ्याक्स नं. ०१-४४६५६०४



## **Brief Information on the Proposed Improvement of Suryabinayak - Dhulikhel Road Brief Information about the Project:**

At the request of Nepal Government, the Japanese Government's assistance agency, namely JICA's technical team has started its preparatory survey to propose widening works of Suryabinayak – Dhulikhel section in Arniko Highway and a new road construction to bypass the existing road section from Nalinchowk to Sanga. This road section has many curves, is steep and cause much discomfort and dangerous to the road users. To avoid this section an approximately 2.5 km new road has been planned. Full Bright Consultancy (Pvt.) Ltd. has started its works on Environmental Impact Assessment for the Project.

### **Some features of the Proposal :**

Name of the Proposal: Improvement of Suryabinayak - Dhulikhel Road and Implementation  
Proponent's Name and Address: Department of Roads, Geo-Environment and Social Unit,  
Babar Mahal, Kathmandu

Possible Affected Municipality and VDCs:

Bhaktapur District:

Bhaktapur Municipality  
Sipadol VDC  
Nangkhel VDC  
Chitapol VDC

Kavrepalanchowk District:

Nasikasathan Sanga VDC  
Janagal VDC  
Banepa Municipality  
Dhulikhel Municipality

### **Some Technical Features:**

1. Brief description : 4 lane road based on Class I in the Nepal Road Standard
2. Approximate length: Approximately 16 km (Total)
3. New road length : Approximately 2.5 km
4. Right -of -Way: 25m from center line in both sides
5. Start and end point : From Suryabinayak, Bhaktapur District (End point of Kathmandu-Bhaktapur Road) to Dhulikhel, Kavrepalanchowk District (the intersection between Arniko Highway and Sindhuli Road)

### **Brief Introduction About Environmental Impact Assessment of this Project**

As per the EPA and EPR, it is mandatory for conduct an Environmental Impact Assessment prior to implementation of the Project, to identify and recommend mitigation measures of possible impacts in Physical, Biological and Social Aspect, related to Project works, during construction and during operation period.

Prior to conducting the EIA study, a Scoping process is required when it is necessary to identify the current situation of the project area and also interact with the local stakeholders, so that local issues and concerns are identified and their detailed study can be conducted during the EIA study. With this objective an Public Notice has also been published, requesting any suggestions or concerns that need to be addressed in the EIA study. Such suggestions can be forwarded to the address below, within 15 days from the publication of the notice.

### **Address where the notice can be forwarded:**

Department of Roads, Geo-Environment and Social Unit Babarmahal, Kathmandu Tel : 01 4262996 Fax: 01 4262993	Full Bright Consultancy (Pvt.) Ltd. 316 Baburam Acharya Sadak, Sinamangal, Kathmandu Tel: +977 1 4468749, 4468118 Fax: +977 1 4465604 Email: fbc@mos.com.np
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**ANNEX-VI: PUBLIC NOTICES, MINUTES AND LETTERS FROM  
STAKEHOLDERS**





नेपाल सरकार

वन तथा वातावरण मन्त्रालय

भक्तपुर तथा काभ्रेपलान्चोक जिल्लामा प्रस्तावित सूर्यविनायक-धुलिखेल सडक विस्तार/सुधार आयोजनाको वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदनमा राय सुभाबको लागि आह्वान गरिएको सार्वजनिक सूचना

(प्रथम पटक प्रकाशन मिति २०७५/०४/१६)

प्रस्तावक श्री सडक विभाग, भू-वातावरण तथा सामाजिक शाखाले भक्तपुर जिल्लाको सूर्यविनायक र भक्तपुर नगरपालिका तथा काभ्रेपलान्चोक जिल्लाको बनेपा र धुलिखेल नगरपालिका भित्र विस्तार/सुधार हुने अरनिको राजमार्ग अन्तरगत सूर्यविनायक-धुलिखेल सडक खण्डको वातावरणीय प्रभाव मूल्याङ्कन प्रतिवेदन पेश गरेको छ । प्रस्ताव अनुसार सूर्यविनायक देखि धुलिखेल सम्म निर्माण हुने यो सडकको लम्बाई १४.९१ कि.मि., चौडाई २६.५ मि. र अधिकार क्षेत्र ५० मि. रहनेछ र यस सडकमा १.३ कि.मि. को सुरुङ्गमार्ग समेत प्रस्ताव गरिएको छ । यस आयोजनाले (ROW भित्र पर्ने) १६.७६ हेक्टर निजी जग्गाको भू-उपयोग परिवर्तन गर्ने र ४२६ वटा घर टहरा अधिग्रहण गर्ने प्रस्ताव रहेको छ । पेश भएको प्रस्ताव अनुसार यस सडकले विभिन्न साना ठूला गरी ७ नदि/खोलाहरूलाई छिचोल्ने छ र १४ स्थानमा Crossing को लागि Overhead Bridge समेत प्रस्ताव गरिएको छ ।

वातावरण संरक्षण ऐन, २०५३ को दफा ६ बमोजिम यस प्रतिवेदन राय-सुभाब दिनका लागि सर्वसाधारणले प्रतिवेदन पढ्न वा उतार गरी लैजान पाउने व्यवस्था रहेकोले वातावरण संरक्षण नियमावली, २०५४ को नियम ११ (२) बमोजिम यो प्रतिवेदन निम्न स्थानहरूमा सार्वजनिक गरिएको छ । प्रतिवेदनमा उपयुक्त राय सुभाब प्राप्त भएमा यस मन्त्रालयले उक्त प्रस्ताव कार्यान्वयनका लागि स्वीकृति दिने क्रममा त्यस्ता राय सुभाबहरूलाई समेत ध्यानमा राखिनेछ । उक्त प्रतिवेदन सम्बन्धमा सर्वसाधारण व्यक्ति वा संस्थाको कुनै राय सुभाब भए यो सूचना प्रथम पटक प्रकाशन भएको मितिले तीस (३०) दिन भित्र आफ्नो राय सुभाब निम्न ठेगानामा पठाई दिनु हुन यसै सूचनाद्वारा आह्वान गरिन्छ ।

प्रतिवेदन हेर्ने वा उतार गर्न सकिने स्थलहरू :-

- श्री वन तथा वातावरण मन्त्रालयको पुस्तकालय, सिंहदरवार काठमाण्डौं ।
- श्री त्रिभुवन विश्वविद्यालय केन्द्रिय पुस्तकालय, किर्तिपुर, काठमाण्डौं ।
- श्री पुस्तकालय, संसद सचिवालय, सिंहदरवार, काठमाण्डौं ।
- श्री आदिवासी तथा जनजाती महासंघ नेपाल, एकान्तकुना, ललितपुर ।
- श्री भक्तपुर नगरपालिकाको कार्यालय, भक्तपुर ।
- श्री सूर्यविनायक नगरपालिकाको कार्यालय, भक्तपुर ।
- श्री बनेपा नगरपालिकाको कार्यालय, काभ्रेपलान्चोक ।
- श्री धुलिखेल नगरपालिकाको कार्यालय, काभ्रेपलान्चोक ।

राय सुभाब पठाउने ठेगाना :-

वन तथा वातावरण मन्त्रालय, वातावरण प्रभाव अध्ययन शाखा  
सिंहदरवार, काठमाण्डौं ।

फोन नं. ०१-४२११६४१, ४२११५८६, ४२११६३८, फ्याक्स नं. ०१-४२११९५४

PUBLIC NOTICE

राजधानी

बिहीवार २३ असोज २०७१ (Thursday 9 October 2014)



नेपाल सरकार  
भौतिक पूर्वाधार तथा यातायात मन्त्रालय  
सडक विभाग

भू-वातावरण तथा सामाजिक शाखा, बबरमहल, काठमाण्डौ

**अरनिको लोकमार्ग (सूर्यविनायक-धुलिखेल खण्ड) को स्तरोन्नतीको तथा विस्तार  
कार्यको लागि वातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययन को लागि  
क्षेत्र निर्धारण (Scoping) सम्बन्धी सार्वजनिक सूचना**

प्रथम पटक प्रकाशित मिति: २०७१/०६/२३

सडक विभाग, भू-वातावरण तथा सामाजिक शाखा अन्तर्गत निम्न बमोजिम प्रस्ताव कार्यान्वयन गर्न लागिएकोले वातावरण संरक्षण नियमावली २०५४ को (पहिलो संशोधन २०५५) को नियम ४, उपनियम २ बमोजिम यो सूचना प्रकाशित गरिएको छ।

प्रस्तावकको व्यहोरा : अरनिको लोकमार्ग (सूर्यविनायक-धुलिखेल) सडक खण्ड स्तरोन्नती तथा विस्तार कार्य

प्रस्तावकको नाम र ठेगाना : सडक विभाग, भू-वातावरण तथा सामाजिक शाखा, बबरमहल।

प्रभाव पर्न सक्ने जिल्ला तथा गा.वि.स./नगरपालिकाहरु :

भक्तपुर जिल्ला : भक्तपुर नगरपालिका, सिपाडोल, नःखेल र चितापोल

काभ्रेपलाञ्चोक जिल्ला : नासिकास्थान साँगा, जनागल, बनेपा नगरपालिका र धुलिखेल नगरपालिका

भक्तपुर र काभ्रेपलाञ्चोक जिल्लामा पर्ने अरनिको लोकमार्ग (सूर्यविनायक - धुलिखेल) सडक खण्ड सुधार तथा स्तरोन्नती गरि निर्माण तथा संचालन प्रस्तावको कार्यान्वयनको सिलसिलामा, वातावरण संरक्षण ऐन २०५३ तथा वातावरण संरक्षण नियमावली २०५४ को (संशोधन २०६५) को नियम ३ को अनुसूची २ बमोजिम वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदन तयार गर्नु पर्ने भएको छ। सो प्रस्ताव कार्यान्वयन गर्नु अघि सो प्रस्तावको कार्यान्वयनबाट निम्न क्षेत्रहरुमा के कस्तो प्रभाव पर्दछ भनि यकिन गर्नु आवश्यक छ। अध्ययन गर्नु पर्ने क्षेत्रहरु :

१. प्राकृतिक प्रणाली
२. सांस्कृतिक प्रणाली
३. सामाजिक प्रणाली
४. आर्थिक प्रणाली र
५. अवयवहरु तथा यिनीहरु बीचको अन्तरक्रिया र अन्तरसम्बन्ध।

अतः, यो सूचना प्रथम पटक प्रकाशित भएको मितिले १५ दिन भित्रमा तलको ठेगानामा आइपुग्ने गरी, यस प्रस्ताव सम्बन्धि लिखित राय सुझावहरु उपलब्ध गराइ सहयोग गरि दिन हुन सो स्थानको गा.वि.स.हरु तथा त्यस क्षेत्रका विद्यालय, अस्पताल, स्वास्थ्य चौकी तथा सम्बन्धित सबै सरोकारवाला व्यक्ति वा संस्थाहरुलाई अनुरोध गरिन्छ। यस बमोजिमको राय सुझावको प्रतिलिपी सम्बन्धित मन्त्रालयहरुलाई समेत दिन सकिनेछ।

राय सुझावको लागि पत्राचार गर्ने ठेगाना :

सडक विभाग  
भू-वातावरण तथा सामाजिक शाखा,  
बबरमहल, काठमाण्डौ।  
फोन : ०१-४२६२९९६  
फ्याक्स नं. ०१-४२६२९९३

फूल ब्राईट कन्सल्टेन्सी (प्रा.) लि.  
पो.ब.नं. ४९७०, सिनामंगल, काठमाण्डौ।  
फोन नं. ०१-४४६८७४९, ४४८६९९८  
फ्याक्स नं. ०१-४४६५६०४





# सूर्यविनायक नगरपालिका

नगर कार्यपालिकाको कार्यालय

फोन नं.:

पत्र संख्या: ०७४/०७५

चलानी नं.: २५१९

कटुञ्जे, भक्तपुर  
नेपाल  
सूर्यविनायक नगरपालिका  
३ नं. प्रदेश, नेपाल  
कटुञ्जे, भक्तपुर  
३ नं. प्रदेश, नेपाल

मिति : .....  
२०७५/२/२७

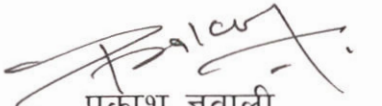
विषय : राय सुभाब सहित सिफारिस सम्बन्धमा।

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय  
सडक विभाग  
वैदेशिक समन्वय शाखा

प्रस्तुत विषयमा तहावाट मिति २०७५/२/१७ को प.सं. वै.स.म. ९/१४/०७४/०७५, च.न.७१५ को पत्रानुसार व्यहोरा अवगत भयो। EIA प्रतिवेदनमा सूर्यविनायक नपाका तर्फबाट अध्ययन गरि देहायका राय सुभाबहरु उल्लेख गरिएको छ।

तपशिल

- १) EIA प्रतिवेदनमा उल्लेख गरिएको वातावरण व्यवस्थापन योजना समेत कमशः कार्यान्वयन गर्दै लैजाने र EMP का क्रियाकलापहरुका सम्बन्धमा न.पा लाई जानकारी गराउने।
- २) सडक निर्माणका क्रममा यातायात आवतजावतमा हुन सक्ने समस्यालाई पूर्व विश्लेषण गरि समय तालिका, वाइपास वाटो, धुलो नियमन प्रकृत्यामा जोड दिने,
- ३) सडक विस्तारका क्रममा प्राकृतिक, सांस्कृतिक महत्वका संरचना, सामाजिक संरचनाहरुमा कम प्रभाव पर्ने गरि आयोजना कार्यान्वयन गर्ने,
- ४) परियोजना कार्यान्वयनको सन्दर्भमा प्रकाशित हुने सुचना, वुलेटिन र निर्माणहरुको समय समयमा नगरपालिकामा जानकारी गराउने,
- ५) आयोजना कार्यान्वयनको क्रममा हुन सक्ने वातावरणिय जोखिमलाई न्युनिकरण गर्न स्थानियहरुको गुनासो सुन्ने व्यवस्था गर्ने।
- ६) EIA को प्रारम्भिक प्रतिवेदन यस न.पा लाई उपलब्ध भएपछि थप सुभाबहरु उपलब्ध गराइने छ।

  
प्रकाश जवाली  
इन्जिनियर  
इन्जिनियर



शुभ नगरपालिका  
**भक्तपुर नगरपालिका**  
**BHAKTAPUR MUNICIPALITY**  
 नगर कार्यपालिकाको कार्यालय  
 OFFICE OF THE MUNICIPAL EXECUTIVE

दस्वारस्वार्, भक्तपुर  
 DURBAR SQUARE, BHAKTAPUR

पत्र संख्या: ११००

चलानी नं. २४९८

श्री सडक विभाग,  
 वैदेशिक समन्वय महाशाखा  
 कुपण्डोल, ललितपुर।

३ नं. प्रदेश, नेपाल

सडक विभाग

वैदेशिक समन्वय महाशाखा मिति: २०६२/३/२०

भक्तपुर दर्ता नं.: २०७३ २६९४

दर्ता मिति: २०६२/०३/२९

आ.नं. कर्त	आ. नं. को नं.को	कारण ज्ञाने	प्रति
A&M/			

विषय : राय सुभाब सहितको सिफारिस उपलब्ध सम्बन्धमा।

उपरोक्त सम्बन्धमा तहां विभागको च.नं. ७९६, मिति २०७५/२/१७ गते पत्र प्राप्त भई व्यहोरा अवगत भयो। सो सम्बन्धमा मिति २०७५ असार १८ गते सोमबार बिहान ७:३० बजे प्रमुख श्री सुनिल प्रजापतिज्यूको संयोजकत्वमा अरनिको राजमार्गको सूर्यविनायक-धुलिखेल सडक खण्डको स्तरोन्नती चौडा गर्ने कार्यको लागि जापान अन्तर्राष्ट्रिय सहयोग (जाइका) को सहयोगमा सम्भाव्यता अध्ययन कार्य सम्पन्न भएको र यस कार्यको लागि वातावरणीय प्रभाव मूल्यांकन सम्बन्धमा स्थानीय सरोकारवालाहरूसंग छलफल परामर्श कार्यक्रम गरी देहाय बमोजिम सुभाबहरु संकलन भएको देहायका सुभाबहरुलाई मध्यनजर गरी वातावरणीय प्रभाव मूल्यांकन प्रतिवेदन (EIA) गर्न सिफारिस गरिन्छ।

**सुभाबहरु:**

१. आकाशे पुलको व्यवस्थापन ठाउँ ठाउँमा गर्नुपर्ने।
२. ढल निकास र खानेपानीको पाइपल्यानको व्यवस्थापन बाटोको कार्य शुरु हुन अगावै गर्नुपर्ने।
३. आकाशे पुल र जेब्राक्रसिङ्गको दूरीमा फरक हुनुपर्ने।
४. पुरानो रुखहरुको पहिचान गरी मात्र निर्माण कार्य प्रारम्भ गर्नुपर्ने र पुरानो रुख ढाल्नु पर्ने।
५. साइकल / मोटरसाइकल लेनको व्यवस्था हुनुपर्ने।
६. आकस्मिक दुर्घटना हुने क्षेत्र पहिचान गरी सोको न्यूनिकरण गर्न विभिन्न उपायहरु अवलम्बन गर्नुपर्ने।
७. थप फराकिलो (Extra Widening) सहितको पार्किङ स्थलको व्यवस्था हुनुपर्ने।
८. चालक र सहचालकलाई प्रशिक्षण गर्नुपर्ने।
९. निर्माण सामग्री तथा अन्य ढुवानीका साधनहरु राती ८:०० बजे पछाडिबाट बिहान ५:०० बजेसम्म गुड्न पाउने नीति पारित गर्नुपर्ने।
१०. फुटपाथका पसलहरु र सेटब्याकमा निर्माण सामग्री थुपार्ने व्यक्ति समूहलाई निरुत्साहित गर्नुपर्ने।
११. पेट्रोल पम्पहरु बाटो भन्दा २०० / ३०० मिटर पर रहनुपर्ने।
१२. चखु खोलाबाट हुने प्राकृतिक प्रकोपबाट बच्ने उपाय अवलम्बन गर्नुपर्ने।
१३. आदर्श बसस्टपदेखि काल्हाचा खोलासम्मको उत्तरतर्फको बाटो गहिराईमै बनाउनु पर्ने।
१४. सडकको पूर्ण डिजाइन सहित छलफलमा ल्याउनु पर्ने।
१५. बाटोबाट आउने भेलहरु ठाउँ ठाउँमा व्यवस्थापन गरी खोलामा जोड्नु पर्ने।
१६. सडकको बीचमा तथा दुवै छेउमा वृक्षारोपण गर्ने।
१७. चोक चोकमा ट्राफिक लाइटको व्यवस्था गर्ने।
१८. क्षतिपूर्ति।
१९. मोडहरुमा/चोकहरुमा सीसी क्यामेरा जडान गर्नुपर्ने।

श्री श्री श्री

श्री श्री श्री

३२९-  
३/२९

रोहित राज पोखरेल  
 प्रमुख प्रशासकीय अधिकृत





# बनेपा नगरपालिका

## नगर कार्यपालिकाको कार्यालय

बनेपा, काभ्रेपलाञ्चोक

३ नं. प्रदेश, नेपाल

पत्र संख्या:

चलानी नं.: २८४८

मिति: .....

२०७१।२।३१

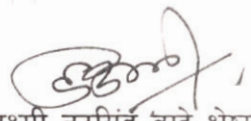
श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय  
सडक विभाग  
वैदेशिक समन्वय महाशाखा  
कुपन्डोल - १० ललितपुर ।

विषय:- रायसुभाब सहितको सिफारिस पठाएको ।

उपरोक्त सम्बन्धमा त्यस महाशाखाको मिति २०७१।२।१७ पं.सं. वै.स.म.९.१४.०७४/०७५ चं.नं. ७१४ को अरनिको राजमार्गको सुर्यविनायक - धुलिखेल सडक खण्डको स्तररोन्नती /चौडा गर्ने कार्यको लागि राय सुभाब सहितको सिफारिस माग सम्बन्धमा जानकारी भई व्यहोरा अवगत भयो । सो सम्बन्धमा यस नगर कार्यपालिकाको मिति २०७१।२।२७ गते वसेको बोर्ड बैठकबाट देहाय बमोजिम कार्य हुन निर्णय भएकोले सोही व्यहोरा उल्लेख गरी पठाएको व्यहोरा सिफारिस साथ अनुरोध गरिन्छ ।

- १) नेपाल सरकारबाट यस अगाडि कायम भएको सडक सीमा सम्बन्धी निर्णय समेतका आधारमा अरनिको राजमार्गको २० कि.मी. (साँगा चोक) देखि पूर्वतर्फ बनेपा नगरपालिका सीमासम्म सडकको राइट अफ वे ७५ फिट अर्थात पच्चीस गज कायम गरिनु पर्ने ।
- २) हाल विस्तार भई रहेको शहरी स्वरूप र भविष्यको विस्तार समेतलाई दृष्टिगत गरी ठाउँ ठाउँमा ओभर हेड ब्रिजको व्यवस्था हुनु पर्ने ।
- ३) ओभरहेड ब्रिज नरहने स्थानमा पनि यात्रुहरुबाट सडक पार गर्ने प्रयोजनका लागि जेब्रा क्रसिङको व्यवस्था हुनु पर्ने ।
- ४) यात्रु चढ्ने ओर्लने स्थानहरुमा यात्रु प्रतिकालयको व्यवस्था रहनु पर्ने ।
- ५) सडकमा आवतजावत गर्ने सवारी साधनहरु एकतर्फी हुने गरी बिचमा उपयुक्त साइजको आइल्याण्ड रहनु पर्ने ।
- ६) मुख्य सडकको दायाँवायाँ सर्भिस रोड सहितको फुटपाथको व्यवस्था हुनु पर्ने ।
- ७) सडक सीमाभित्र परेका घर भवनहरुको उपयुक्त क्षतिपूर्तीको व्यवस्था हुनु पर्ने ।
- ८) सडक सीमा भित्र पर्ने ऐतिहासिक तथा सांस्कृतिक धरोहरहरुको उपयुक्त व्यवस्थापन हुनु पर्ने ।
- ९) सडक सीमा भित्र पर्ने परम्परागत खानीपानीका स्रोतहरुको संरक्षण हुनुपर्ने ।
- १०) अरनिको रजमार्गसँग जोडिने सहायक सडकहरुको कम्तिमा २०० मीटर पीच हुनु पर्ने ।
- ११) केन्द्रीय राजधानीसँग पूर्वतर्फ जोड्ने अरनिको राजमार्गको स्तररोन्नती अति आवश्यक भएकोले उक्त राजमार्गको स्तररोन्नतीमा बनेपा नगरपालिकाले आफ्नोतर्फबाट सक्दो सहयोग गर्ने प्रतिवद्धता व्यक्त गर्ने ।

७/८

  
लक्ष्मी नरसिंह वादे श्रेष्ठ  
प्रमुख  
प्रमुख



धुलिखेल नगरपालिका  
Dhulikhel Municipality

नगर कार्यपालिकाको कार्यालय  
धुलिखेल, काभ्रेपलाञ्चोक



पत्रसंख्या :- ०७४/०७५

च.नं. :- १९७३

धुलिखेल नगरपालिका ३ नं. प्रदेश, नेपाल  
धुलिखेल, काभ्रेपलाञ्चोक  
३ नं. प्रदेश नेपाल  
२०७३

मिति : ०७५/०२/२७

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय  
सडक विभाग  
वैदेशिक समन्वय महाशाखा  
कुपन्डोल, ललितपुर ।

विषय - राय सुभाब सहितको सिफारीश पेश गरिएको सम्बन्धमा ।

उपरोक्त सम्बन्धमा ताँहा कार्यालयको प.स.वै.स.म.९/१४/०७४/०७५ को पत्रानुसार राय सुभाब माग भए वमोजिमक यस नगरपालिकाको वडा तथा जनतावाट आएको प्राप्त मौखिक सुभाबहरु निम्न वमोजिम संलग्न गरि पठाईएको व्यहोरा अनुरोध छ ।

तपशिल

- १) आकाशे पुलको व्यवस्थापन सार्वजनिक शौचालय निर्माण र व्यवस्थापन ।
- २) सर्वसाधारण हिड्ने फुटपाथ निर्माण ।
- ३) सौर्य सडक बत्ति, ट्राफिक पोष्ट, लाईटको व्यवस्थापन ।
- ४) वर्षादको पानी ढल निकास ।
- ५) सडक दायाँ बायाँ र विचमा हरियाली, पोखरी र सिञ्चाइ सहितको व्यवस्था ।
- ६) घरधुरी वाट बग्ने ढल निकासको व्यवस्था र ढल प्रशोधन केन्द्र सहितको पूर्वाधार विकास ।
- ७) जेब्रा क्रसिङको व्यावस्थापन

(महेश बराल)

प्रमुख प्रशासकीय अधिकृत

प्रमुख प्रशासकीय अधिकृत





शुभ नगरपालिका  
**भक्तपुर नगरपालिका कार्यालय**  
 दरबार चौर, भक्तपुर  
**BHAKTAPUR MUNICIPALITY OFFICE**  
 (DURBAR SQUARE, BHAKTAPUR)



पत्र संख्या: १०४८  
 चलानी नं. १०४८

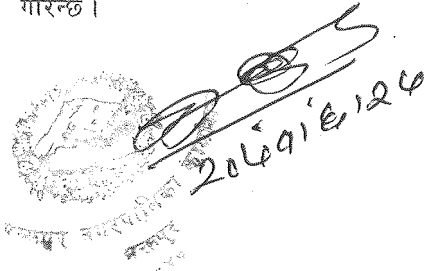
मिति:-  
 २०७१/१२/२५

विषय : सूचना टांस सम्बन्धमा ।

श्री सुदस विमला  
एयर मेलन ३१०३१०३१ /

उपरोक्त सम्बन्धमा तर्हाको च.नं. ————— मिति २०७१/१२/२५

गतेको पत्र साथ प्राप्त सूचना यस कार्यालयको सूचना पाटीमा टांस गरिसकेको व्यहोरा अनुरोध गरिन्छ ।

  
 २०७१/१२/२५



# गाउँ विकास समितिको कार्यालय

गाउँ विकास समितिको कार्यालय  
सिपाडोल, भक्तपुर

पत्र संख्या: ०७९/०७२

च. नं. :- ६४२

मिति २०७९/०६/२५

विषय:- मुचुल्का पठाएको बारे ।

श्री सुदङ्ग विनाय, भु. वल्लभराज तथा लामाजिउ शाला,

वाराणसी कामाण्डौ ।

उपरोक्त सम्बन्धमा त्यस कार्यालयबाट पठाएको प.सं. ०७९/०५२ च.नं. ....

मिति २०७९/०६/२४ ..... को पत्र प्राप्त भै व्यहोरा अवगत भयो । सो

पत्राबत्तार सूचना टाँस गरी मुचुल्का टाँस यसै पत्रसाथ संलग्न गरी पठाईएको व्यहोरा अनुरोध गर्दछु ।

*Prasad*  
६/२६  
बन्दी प्रसाद नेपाल  
गा.वि.स. सचिव



श्री

सं: ६५४०००५

# गाउँ विकास समितिको कार्यालय

०७१०७२

प. सं.:-

ब. नं.:- २४९



मिति: २०७१/०६/२७

विषय:- सूचना टाँस गरिएको सम्बन्धमा ।

श्री सडक विभाग,  
भू-वातावरण तथा सामाजिक शाखा  
बबरमहल, काठमाण्डौ ।

उपरोक्त विषयमा फुल ब्राइट कन्सल्टेन्सी प्रा.लि., सिनामंगल, काठमाण्डौको मिति २०७१/०६/२४ गतेको पत्र प्राप्त भै व्यहोरा अवगत भयो । तत्सम्बन्धमा पत्र साथ संलग्न भै आएको अरनिको राजमार्ग (सूर्यविनायक-धुलिखेल खण्ड) को स्तरोन्नतीको तथा विस्तार कार्यको लागी वातावरणिय प्रभाव मूल्यांकन (EIA) अध्ययनको लागि क्षेत्र निर्धारण (scoping) सम्बन्धि मिति २०७१/०६/२३ गतेमा राजधानी राष्ट्रिय दैनिक पत्रिकामा प्रकाशित सार्वजनिक सूचना यस कार्यालयको सूचना पाटीमा आज मिति २०७१/०६/२७ गतेका दिन टाँस गरिएको व्यहोरा जानकारीको लागि अनुरोध गरिन्छ ।

९/२६

विनोद कुमार आचार्य  
गा.वि.स. विकास समिति कार्यालय  
भा.वि.स. सचिव



# गाउँ विकास समितिको कार्यालय

०१६५४०३७२  
९८४१२५७१००

नखेल, भक्तपुर



च.न. १२५.

प.स. ०८११०७२

मिति-२०७१/६/२९

बिषय- सुचना टाँस गरिएको बारे।

श्री सडक विभाग

भू-वातावरण तथा सामाजिक शाखा  
वबरमहल काठमाडौं ।

प्रस्तुत विषयमा अरनिको राजमार्ग (सुर्यविनायक -धुलिखेल खण्ड)को स्तरोन्नती तथा विस्तार कार्यको लागि वातवरणीय प्रभाव मुल्यांकन (EIA) अध्ययन को लागि क्षेत्र निर्धारण scoping सम्बन्धि मिति २०७१।०६।२३। मा राजधानी राष्ट्रिय दैनिकमा प्रकासित सार्वजनिक सूचना यस कार्यालयको सुचना पाटिमा मिति २०७१।०६।३६ मा टाँस गरीएको व्यहोरा अनुरोध गरिन्छ ।

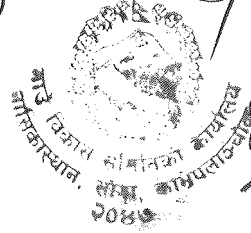
m/का/९/११  
लोक बहादुर थापा  
गा.वि.स.सचिव

श्री गौरी विद्यालय (सिपिनि) काठमाडौं  
सामाजिक कार्य, (सोनी, काठमाडौं)

श्री सडक विभाग  
कवम हल, काठमाडौं, नेपाल

विषय: सूचना एफेस (अवकाश)

प्रस्तुत विषयमा तलका कारणले कार भित्र २०७१/११२६ मा अर्को  
लोकमार्ग (सूर्य विकल्प - पुलिकेन खण्ड) को समेत निर्माण तथा विस्थापन कार्यको  
कारणले सूचना गर्दै।  
प्रकार - १ फापर गैर सोही दिने उक्त सूचना एफेस अर्को व्यहोरा जानकारीको  
गोपनीय अनुरोध गर्दछु।



*[Handwritten signature]*  
०५१/६१५०



# गाँउ विकास समितिको कार्यालय

OFFICE OF THE VILLAGE DEVELOPMENT COMMITTEE

उग्रतारा जनांगाल, काभ्रेपलाञ्चोक

UGRATARA JANAGAL, KAVREPALANCHOK

२०४७

प.सं. : ०७१/७२

मिति:- २०७१।०६।२६

च.नं. : २३७

बिषय :- सूचना टाँस गरिएको बारे ।

श्री सडक विभाग

भू-वातावरण तथा सामाजिक शाखा

वबरमहल काठमाण्डौ ।

प्रस्तुत विषयमा अरनिको राजमार्ग ( सूर्यविनायक - धुलिखेल खण्ड ) को स्तरोन्नती तथा विस्तार कार्यको लागी वातावरणीय प्रभाव मूल्यांकन ( EIA ) अध्ययन को लागी क्षेत्र निर्धारण ( Scoping ) सम्बन्धी मिति २०७१।०६।२३ मा राजधानी राष्ट्रिय दैनिकमा प्रकाशित सार्वजनिक सूचना यस कार्यालयको सूचना पाटीमा मिति २०७१।०६।२६ मा टाँस गरिएको ब्यहोरा अनुरोध गरिन्छ ।

  
विमल सुनार

गा.वि.स. सचिव  
विमल सुनार  
गा.वि.स. सचिव





# बनेपा नगरपालिका कार्यालय Banepa Municipality Office



पत्र संख्या:

चलानी नं.: ६८६



काभ्रेपलाञ्चोक

मिति:- .....

२०७१/६/२६

विषय:- जानकारी पठाएको ।

श्री सडक विभाग  
भू-वातावरण तथा सामाजिक शाखा,  
बबरमहल, काठमाडौं ।

उपर्युक्त सम्बन्धमा फुलब्राइट कन्सल्टेन्सीको मिति २०७१/६/२४ को पत्र द्वारा लेखि आए बमोजिम त्यस कार्यालयबाट प्रकाशित अरनिको लोकमार्ग (सूर्यविनायक-धुलिखेल खण्ड) को स्तरोन्नतीको तथा विस्तार कार्यको लागि वातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययनको लागि क्षेत्र निर्धारण (Scoping) सम्बन्धी मिति २०७१/६/२३ को सार्वजनिक सूचना यस कार्यालयको सूचना पाटीमा मिति २०७१/६/२६ गते टाँस गरिएको व्यहोरा अनुरोध गरिन्छ ।

धुवराज नेपाल  
वरिष्ठ राजश्व अधिकृत

धुवराज नेपाल  
वरिष्ठ राजश्व अधिकृत



धुलिखेल नगरपालिका कार्यालय  
(DHULIKHEL MUNICIPALITY OFFICE)



संख्या :- ०७१।०७२

चलानी नम्बर :- S 66


मिति: २०७०/०६/२६

श्री सडक विभाग

भू-वातावरण तथा सामाजिक शाखा, बबरमहल, काठमाण्डौ ।

विषय: जानकारी सम्बन्धमा ।

उपर्युक्त सम्बन्धमा त्यस विभागको मिति २०७३/०६/२३ गते अरनिको लोकमार्ग अन्तर्गत (सूर्यविनायक-धुलिखेल खण्ड) को स्तरोन्नतीको तथा विस्तार कार्यको सार्वजनिक सूचना यस नगरपालिकाको सूचना पाटीमा टाँस गरिएको व्यहोरा जानकारीको लागि अनुरोध गरिन्छ ।

  
(मिनाक्षी भूतल)  
कार्यकारी अधिकृत  
कार्यकारी अधिकृत



सुर्यविनायक नगरपालिका, भक्तपुर १

२०७१

संयुक्त वडा कार्यालय, वडा नं. ६, ७, ८

प.सं. ०७१०७२

च.नं. ८५

मिति-२०७१०९१३

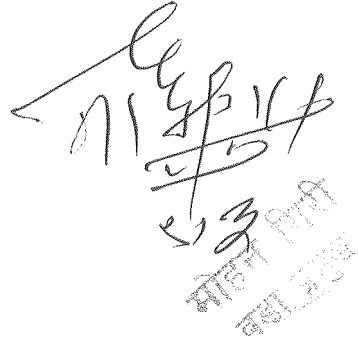
विषय:- राय सुभाब सम्बन्धमा ।

श्री सडक विभाग,  
भू-वातावरण तथा सामाजिक शाखा,  
बबरमहल, काठमाण्डौ ।

उपरोक्त सम्बन्धमा फुलब्राईट कन्सल्टेन्सी प्रा.वि.को मिति २०७१।६।२७४ गतेको पत्रद्वारा लेखी आए बमोजिम अरनिको लोकमार्ग (सुर्यविनायक-धुलिखेल खण्ड)को स्तरोन्ती तथा विस्तार कार्यको लागि वातावरणिय प्रभाव मुल्याङ्कन -EIA)सम्बन्धमा तत्कालिन नसिपाडोल गा.वि.स हाल सुर्यविनायक न.पा. वडा न. ६,७,८ को राय सुभाब पठाइएको ब्यहोरा जानकारी गराईन्छ ।

राय सुभाब:(

अरनिको राजमार्ग धुलिखेल खण्ड सडक विस्तारको प्रतिक्रिया राय सुभाब पठाउने सम्बन्धमा उक्त सडक विस्तारबाट प्रभावित हुने ब्यक्तिहरुलाई हालको चलनचल्तीको दररेटमा क्षतिपुर्ति दिई प्राकृतिक तथा ऐतिहासिक संरचना नष्ट नहुने गरि कार्य गर्न राय सुभाब पठाईयो ।

  
मोहन गिरी  
वडा न. ६, ७, ८



# सूर्यविनायक नगरपालिका कार्यालय

१२, १३ र १४ नं. संयुक्त वडा कार्यालय



चित्तपोल, भक्तपुर

पत्र संख्या:- ०७११०७२

नं.:- ३१

२०७१/०९/०३

मिति:.....

**विषय:-** राय सुझाव सम्बन्धमा ।

श्री सडक विभाग

भू-वातावरण तथा सामाजिक शाखा

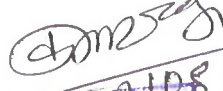
बबरमहल, काठमाण्डौ ।

उपरोक्त सम्बन्धमा फुलब्रइट कन्सल्टेन्सी प्रा.लि.को मिति २०७१/०३/२७ गतेको पत्र द्वारा लेखि आए बमोजिम अरनिको लोकमार्ग (सूर्यविनायक -धुलिखेल खण्ड) को स्तरोन्नती तथा विस्तार कार्यको लागि वातावरणिय प्रभाव मूल्यांकन (EIA) सम्बन्धमा तत्कालिन चित्तपोल गा.वि.स.हाल सूर्यविनायक नगरपालिका वडा नं. १२, १३ र १४ को राय सुझावको लागि भएको निर्णय उतार गरी पठाईएको ब्यहोरा जानकारीको लागि अनुरोध गरिन्छ ।

निर्णय उतार :

मिति २०७१/०७/२७ गतेको बैठकको निर्णय नं. २ :

अरनिको राजमार्ग धुलिखेल सडक विस्तारको प्रतिक्रिया राय सुझाव पठाउने सम्बन्धमा उक्त सडक विस्तारबाट प्रभावित हुने ब्यक्तिहरुलाई चलन -चल्तीको दररेटमा क्षतिपूर्ति दिई, प्राकृतिक तथा ऐतिहासिक संरचना नष्ट नहुने गरी कार्य गर्न राय सुझाव पठाउने निर्णय गरियो ।

  
कुबुटा प्रमुख  
वडा प्रमुख



# सूर्यविनायक नगरपालिका कार्यालय

९, १० र ११ नं. संयुक्त वडा कार्यालय

अखिल, भक्तपुर

पत्र संख्या:- 069162

च. नं.:- २४

मिति २०६९/९/१३


विषय:- राय सुभाष सम्बन्धमा ।

श्री सडक विभाग  
श्री. कातावरण तथा सामाजिक शाखा  
व्यवहारमहल, काठमाडौं ।

उपरोक्त सम्बन्धमा फुलवड्ट कन्सल्टेन्सी प्रा. लि. को गिति २०६९/६/२६ गते को पत्र द्वारा लेकी आफ्नो कम्पेजिस अरन्जिको कोक गाडी (सूर्यविनायक-धुलिखेल स्वरण) को अन्तरोन्मती तथा विस्तार कार्यको लागी कातावरणिय प्रभाव मूल्यांकन (EIA) सम्बन्धमा तत्कालिन भन्नेल जा वि.स हाल सूर्यविनायक नगरपालिका वडा नं ९, १० र ११ को राय सुभाष पहाडको व्यहोरा जानकारी अर्दि

राय सुभाष

अरन्जिको राज गाडी धुलिखेल स्वरण स्वरण विस्तारको प्रतिक्रिया राय सुभाष पहाडने सम्बन्धमा उक्त सडक विस्तारकाट प्रभावित हुने व्यक्तिहरूलाई चल्न-पल्तीको दररेटमा कल्पिपुर्ण दिई प्राकृतिक तथा सतिहासिक संरचना नष्ट नहुने गर्चे कार्य गर्ने राय सुभाष पहाडको ।

  
०६९/९/१३.  
अच्युतम खत्री  
वडा प्रमुख





# गाउँ विकास समितिको कार्यालय

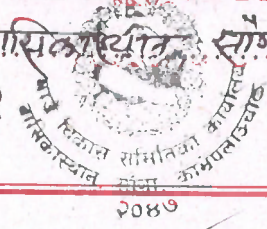
OFFICE OF THE VILLAGE DEVELOPMENT COMMITTEE

.....नासिकास्थान, सोगा, काभ्रेपलाञ्चोक

पत्र संख्या (Letter No.): - ०६९/०६२

चलानी नं. (Ref. No.): - ३९३

मिति (Date): - २०७९.१५.१६...



२०४७

विषय (Subject): राष्ट्र सुकाव पढाइएको बारे।

श्री सञ्जु विभाग

श्री - कातावरण तथा सामाजिक क्षरण  
प्रकारमहल, काठमाडौं )

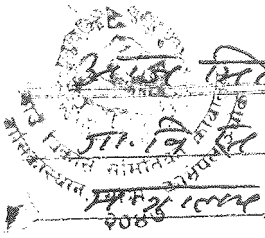
प्रस्तुत विषयमा फुलब्राइट कन्सल्टेन्सी प्रा. लि. को मिति  
२०७९।६।२४ को पत्रद्वारा लेखिएका एवमोजिम अरनिको लोकमार्ग  
(सुर्ख विनाखड - धुलिखेल खण्ड) को स्तरोन्नती तथा विस्तार कार्यको  
लागि कातावरणिय प्रभाव मूल्यांकन (EIA) सम्बन्धमा यस  
जा.वि.स. को राष्ट्र सुकाव जहाँ पत्रशाथ संलग्न जारी पढाइएको  
प्यहोश अनुरोध हो।

०६९/०७९६

राजनकुमार आचार्य

जा.वि.स. सचिव





आज्ञापन नं. २०६९ साल भाद्र ११ गतेको दिन यस न्यायिकस्थान सँग  
 गा. वि. सं. भक्तपुर नेपाल राष्ट्र शासितिके अन्तर्गत पूर्वकार तथा पालापाल  
 मा. वि. सं. रा. वि. सं. विभाग संपत्ती व्यवस्थापन, ठेका व्यवस्थापन तथा  
 गुणस्तर नियन्त्रण आयोजना को फिलि ०६९/४/२६ को पत्रको सन्दर्भमा यस  
 गा. वि. सं. को सचिवालय। सचिवालयको तर्फबाट कम्प्युटरको उपस्थिति,  
 नदी तर्फको निर्माण गरियो।

तपस्विल

- ७) गा. वि. सं. सचिवालय - श्री राजन कुमार आचार्य - सचिव
- ८) क. उ. पा. पार्टी प्रतिनिधि - श्री सुधनारायण शर्मा - सचिव
- ९) क. उ. पा. समाले पार्टी प्रतिनिधि - श्री रामलाल पुजाल - सचिव
- १०) श. क. उ. पा. साझेदारी पार्टी प्रतिनिधि - श्री जित क. लामस - सचिव
- ११) क. प्र. वि. पा. पार्टी प्रतिनिधि श्री लक्ष्मीराज सुब्बा प्रधान - सचिव
- १२) श. प्र. पा. पार्टी प्रतिनिधि - श्री दिपक जंङ्ग शर्मा - सचिव
- १३) क. उ. पा. - साझेदारी पार्टी प्रतिनिधि - श्री कृष्ण गोपाल कर्माचार्य
- १४) प्रत्येक अर्थ अधिकारी प्रेरण लोकाचार्य - श्री राजेश लामस
- १५) सचिवालय सचिवालयको पार्टी प्रतिनिधि - श्री कमल लामस
- १६) स्थानीय अड्डाको कानून - श्री सु. शर्मा
- १७) निर्देशक गा. वि. सं. कृष्ण - श्री रामहरि शर्मा
- १८) स्थानीय अड्डाको पार्टी - श्री जगतलाल शर्मा
- १९) " " " " - श्री धर्म प्रसाद शर्मा
- २०) १८ " " " " - श्री प्रेमलाल शर्मा
- २१) " " " " - श्री पुष्प शर्मा
- २२) " " " " - श्री कुशक शर्मा
- २३) " " " " - श्री रामेश कुशक
- २४) " " " " - श्री सिंह शर्मा
- २५) " " " " - श्री विनोद शर्मा
- २६) " " " " - श्री रामेश शर्मा
- २७) " " " " - श्री राम शर्मा
- २८) " " " " - श्री राम शर्मा
- २९) " " " " - श्री राम शर्मा
- ३०) " " " " - श्री राम शर्मा
- ३१) " " " " - श्री राम शर्मा
- ३२) " " " " - श्री राम शर्मा
- ३३) " " " " - श्री राम शर्मा
- ३४) " " " " - श्री राम शर्मा
- ३५) " " " " - श्री राम शर्मा
- ३६) " " " " - श्री राम शर्मा
- ३७) " " " " - श्री राम शर्मा

सचिवालय  
 गा. वि. सं.

24	"	"	"	जोशी	जोशी
25	"	"	"	सुरेश	सुरेश
26	"	"	"	विठ्ठल जोशी	विठ्ठल जोशी
27	"	"	"	देवराव मानधर	देवराव मानधर
28	"	"	"	प्रकाश लाल मानधर	प्रकाश लाल मानधर
29	"	"	"	पंच कुमार मानधर	पंच कुमार मानधर
30	"	"	"	रामहरी श्रेष्ठ	रामहरी श्रेष्ठ
31	"	"	"	सुरेश राम श्रेष्ठ	सुरेश राम श्रेष्ठ
32	"	"	"	नकिर श्रेष्ठ	नकिर श्रेष्ठ
33	"	"	"	जीवन श्रेष्ठ	जीवन श्रेष्ठ
34	"	"	"	विठ्ठल प्रकाश जोशी	विठ्ठल प्रकाश जोशी
35	"	"	"	विठ्ठल नाथ जोशी	विठ्ठल नाथ जोशी
36	"	"	"	जानकीजी शिंदे	जानकीजी शिंदे
37	"	"	"	राजेश शिंदे	राजेश शिंदे
38	"	"	"	राम कृष्ण कामनाथ	राम कृष्ण कामनाथ
39	"	"	"	इंदर बा	इंदर बा
40	"	"	"	मिना - जयलाल - मिना	मिना - जयलाल - मिना
41	"	"	"	गिराज शिंदे - गिराज	गिराज शिंदे - गिराज
42	"	"	"	कल्याण देवी - जोशी - कल्याण देवी	कल्याण देवी - जोशी - कल्याण देवी
43	"	"	"	गंगा शिंदे - गंगा शिंदे	गंगा शिंदे - गंगा शिंदे
44	"	"	"	वानी शिंदे - वानी	वानी शिंदे - वानी
45	जोशी	जोशी	जोशी	अश्वरुद्र शिंदे - अश्वरुद्र	अश्वरुद्र शिंदे - अश्वरुद्र
46	राधा राम	राधा राम	राधा राम	राधा राम शिंदे - राधा राम	राधा राम शिंदे - राधा राम
47	"	"	"	राधा राम शिंदे - राधा राम	राधा राम शिंदे - राधा राम
48	मोहन भावा	मोहन भावा	मोहन भावा	मोहन भावा	मोहन भावा
49	मिनादेवी	मिनादेवी	मिनादेवी	मिनादेवी	मिनादेवी
50	इश्वर शिंदे	इश्वर शिंदे	इश्वर शिंदे	इश्वर शिंदे	इश्वर शिंदे

प्रस्ताव नं. 9 अरुणिको राजमार्ग स्तरोन्नती को साथ प्रतिक्रिया सम्बन्धित।

प्रस्ताव नं. 9 माथी कृषकसभाले दलदल गर्दी नेपाल सरकारको सिंगा बाट  
 चण्डेश्वरी खोला राम 66x14 यथा (डि) कामम अरु अनुसार के बाट  
 जग्गा, रहरा लगायत भौमिक संरचनाको प्रचलित बनाउनु अरु अनुसार

के मुआवजा, इन्विट प्रतियुक्ति विद्यार्थियों के मात्र सड्ड स्वरोन्मुखता को  
हुने पर।

② राजभाषा में परने अब मांडी पार्टी पैका जस्ते नालिडा मांडी, बापुडी  
पौरवरी, महादेव पौरवरी, दुडेधारा, कुवा, सैगाजोरे, गौसैलेश्वर  
महादेव के लगायत रोनिहासिडे पौराणिक, सोल्कतिडे सनिजतिडे महत्त्व  
का संरचना के प्रयास स्थापना संरक्षण र प्रोत्साहित व्यवस्थापन हुने परने।

③ धरत जा. वि. स. का विभिन्न शाखा सड्ड फल (अरनिडे) राजभाषा कोर  
कोलाई जाने आडने इयाडे रारने र फलडे व्यवस्था हुने परने साथै सड्ड  
को दाया बाया १२०० मीटर एक कोठे जिन हुने परने।

④ शरी कृपया विस्थापीत हुने हर परिवारको इन्विट केंडलीड वसोवासको  
व्यवस्था हुने परने।

⑤ सड्ड बनाडने क्रमका सड्ड को दाया बाया हुने रवाल्डाहडु क्रम  
बनाडने मदी रवाल्डा कताएका ररमाडने।

⑥ २०२१ ररवल आगाडिडे सड्डको नाय नरस, अनुसारको कौन sentral  
paent) अरनिडे र राजभाषा कोरमा जादिने परने।

⑦ खानेपानी, पाइपलाइन प्रयास स्थापना संरक्षण हुने परने।

⑧ कोरोडे, दुडे धियाराम तथा बाड अनुसार सिन्हाई को लगी कुलो कोठे  
कोरी रारने व्यवस्था मिलाई दिनु परने।

⑨ धरत जा. वि. स. मा रहेको अरनिडे राजभाषा कोरको राज कुलो के इन्विट  
व्यवस्थापन हुने परने।

⑩ प्राक्कता अरुला मानिसको वही प्राक्कता जावत हुने स्थापना overhead  
bridge प्राक्कता पुल, तथा प्राक्कता प्रतिपालय के व्यवस्था हुने परने।

⑪ अरनिडे राजभाषा को दाया बाया सड्ड कोठे व्यवस्था हुने परने।

*(Handwritten signatures and notes at the bottom of the page)*



# गाँउ विकास समितिको कार्यालय

OFFICE OF THE VILLAGE DEVELOPMENT COMMITTEE

उग्रतारा जनाङ्गल, काभ्रेपलाञ्चोक

UGRATARA JANGAL, KABREPALANCHOK



प.सं. :- ०७१/०७२

च.नं. :- ४२०

मिति :- २०७१।०८।१४

विषय :- राय सुझाव पठाईएको बारे ।

श्री सडक विभाग

भू-वातावरण तथा सामाजिक शाखा


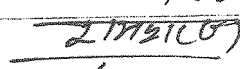
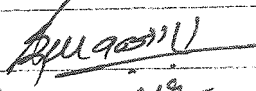






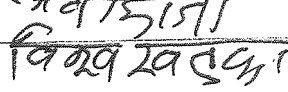
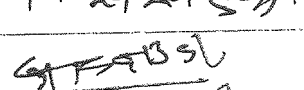

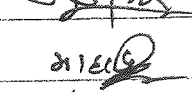
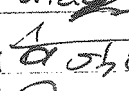
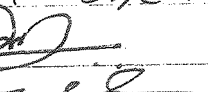

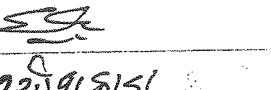
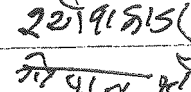




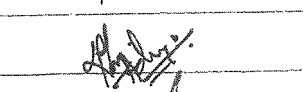

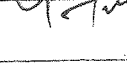


बबरमहल, काठमाण्डौ ।

प्रस्तुत विषयमा फुलब्राईट कन्सल्टेन्सी प्रा. लि. को मिति २०७१।०६।२४ को पत्रद्वारा लेखिआएबमोजिम अरनिको लोकमार्ग (सुर्यविनायक — धुलिखेल खण्ड) को स्तरोन्नती तथा विस्तार कार्यको लागि वातावरणिय प्रभाव मूल्यांकन (EIA) सम्बन्धमा यस गा.वि.स. को राय सुझाव यसैसाथ संलग्न गरी पठाईएको ब्यहोरा अनुरोध गरिन्छ ।

  
विमल सुनार  
गा.वि.स. सचिव  
गा.वि.स. उग्रतारा

आज दिनि २०६१ साल भाद्र माहिनाको २३ गते सोमवार जाकिस  
 अचिठ श्री विमल सुमरको अध्यक्षतामा गाउँ विकास समितिमा बसे  
 बस्यो।

(क) उपस्थिति:-

- |  |   |
|--|---|
| १. श्री विमल सुमर, जाकिस अचिठ                    |    |
| २. श्री रामबाण खत्री, रुमापत्रि, त्रे. क.        |    |
| ३. श्री इन्द्रवर बज्रारा, अध्यक्ष, त्रेडपा रमाते |    |
| ४. श्री मिनाज डे. सी. अध्यक्ष, त्रेडपा (माओवादी) |    |
| ५. श्री जौबिन्द थापा, " , त्रेडपा- माओवादी       |    |
| ६. श्री कृष्ण खड्गल, फुल प्राइट इन्सल्ट्यान्सी   |    |
| ७. श्री विमल विष्ट                               |    |
| ८. श्री मधुसुधन विष्ट                            |    |
| ९. श्री अयामकुला चामुभागी                        |   |
| १०. श्री प्रतीकाती थापा                          |  |
| ११. श्री विमल खड्का                              |  |
| १२. श्री. पाण्डव विष्ट, कर्मचारी. ए              |  |
| १३. श्री जुजु भारी रेजीलन्सल                     |  |
| १४. श्री महादेवी खड्का                           |  |
| १५. श्री विठ्ठला श्रेष्ठ                         |  |
| १६. श्री त्रिलोक रंजितकार                        |  |
| १७. श्री चन्द्र कदापुर खड्का                     |  |
| १८. श्री जयराज खड्का                             |  |
| १९. श्री बृष कदापुर विष्ट                        |  |
| २०. श्री जोषाल श्रेष्ठ                           |  |
| २१. श्री शम्भुनाथ श्रेष्ठ                        |  |
| २२. श्री भगवान विष्ट                             |  |
| २३. श्री हरिश्चन्द्र मन्धेर                      |  |
| २४. श्री शिवहरि तिमल्सिना                        |  |
| २५. श्री प्रदीप श्यामर्षी                        |  |
| २६. श्री शिव प्रसाद तिमल्सिना                    |  |
| २७. श्री सुरोज कर्ती श्रेष्ठ                     |  |

(ख) प्रस्ताव तथा निर्णयद्वय

प्रस्ताव नं. १ सूर्यविनायक - धुल्लिखेल सुड्ड सुधार तथा स्तरोन्मती

कुर्येडी लजि राय सुशाव सभबधमा,

निर्णय नं. १ प्रस्ताव नं. १ प्राची दलकल गदी प्रपात सरदार

भौतिड सुवीधार तथा यातायात मंत्रालय, यूपनि व्यवस्थाप

ठेक्का व्यवस्थाप, गुणस्तर नियंत्रण आयोजनाडी मिति २०६१

१४३६ डी सूर्यविनायक - धुल्लिखेल सुड्ड सुधार तथा स्तरोन्मती

कुर्येडी लजि प्रतिक्रिया पदादिति मंत्र मन्त्रालयी अपर पत्र

डी सभबधमा देहायकौजित राय सुशाव पदाडि सुर्वसमात

निर्णय गरियो ।-

(क) सांगकार चण्डेश्वरी खोलासमा ७५ (पयस्तर) मिटर आयत

नर अनुसार डी घर, जग्गा, दहर लगायत भौतिड संलग्नडी

प्रचलित वजार भाड अनुसारडी सुआवता, उचित क्षतिपूर्ति

दिइएपछी मात्र सुड्ड स्तरोन्मती हुनुपर्ने,

(ख) राउमार्गमा पर्ने मठ मन्दिर, पारी पाँवा लगायत ऐतिहासिक

पौराणिक, सांस्कृतिक तथा सांस्कृतिक महत्वडी संलग्नछडी

ग्रथास्थापना संरक्षण र यथोचित व्यवस्थाप हुनुपर्ने,

(ग) र्ण कृपा विस्थापित हुने घर परिवारडी भाडी उचित

दंडादि व्यवस्था हुनुपर्ने,

(घ) सुड्ड वजार कृपा सुड्डडी कायाँ कायाँ हुने (नाम्डासुड्ड

दुड्ड डम वजार गरी सुड्ड स्तरोन्मती गर्नु पर्ने,

(ङ) कार्यालयी पाइपदुड्डको यथास्थापना संरक्षण हुनुपर्ने,

(च) सुड्डडी कायाँकायाँ सुड्ड करीडी व्यवस्था हुनुपर्ने,

(छ) आवश्यकता अनुसार मास्तिडी वडी आवतजावत हुने स्थान

आवरो पुल तथा यात्रु प्रिक्षालय डी व्यवस्था हुनुपर्ने,

(ज) राजमार्गडी दुड्डडाडमा रहेडा आवदी रेलवेडमा सिंकाडी लजि

दाल कायम रहेडी राजकुलोडी संरक्षण हुनुपर्ने र मरुडी हाडमा

राजकुली निर्माण हुनुपर्ने,



12) राजमर्जीडी सुखयुक्त मर्जी दफ्तरी कमीमा १५,०० (पन्च सय)  
पीयर पीय हुनुपर्ने र ललडी अचिर व्यवस्थापन हुनुपर्ने,

13) २०५६ साल मन्दा अगाडीको मापदण्ड अनुसारको एड्ड को  
केन्द्रविषय आयत हुनुपर्ने,

जसुपर. (मम्म) ~~अ.प.~~ विश्व एड्डा  
गोबरदन रुधिरा (३६२५९३)  
राम ~~अ.प.~~ ~~अ.प.~~  
~~अ.प.~~ ~~अ.प.~~ ~~अ.प.~~ ~~अ.प.~~  
~~अ.प.~~ ~~अ.प.~~ ~~अ.प.~~ ~~अ.प.~~

रुधिरा (३६२५९३)



# बनेपा नगरपालिका कार्यालय Banepa Municipality Office



पत्र संख्या: ०६९१०६२  
चलानी नं. ९९६४



काभ्रेपलाञ्चोक

मिति: - .....

२०७९।०।१४

विषय: सुभाव सम्बन्धमा ।

श्री सडक विभाग,  
भू- वातावरण तथा सामाजिक शाखा,  
बबरमहल, काठमाण्डौ ।

उपर्युक्त सम्बन्धमा फुलब्राइट कन्सल्टेन्सीको मिति २०७९।६।२४ को पत्रद्वारा लेखि आए बमोजिम त्यस कार्यालयबाट प्रकाशित अरनिको लोकमार्ग (सूर्यविनायक धुलिखेल खण्ड) को स्तरोन्नती तथा विस्तार कार्यको लागि वातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययनको लागि क्षेत्र निर्धारण सम्बन्धी मिति २०७९।६।२३ को सार्वजनिक सूचना यस नगरपालिका समेतमा टाँस भई मिति २०७९।७।२३ गतेका दिन सरोकार व्यक्तित्वहरुको उपस्थितिमा बनेपा नगरपालिका हलमा उक्त कन्सल्टेन्सीको संयोजनमा प्रस्तुति तथा छलफल कार्यक्रम समेत सम्पन्न भईसकेको छ । उक्त उलफल कार्यक्रममा व्यक्त भएका धारणा र सो भन्दा अगाडि भएका छलफल बैठकमा प्रस्तुत भएका राय सुभाव समेतका आधारमा उल्लेखित लोकमार्ग स्तरोन्नतीको कार्य अगाडि बढाउन यस नगरपालिकाको देहाय बमोजिमका सुभाव रहेको व्यहोरा अनुरोध गर्दछु ।

सुरेश दाहाल

नि. कार्यकारी अधिकृत

नि. कार्यकारी अधिकृत

सुभावहरु

१. ६ लेन भित्र परेका जग्गा तथा घरहरुको उचित क्षतिपूर्ति ।
२. बजार क्षेत्रमा सब वेको व्यवस्था । एक्सप्रेस लेन दुई लेन गरी सो बाहिर लोकल बसहरुको लेन राखी फुटपाथको व्यवस्था गर्ने र एक्सप्रेस लेन र लोकल बस लेनका विचमा रेलिङ्गको व्यवस्था गर्ने । एक्सप्रेस लेनको एक लेन रेडटप भएको बनाउने । फुटपाथ अपाङ्ग मैत्री बनाउन पर्ने ।
३. आवश्यक स्थानहरुमा आकाशे पुलहरुको व्यवस्था ।
४. तोकिएको स्थान बाहेक अन्य स्थानहरुमा सडक वारपार गर्न नमिल्ने गरी करिव चार फिटको डिभाइडर राखी सो मा जि आइ पाईपको रेलिङ्ग राखी साही रेलिङ्गको पाइपबाट आवश्यक मात्रामा सडक सफाई गर्न पानी प्रयोग गर्न सक्ने व्यवस्था मिलाउनु पर्ने ।
५. आवश्यक स्थानहरुमा ट्राफिक संकेतहरुको व्यवस्था ।



# बनेपा नगरपालिका कार्यालय Banepa Municipality Office



बनेपा

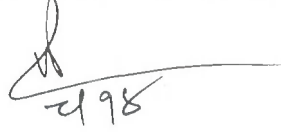
पत्र संख्या:

काभ्रेपलाञ्चोक

चलानी नं.:

मिति:- .....

६. सडक क्षेत्रमा आवश्यक ढल, खानेपानी, अण्डरग्राउण्ड टेलिफोन आदिको व्यवस्था ।
७. फुटपाथ संगसंगै दुईफीटको खुल्ला ढलको व्यवस्था ।
८. बनेपा नगरपालिका वडा नं. ५ अवस्थित पुण्यमाता खोला वरिपरि डुवानहुने क्षेत्रमा सडको उचाई उकास्ने व्यवस्था ।
९. लोकमार्गको स्तरोन्नतीको कार्यलाई निर्वाध सम्पन्न गर्न बनेपा नगर क्षेत्र भित्रको बैकल्पिक मार्गको आवश्यक मर्मत सुधार गरी प्रयोगमा ल्याउने व्यवस्था मिलाउने ।
१०. लोकमार्गसंग जोडिने सहायक सडकहरूको १०० मि. सम्मको पीचको व्यवस्था ।
११. लोकमार्ग क्षेत्र भित्र पर्ने मन्दिर, मूर्तिहरूको सके सम्म सोही स्थानमा प्रयोग गर्न सकिने गरी उचित व्यवस्थापन ।
१२. बनेपा नगर क्षेत्र भित्रको बसपार्कको स्तरोन्नती गरी सोही अनुसार प्रयोग गर्ने वातावरण मिलाउन पर्ने ।

  
५१४

## ANNEX-VII: LIST OF EIA STUDY TEAM MEMBERS & DECLARATION

**Table 7 A: Study Team Members and Position (Local Consultancy)**

SN	Name	Position in EIA Study Team
1	Manjul K. Manandhar	Team Leader, Environment Specialist
2	Arun Acharya	Environment Expert, Physical Environment
3	Lokesh Sapkota	Environment Expert, Biological Environment
4	Suman Pariyar	Environmentalists, Issues/impacts Evaluation
5	Devi Dotel	Sociologist/Socio-Economist
6	Durga Pd. Osti	Sr. Highway Engineer
7	Dibesh Khadka	Hydrologist
8	Achutya Koirala	Sr. Geologist

## List of EIA Study Team Members

### Title of the EIA Report :

**"Environmental Impact Assessment of Suryabinayak – Dhulikhel Road Improvement Project"**

### Name / Address of the Project Proponent :

Government of Nepal  
Ministry of Physical Infrastructure and Transport  
**Department of Roads**  
Geo-Environment and Social Unit  
Babar Mahal, Kathmandu, Nepal  
Tel. 01 4262996, 426 2675 Fax: 01 426 2993  
Email: gesunit@dor.gov.np

### On Behalf of:

**Foreign Cooperation Branch**  
Department of Roads  
Babar Mahal, Kathmandu

Name	Position in EIA Study Team	Qualification	Area(s) of study in EIA	Signature & Date
Manjul K. Manandhar	Team Leader, Environment Specialist	ME (Env. / Infrastructure)	Overall responsibility on all aspects of EIA process	<i>[Signature]</i> June 10, 2018
Arun Acharya	Environment Expert, Physical Environment	M.Sc. (Env.)	Physical issues/impacts of project and mitigation measures	<i>[Signature]</i> June 10, 2018
Lokesh Sapkota	Environment Expert, Biological Environment	M.Sc. (Env.)	Biological issues/impacts of project and mitigation measures	<i>[Signature]</i> 10.6.2018
Suman Pariyar	Environment Expert	B.Sc. (Env.)	Env. issues/impacts evaluation and mitigation measures	<i>[Signature]</i> 10.6.2018
Devi Dotel	Socio-Economist	MA Sociology	Social issues/impacts of project and mitigation measures, resettlement issues	<i>[Signature]</i> 10-6-2018
Durga P. Osti	Highway Engineer	MSc. Civil /Highway	Physical issues/impacts of project and mitigation measures	<i>[Signature]</i> 10/06/2018
Dibesh Khadka	Hydrologist	MSc. Water Resources	Hydrological issues/impacts of project and mitigation measures	<i>[Signature]</i> 10-6-2018
Achutya Koirala	Sr. Geologist /Geotechnical Engineer	MSc. Geology	Geological issues/impacts of project and mitigation measures	<i>[Signature]</i> June 10, 2018





## DECLARATION FROM EIA STUDY TEAM LEADER

### Title of the EIA Report :

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Email: gesunit@dor.gov.np


On Behalf of:

**Foreign Cooperation Branch**  
Department of Roads  
Babar Mahal, Kathmandu

I declare the following:

- (i) I have read and checked the content of this EIA Report;
- (ii) My study team members have conducted the study professionally using acceptable methodologies;
- (iii) The study findings are correct to the best of my knowledge; and have not been altered in any manner;
- (iv) Myself and my team shall be accountable for any misleading information in any part of this report.

Signature :

  
**Name : Manjul K. Manandhar,**  
**Full Bright Consultancy (Pvt.) Ltd.**

Date : June 10, 2018

Official Stamp:





## DECLARATION FROM PROJECT PROPONENT

### Title of the EIA Report :

**"Environmental Impact Assessment of Suryabinayak – Dhulikhel Road Improvement Project"**

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On Behalf of:

**Foreign Cooperation Branch**  
Department of Roads  
Babar Mahal, Kathmandu

I declare the following:

- (i) I have provided correct and relevant information to the EIA Study Team;
- (ii) I have allowed the EIA Study Team to conduct the EIA study professionally and independently;
- (iii) I have read and understood the content of the EIA Report.

Signature : *Sanjaya Kumar Shrestha*

Name : *Sanjaya Kumar Shrestha*  
Government of Nepal  
Ministry of Physical Infrastructure and Transport  
**Department of Roads**  
Geo-Environment and Social Unit  
Babar Mahal, Kathmandu, Nepal  
Tel. 01 4262996, 426 2675 Fax: 01 426 2993  
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Official Stamp:

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On Behalf of:

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I declare the following:

- (i) I have conducted the study professionally using acceptable and standard methodologies;
- (ii) The study findings are correct to the best of my knowledge; and have not been altered in any manner;
- (iii) I shall be accountable for any misleading information in the part of this report related to by area(s) of study

Signature: *A. Acharya*

Name : *Arun Acharya*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:



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Signature : *Wollesh Sapkota*

Name : *Wollesh Sapkota*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:



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Signature :



Name : *Suman Pariyas*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:



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- (iii) I shall be accountable for any misleading information in the part of this report related to by area(s) of study

Signature :



Name :

*Devi Pd. Dotel*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:





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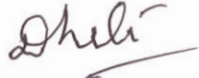
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- (iii) I shall be accountable for any misleading information in the part of this report related to by area(s) of study

Signature :



Name :

*Durga Prasad Osti*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:





## DECLARATION FROM EIA STUDY TEAM MEMBERS

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- (iii) I shall be accountable for any misleading information in the part of this report related to by area(s) of study

Signature :



Name : **Dibesh Chandra**  
Full Bright Consultancy (Pvt.) Ltd.

Official Stamp:



Date : June 10, 2018

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Email: gesunit@dor.gov.np

On Behalf of:

**Foreign Cooperation Branch**  
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Babar Mahal, Kathmandu

I declare the following:

- (i) I have conducted the study professionally using acceptable and standard methodologies;
- (ii) The study findings are correct to the best of my knowledge; and have not been altered in any manner;
- (iii) I shall be accountable for any misleading information in the part of this report related to by area(s) of study

Signature : *Achyuta Koirala*

Name : *Achyuta Koirala*  
Full Bright Consultancy (Pvt.) Ltd.

Date : June 10, 2018

Official Stamp:



## ANNEX-VIII: QUESTIONNAIRE AND CHECKLIST

### Questionnaire for Socio-Economic Census and Inventory of Loss for Project Affected People for Improvement of Suryabinayak-Dhulikhel Road

#### 1. LOCATION

- 101 Km Post:.....km+.....m 102 Right orLeft \*Toward Kathmandu
- 103 District: ..... 104VDC/Municipality: .....
- 105 Ward No.: .....106Village/ Tole: .....
- 107 Plot No:.....
- 108 Distance from C.L. of existing road to people's land boundary: .....m
- 109 Distance from C.L of existing road to people's house: ..... m

#### 2. DETAILS OF AFFECTED HOUSEHOLD

- 201 Name of owner: (Mr. / Ms.).....
- 202 Name of father: .....
- 203 Name of household head(Mr. / Ms.).....
- 204 Name of respondent(Mr. / Ms.).....
- 205 Name of spouse:(Mr. / Ms.).....
- 206 Caste/Ethnicity:..... 207. Religion:.....
208. Status of project affected property

S.N.	Assets	Partially affected	Fully affected
1	House		
2	Business/shop		
3	House and business		
4	Shed		
5	Other structures		
5	Cultivated land		
6	Other private land		
7	Others(mention)		

*code*

*Partially Affected Area:*

*Affected Area Size: a) less than30sqm, b) 30-100sqm, c) 100-300sqm, d) >300sqm*

209. Status of affected household:

1.Legal title	2.Tenant	3.Squatter	4.Lessee in rented

210. Family members (Start from the Head of the Household):

S. N.	Relationship with household head	Sex <sup>1</sup>	Age	Education <sup>3</sup> (6 years and above only)	Skill/Training <sup>4</sup> (10 years and above only)	Main Occupation <sup>5</sup>	Average monthly income (NRs)
1	Household head						
2							
3							
4							
5							
6							
7							
8							
9							
<b>Total</b>							

code

- 1) **Sex:** 1. Male, 2. Female
- 3) **Education:** 1) Schooling not started 2) Illiterate 3) Literate but no schooling, 4) Grade I-V 5) Grade VI-X 6) Certificate completed 7) Bachelor completed 8) Masters completed and above
- 4) **Skill Training:** 1) no skill 2) Mason worker, 3) Carpenter, 4) Tailor, 5) Blacksmith, 6) Shoemaker, 7) Weaver, 8) Driver, 9) Technical work, 10) Computer work, 11) Others (specify) . . . .
- 5) **Main Occupation:** 1) Agriculture, 2) Animal husbandry, 3) Trade/ industry, 4) Service, 5) Student, 6) Housewife, 7) Dependent (child, aged), 8) Labor 9) Pension, 10) Others (specify) . . . . .
211. When did you start to live here? ..... (Already Past ..... year(s))
212. Have you setback / acquired land within 25 yards after 1960s? If Yes, when did you setback? .....
213. Have you compensated for your setback / acquisition? Did you have any record of compensation? How much it was? .....NRs.
214. Did you have any taxation trouble regarding past setback resettlement?

### **3. INCOME AND EXPENDITURE**

301. Please provide details of your family income by sources during last year.

S. N.	Description	Annual Income (NRs.)
1	Service	
2	Trade/ Business	
3	Agricultural products	
4	Labour	
5	Pension	
6	Small grocery/tea shop	
7	House / Land renting	
8	Remittance from outside	
9	Others (specify)	
<b>Total Income</b>		

302. Please provide details of cereal and cash crops grown on your total land holding during last year including production and sales.

S.N.	Crops	Production (kg)	Quantity Sold (last year)	
			Qty (kg.)	Total income Rs.
1	Paddy			
2	Maize			
3	Wheat			
4	Potato			
5	Other Vegetables			
6	Oilseed			
7	Others			

303 From above production, how many months would your family be food sufficiency?

- 1) Less than 3 months 2) 3 to < 6 months 3) 6 to 12 months 4) > 12 months

304 If not sufficient, how do you fulfill your food deficiency?

- 1) Other sector income (business, Salary) 2) Labour 3) Sals of cattle or other commodities  
4) Debt 5) Foreign Employment (remit.) 6) others (Specify).....

305. Please provide details of your expenditure during last year.

S.N.	Description	Annual Expenditure(NRs.)
1	Food / lentil items etc	
2	Vegetables/spices etc.	
3	Meat item and fruits	
4	Milk items	
5	Fuel(firewood, kerosene, gas etc)	
6	Electricity, drinking water	
7	Communication	
8	Medicine	
9	Education	
10	Festival, Ceremony	
11	Clothes	
12	Others	
Total		

#### **4. DETAILS OF AFFECTED ASSETS**

401. Please provide following details about your land (homestead, agricultural/ forestry) and production to be affected by Project.

S.N.	Owner's Name	Plot No	Area in Ropani*				Type of Land (see code)	Occupancy Status (see code)	Use of Land (see code)	Current Price (NRs./Ropani)
			R	A	P	D				
1										
2										
3										
4										
5										
6										

\* Area: R= ropani A Ana P= Paisa, D=Dam

#### **Codes:**

**Type of Land**

**Occupancy Status**

**Use of Land**

- 1) Homestead 1) Owner-cultivator 1) Traditional farming  
 2) Irrigated Agricultural land 2) Tenant (Fix rented) 2) Business Farming  
 3) Non-irrigated Agricultural land 3) Tenant (Share cropped) 3) others.....  
 4) Others.....

402. House(s) affected by the Project

Description	House 1	House 2	House 3
Type of House(See code)			
Storied			
Rooms			
Area (L x W) (in feet)			
Year of built			
<b>Year of Setback</b>			
Replacement Price (Rs)			

**Code for type of house**

- 1) Simple hut 2) Thatched roof, walls constructed with bamboo and mud/stone 3) Tile/iron roof, walls constructed with brick/ mud/stone 4) Iron sheet/roofing with stone/ brick wall/cemented plaster 5) RCC building 6) Movable kiosk/wall/fence etc 7) others specify.....

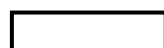
403. If there are trees in the affected land, please provide the following information

S. N.	Types of Trees/Plants	Age		Total No.	If Fruit bearing Annual Production (Kg)	Amount Sold (last year)	
		Fruit Bearing	Non fruit Bearing			Amount (Kg)	Income Rs

**5. LIVELIHOOD**

501. What types of impact dose occur to your family if the land will acquisition by the project?  
 .....
502. If your land will take by the project, do you or your family members want to take any training?  
 1) Yes 2) No
503. What type of skill training do you prefer specify name.....
504. Do you have any suggestion regarding livelihood improvement.....  
 .....

**6. PREFERENCES FOR COMPENSATION, RESETTLEMENT AND REHABILITATION**





601. What do you think about the project?  
 0 = No answer      1 = Bad      2 = Good & Bad      3 = Good      4 = Very good

602. If good/very good, rank the 3 following statements in the boxes:

	Improve cargo transportation		Improve environment
	Decrease of congestion/accident		Create more direct/indirect job
	Improve travel of tourist		Reduced daily expenditures
	Attract more investment		Flood prevent
	Increase land price		Big push to outskirts area (Bypass)
	Improve access other facilities		Improve local product marketing
			Others (specify.) .....

603. If you think there are some bad things about the project, rank 3 following statement in the boxes:

	Increase daily expenditures		Worsen environmental impact
	Loss of good trading site		Decrease household income
	Increase accident		Affected on public facilities
	Disturbs families and community		Loss occupation
	Loss house / shop		Worsen people health condition
	Loss of land use in ROW		Makes people migrate away
	Worsen access to school		other (spec.) .....

604. Will you agree to move your affected properties from ROW?   
 0 = No answer      1 = Not agree      2 = Agree with assistant      3=Voluntary to move

605. If your land or property is to be acquired by project, what type of compensation package do you prefer (select two in your priority and write 1 and 2)

1. Cash Payment.....
2. Land for land .....
3. House for house.....
4. House for house and land for land .....
5. Others (Specify .....

606. If you prefer cash compensation, please specify the reason.

- 1) To purchase land      2) To build house      3) To pay debt
- 4) To start business      5) other (specify)

607. **(Only ask house affected persons)** Do you have other house which is not affected by the project?      1) Yes      2) No

(1) If yes, where it is? -----

(2) What kind of resettlement do you expect in case your house is affected by project?

1) Resettle by self      2) Resettle as community

608. Are you aware of Government's policy on house/ land acquisition by offering compensation to affected families? 1) Yes                      2) No

609. As a project affected household what kind of opportunities/benefits do you expect from this project?

1) Employment 2) Skill training 3) Soft loan      4) Others (Specify)

610. How would you expect to effectively resolve the determination of compensation issues?

1) Accepting government's decision 2) Participation of PAFs representatives 3) Others....

611. If project provides opportunities of skill development training for project affected people, who will participate from your family?

.....

612. Please give your opinion about benefits of this project?

.....

.....

14. What are your suggestion to minimize losses of income and property? -----

## Checklist Questionnaire for the Community Discussion

१. यहाँका हाल सन्चालन भइरहेका आर्थिक कृयाकलापहरु के के हुन् ? मुख्य आम्दानीका श्रोतहरु के के हुन(प्रतिशतमा खुलाउने) ?
  - १.१ खेतीपाति(अन्नबाली मात्र).....१.२ नगदेबाली .....१.३ पशुपालन.....
  - १.४ व्यापार..... १.५ विदेशबाट.....१.६ नोकरी.....१.७ पेन्सन.....
  - १.८ ज्याला/मजदुरी..... १.९ ठेक्कापट्टा.....१.१० अन्य.....
२. यस समुदायमा सिप तथा तालिम लिएका दक्ष मानिसहरु भए, कस्तो प्रकारको सिप तथा तालिम लिएको हो, विवरण दिनुहोस् ।
३. कस्तो प्रकारको सिप तथा तालिम पाएको खण्डमा चाँडै राजगारीको सम्भावना हुन्छ ? सम्भावित तालिमका नामहरु.....
४. चल अचल सम्पत्ति जस्तो जग्गा, घर महिलाको नाममा कतिको राख्ने चलन छ, सरदर कति कति प्रतिशत पुरुषको नाममा र महिलाको नाममा राखिएको छ ?
५. मिटिङ बैठक तथा अन्य कार्यक्रमहरुमा महिलाहरुको सहभागिता कतिको रहन्छ ? जस्तै न्युन, मध्यम तथा धेरै राम्रो
६. विधालय जाने उमेरका छात्र छात्रा मध्ये के कति प्रतिशत पठाउने गरिन्छ ?

यदि विधालय नजाने गरेको भए के कारण होला ?
७. गाउँबाट विदेशमा गएर काम गर्नेहरुको संख्या.....
८. विदेशबाट पठाएको रकम धेरैजसो के कामको लागि प्रयोग गरेको पाइन्छ?
९. स्वास्थ्य सेवा सम्बन्धि के कस्ता निकायहरु द्वारा कार्य गरिरहेका छन ? के कस्ता थप स्वास्थ्य निकायहरु आवश्यक हुन सक्छन ?
१०. यहाँको खानेपानीका प्रमुख श्रोतहरु के के हुन ? यसको अवस्था के कस्तो छ ?
११. सरसफाइ तथा शौचालयको अवस्था के कस्तो रहेको छ ?
१२. घरमा प्रयोग गर्ने इन्धनका श्रोतहरु के के हुन ? बिजुली बत्तिको प्रयोगको अवस्था के कस्तो छ ?
१३. अन्य सेवा सुविधाहरु को अवस्था के कस्तो छ ?
१४. यहाँहरुको विचारमा यो आयोजना संचालन हुनु भन्दा पहिले आयोजनाका तर्फबाट गरिनुपर्ने कामहरु के के हुन्?
१५. यदि यो आयोजना संचालन भएको खण्डमा के कस्ता समस्याहरु आउन सक्छन् ?
१६. आयोजनाबाट यस समुदायले के कस्ता फाइदाहरु लिन सकिन्छ?
१७. आयोजनाबाट हुने क्षतिलाई कसरी कम गर्न सकिन्छ?
१८. आयोजनाको कारणबाट असरपर्ने सार्वजनिक महत्वका वस्तुहरुलाई कसरी संरक्षण गर्न सकिन्छ ?
१९. आयोजनाबाट क्षति पुग्ने परिवारहरुलाई के कस्तो सहयोग सहयोगको अपेक्षा राख्नु भएको छ ?

**ANNEX-IX: PHOTOGRAPHS**



**Photo 1.** Strat Point at Suryabinayak, showing two-lane road & road-side Kangiyo trees & electric poles



**Photo 2.** Road-side houses near Jagati, total 13 nos. old houses to be demolished, & electric poles



**Photo 3.** Road-side agriculture use by local people



**Photo 4.** Road-side use by local school as play-ground and electric poles & transformers



**Photo 5.** Some very old houses along Road, some newer house, need to be removed



**Road 6.** Sheds along Road, used for small shops, need to be removed



**Photo 7.** Small shrines along Road, near Palase



**Photo 8.** Nasikasthan Temple near Road's ROW, at Sanga and electric poles, transformer

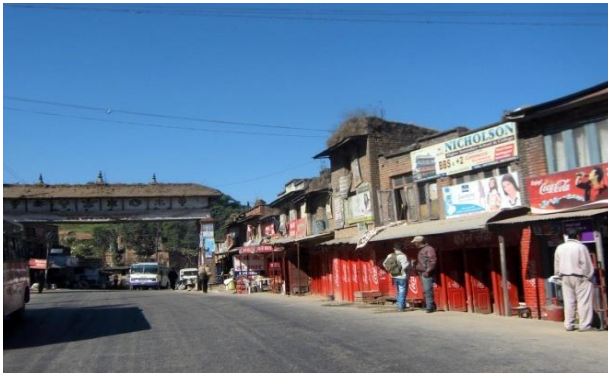




**Photo 9.** Non-functioning Dunge Dhara along Road



**Photo 10.** Low free-board at Banena Bridge during dry season, overflow during monsoon



**Photo 11.** Sanga Gate and road-side houses, shops, need to be removed



**Photo 12.** Road-side houses at Dhulikhel, some of which lie within ROW



**Photo 13.** Public Consultation meeting At Banepa Municipality Office Hall



**Photo 14.** Participant Expressing their View At Public Consultation meeting









**Photo 15.** Public Consultation meeting AtPalanse



**Photo 16.** Road-side houses in Banepa, outside ROW



**Photographs of Tunnel Area**

	
<p><b>Photo 17.</b> Private Trees along the western tunnel portal</p>	<p><b>Photo 18.</b> Piped water being supplied from tank at Sanga-Ittacha</p>
	
<p><b>Photo 19.</b> Private trees &amp; tank factory at eastern portal</p>	<p><b>Photo 20.</b> Interaction with chairperson of Suryamode CF Mr. Arjun Ranamagar</p>
	
<p><b>Photo 21.</b> Kuwa (shallow aquifer) at the eastern portal</p>	<p><b>Photo 22.</b> Tapped water at Sanga-Ittacha, above tunnel</p>
<p><b>Air Water and Noise Level Monitoring at Tunnel Area</b></p>	
	
<p><b>Photo 23.</b> West Portal, Air Quality Monitoring site</p>	<p><b>Photo 24.</b> West Portal, Air Temperature &amp; Wind Speed</p>





**Photo 25.** West Portal LVAS along with Gaseous pollutant Monitoring



**Photo 26.** West Portal, SPL Monitoring



**Photo 27.** East Portal, Gaseous Pollutants Sampling site



**Photo 28.** East Portal Wind speed & Temperature Monitoring



**Photo 29.** East Portal, SPL Recording



**Photo 30.** East Portal Downstream Water Sampling



**Photo 31:** Water Sample Collection West Portal



**Photo 32:** Air Quality Sampling at West Portal



**SOME PHOTOGRAPHS OF PUBLIC CONSULTATION AT TUNNEL AREA**



**Photo 33: Brief Description About Project**



**Photo 34: Public Participation**

**Photo 35: Discussion with local People**



**Photo 36: Women Participating in the Consultation**

**SOME PHOTOGRAPHS OF PUBLIC CONSULTATION AT BHAKTAPUR AND BANEPA**



**Photo 37: Brief information about the Project by DDG**

**Photo 38: Participating in the Bhaktapur Meeting**





**Photo 39:** Speaking ilmpotrance of about the project Member of Parliament, as chife guest



**Photo 40:** Brief Description About Project and Chief Guest at Bapena Meeting



**Photo 41:** Participating in the Banepa Public Consultation



**Photo 42:** Women Participating in the Consultation

**Public Consultation of EIA**



**Photo 43:** Brief Description about project with Presentation



**Photo 44:** Public Participation



**Photo 45: Discussion with local People**



**Photo 46: Women Participating in the Public Hearing**

**ANNEX-X: APPROVED TERM OF REFERENCE (TOR)**





Government of Nepal  
Ministry of Physical Infrastructure and Transport  
Department of Roads

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**TERMS OF REFERENCE**  
**FOR**  
**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)**  
**OF**  
**SURYABINAYAK - DHULIKHEL SECTION OF ARNIKO**  
**HIGHWAY UPGRADING/WIDENING PROJECT**

Submitted to:  
**Ministry of Science, Technology and Environment**  
Singha Durbar, Kathmandu, Nepal

Submitted through:  
**Ministry of Physical Infrastructure and Transport**  
Singha Durbar, Kathmandu, Nepal

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**Project Proponent :**

Government of Nepal  
Ministry of Physical Infrastructure and Transport  
**Department of Roads**  
**Geo-Environment and Social Unit**  
Babar Mahal, Kathmandu, Nepal  
Tel. 01 4262996  
Email: gesunit@dor.gov.np

On Behalf of:  
**Foreign Cooperation Branch**  
**Department of Roads**  
Babar Mahal, Kathmandu, Nepal

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*December 2015*





नेपाल सरकार

# विज्ञान, प्रविधि तथा वातावरण मन्त्रालय

वातावरण मूल्याङ्कन शाखा

पत्र संख्या :

च.नं. : २३०६

मिति २०७२/०८/२०

श्री भौतिक पूर्वाधार तथा यातायात मन्त्रालय,  
सिंहदरवार, काठमाण्डौ ।

विषय: क्षेत्र निर्धारण प्रतिवेदन र कार्यसूची स्वीकृत गरिएको बारे ।

तहाँ मन्त्रालयको च.नं. २१५६, मिति २०७२/०३/०९ को पत्र साथ भू वातावरण तथा सामाजिक शाखा,सडक विभाग प्रस्तावक रहेको सूर्य विनायक-धुलिखेल सडक खण्डको वातावरणीय प्रभाव मूल्याङ्कन (EIA) सम्बन्धी क्षेत्र निर्धारण प्रतिवेदन (SD) तथा कार्यसूची (TOR) माथी कारवाही हुँदा प्रस्तावकद्वारा पेश गरिएको परिमार्जित प्रस्तावको SD/TOR August,2015 लाई निम्नानुसारका शर्तहरु सहित स्वीकृत गरिएको ब्यहोरा नेपाल सरकार (मा.मन्त्री स्तर) को मिति २०७२/०८/१७ को निर्णयानुसार अनुरोध छ

### शर्तहरु:

- १.EIA अध्ययनको क्रममा कुनै नया/थप सवाल पहिचान हुन आएमा तिनलाई समेत EIA प्रतिवेदनमा सम्बोधन गर्नु पर्नेछ ।
- २.कार्यसूचीले औल्याएका सवालहरु अनुसार Impacts र Mitigation measures हरु क्रमबद्ध रुपमा प्रस्तुत गर्नु पर्नेछ ।
- ३.वातावरण व्यवस्थापन योजनामा सकारात्मक प्रभाव अभिवृद्धि र नकारात्मक प्रभाव निराकरणका उपायहरु के,कहाँ,कसरी,कसले र कहिले गर्ने बारे उल्लेख भएको हुनु पर्नेछ ।
- ४.पेशागत स्वास्थ्य सुरक्षा सम्बन्धी सवाललाई EIA प्रतिवेदनमा सम्बोधन गर्नु पर्नेछ ।
- ५.आयोजना निर्माणको क्रममा निस्कने Muck र Spoil लाई यथासम्भव Reuse गर्नु पर्ने नीतिलाई EIA अध्ययनले प्राथमिकतामा राख्नु पर्नेछ ।
- ६.वातावरण प्रभाव मूल्याङ्कन प्रतिवेदन तयारीका क्रममा landslide inventory map पनि समेटिनु पर्ने ।
- ७.वातावरणीय प्रभाव मूल्याङ्कन अध्ययनको क्रममा earth quake induced landslide को पनि अध्ययन गर्नु पर्ने ।

  
.....  
(ईश्वरी दत्त पनेरु )  
शाखा अधिकृत

### बोधार्थ

श्री भू-वातावरण तथा सामाजिक शाखा  
सडक विभाग,काठमाण्डौ ।

जनमुखी प्रशासन: अनुशासन र सुशासन

कार्यालयको ठेगाना:  
सिंहदरवार, काठमाडौं  
नेपाल

कार्यालयको टेलिफोन नं.:  
४२९९७३४, ४२९९६४९, ४२९९६५६  
४२९९६४६, ४२९९८५४, ४२९९७३७  
४२९९५८६, ४२९९६५८

फ्याक्स नं.:  
६७७-९-४२९९६५४

इमेल:  
info@moste.gov.np

वेब साईट:  
www.moste.gov.np



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## ANNEXES

### ANNEX I MAPS



## ABBREVIATION AND ACRONYM

ADB	Asian Development Bank	NO <sub>2</sub>	Nitrogen Dioxide
AP	Affected Persons	NPC	National Planning Commission
BOD	Biological Oxygen Demand	NTFP	Non Timber Forest Products
BPL	Below Poverty level	PAF/P	Project Affected Families/Population
CBO	Community Based Organizations	PM10	Particulate Matter below 10 micron in Aerodynamic size
CDC	Compensation Determination Committee	PPP	Public Private Partnership
CDO	Chief District Officer	PSA	Poverty and Social Assessment
CFC	Compensation Fixation Committee	RoW	Right-of-Way
CFUG	Community Forest Users' Group	RP	Resettlement Plan
CPR	Community Property Resource	RR	Resettlement and Rehabilitation
DDC	District Development Committee	SD	Scoping Document
DFO	District Forest Officer	SPAF/P	Severely Project Affected Families/Population
DIA	Direct Impact Area	STD	Sexually Transmitted Disease
DoR	Department of Roads	ToR	Terms of Reference
DPR	Detail Project Report	TRP	Tribhuvan Raj Path, Tribhuvan Highway
EA	Executive Agency	TSS	Total Suspended Solids
EIA	Environmental Impact Assessment	VDC	Village Development Committee
EIAG	Environmental Impact Assessment Guidelines	VPD	Vehicles per Day
EMP	Environment Management Plan	WB	World Bank
EPA	Environmental Protection Act	WHH	Women- Headed Households
EPR	Environmental Protection Regulations	WHO	World Health Organization
ERT	Electrical Resistivity Survey	WL	Water Level
EWB	East West Highway	ZOI	Zone of Influence
FGD	Focal Group Discussion		
GESU	Geo-Environment and Social Unit		
GoN	Government of Nepal		
GRC	Grievance Redress Committee		
Ha.	Hectares		
IA	Implementing Agency		
IEE	Initial Environmental Examination		
IIA	Indirect Impact Area		
IP	Indigenous Peoples		
IRP	Involuntary Resettlement Plan		
JICA	Japan International Cooperation Agency		
LAA	Land Acquisition Act		
LAR	Land Acquisition and Resettlement		
masl	meters above sea level		
MCT	Main Central Thrust		
MoFSC	Ministry of Forest and Soil Conservation		
MoPIT	Ministry of Physical Infrastructure and Transport		
MoSTE	Ministry of Science, Technology and Environment		
mt.	Metric Ton		
NAAQS	National Ambient Air Quality Standard		
NGO	Non Government Organizations		



## 1 INTRODUCTION

### 1.1 General Description of Proposal

This Terms of Reference (TOR) has been prepared for the conduction of EIA of "Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project" as prescribed in, and as per EPR 1997 Rule5, Schedule 4, requirements.

As per the Environment Protection Act, 2053 (EPA) 1997, Article 3 and Environment Protection Regulations, 2054 (EPR) 1997, Rule 3, **Clause D Road Sector – 1 (a)** (construction work of National Highway), of **Schedule 2, (pertaining to Rule 3) EPR, 1997** (amended 2007/08/02) the proposed Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project construction requires an EIA

### 1.2 Name and Address of Proponent

The proponent of the "**Environmental Impact Assessment of Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project**" in Bhaktapur and Kavrepalanchowk Districts is Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads.

Name and address of the proponent is as follows:

Government of Nepal  
Ministry of Physical Infrastructure and Transport  
Department of Roads  
Geo-Environment and Social Unit  
Babar Mahal, Kathmandu, Nepal  
Tel. 01 4262996, 426 2675 Fax: 01 426 2993  
Email: gesunit@dor.gov.np

On Behalf of:  
Foreign Cooperation Branch  
Department of Roads  
Babar Mahal, Kathmandu

#### 1.2.1 Institute Preparing the EIA Report

The Scoping Document on the "**Environmental Impact Assessment of Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project**" has been prepared for the Project Proponent by:

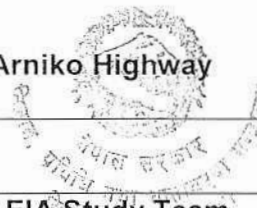
Full Bright Consultancy (Pvt.) Ltd.  
P.O. Box 4970, Sinamangal, Kathmandu  
Tel: 01 4468149, 4468118 Fax: 01 4465604  
Email: [fbc@mos.com.np](mailto:fbc@mos.com.np)

#### 1.3 EIA Study Team

The overall responsibility of the contents of this Scoping Document for EIA study shall lie with the report preparing institution, namely, Full Bright Consultancy (Pvt.) Ltd. All the team members have duly declared their involvement and have taken due responsibility in preparation of this Scoping Document. The declaration forms from the Study Team members and the Project Proponent are attached in ANNEX X of Scoping Documents.

Table 1-1 Study Team Member and Position

SN	Name	Position in EIA Study Team	Duration
1	Manjul K. Manandhar	Team Leader, Environment Specialist	7 Month
2	Arun Acharya	Environment Expert, Physical Environment	6 Month



SN	Name	Position in EIA Study Team	Duration
3	Prayag Tamrakar	Forestry, Wildlife and Aquatic, Ecology	2 Month
4	Dipendra Pant	Socio-Economist	4 Month
5	Robin Bhandari	Sociologist	6 Month
6	Devi Dotel	Sociologist	6 Month
7	Durga Pd. Osti	Sr. Highway Engineer	3 Month
8	Achutya Koirala	Sr. Geologist	2 Month
9	Sushil K. Rajbhandari	Geotech. / Material Engineer	2 Month
10	Navin K. Verma	Legal Expert	2 Month

#### 1.4 Rationality for Conducting EIA, Importance of EIA Study

The rationality for conducting EIA is to determine whether the implementation of project may result adverse environmental impacts to the local people and its surroundings. This Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project consists of entirely upgrading and widening of the existing road of (i) Arniko Highway – Suryabinayak Chowk to Dhulikhel of 15.5 km and (ii) some new construction works between this section for Highway improvement.

In past, IEE was already conducted and under approval process for this Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project but at present the same Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening scope has been change with proposing new alignment at some places from Palansa to Sangha and KU Chowk for the smooth lining of the road and improving sharp tune and curves. Due to this added scope of work which requires government to acquire totally new addition private land and property apart from the formal declared RoW. Hence, these acquiring new public land area and property have made this project to carry out the full phase EAI study.

The new construction works of added magnitude is expected to cause environmental impacts in the physical, biological and social aspects. Thus an EIA level study is necessary to identify and study the extent and magnitudes of the impacts and to suggest necessary mitigation measures.

#### Legal Rationality

##### (1) Highway

The Project is upgrading, widening and rehabilitation of the existing road with construction of new alignment for National Highway. According to the Schedule 2 (pertaining to Rule 3) Clause D Road Sector – No. 1 (a) of the Environmental Protection Rules, 1997 (last amendment 2007/08/02), the Project is required full-scale EIA that require approval of MoSTE, including identification of the impacts and their significance, and the proponent's proposal for mitigation and monitoring measures and plans.

In this context, this Proposal is considered to require a full scale EIA Study to be conducted and receive approval from, Ministry of Science, Technology and Environment (MoSTE), which is the competent agency for the approval of EIA studies and ensure the integration of mitigation measures with project activities. The EIA Report of the Proposal will be prepared after the approval of Scoping Document and Terms of Reference (ToR).

The GoN has made it mandatory and requires proof of people's participation in the very beginning of the project. It is required by the Act that an early scoping report is presented to the decision makers before a detailed EIA is carried. The very early stage of EIA, in the scoping phase itself, if issues existed, discussion forums are availed legally to overcome those before a proposal is enacted on. Issue identified during scoping, provides guidance to



EIA and Environmental Management Plan (EMP). Public consultation is the key process for conducting scoping to identify the issues, which upon analysis can be ascertained as significant issue.

### 1.5 Objective of EIA

The principle objective of EIA is to inform decision makers about the potential impacts of the project and to suggest appropriate mitigation measures for eliminating or minimizing adverse impacts at acceptable level so that the project is implemented in socially acceptable and environmentally sound manner. In specific terms, the objectives of the EIA of this project are as follows:

- To identify and document the existing physical-chemical, biological, socio-economic and cultural baseline conditions in the project affected areas
- To analyze and determine the potential positive and adverse impacts of the project in terms of both direct and indirect impacts, including definition of their extent in the context of areas affected and whether these are temporary or permanent
- To formulate and propose practical mitigation measures for adverse impacts, enhancement measures for positive impacts and to incorporate necessary safeguards in project design, construction and operation plans
- To outline requirements to minimize risks of environmental damage and of environmental risks to the project or other resource management entities operating in the area and to determine the potentials for improvements to natural resources and environmental management and socio-economic benefits to communities in the project area and its surroundings
- To prepare Environmental Impact Assessment Report as per EPR, 1997 and suitable for the internal and external lending agencies so that the Project could be implemented.

## 2 GENERAL DESCRIPTION OF THE PROPOSED PROJECT

### 2.1 General Project Background: Arniko Highway

Arniko Highway is an important link to the hills in the Central and Eastern Regions, linking Kathmandu and Chinese Border at Kodari about 114 km, is part of Nepal's Strategic Road Network. So far, it is the only motor-able link in operation with China. The Highway was constructed under Nepal-China Cooperation which was started in 1969, completed on 1971 and came into service from January 1972. In the national level, Arniko Highway has political and economical significance. This Highway has played important role in serving the populations of Kavre, Sindhupalchowk and Dolakha districts via Lamosangu - Jiri Road, Dolalghat - Chautara and others. Besides this, this Highway at Dhulikhel is being connected with Terai region in the near future through B.P. Lokmarga.

Arniko Highway connects the urban area of Kathmandu with those in Thimi, Banepa and Dhulikhel. With the eastward growth of the settlement in Kathmandu, the urban traffic on the highway from Kathmandu to Dhulikhel is considerable. The resulting highway and interurban traffic is already beyond the carrying capacity at certain sections during peak hours. After the operation of this Highway, it has been undergone rehabilitation several times because of alignment situated in fragile mountain.

With the increasing trade volume between neighboring India and China, the international traffic on Arniko Highway is going to be increased in the coming years. The construction of the dry-ports at the Indian and Chinese borders as well as the forthcoming Kathmandu-Terai Fast Track will in fact facilitate this additional traffic on the highway. Hence it is high time to widen the highway to cater the ever increasing traffic, to attract further economic activities along the corridor and to facilitate the resulting future traffic.

Government of Japan had supported to widen the Tinkune (of Kathmandu) – Suryabinayak (of Bhaktapur) section (10km) of the Arniko Highway. The work has already completed and the road has become functional. This work consists basically of widening of the double lane road carriageway to 4 lanes road, separated by a median strip and flanked by paved shoulder. On the both side of the Highway, service roads are built under Government of Nepal (GON) funding.

Further, Government of Nepal has planned to extend the widening of this Highway from Suryabinayak to Dhulikhel focusing on curves and turn improvement with smooth lining of the road geometry at several such extreme places like Sangha Bhanjyang area and KU chowk at Dhulikhelk where it requires a massive change in alignment with huge turns and curves improvement. So this activity requires acquiring addition land area then that of previously allocated ROW. Total length of this section for upgrading works consists of 15.5 km. Initially regarding this Upgrading/Widening of this section there has been lots of public disagreement and protest about the RoW set by the government, and regarding the compensation policy set forward by the Government.

As a road engineering, this new proposed alignment have been design with 2 lanes on either side as main lane. Similarly there have provision of 1 lane on either side as service track lane which is not throughout the alignment but at major urban areas. Project has proposed to have Pedestrian overhead crossing on his road alignment section at 6 locations.

#### 2.1.1 Suryabinayak - Dhulikhel Section of Arniko Highway

The Government of Nepal has planned to widen this Highway from Suryabinayak to Dhulikhel (total length 15.5km). The existing road cross-section is double-lane standard and the present paved carriageway width of the road is 6 to 6.5m. The Right-of-Way (ROW) of the road is 25m from the road's center line.

The proposed section will be the continuation of Tinkune (Kathmandu) – Suryabinayak (Bhaktapur) road upgrading project. The upgrading works include widening of the existing two lanes to four lanes as fast lanes, with provision of new construction of bridges and culverts, sidewalks and junction improvements. The two lanes on either side of fast lanes are also proposed as a service road.

The Suryabinayak - Dhulikhel Section of Arniko Highway passes through the built-up areas of Bhaktapur Municipality, Sipadol, Chittapol, Nankhel of Bhaktapur District, and similarly Sanga, Janagal, Banepa Municipality, Dhulikhel Municipality of Kavrepalanchowk district.

Arniko Highway at Dhulikhel is to be connected with BP Highway in near future which will increase the number of traffic in this section. With the increasing trade volume between neighboring between India and China, the construction of the dry ports at the Indian and Chinese borders as well as the forthcoming Kathmandu -Terai Fast Track will increase the traffic volume in coming years. Moreover to settle the present traffic situation in this section the widening of road is felt to be necessary. The upgrading work will provide better transportation facilities to the road users, enhance the socio economic activity of number of villages within Bhaktapur and Kavrepalanchowk Districts, enhancement of tourism in the project influenced area, employment generation etc.

The general environmental setting of this road is that it passes through some urban areas such as Jagati, Sanga, Banepa and Dhulikhel. Other than these places, most of the road passes through agriculture and sparse, separate houses. Some lengths of the road pass through forest areas also. There are roads-side trees in Jagati area which need to be cleared. Private houses are outside the ROW and need not be disturbed, except at Jagati where old settlement houses are next to the existing road and need to be cleared. Other major environmental issues are not foreseen at present.

At present, after the completion of upgrading of Kathmandu – Suryabinayak road, the travel time from Kathmandu to Suryabinayak is approximately 15 minutes. At present the travel time from Suryabinayak to Dhulikhel is approximately 30 min. After the upgrading of the Highway, the travel time is expected to reduce by half. So, the travel time from Kathmandu to Dhulikhel will be approximately 30 minutes, after completion of upgrading of Suryabinayak to Dhulikhel section. Importantly, the journey will be comfortable, wear and tear of the vehicles will be less along with fuel consumption and maintenance cost of the vehicles will also be less which results in increase in private savings. This reduction in travel time, and costs will be beneficial mainly to the people from Banepa, Dhulikhel and people using Arniko Highway and BP Highway to enter and exit from Kathmandu Valley.

## 2.2 Salient Features of the Project

The Project is to upgrading and widening of the existing Road and construct new alignment of road in some area of Suryabinayak - Dhulikhel section of Arniko Highway.

**Table 2-1 Salient Features of the Road Section under study**

Project	Suryabinayak - Dhulikhel Section of Arniko Highway Upgrading/Widening Project	
Development Region	Central	
Zone	Bagmati	
Districts	Bhaktapur	Kavrepalanchowk
VDCs / Municipality	Bhaktapur Municipality, Sipadol, Chittapol, Nankhel	Nasikasthan Sanga, Janagal, Banepa & Dhulikhel Municipality
Total Length	Suryabinayak - Dhulikhel section 15.5 Km	
Road Standard	National Highway Standard of DOR	
Number of Lanes of Highway Carriageway	4 lanes ( 2 lanes for each direction)	

Number of Service Road Carriageway	2 lanes ( 1 lane for each direction)
Width of the Central Divider	3.0 m
Width of Paved Shoulder	2.5 m
Width of Bus-bays	3.0 m
Design Speed	80 Kmph
Surface Type	Asphalt
Type of Work	Upgrading including widening
Improvement of intersections	3 locations (Jagati, Palanse & Banepa) Grade Separated
Pedestrian Crossing Overhead Bridge	Proposed at 14 locations
Total number of Bus Laybys	Proposed at 26 nos.
Total Project Cost	Under review
Economic Indicators	Under review

Source: Preliminary Report, JICA Study Team, 2014

### 2.3 Relevancy of the Proposal

The Project is upgrading, widening and rehabilitation of the existing road with construction of new alignment for National Highway. According to the Schedule 2 (pertaining to Rule 3) Clause D Road Sector – No. 1 (a) of the Environmental Protection Rules, 1997 (last amendment 2007/08/02), the Project is required full-scale EIA. In addition, the Project area does not fall under Historical, Cultural, Archeological or National Park areas and the forest clearance required is estimated to be less than 5 hectares. Thus, the EIA Study of the Proposal is a mandatory as per this provision.

### 2.4 Geographical Location of the Project

The Project is located in mainly in Bhaktapur and Karvepalanchowk districts. The Project Location Map is attached in the ANNEX – LOCTION MAP. The approximate area is indicated in the following location map.

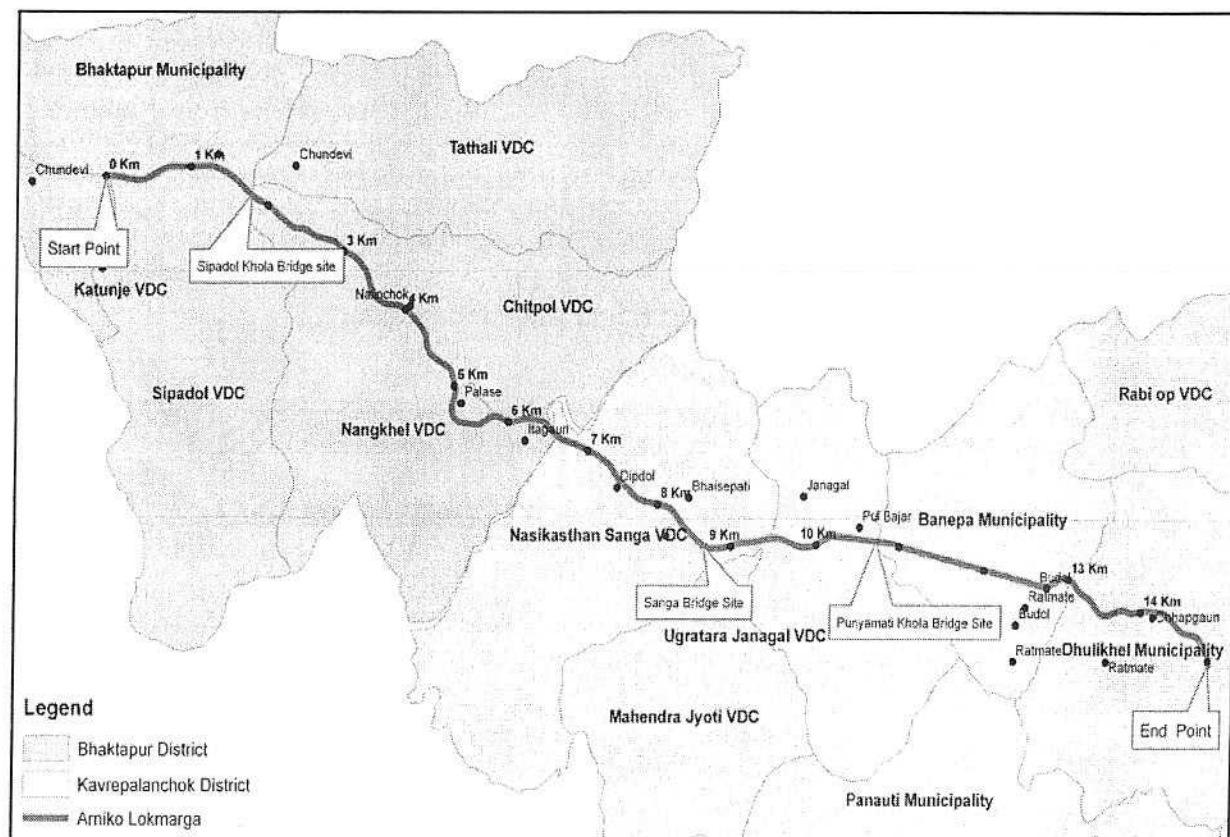


Figure 2-1 Location Map of Project Road



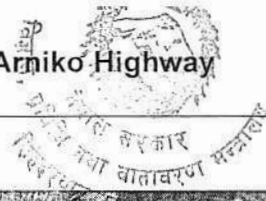


Figure 2-2 Satellite Imagery of Project Location

Source: JICA Survey Team, 2014

## 2.5 Project Area Delineation

This highway is strategically important from the point of view of the whole nation especially for the most of the population of eastern region of Kathmandu valley. It became very much important after the completion of construction of Banepa – Shinduli – Bardibas highway that connects the Kathmandu valley with the eastern terai having shorter route in comparison with the presently available one. Hence the influence area of the road is large. For the study of EIA, the possible areas where the impacts can be expected is delineated as Direct Impact Area (DIA), Indirect Impact Area (IIA) and Cumulative Impact Area (CIA). The description of the delineated areas, along the alignment is described as follows:

### Direct Impact Area (DIA):

This project's Direct Impact Area (DIA) includes all the areas where activities related to the construction will take place. The areas within the Right-of-Way (RoW) of the proposed highway alignment (25m on either side from the centre line of the road) are referred as Direct Impact Area (DIA) because land use change will occur within this corridor and land and property acquisition will take place within this corridor. This area will have greater chances of impact upon human population, private land and resources and impacts on physical, biological as well as socio-economic and cultural environment and thus is considered as high impact area.

### Indirect Impact Area (IIA):

The immediate adjacent area of 500m corridor from the edge of RoW is considered as the Indirect Impact Area (IIA). In this area, physical, biological environment will experience minimal impacts. However, impacts during construction phase are likely in these areas due to various construction activities. In addition, labor related impacts affect the socio-economic and cultural environment of the project area. This is the moderate impact area.

### Zone of Influence (Zoi):

Other areas other than DIA and IIA may also come into influence during construction stage which is its Zone of Influence (Zoi). The Zone of Influence (Zoi) of this project consists of VDCs falling within its alignment where the project activities will not have its direct effects and the impacts will be low. However, the project related impacts shall also be studied in this zone.

Based on the delineated area described above, the ward wise directly impacted areas and indirectly impacted areas of the project components during upgrading and widening along with the new improved road alignment and soil disposal area is presented in the Table 2-4 and shown in Fig.2-15.

**Table 2-2 The VDCs included in the Project Affected Area**

District	Municipality/ VDC	Direct Impact Area (DIA)	Indirect Impact Area (IIA)	Existing Road
		Ward No.	Ward No.	Section of New road
Bhaktapur	Bhaktapur,	2,6,7,11 & 12		
	Sipadol	1, 2, 8 & 9		
	Nankhel	1,7,8 & 9	2, 5, & 6	
	Chittapol	1 & 2	3, 5 & 6	Yes
Kavre	Nasikasthan,	1, 3, 4 & 6	5	
	Janagal	1,3, 4, 6 & 7		
	Banepa	5,6,8, 10 & 11	1, 2, 3, 4, 7 & 9	
	Dhulikhel	4,6 & 7	1, 2, 3 & 5	Yes

DIA: 50 m ROW for surface road, and alignment. Defined as 'directly affected area.'

IIA: Within 500 m from the boundary of the ROW. Defined as 'indirectly affected area.'

Source: JICA Survey Team, 2014

## 2.6 Project Description Summary

### 2.6.1 Design Standard and Right of Way

#### Road Design Criteria

The main criterion followed for the design of the present project road is in accordance with the design criteria indicated in the ToR for the road. The other guiding principle for the adoption of design criterion being the Nepal Roads Standards (revised, 2064). The road is planned to be 4 lane divided highway standards with 2 service tracks each on either side of the highway. These factors are taken into consideration while adopting the design criteria of the road.

**Table 2-1 Highway Design Standards**

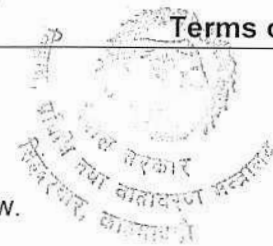
S. N.	Description	Standards	Remarks
1	Number of lanes of highway carriageway	4	3.5 m / lane
2	Number of service road carriageway	2	3.5 m
3	Width of the central divider	3.0 m	
4	Width of road per lane	3.5 m	
4	Width of paved shoulder	2.5 m	
5	Width of bus-bays	3.0 m	
6	Number of access per km	2	
7	Design speed	80 km ph	For a limiting case 60 kmph
8	Maximum super elevation	7%	
9	Minimum Radius of Horizontal Curve	130 m	For limiting speed of 60 kmph
10	Maximum Vertical gradient	7%	
11	Maximum recover gradient after 7%.	4%	

Source: Detail Design Report, Dept. of Roads, 2011

#### Right-of-Way (ROW)

As per Nepal Government's Road Standard, all roads that are designated as Highways have a Right-of-Way (ROW) of 25m on either sides of its Centre-line. In the context of Arniko Highway, the then Government had mentioned 25 yards as the ROW which was later amended as 25m. There still exists a discrepancy between 25 yards (equal to 22.8m) and 25m. In addition to this, as per the Supreme Court's decision, the Government of Nepal decided that the Highway between Sanga and Banepa will have 22.8m as ROW (as per National Gazette of 2058/11/27).





**Typical Road Cross-section**

Typical Road Cross-section at different locations is shown below.

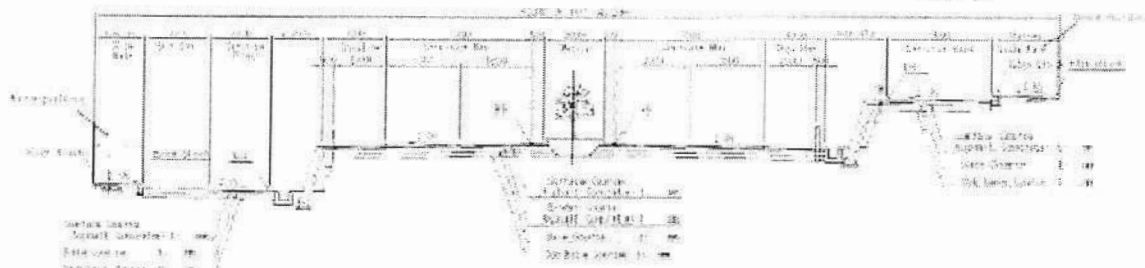


Figure-1 Typical Cross Section (Urban area near start point where existing ground is uneven)

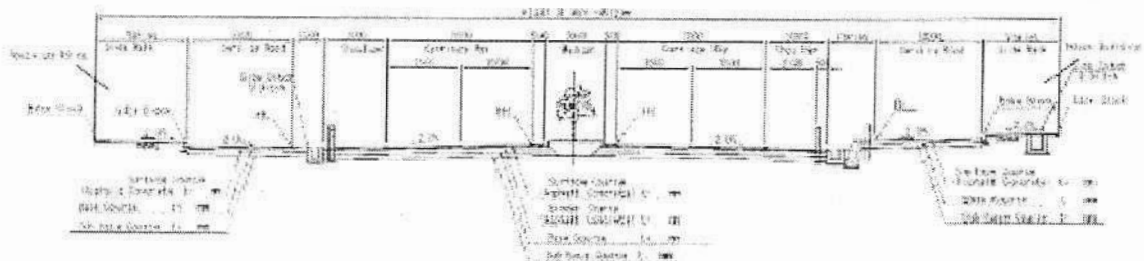


Figure-2 Typical Cross Section (Urban area near start point where existing ground is even)

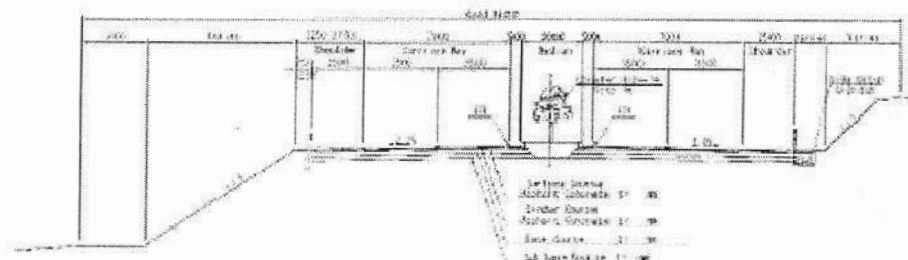


Figure-3 Typical Cross Section (Section without Service Road)

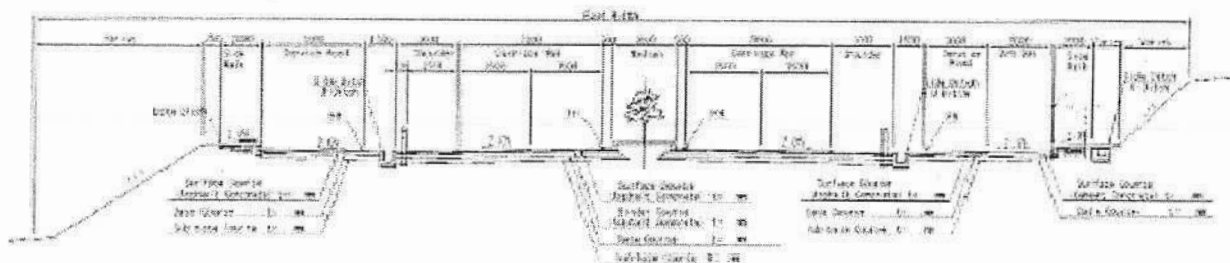


Figure-4 Typical Cross Section (Jagati - Nalinchowk and Sanga - Banepa Section)

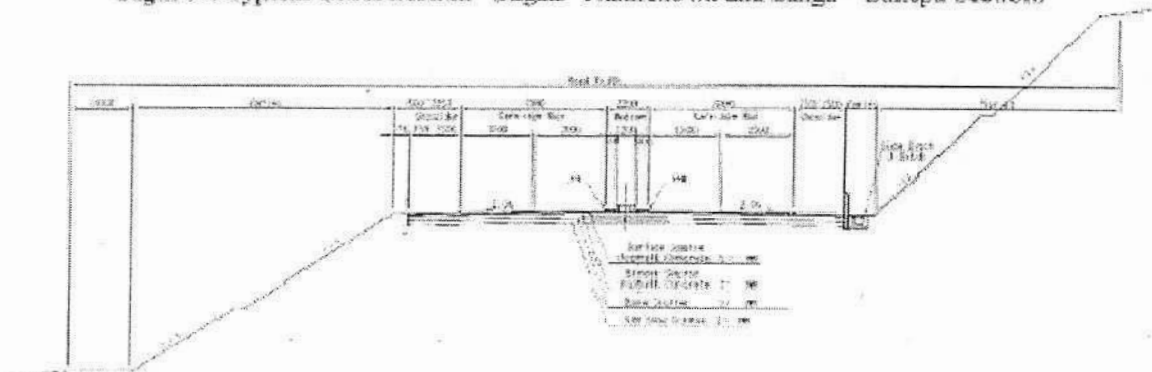


Figure-5 Typical Cross Section of Earth Section (Bypass between Nalinchowk and Sanga)

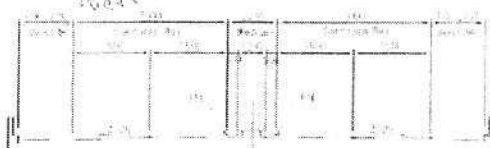


Figure-6 Typical Cross Section of Bridge Section (Bypass between Nalinchowk and Sanga)

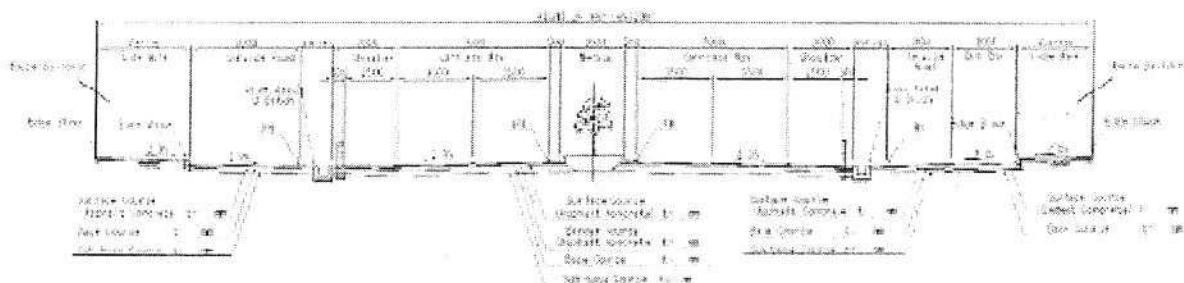


Figure-7 Typical Cross Section (Banepa Urban Area)

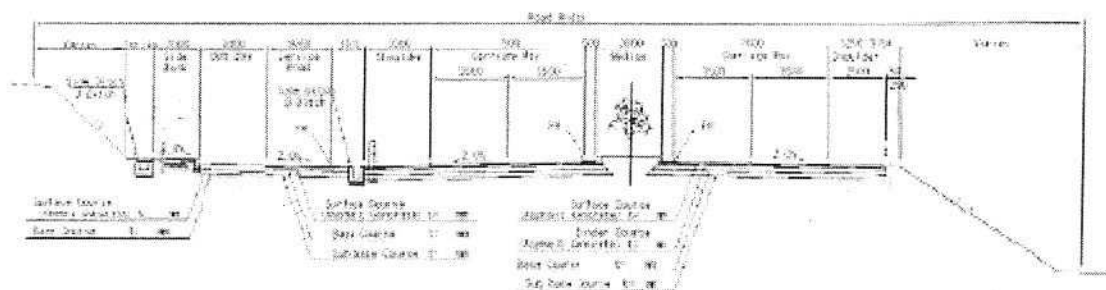


Figure-8 Typical Cross Section (Dhulikhel Urban Area)

Source: Preliminary JICA Report, 2014

### 2.6.2 Project's Major Activities

The proposed road upgrading works includes standard road widening works that will be undertaken along the length of the road and major site specific works undertaken where a significant road formation features has to be improved. Major activities for the proposed project include:

#### Widening of road surface from the present 2 lanes to 4 lanes

The major activity of this project is to widen the present two lanes carriageway to four lanes for the stretch of 15.5 km. The detailed design works for this proposed widening project has been carried out. The center-line of the road will not be changed, in majority of the road length, but need to be changed at some sections to maintain the desired design speed. For adding two lanes at both sides of the center line, the electric poles need to be relocated and road-side trees need to be cleared.

#### Addition of Bridges and Culverts

The three existing bridges at Jagati, Sanga and Banepa are double-lane bridges and so, additional two-lane bridge need to be constructed, at the side of the present bridge. In addition, one slab culverts need to be widened and additional cross drainage structures added.

#### Construction of Service Lane, Pedestrian Path, Road Crossing and Side drains

One-lane service lane road will be constructed at both sides of the road. The service lane will have lateral accesses. Construction of pedestrian pathways on both sides of the road will

also be a major activity. Since the road will be cater high speed vehicles, pedestrian road crossing bridges will also need to be constructed at various junctions. Besides these, new side drains and repair of existing side drains will be necessary to improve road surface drainage and reduce erosion.

#### Intersection Improvement Works

Intersection improvements works will need to be carried out at 3 different junctions for which additional land acquisition may be necessary. The proposed location of intersection improvements with a Grade Separated intersection are at: Chainage: 1+140 Jagati, 5+260 Palanse and 11+650 Banepa.

#### Slope stabilization works, Retaining wall and Bio-engineering

Some slope stabilization works at certain sections will be necessary. Retaining walls and breast walls are also needed at certain sections. Bioengineering measures shall be undertaken in most of the areas to protect slope.

#### Pedestrian Crossing Bridges 6 nos.

As the road passes through the urban area with lots of mobility of the local people, hence then project have design and proposed to have under head bridges for the pedestrian crossing at 6 different location along this Suryabinayak - Dhulikhel section. The detail and location of each proposed overhead pedestrian crossing is illustrated in the Table 2-4.

**Table 2-2 Chainage Wise Location of Pedestrian Overhead Crossing**

S.N	Chainage	Location
1	0+100	Suryabinayak Chowk
2	0+960	Jagate
3	11+040	Banepa-I
4	11+340	Banepa-II
5	11+740	Banepa-III
6	13+270	KU Intersection
<b>Total</b>		<b>6</b>

#### 2.7 Additional Land Acquisition

The Project intends to make the road meet its design criteria of Highway standards. To meet this criteria, the Project has proposed to make massive changes in the present alignment at mainly two locations, namely at (i) Palanse – Sanga section and at (ii) KU Chowk area and some minor changes in the Sharpe turn and bends.

The total additional land to be acquired at these different locations is approximately 340 Ropanis for (i) Palanse – Sanga section (191.58 Ropanis), (ii) KU Chowk area (30.82 Ropanis) and (iii) Other areas at 42 places (117.11 Ropanis).

The summary of the other land required are shown in Table 2-5 below.

**Table 2-5 Summary of Additional Land to be Acquired**

Location	Area in m2	Area in Ropanis
New Alignment at Palanse to Sanga	97462	191.58
KU Chowk Improvement	15678	30.82
Other Curves Improvement	59577	117.11
<b>Total</b>	<b>172717</b>	<b>339.50</b>

#### Other Land Requirement

Temporary Land Required	5 Ropanis x 5 sites for material storage
-------------------------	--

## 2.8 Construction Technology

### 2.8.1 Road Construction

#### (1) Applied Technology

The Approach Road section is planned on relatively flat ground. In this regard, the construction technology will be machine-and-labor mixed, with no special technology, special equipment or material be required.

#### (2) Major Construction Equipment

The list of major construction equipment and its procurement conditions are summarized in Table 2-6.

Most of the major construction equipment used for the construction of roads except for piling rigs for bridge construction is available locally. Asphalt paver is owned by some of the construction companies. The reliability of such equipment in local market, however, is unknown, and the possibility of importing shall also be considered during the basic design phase.

**Table 2-6 List of Major Construction Equipment and Availability**

S.N	Major Construction Machinery	Specification	Local Procurement	Import	Remarks
1	Excavator (Back Hoe)	0.45, 0.8 m <sup>3</sup> bucket	○	○	
3	Bull Dozer	21 ton	○	○	
4	Giant Breaker	1,300 kg	○	○	
5	Dump Truck	4 ton, 10 ton	○	○	
6	Truck Crane	4.9 ton	○	○	
7	Motor grader	W=3.1 m	○	○	
8	Tire Roller	8-20 ton	○	○	
9	Vibration Roller	10 ton	○	○	
10	Concrete Pump	90-110 m <sup>3</sup> /hr	○	○	
11	Crawler Crane	50 ton	○	○	
12	Generator	10-100 KVA	○	○	
13	Asphalt paver		○	○	Local Contractors

Source: JICA Survey Team, 2014

#### (3) Construction Method of Road

The construction works of the road sector will include excavation of earth, hauling, placement and compaction of embankment materials, pavement, bridges, culverts, and other structural works and installation of road facilities and traffic signals.

The proposed bridges and culverts are mostly reinforced concrete type of structures. They will be constructed basically by cast-in-place with all staging method using false works and formworks. All material, cement, reinforced bars, aggregates for concrete, bitumen, pipes etc. are available locally.

## 2.9 Construction Planning

**Pre-construction Activities:** Land Acquisition and Compensation, Relocation of Houses, Sheds, Shops etc. and rehabilitation of affected families, Relocation of Electric Power lines, Communication lines, Water Supply lines and Sewer lines

**Quarry and Storage facilities management:** Material Storage, transport

**Traffic Management:** Construction and provision of bypass to re-routing of traffic





Camp Site Management: Contractor's labour camp, Contractor's equipment storage site, Contractor and Engineer's Office

### Associated Activities

A number of associated activities for upgrading works will be undertaken at ancillary sites away from the road corridors. These activities will include:

- Extraction of materials from quarries and borrow pits: construction materials, primarily for road gravelling and retaining wall construction shall be sourced from quarries within the Kathmandu valley and no such quarries and borrow pits are within the project area.
- Materials crushing and storage: the crushing of aggregates shall be done at the quarry site and no crushing plants should be operated near the project areas. Storage of construction materials should be done at appropriate place which does not affect the local environment.
- Workforce camps: The project may need to establish a workforce camp if the majority of workers are from outside the area. These temporary camps should be located at places such that it does not disturb the local community and the environment.

### Proposal's Capacity

After the road is upgraded to 3+1 lane standard from Suryabinayak to Dhulikhel, it is expected that the volume of traffic in the Suryabinayak to Dhulikhel will increase from the present 1419 vpd (in 2008) to 5491 vpd (in 2028) [both directions] assuming 7% annual growth.

### Materials to be used

The detailed estimates of material quantities are not available, however, based on road upgrading project of similar nature, the following Table 2-7 covers the estimate of material quantities is assumed to be required:

**Table 2-7** Estimate of Material Quantities

Earthwork in Filling	60 000 m <sup>3</sup>
Sub-base course material	87 900 m <sup>3</sup>
Base course material	74 250 m <sup>3</sup>
Bitumen	386 100 lit
Asphalt Concrete	36 753 m <sup>3</sup>
Cement	5000 ton
Aggregates	15000 m <sup>3</sup>
Steel Reinforcement	8000 ton

Source: Detail Design Report, Dept. of Roads, 2011

Bhakundebesi is the suitable source for construction materials like granular capping layer sub-base and base course considering both quality and quantity. Shipaghat along the River Indrawati has another potential source but the material from Sipaghat meets strength criteria for sub-base only. Sand is also available in both of these sources. Alternatively, the sub-base material from Sipaghat can be used but base-course and wearing course materials should be brought from Bhakundebesi. Required amounts of cement and steel are to be acquired from Nepalese industries.

### Potential Emission Resulting from Implementation of the Proposal

The project is an upgrading project and does not emit polluting substances, but during its construction phase, mainly noise, dust and smoke will be emitted. Noise will be emitted during the operation of heavy equipment such as crushers, tracked excavator, grader, loaders, trucks, concrete mixers, asphalt plant, etc. Dust and Smoke will be emitted while operating the crushers and bitumen mixing plants. These polluting sources will be stationed

away from settlement areas to minimize dust, noise and smoke to human being. Similarly, bitumen and concrete spillage may cause pollution and thus need to treat with caution.

### Energy to be used

The energy that is used in the operation of construction equipments such as crushers, bitumen and concrete plants will be petroleum fuel. In addition, the large workforce in the work camps will need cooking fuel and may have the tendency to use firewood, which need to prohibited and use of kerosene or gas need to be encouraged.

### Manpower Requirement

The workforce required for the project has not been calculated in detail. However, from the records of similar previous project, it is estimated that 18,700 person-days of skilled manpower and 4,500,000 person-days of unskilled manpower would be required depending on the methodology of construction employed. The contractor is required to employ the unskilled manpower from the local communities as far as possible.

### Resources required for the implementation of the Proposal

The detailed estimate of costs for the entire 15.5 km road length is not available, however based on experience on upgrading works of similar road project, NRs. 2.785 billion will be used for the proposed upgrading works of this road.

## 2.10 Resources and Construction Materials to be Consumed

### (1) Major Construction Material

The list of major materials and its procurement condition is summarized in Table 2-6. The basic construction material, such as fill material, rocks, crushers, aggregates, sub-grade (roadbed) material, cement, reinforcement bars, asphalt material and steel structures are available locally, including those products that are manufactured and imported from India. Therefore, the Project is planning to purchase these materials from the local industries, and there is no plan to develop a new borrows pits or quarry sites specific for the project. Also, there are sufficient amount of such materials at the wholesalers and there is no need for coordination of specific individual import for the Project.

The name and location of the potential business entities to be used in the Project, as well as the estimated volume of the raw material needed shall be studied during the EIA survey and the basic design. On the other hand, the steel structures and some large- sized pipes, No. 3 in Table 2-6, need to be ordered and be imported specifically for the Project.

**Table 2-5 Lists of Major Construction Materials and its Procurement Conditions**

S.N.	Major Construction Material	Specifications	Local Procurement	Import	Remarks
1	Cement		○	○	Low quality
2	Reinforced Bars		○	○	
3	Steel Material (Sheet-piles,pipes)			○	
4	Formworks Material		○		
5	Scaffolding/ Supporting, H-beams		○		
6	Aggregate, Sand, Borrow Soil		○		
7	Concrete Pipes	φ 600 to 900 mm	○		
8	Bitumen		○	○	
9	Rock Bolt		○	○	

Source: JICA Survey Team, 2014

### (2) Water

Water used for concrete batch plant planned at West Portal will be taken from surface water



source nearby. Potential location, necessary amount, and duration of water use shall be studied during the EIA survey and the basic design.

### 2.11 Implementation Mechanism

The Project shall be implemented, or planned and constructed, by DOR with funding and technical assistance of JICA. MOPIT and MOF shall be supervising and coordinating institutions.

**Table 2-6 Implementation Mechanism**

Project Proponent	DOR
Supervising Institution	MOPIT
Funding (Loan) and Technical Assistance	JICA
Coordinating Institution	MOF

Source: JICA Survey Team, 2014

### 2.12 Institutions Involved

In addition to the institutions listed as the Implementing Institution in the previous Section, following institutions shall be involved in each phase of the Project.

District Development Committees shall be consulted during the planning phase for information regarding the specific conditions in the Project Area, as well as for effective cooperation and coordination in local development.

**Table 2-7 Institutions Involved**

Organization Level	Institutions Involve	Planning Phase	Construction Phase	Operation Phase
District Level	District Development Committees	X		
	Compensation Determination Committees	X	S/M	
	District Forest Office	X	X	
	Community Forest Users' Committee to be affected	X	X	
VDC Level	VDC Offices	X	S/M	S/M
	Water suppliers or Water Users' Associations to be affected	X	S/M	S/M
	Other public or semi-public organizations in the affected VDCs	X	S/M	S/M
	Project affected people and businesses	X	X	S/M
Other	NEA	X	X	X

Source: JICA Survey Team, 2014

X: Involved in the Project implementation.

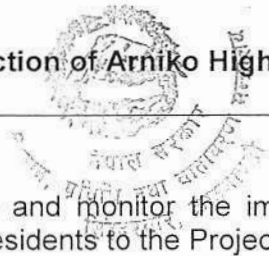
S/M: Involved in the supervision and monitoring.

Source: JICA Survey Team, 2014.

Compensation Determination Committees shall be consulted for determination of the compensation and assistances. The Committees shall supervise the implementation of their decision during the construction phase.

District Forest Office shall be involved in the decision of tree clearance in the national forest and necessary compensation by DOR. Community Forest Users' Committee to be affected shall be consulted during the planning phase for information regarding the forest use and dependency of the users. In the construction phase, it may be involved in the clearance activities if the coordination between the District Forest Office directs so.

VDC Offices shall be consulted during the planning phase for information regarding the specific conditions in the Project Area, as well as for effective cooperation and coordination in local development. The offices are also expected to act in assisting public consultation and information dissemination during the planning phase. VDC Offices in construction phase



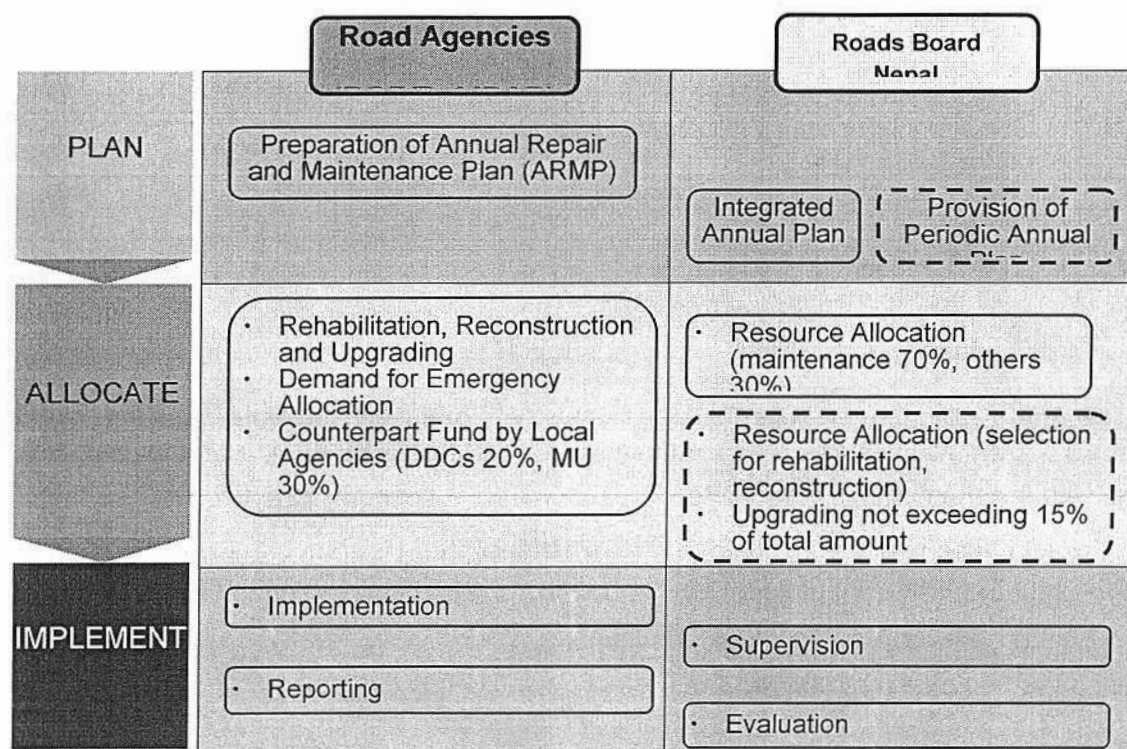
and operation phase shall supervise and monitor the impact of the Project, and convey opinions and grievances of the local residents to the Project Proponent, DOR.

Water suppliers or Water Users' Associations to be affected shall be consulted during the planning phase for potential impacts on their facilities and water supplies. They shall supervise and monitor the impact of the Project, and convey opinions and grievances of the members to the Project Proponent, DOR, in construction phase and operation phase. Other public or semi-public organizations in the affected VDCs, including schools, hospitals, clinics, etc., through public consultation, shall be consulted during the planning phase for information regarding the specific conditions in the Project Area. They shall supervise and monitor the impact of the Project, and convey opinions and grievances of the staff and users to the Project Proponent, DOR, in construction phase and operation phase.

Project affected people and businesses shall be identified during the basic and detailed design phase. They shall be consulted and resettlement, relocation, and necessary compensation and assistances shall be coordinated. Physical resettlement and relocation shall be coordinated during the planning and construction phase, after receiving rational compensation and assistances. DOR shall be responsible for the monitoring of their livelihood after the resettlement of the Project Affected Families, with cooperation of the target families. NEA shall be consulted in the planning phase regarding the supply of electricity for operation phase. In the construction phase, coordination between DOR and NEA shall be necessary for construction of transmission line between the Matatirtha sub-station and the receiving facility at East Portal. In operation phase, continuous operation and monitoring of the electricity supply shall be coordinated between DOR and NEA.

### 2.13 Maintenance Approach

Funding, institutional mechanism and human resources to be used for maintenance of the Approach Road shall be the same with existing National Highway as shown in Figure 2-14.



Source: JICA Survey Team, 2014

Figure 2-3 Structure of Road Maintenance in Nepal

### 3 DATA REQUIRED TO PREPARE EIA REPORT AND METHOD OF COLLECTION

In this section, the data required to be collected during the EIA study phase, and its methods of collection are discussed.

#### 3.1 Data Required

The Project Proponent, during the course of EIA study, shall acquire data / information needed to assess the impacts on two broad aspects:

- to prepare existing environmental condition i.e. the Baseline of the existing situation of the physical, biological and socio-economic and cultural aspects of the environment, and
- Data / information pertaining to prioritized issues and anticipated impacts - some of which are already identified during the scoping study.

During the process of data collection, the data and information collected shall be sufficient to determine and quantify the impacts of the respective activities.

#### A. Physical Aspects

General physical parameters for baseline data shall be collected for:

- Topography along road alignment,
- site and regional climate,
- geology along road alignment,
- soil qualities,
- air and water quality,
- Hydrological aspects of rivers and streams such as flood, minimum flow, water availability, existing water use, bank erosion etc.
- natural drainages and local drainages, including water sources, springs, irrigation facilities

This section of Arniko Highway road alignment passes through hilly areas so following aspects of slope stability, landslide possibility, both during construction and operation phases shall be studied:

- Present condition of existing landslides
  - phenomenon of occurrence/ dimension/ activity
- Condition of slope stability and soil erosion in and around road corridor and project component sites, considering parameters like:
  - slope angle,
  - soil type/ texture,
  - seepage,
  - vegetation and landslide,
  - slope stability,
  - depth of overburden,
  - orientation of discontinuities of rock- mass,
- Assessment of likelihood of:
  - Triggering - existing slide,
  - formation of new slides/ slope instabilities, and
  - Further aggravating soil erosion due to construction activities.
  - Proximity of such slides to the existing settlements and likelihood of settlements getting into the hazard zone.

**Following Information Will Also be Included in the Study:**

- Loss of top soil
  - Particularly from agricultural land (both in temporary and permanent acquisition) shall be considered as an impact.
  - The impact description shall fully account the loss from permanent and temporarily acquired land separately with - top soil loss area, total volume, loss of fertility, etc.
  - In the mitigation chapter, associated mitigation measures shall be proposed:
    - Mitigation could include – collection of top soil, keeping at safe place (location shall be identified), protection from washout, restoration of temporary land before handover, applying the remaining top soil at places upon request by the local people.
  - Soil sample analysis (organic matter content) shall be performed
- Spoil disposal : Physical Characteristics
  - Quality of spoil (tentative volume and weight)
  - Spoil material
  - Topographical features of disposal site – avg. ground slope, terrace of flat
  - Geological/ geo-morphological features – depth of overburden, overburden material, orientation of bedding plane of bedrock, landslide and slope stability conditions around the disposal site both vertical and horizontal directions
- Social Characteristics
  - Proximity of houses/ settlements located nearby site (distance and direction)
  - Existence of other social infrastructures (distance and direction)
  - Existence of agricultural land; their types; tilling, irrigation, and agricultural practices

**B. Biological Aspects**

This section of Arniko Highway road alignment lies within the forest areas around the Sanga Bhanjyang, so significant adverse impact due to clearance of forest area can be expected. Therefore, precise information on existing forest situation and likely loss of forest including type of tree, number, dimensions, volume of wood etc of the forest area to be cleared for road construction will be collected. Identification of forest types e.g. national forest, community forest, religious forest, leasehold forest (as identified in the Forest Act) will be done.

In addition, the status of NTFPs and its use will be studied, including the following aspects:

- NTFPs
  - NTFPs use, collection and sales from different forests
  - Plants having medicinal, agro-forestry, and ethno-botanical values;
  - Identification of species and their composition separately in the core project area (where project structures and project facilities are located) as well as in the surrounding area.
  - Number of dependent families and population,
  - Annual harvest and turnover of each type of species.

Adequate information, as appropriate, on wild mammals, birds, reptiles and fishes, their habitat, situation of biodiversity shall be collected as part of biological environment. The following aspects, specifically as site demanded, shall be studied:

- i) Terrestrial and Aquatic Habitat of wild fauna (affected by the road alignment);
- ii) movement/migration corridor affected by the road alignment;
- iii) Mapping of habitat in adjoining area of road alignment and construction activities and surrounding area.



- a) Data of Wildlife Habitat shall be collected, pertaining to:
- Site Description (Water body/holes, Vegetation cover, Ground and soil / rock features),
  - Important Habitat Type / Features-Tree / Herb / Shrub / Epiphyte / others,
  - Habitat Use –a) Active/Temporary/Migratory Corridor;
  - b) breeding/feeding or hunting/resting/, and others,
  - c) Spawning and migratory route of aquatic fauna
  - Habitat Continuity and Habitat Connectivity
  - State of habitat in terms of – Degradation / Fragmentation / Human encroachments.
  - Threat and Conservation status of animals using habitat based on IUCN's Red Data Book and National Park and Wildlife Conservation Act (1973) respectively

### C. Socio-Economic Aspects

This section of Arniko Highway road alignment also serves to the people residing in the VDCs along the road and nearby vicinity. At some places, private land has to be acquired. Therefore, precise information on socio-economic condition of the people in the affected and surrounding VDCs (DIA and IIA) shall be collected, so that impacts of road construction in their livelihood can be accessed.

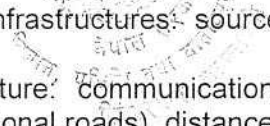
While collecting data and information pertaining to socio-economic and cultural environment, general districts level information shall be collected, followed by affected VDC level information, and then project level information shall be collected. Data and information pertaining to project component level information – location / separation ( within the construction site or at some distance) of structures / components / facilities / services / places of activities pertaining to the socio-economic baseline components shall be collected with respect to the proposed project's components, facilities, activities, and zone of influence.

In particular, following social data shall be collected:

- Population distribution and ethnicity
- Availability of local workers and labor situation
- Major economic activities and income levels
- Agro-economic aspects and production levels
- Food sufficiency and well being level
- Social service facilities
- Cultural practices and religious sites etc.
- Education Status
- Gender Status

Specifically, the data collection and analysis of the under mentioned aspects shall be carried out:

- Location of Houses and Settlements within the project area and in the vicinity.
- (If located outside the project influence zone, approximate distance to them from project structures, ancillary-structures, facilities, activities, shall be given)
- Location/ separation ( within the construction site or at some distance) of:
  - Existing settlements, with their numbers and names of owners,
  - Type of structures and facilities of the proposed project.
- Educational institutions: schools, colleges in the VDCs/Municipalities of project area and its vicinity.
- Health institutions in the project area and its vicinity.
- Sources of energy used; per capita firewood used, and its sources

- 
- Local water related infrastructures: source and infrastructures of – local water supply, irrigation etc.
  - Other local infrastructure: communication, transport (foot trails, trekking trail, Village, District, or National roads), distance to nearest all-weather roads
  - Cultural / Religious / Archaeological / Pilgrimage sites in the vicinity of the project
  - Community services centers, cremation sites, local markets
  - Public / Government institutions

**(1) Project Affected Families**

- Census survey data of the directly project affected families shall be carried out.
- The directly project affected families are to be considered as those families who lose their house/structures, land and other properties to the project.

The affected families shall be categorized as:

- Project Affected Families (PAFs) and
- Seriously Project Affected Families (SPAFs)

**(2) Need of Acquisition of Private Property:**

- Area of individual land property to be acquired
- Number of houses and structures to be acquired
- Possible damage to private property

**(3) Need of Resettlement and Rehabilitation:**

- Number of households to be resettled/ rehabilitated;
- Existing means of livelihood of project affected people
- Detailed accounting of all land and property of people who need to be resettled/ rehabilitated shall be presented.

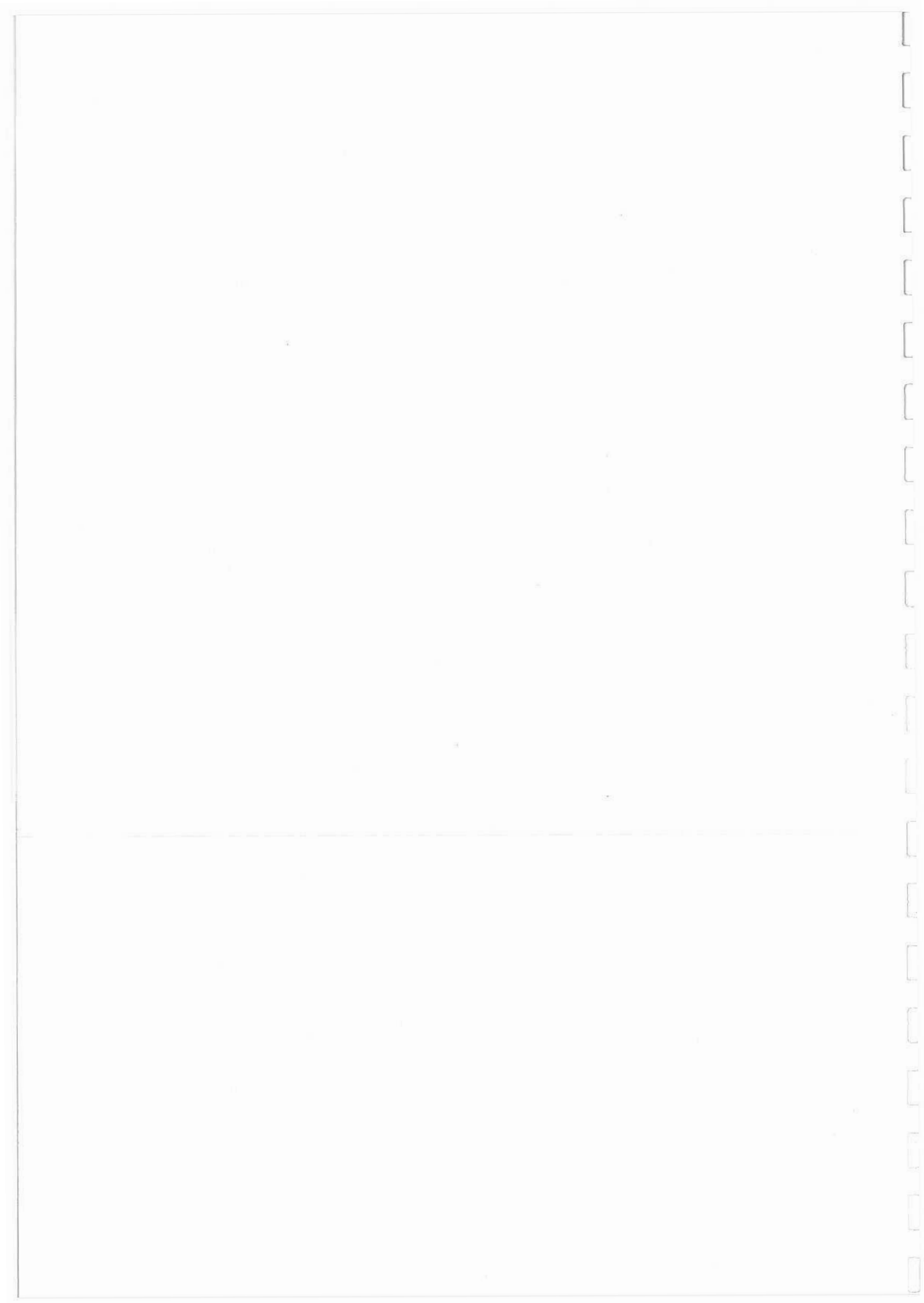
**(4) Perception about the Project and Desired Compensation, Rehabilitation Measures:**

- Opinion of the affected households / people on the project development,
- Opinion of people regarding compensation (cash compensation, land for land , any other),
- Rehabilitation (employment in the project, training for skill enhancement, cash support, loan support, any other), and
- Resettlement (project, self, local area, outside project area) options and reasons to choose different options shall be given.
- Opinion about the Land Acquisition Act 2034

**D. Cultural Aspects**

- Religious, places of worship/ rites/ ritual, and cultural sites
  - Religious, places of worship/ ritual and cultural sites of the region and or the delineated project impact area and their significance shall be identified.
  - Existence of Religious, places of worship/ rites/ ritual, and cultural sites within the project and in the vicinity shall be given; approximate distance to the sites located within the project site and vicinity of the project structures/ ancillary-structures/ facilities shall also be given.
- Historical and Archeological Sites
  - Historical and archeological sites of the delineated project impact area and their significance shall be identified.
  - Existence of Historical and Archeological sites located within the project and in the vicinity shall be given





BOD will be measured by using Winkler Azide Modification (Dilution & Seeding) Method. Coliform will be measured using the test method Multiple Tube Fermentation, 9221 E, APHA for Biological water quality analysis and TSS will be measured by using Oven Drying Method.

Similarly, for air quality analysis parameters like PM<sub>10</sub>, TSP, NO<sub>x</sub> and SO<sub>x</sub> will be analyzed along with other parameters if necessary that relates to pollution monitoring during the study. NO<sub>x</sub> and SO<sub>x</sub> will be measured by using Griess-Saltzman Reaction Method and TSP and PM<sub>10</sub> will be measured by using Gravimetric (LVA), JIS Z 8814 Method.

Similarly the vibration level of the area will be measured. Sound level will be measured during day and night time in two hours interval for 24 hours by using the instrument Digital Sound Level Meter. The noise descriptors will be calculated from the 10 minutes interval monitoring data for each time zone.

Change in Land-use and loss of land; destabilization of slopes, slope failure and erosion. Slope cutting activates, hazardous material, spoil disposal site, hazard due to water flow diversion

Landslide hazard maps, flood hazard map will be prepared covering the entire area through which alignment is proposed. The river cross-section will be surveyed and flood discharge will be computed. The surveyed river cross-sections and the computed design flood discharge will be used as input data to compute water surface profile of all the major rivers of the project area.

## **B Biological Aspects**

### **General Methodology**

Environment survey on biological aspects relating to forest types and watershed management and wildlife and fauna, etc. will be carried out to accomplish the task. Wildlife and other fauna in any including endangered fauna within area will be studied in term of possible impacts to them. Survey of natural forest resources and habitats will be carried out to identify floral species diversity and to identify the status quantitatively and qualitatively.

The baseline information will be collected through primary and secondary information. Type of forest species, distribution, frequency, abundance and coverage of plants will be studied. Forest types by ownership e.g. national forest, community forest, private forest etc. along the proposed alignment will be documented. Forest use or use of forest products etc. also will be documented after due discussion with the Community Forest Users Groups. Vegetation and forest resources assessment will be done with the use of the sampling survey with quadrates method as well as observation through walkthrough survey. Plant species identified in the influence area will be compared to the list prepared by IUCN Red Data Book, CITES and List of Endangered Rare and Threatened Plant Species published by GoN.

Existing flora will be studied on the basis of field visit. Ethno botanical characteristics shall be found out on the basis of discussion with the local people and traditional healers will also be studied.

The baseline data will be collected on fish and aquatic biodiversity to identify possible impact due to construction works in downstream aquatic biodiversity and existing aquatic ecosystem. Impacts on socio-economic and cultural environment of the people dependent for their livelihood on these aquatic fauna will also be assessed. Similarly, economic evaluation of forest loss and loss of other resources will also be carried out.

Literature review, walkover survey, assessment aided with maps, photographs, checklist and questionnaire will be used for identifying the species, their applicable values and their local status including protected species.

### Specific Methodology

#### Forest / Vegetation Survey

- i) **Stratification and Population:** The natural resources (forests and wetland) affected is stratified for the survey. A stratified systematic strip sampling design will be opted for the study. With these details, remaining within the design, the forests and its area will be stratified. The population of individual species shall be documented along the road alignment strip within these strata.
- ii) **Sample Intensity:** Sample plot (also called quadrant) Lay should accommodate a minimum of 20 units of measurement, targeted to be collected. An inventory design to be followed by a large survey is lower intensity of sampling intensity. However, to attain a greater accuracy and to obtain a higher quality of data to be collected, a 2.34% of sampling intensity will be carried. Of the total sample area, individually 1% has been set aside for herbs and regeneration, 4% for seedlings and saplings and 95% for trees and poles, respectively.
- iii) **Plot Size and Number:** The plot designed is 25m x 25m, and accommodates one 5m x 5m sub-plot and two 2m x 2m sub-plots. Sample plot 25m x 25m measures all trees and poles, 5m x 5m sub-plot will be used to measure sapling and seedlings and 2m x 2m for regeneration, herbs and grasses.
- iv) **Data Collection and Tree Parameters:** Parameters such as diameter at breast height, height and crown size of a tree/pole, crown coverage (forest), number of seedlings etc will be measured for tree species. Average height, coverage percentage and number of plant species will be enumerated for shrub species. And number of plant species, their individual number and ground coverage shall be enumerated for herb species.

Inside 25m x 25m, and two 5 m x 5m, 2m x 2m sized small plots will be laid to count the individual plant while the percentage coverage will be estimated instantly. Individual tree species will be counted along with their DBH, height and crown cover. For the calculation of frequency, density, coverage, basal area and volume, models presented in "Analysis and Presentation" will be used.

Environmental variables such as aspect, slope and altitude of each plot will be measured by GPS and visual observation. Majorities of the species encountered will be identified in the field and remaining unidentified specimens will be identified in National Herbarium, Godawari, and Tribhuvan University Herbarium, Kathmandu, Nepal.

#### v) Expected Outcomes

Expected outcome of the forest / vegetation survey/study shall be:

- a) List of common species of tree, shrubs and herbs (with Government of Nepal protected, rare, threatened and endangered species, if any),
- b) Tree volume, biomass of other tree component,
- c) Tree basal area, species density, frequency/distribution and crown cover and
- d) Important Non-timber Forest Products (NTFP), their collection and use status
- e) Loss of forest and other resources in terms of economic value



## **Faunal Survey**

### **i) Wild and Aquatic Life Survey**

Survey method shall include observation and interaction with local people. Sites representative of different habitat types with adequate possibilities for observing wildlife will be selected for study.

#### **a) Survey Block Design**

The study area will be divided into appropriate survey blocks of habitats areas. The distribution of different mammalian and herpeto faunal species in the study area will be made in a topographic map. Animal location, feeding sites, roosting sites and nesting sites will be surveyed to analyze the distribution of the species.

Survey of the wildlife shall be made using techniques such as:

### **ii) Distribution Survey**

#### **• Viewing and Counting**

Suitable viewpoints will be selected and waited for the activities. Whenever the species sighted time, activity, elevation, vegetation type and other topographic features will be noted down.

#### **• Vocal Counts**

Suitable points will be visited during dawn and dusk and wait for sound/noise of the species. The noise/cry of the species will be recorded.

### **iii) Sign Transect Survey**

Cat families and other field and candid sign surveys will be conducted in different habitats. Potential habitats will be plotted in a topographic map where animal sign is most likely to be found (ridge lines, along the base of cliffs etc). All transects (refer to bird survey) will be walked and signs recorded.

### **iv) Questionnaire Survey**

Interview with local people to know the presence/absence status, population and threats to wildlife.

### **v) Analysis**

The survey data will be analyzed through scatter plots, frequency distribution, descriptive statistics and multivariate exploratory analysis.

### **vi) Bird Survey**

Survey will be carried out mainly in Suryamul-Perunge Community Forest areas of Sanga Bhanjyan area in Chitapol VDC-2. A stretch of entire forest area fall under the road alignment on in each side of the road will be observed. The study will be a combination of encountered transect and point count. Potential habitat will be decided using the topographic map.

### **a) Expected Outcomes**

Expected outcome of the bird survey/study will be:

- A species discovery curve (Species-richness counting method),
- List of residential and migratory species, their habitats, loss of habitat due to road construction
- List of threatened birds, biological hot spots
- List of important species found in the area

### C Socio-Economic and Cultural Aspects

Environmental survey on social aspects of people residing within the region of influence of the Proposal will be conducted using secondary as well as primary information collection. Household Survey, field observation, focus group discussions, formal and informal interviews and deliberations tools etc. will be used to collect the data. Key informants namely, water Users committee members, local farmers, field level stakeholders, VDC secretaries, local elite, member of political parties will be consulted to accumulate information regarding social environment. Place-wise information regarding the social behavior and practice, festivals, activities etc. shall be documented using questionnaires during the field survey. Information collected through secondary sources will be verified with the data collected from primary sources.

Information on existing land use pattern of the project area, water supply system, irrigation system, road and trail networks, energy source and consumption pattern, social infrastructure facilities (schools, health posts, financing institutions etc.), industrial and commercial establishments and operation, religious and cultural sites, gender balance and sensitivity, recreational facilities etc. shall be collected, analyzed and referred for prediction of environmental impacts. Agriculture inputs, market for agriculture products, crop diversity, agriculture extension services etc. shall also be recorded. Socio-economic and cultural environment survey will be done using prescribed household survey questionnaires through the mobilization of trained Research Assistants and Enumerators under the overall supervision and guidance of the Socio-economist and Sociologist of the Study Team.

The methodologies, tools and techniques used in sampling /observation/ survey will be described in the report.

- Source of all data and information given in the reports shall be identified:
  - For field survey, year of survey conduction and specific methodologies to be used shall be given
  - For published reports or literatures, standard reference format shall be used with reference list
- While describing existing environmental condition using outcome of field data collection, following information shall be used:
  - Date and time of sampling/ observation,
  - Location of all the sampling site (in terms of distance) with respect to project structures
  - Data collected from each sampling sites and sample plots must be attached in the report
  - Photographs of sample sites must also be attached

The data collection methods for Physical, Biological and Socio-economic and Cultural environments are specifically described by the Data Collection Matrix as illustrated in Table 3-1.

#### 3.3 Public and Stakeholder Consultation

A detailed public consultation will be conducted after the publication of public notice to collect the opinions/suggestions from the concerned stakeholders in the affected VDCs during scoping phase and other phase during EIA study. The Public opinions/suggestions received from such discussions through formal and informal gathering, discussions, interview and the issues raised during the consultation will be recognized and used as positive inputs for EIA report preparation and implementation of the proposal. Similarly while collecting baseline data during EIA study the concerns of the stakeholders will be collected through Focused Group Discussions.



After the preparation of the Draft Report, a concise leaflet about the project activities in Nepali language will be prepared to share information with the local people and different stakeholders in order to disclose the draft EIA report in accordance with Rule 7 (Sub-Rule 2) of the Environment Protection Rules, 1997. The public hearing will be conducted at appropriate locations so that the project related information will be shared to the general public and the local people will be pre-informed about the meeting through local Radio/FM, local newspapers.

The stakeholders for public consultation will include authorized representatives from district forest office and community forest users groups. If due to the project activity government forest/ community forest or trees need to be cut down then suggestions and recommendation letters from the district forest office or the community forest user groups will be collected and the suggestions will be incorporated in the EIA report.

### **3.4 Other Requirements**

#### **3.4.1 Matters to be Included in the Recommendation Letters From Affected VDCs**

The matters to be included in the recommendation letters provided by the project affected VDCs are listed below:

- Impacts on the local resources within the road alignment of the respective VDCs to be affected by the project activity and its possible mitigation measures.
- Impacts on the physical infrastructure within the project area and its possible mitigation measures.
- Both positive and negative impacts on socio-economic activities within the project area during construction and implementation stage.
- Impacts on the religious sites, chautaries, cremation sites which the people have sentiment attachment towards it and the possible alternative route suggested as a possible mitigation measures.
- Impact on the forests and its resources due to the project activity and the possible mitigation measures to minimize it.

#### **3.4.2 Matters to be Included in the Recommendation Letters from Affected CFUGs and DFO**

The matters to be included in the recommendation letters provided by the affected community forest user groups and district forest offices are listed below:

- Measures proposed to mitigate the sound and vibration effect during construction stage inside the forest area.
- Measures proposed to minimize the pressure on forest resources by the construction workers as a mitigation measures
- Measures proposed to minimize the loss of trees and Non-Timber Forest Products & the actual number of trees to be cut down due to project activity.
- Appropriate place for re-plantation in the ratio of 1:25 as per the CFUG law as a compensatory plantation for the loss of trees.

### **3.5 Data Collection Method Proposed**

The following possible environmental issues, in order of priority and categorized as above, has been identified and prioritized for its respective environmental domain and their respective method to be adopted to collect Data and required information has been summarized and presented in matrix form in the following Table 3.1 for Beneficial Impact and in Table 3-2 for Adverse Impact.





**Table 3-1 Data Collection Matrix for Beneficial Impacts**

Issue No.	Possible Impact Identification	Study Method
<b>Construction Phase</b>		
BC -i	Generation of Employment opportunities and increase of Income	Number of local employment will be anticipated during feasibility household survey
BC -ii	Increase in the income level of local people through opportunity to work and income generation activities	Household Survey
BC -iii	Strengthening of skills and capacity of locals	Number of skilled and capable labors that will be generated during construction will be anticipated with local people interaction during feasibility
<b>Operation Phase</b>		
BO -i	Shortening of Travel Time	Interview with people in Project influence zone will be conducted
BO -ii	Shortening of Travel Distance	Detail of easy accessibility of goods and services will be further study
BO -iii	Saving of Vehicle Running Cost	Economic activities will be undertaken supplemented by household survey data
BO -iv	Reduction of Traffic Accidents	Status of local's Accidental cases will be studied.
BO -v	Application as a Model Case	Household survey and local commuters survey
BO -vi	Access improvement for people	Household survey.
BO -vii	Control Air Pollution	Periodic Air Quality monitoring and analyses will be carried out.
BO-viii	Economical benefit	Occupation and livelihood of the locals and women's involvement into economic activities will be studied and Household survey.

**Table 3-2 Data Collection Matrix for Adverse Impacts**

Issue No.	Possible Impact Identification	Study Method/Remarks
<b>Physical Environmental (Construction Phase)</b>		
<b>P1</b>	<b>Temporary and Permanent change in land use</b>	
P1-i	Loss of agricultural land.	Details study of necessary lands area to be acquired by cadastral survey and topographic survey
P1-ii	Impact due to change of forest area into road formation	Details forest areas assessment and Vegetation Survey will be carried out
P1-iii	Cumulative impact of loss of cultivated land and decrease in agricultural production	Study of agricultural production of that area and their loss will be determined proportionately.
<b>P2</b>	<b>Impacts on air, noise and water quality degradation due to construction activities</b>	
P2-i	Air pollution and quality degradation due to operation of drilling machines, excavators, vehicle movements on unpaved roads with alteration on the level of air quality parameters like NO <sub>2</sub> , SO <sub>2</sub> , TSP and PM <sub>10</sub> .	Existing condition of air quality on Arniko HWY and at the planned Road will be measured.  The locations for all the machines that may cause dust will be verified.
P2-ii	Degradation of water qualities of existing rivers. Siltation and deposition at lower, downstream sections on river banks altering the level of pH and Suspended Solid. Surface and ground water contamination from unsanitary disposal of waste on nearby water bodies altering the BOD level.	Existing condition (SS) of rivers at Chakku khola of Bhaktapur, Bikateshwor Mahadev Khola of Kavare, Punyamati Khola, and Chandeshowri Khola, of Banepa.  Location of any major spots of water use, such as washing and drinking, downstream of the planned location of the Soil Disposal Site and the bridges/culverts of the Approach Road.  Existing condition (BOD) and Coliform concentration of rivers at Bhaktapur, Kavare and Banepa.  Monitor the effectiveness and use of septic tank with

Issue No.	Possible Impact Identification	Study Method/Remarks
		proper discharge and drainage system in the area. Possibility of connecting the facilities to the government sewer network.
P2-iii	Impact due to noise and vibration pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	List up the equipments and tools used at various locations of the Work areas. Consider whether the low-noise low vibration producing type equipments and tools are available. Visit locations of similar construction sites to measure the impact on noise from similar equipments and tools. Identify public facilities near the Work Areas that require quiet environment and will be especially vulnerable for noise and vibration pollution, i.e. hospitals and schools.
<b>P3</b>	<b>Impacts on Physical environment due to solid waste, soil waste &amp; Liquid waste</b>	
P3-i	Solid waste disposal issues and impacts	Estimated volume and types of wastes generated at particular location. Availability of waste collection services and their cost. Designated disposal areas for each type of waste, and remaining volume capacities.
P3-ii	Impact due to Soil Waste	Estimated volume of excavation material to be disposed. Local acceptance condition of proposed disposal site(s). The capacity, engineering design of the disposal site(s) and the safety standards applied. Possibility of disruption of water use downstream of the disposal site(s).
P3-iii	Impact due to Liquid waste	Estimated volume and types of liquid wastes generated at particular location. Availability of liquid waste treatment measures and their cost. Planned disposal measures and locations of the treated water. Environmental standard for waste water discharge to public water.
<b>P4</b>	<b>Impact on top soil and soil Contamination</b>	
P4-i	Impact due to soil contamination by chemical such as epoxy, sulfur, additives, admixtures, cements etc	The list of the types of hazardous chemicals, oils, and any other contaminating material to be used in the Construction Phase, and handling manuals or guidelines for each substance. Typical and alternative safety measures to prevent spills and soil contaminations at sites..
<b>P5</b>	<b>Impact of Chemical upon Environment</b>	
P5-i	Chemical contamination of water bodies due to mechanical parts/ workshop/ vehicle maintenance and cleaning and mixing of its discharge into water bodies	Chemical contaminants will be identified Identify possible areas for the establishment of workshops etc.
P5-ii	Chemical such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. residues mixing in land and water bodies	Use of such materials during construction will be analyzed.
<b>P6</b>	<b>Impacts due to Labour Camp, Contractor's Camp operation</b>	
P6-i	Temporary loss of land	Possible areas for camp location will be identified
P6-ii	Solid waste disposal issues	Proper Disposal areas for solid waste will be identified
P6-iii	Surface and ground water contamination from	Proper Disposal of toilet waste will be identified

Issue No.	Possible Impact Identification	Study Method/Remarks
	unsanitary disposal of toilet waste	
<b>P7</b>	<b>Physical Impacts due to slope instability of embankment area and due to slope instability, landslide, erosion of hill slopes</b>	
P7-i	Impact upon slope instability of embankment slopes and hill slopes	Geological investigation along road alignment to identify weak, fragile, landslide prone zones will be undertaken Possible hazard mapping along road alignment will be undertaken Analysis of soil and rock type at cut slopes angle will be undertaken. Standards and guidelines, good examples of artificial slope stability in Nepal and in Japan.
P7-ii	Soil erosion, gully formation at new open cut sections	
<b>P8</b>	<b>Physical Impacts due to incorrect disposal of excess excavated earth material</b>	
P8-i	Direct disposal and deposition of excavated materials at the valley side of the road affecting river and vegetation cover and its loss	Volume of excess material will be estimated from each road length sections Available areas / sites where safe disposal is possible will be identified Areas where likely loss of vegetation will be identified
P8-ii	Disruption / blockages to natural drainage. (Small drainages and large drainage systems)	Steep slope areas where tipping will cause direct effect will be identified Available areas / sites where safe disposal is possible will be identified
P8-iii	Direct disposal and deposition of excavated materials on valley side affecting land, agriculture land, other lands, and possible triggering of erosion/slides of deposited soil	Volume of excess material will be estimated from each road length sections Available areas / sites where safe disposal is possible will be identified Areas where valley side private agriculture land exists will be identified
P8-iv	Dangers of future washout during heavy rains, damage to road width	Detail alignment survey, proper identification of tipping sites and roadside embankment management works will be analyzed.
<b>P9</b>	<b>Impacts on River flow regime and river environment</b>	
P9-i	Impact due to i) Change on river flow regime, ii) Due to storing of foundation excavation material of bridges, iii) Due to temporary flow diversion during construction of bridges	Location and popularity, importance of water wells on the hills over the planned road alignments. Construction plan in view of minimizing its impact on groundwater. Groundwater level and geological formation in the hills. River flow regime and Hydrological Study will be carried out
P9-ii	Impact on the ground water	Location, popularity, and importance of water wells on the hills over the planned road alignment. Construction plan of the road in hill area in view of minimizing its impact on groundwater. Groundwater level and geological formation in the hills.
<b>P10</b>	<b>Impact upon existing Physical Structures and Infrastructures</b>	
P10-i	Likely damage to existing highway road surface, damage to culverts etc, causing difficulty in local movements.	Inventory of the existing road surface, culverts, electric pylons will be taken into account which will be followed by all the formalities and procedures requiring relocation of affected one.
P10-ii	Electric poles, pylons are likely to be affected at few locations	
P10-iii	Damage to existing irrigation canals, water pipelines, local trails, etc.	Inventory of existing irrigation-canals, water supply pipelines, local trails and other infrastructures will be taken
P10-iv	Impact upon houses and residences, temples,	Number and types of likely affected residence,

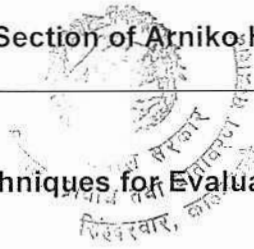


Issue No.	Possible Impact Identification	Study Method/Remarks
	communal wells, and springs	shrines and community public, communal, or private water supply facilities will be surveyed and analyzed
<b>P11</b>	<b>Impact due to operation of Asphalt concrete plant/hot mix plant</b>	
P11-i	Increases Air Pollution	Existing condition of air quality on Arniko HWY of the project site and at the planned Road will be measured. The locations for all the machines will be verified. Control the use of fire wood for heating the bitumen and encourage kerosene
<b>P12</b>	<b>Impact/Issues due to operation of Crusher plant and Batching plant</b>	
P12-i	Local people and labor force are prone to air, noise and water pollution	Location of the crusher and biting plant will be monitored and away from public and water source Monitor the operation as per the manufacturer's specification and with dust control and noise control devices.
<b>Operation Phase</b>		
<b>Physical Environmental Issues / Impacts</b>		
<b>P13</b>	<b>Obstruction to local movement between adjacent lands and settlement of highway alignment</b>	
P13-i	Inaccessibility between adjacent settlement and market areas	Major inaccessible settlements, market areas, agricultural and forest area will be analyzed
<b>P14</b>	<b>Impact of land fragmentation</b>	
P14-i	Possible fragmentation of agricultural land with the implementation of project and difficulty caused by it to access the land	Inventory of suitable locations for indirect highway crossings throughout the alignment will be undertaken.
<b>P15</b>	<b>Impact on air Quality during project operation</b>	
P15-i	Impact due to noise pollution; as large number of vehicles will ply through the road	Number of vehicle plying will be studied and noise generation will be studied and analyzed.
P15-ii	Impact upon air and water due to plying of vehicles	Existing Water quality will be studied
<b>P16</b>	<b>Impact due to and noise and Vibration pollution during project operation</b>	
P16-i	The noise from the traffic on the Approach Road shall be felt by local residents along the road.	The noise and vibration level of existing Highway shall be measured and it is assumed that the noise on the Approach Road shall be in the same level. Identify public facilities along the Approach Road.
<b>P17</b>	<b>Issues related to High Speed Highway and Road Safety</b>	
P17-i	Issue of road safety and safe driving in extended road	Geometric design of highway and tunnel and its safety parameters will be studied.
P17-ii	Issues related to traffic management	Various traffic signals required within the tunnels will be studied. Monitoring of the follow up of required traffic and road safety rules and regulation.
<b>Biological Environment (Construction Phase)</b>		
<b>B1</b>	<b>Permanent loss of Forest Areas</b>	
B1-i	Loss of mature trees and forest	Detailed inventory of Forest loss will be prepared, including tree species, girth, no., timber volume and biomass of remaining tree component in different types of forests. The inventory will define the forest condition with seedling, sapling, poles and tree composition.
B1-ii	Depletion of NTFP resources such as chir resin, sal oleo-resin, etc	Study NTFP availability in forests, its collection, use, production potential and information details as marketed by CFUGs in the region.
B1-iii	CFUG and LFUGs affected due to acquisition of their forest land	Details of Community forests along the road side will be prepared

Issue No.	Possible Impact Identification	Study Method/Remarks
		List of community forest and their status will be studied.
B1-v	Impact upon shrub land and loss of vegetation	Detailed inventory of loss will be identified in feasibility
<b>B2</b>	<b>Impact due to disturbance to species of flora and fauna of the forest area</b>	
B2-i	Possible depletion of threatened species	Study of existence of rare, endemic, endangered, protected and threatened species of flora and fauna
<b>B3</b>	<b>Impact to Wildlife habitat</b>	
B3-i	Fragmentation of wildlife movement / corridor, wildlife loss, breeding area and its loss	Inventory will be executed to study the wildlife behavior, breeding pattern, movement tracts etc
B3-ii	Disturbance to wildlife by construction works	Inventory of wildlife will be conducted using transect method, viewing and counting, vocal count, questionnaire survey etc
B3-iii	Impact on Habitat of wildlife and bio-diversity of protected species	Inventory of forest resource and wildlife will be carried in close coordination with FUG and concerned line agencies
B3-iv	Impact due to wildlife poaching, illegal tree felling and fire hazards	Details of wild life poaching and illegal felling including fire hazard will be studied during feasibility stage.
<b>B4</b>	<b>Indirect impact of forest area degradation and possible loss of vegetation</b>	
B4-i	Pressure on forests for fuel wood in labour camps	Current use of forest and forest products will be studied
B4-ii	Impact on the forest resources due to increased accessibility	Current use of forest and forest products will be studied
<b>Operation Phase</b>		
<b>Biological Environmental Issues / Impacts</b>		
<b>B5</b>	<b>Impact due to encroachment into forest areas and excess harvesting of fuelwood from the forest area</b>	
B5-i	Encroachment into forest areas	Detail inventory survey of the forest area will be undertaken in close coordination with the FUG and line agencies
<b>Socio-Economic &amp; Cultural Environment (Construction Phase)</b>		
<b>S1</b>	<b>Impact due to Impact due to relocation of Physical Facilities</b>	
S1-i	Disruption of physical facilities for long periods during construction periods	Inspect relocation plan made by Project, with concerned agencies Inspect alternative provisions made by Project to tackle disruptions
<b>S2</b>	<b>Impact due to arrangement/ management of material Storage and Quarrying sites</b>	
S2-i	Likely adverse impacts to local community and environment due to material storing and quarrying site	Inspect material storing plan made by Contractor Inspect alternative provisions made by Contractor to avoid nuisance caused by material storing or quarrying Interview local people about nuisance caused by material storing or quarrying
<b>S3</b>	<b>Impact due to Private/Public Property Acquisition for Construction</b>	
S3-i	Impact due to Land Acquisition; the cultivated land (both Khet and Bari) will be acquired permanently.	Cadastral survey and topographic survey will be undertaken to identify the details of affected lands area to be acquired.
S3-ii	Impact due to acquisition of residential houses	Details of Houses acquisition, compensation and resettlement plan will be prepared
S3-iii	Impact on landless farmers and small landholders due to acquisition of their land	Details of the such affected families will be studied
S3-iv	Fragmentation of agricultural land	Study of adjacent lands along the road corridor will be undertaken
S3-v	Decrease in agriculture production due to loss	Agriculture yield of the project area will be calculated

Issue No.	Possible Impact Identification	Study Method/Remarks
	of agricultural land	
S3-vi	Likely obstruction by marginal land holding and low income level population upon construction	PAFs/SPAFs will be analyzed and Compensation and Resettlement plan will be prepared and implemented.
<b>S4</b>	<b>Health and safety issues during Construction</b>	
S4-i	Occupational Health and Safety of labors during construction	Study about the safety measures complied by the contractor Study of health and safety measures used by the labors during construction
S4-ii	Health and Safety of the local people	Existing handling practices, guidelines, methods will be studied and analyzed
S4-iii	Road safety issues during construction works	Traffic analysis of the project area and analysis of construction vehicle movement The number and daily movement of the traffic generated for the construction works that run existing highway
S4-iv	Safety issues due to handling, transporting, storing and use of toxic and combustible materials	Existing handling practices, guidelines, methods will be studied and analyzed
S4-v	Gender involvement and Child labor during construction	Awareness raising to promote gender equality and involvement on work site and stop using child labor on construction work Preventive/curative measure will be introduced along the alignment to control use to child labor
<b>S5</b>	<b>Impact due to Outside Workers</b>	
S5-i	Possible social conflict and social pollution; impact on social, cultural and religious practices due to in-migration of people	Study of socio-cultural activities will be undertaken
S5-ii	Impact due to pressure on social service facilities such as drinking water, school, health post etc. by influx of construction workers	Study of socio-cultural activities will be undertaken Comparison of past and present demand on service facilities of the area will be undertaken supplemented by survey data
S5-iii	Degradation of sanitation and hygiene condition	Existing sanitary condition of the project area will be studied Awareness about sanitation and hygiene will be carried among construction workers
<b>Operation Phase</b>		
<b>S6</b>	<b>Impact due to Road Accidents and Road Safety</b>	
S46i	Likely increase in road traffic accidents due to speed and flow	Traffic data will be studied and analyzed in further detail
<b>S7</b>	<b>Impact on livelihood Issues</b>	
S7-ii	Possible impact on livelihood based on business of various agricultural products.	Analyzed and comparison of household income of locals before and after construction of road
<b>S8</b>	<b>Impacts due to increase population pressure, change in social behavior</b>	
S8-i	Possible increase in Smuggling and illegal activities	Interview results of expert knowledge. Chronological data (last 5 to 10 years) of items and routes of illegal smuggling found.
S8-ii	Trafficking/prostitution, import and consumption of alcoholic products could increase because of heavy flow of migrants	Details information and data of this area will be taken from the concern sector
<b>S9</b>	<b>Impact due to Land Fragmentation</b>	
S9-i	Inaccessible / separation due to fragmentation of public and private land	Requirement of either flyover or underground way will be analyzed for the accessibility of lands situated adjacent to the highway.





### 3.6 Indicative Method and Techniques for Evaluation of Impacts

#### 3.6.1 Assessment Sectors

The Proponent shall assess and evaluate each issue employing standard analytical methods and include them in the EIA report in a concise form preferably in a matrix form and/ or as provided in the environmental guidelines. Impacts on the following aspects will be focused:

- Impact on Physical Environment
- Impact on Biological Environment
- Impact on Socio-Economic and Cultural Environment

#### 3.6.2 Impact Prediction Method

To predict the impacts, the following 'Impact Prediction Techniques', depending on the nature of the impact, shall be used:

- Extrapolative
- Experts' Judgment
- GIS, Maps

#### 3.6.3 Impact Categorization and Evaluation

After assessment each impact will be categorized and quantified into following categories:

- Nature : direct or indirect
- Magnitude : high, moderate, low
- Extent : Regional, National , Trans- boundary
- Timing : immediate, medium-term, long-term
- Duration : temporary, permanent
- Reversibility: reversible, irreversible
- Impact quality: beneficial, negative

After categorization the impacts shall be evaluated in terms of their environmental significance into unimportant / important, significant / insignificant or non-significant.

To evaluate identified and predicted impacts in terms of their importance, unimportance, significance, insignificance and non-significance the following 'Impact Evaluation Methods', depending on the nature of impact, shall be employed:

- Consultation with experts and stakeholders
- Delphi Method
- Use of Numerical values (National EIA Guidelines, 1993)
- Consideration of Policies and Laws

After impacts evaluation significant and important impacts on physical, biological, socio-economic and cultural (if any) environmental domains shall be sorted out to meet the requirements as per EPR, 1997.

## 4 POLICIES, LAWS, RULES AND MANUALS TO BE CONSIDERED WHILE PREPARING THE EIA REPORT

Limiting within the scope of works, relevant legal aspects shall be studied and appropriate information shall be incorporated into the EIA report which are presented hereunder:

### A. Review of Constitution

- Interim Constitution of Nepal, 2063 (2007)

### B. Review of Environment Related Acts

- Environmental Protection Act (EPA), 2053 (1997)
- Local Self Governance Act, 2056 (1999)
- Public Road Act, 2031 (1974)
- Land Acquisition Act, 2034 (1977)
- Immovable Property Acquisition Act, 2013 (1956)
- Forest Act, 2049 (1993)
- Labor Act, 2048 (1992)
- Child Labor (Prohibition and Regularization Act), 2056 (2001)
- Soil and Watershed Conservation Act, 2039 (1982)
- Solid Waste Management Act, 2068 (2011)
- Explosive Material Act, 2018 (1961)
- Ancient Monument Preservation Act, 2013 (1956)
- Vehicle and Transport Management Act, 2049 (1992)
- Water Resources Act, 2049 (1992)
- Road Board Act, 2059 (2002)
- Town Development Act, 2045 (1988)

### C. Review of Environment Related Rules

- Environmental Protection Rules (EPR), 2054 (1997) (First amendment 1999)
- Forest Rules, 2051 (1995)
- Solid Waste (Management and Resource Mobilization) Rule, 2047 (1990)
- Public Procurement Rules, 2064 (2007)
- Vehicle and Transport Management Rules, 2054 (1997)

### D. Review Of Guidelines, Manuals, Codes and Standards

- National EIA Guidelines, 1993
- EIA Guidelines for the Forestry Sector, 1995
- Environmental Management Guidelines, GESU / DOR, July, 1997
- Environmental and Social Management Framework, DOR, 2007
- Guidelines For Environmental And Social Considerations, JICA, 2010
- Public Road Management and Land Acquisition Directives, DoR, 2002
- Land Acquisition Guidelines, 1989
- Forest Produce Collection and Sales Distribution Guidelines, 2001
- Environmental and Social Management Framework, DoR, 2007
- Roadside Bio-Engineering, DoR, GoN, 2002
- Guide to Road Slope Protection Works, DoR, GoN, 2007
- Nepal Road Statistics-2009/10, DoR, GoN
- Environmental Management Guidelines for Roads and Bridges, Geo-Environmental Unit DoR, GoN, 1999
- A Guide to Streamlining of Environmental Impact Assessment Approval Process (MoSTE, 2006a)
- National Ambient Air Quality Standard, 2012
- Generic Effluent Standards Discharged into Inland Surface water, GoN 2001

- The Standard of Emission from the DG sets into the ambient air, 2069
- Nepal Vehicular Exhaust Standard, 2056
- National Noise Standard, 2056

**E. Review of Plans and Policies**

- Thirteenth Plan FY 2070/71-2072/73
- Three Years Interim Plan (2010 – 2013) and its policies and strategies with emphasis on transport and environment sector
- National Transport Policy, 2001
- 20 Years Road Master Plan, 2002
- Environmental Assessment in the Road Sector of Nepal: A Policy Document, GESU / DOR, January, 2000
- Land Infrastructure Development Policy, 2004
- Public Infrastructure Built and Operate Policy, 2000
- Forest Policy, 1993
- Master Plan for Forestry Sector Policy, 1993
- Priority Investment Plan, 2006
- District Transport Master Plan of Kathmandu District

**F. Review of Environment Related International Conventions, Strategies**

- Convention on Biological Diversity (CBD), 1992
- Convention on International Trade in Endangered Species (CITES), 1973
- Plant Protection Agreement for the South East Asia and the Pacific (as amended), 1956
- ILO Convention, 1969
- National Biodiversity Strategy, 2002.

## 5 TIME, ESTIMATED COST AND REQUIRED EXPERTS TO PREPARE THE REPORT

### 5.1 Time Frame

A preliminary study of the Proposal/Project Area as well as comparison of Project Alternatives has been carried out by the JICA Study Team for the Information Collection Survey between September and December 2014.

The detailed engineering study and other necessary field investigations were started in May 2015, by the JICA Study Team for the Suryabinayak-Dhulikhel Section of Arniko Highway Upgrading and Widening Project. The following Table shows the proposed schedule for EIA Report preparation.

**Table 5-1 Proposed Schedule for EIA Report Preparation and Approval**

Activities	Tentative Date	Remarks
Scoping Notice	09 Oct. 2014	Published in National Daily Newspaper
Scoping Report/ TOR Submission	May. 2015	
Approval of TOR from the concerned Ministries	June. 2015	Approval from MoPIT & MoSTE
EIA Study	June. – July 2015	
Draft Report Submission	Mid Aug. 2015	
Public Hearing	End Aug. 2015	
Draft Final Report Submission	End Sept. 2015	Approval from MoPIT
Approval of EIA Report	Oct. 2015	Approval from MoSTE

### 5.2 Estimated Budget

The JICA Study Team has allocated amount of Rs. 5 million for the conduction of the Study.

### 5.3 Necessary Experts for EIA Study

The following are the necessary consulting experts for the EIA study of the proposed project. The Proponent shall secure that the JICA Study Team employ necessary field assistants to collect field data as required. The overall responsibility of the contents of this Scoping Document for EIA study shall lie with the report preparing institution, namely, CTI Engineering International Co., Ltd. JV and Full Bright Consultancy (Pvt.) Ltd.

The necessary experts for the EIA Study are listed in Table 5-2.

**Table 5-2 Necessary Experts for EIA Study**

S.N.	Position in EIA Study Team	Duration of Expect
1	Team Leader, Environment Specialist	7 Month
2	Environment Expert, Physical Environment	6 Month
3	Forestry, Wildlife and Aquatic, Ecology	2 Month
4	Socio-Economist	4 Month
5	Sociologist-I	6 Month
6	Sociologist-II	6 Month
7	Sr. Highway Engineer	3 Month
8	Sr. Geologist	2 Month
9	Geotech. / Material Engineer	2 Month
10	Legal Expert	2 Month

## 6 SCOPE DETERMINATION FOR THE PREPARATION OF THE EIA REPORT

Scope of the work of conducting an EIA study includes data collection, compilation, analysis and reporting in general for baseline preparation and specifically for the issues identified and prioritized during the scoping phase. After the collection of data regarding the issues, it shall be analyzed to predict, evaluate impacts and propose mitigation measures to minimize adverse and enhance beneficial impacts.

The possible impacts identified during the Scoping phase and considered as scope for study during EIA study is given hereunder as prioritized issues for this study. The summary of the environmental issues identified and prioritized for study in the EIA phase is summarized hereunder:

### 6.1 Beneficial Issues/Impacts

The improvement/upgrading of proposed road will pose both beneficial and adverse impacts on the environment during the construction and operation stages. The project will generate opportunities of employment to a large number of local people and improve the technical skills of the workers during the construction stage. It will also help to increase the income level of local people through opportunity to work in the project, promote trade and business and enhance access to social services facilities. The availability of improved access will also help in the promotion of trade for agriculture as well as export of endogenous production such as herbal, handloom products to better market area. In addition the local people will be benefited from the agro based industrial activities, market, centers and other economic activities during the operational stage. Growth in local tourism will have direct benefit of enhancing local economic development.

### 6.2 Adverse Issues/Impacts

#### a) Physical environment

The major issues identified are as followings:

- Substantial loss of arable land lying within the strip of its alignment
- Road construction might disturb natural drainage, leading to water logging and flooding
- Soil erosion from quarrying, earth works, and disposal of spoils
- Disturbance to irrigation channels
- Increased dust emission and water pollution
- Excessive noise and vibration during construction of the project and during excessive movement of the Vehicles
- The use of various chemicals including fuel, lubricants, oil, acid, cement, bitumen, paints, etc during road construction works
- Use of explosives, combustibles and toxic materials during construction works
- Operation of Asphalt concrete/hot mix plant, Crushing Plant and Batching Plant increases the pollution and toxic.

#### b) Biological Environment

Some portion of the alignment (about 1 km length) passes through the community forest area at the Sanga Bhanjyang area which will get further damage if the road is maintained with the pervious RoW of DOR. The major issues related to the biological environment



identified during the field visit for Scoping exercises/ meetings in different stretches of this road section area to be summarized as the followings:

- Cutting of trees and clearing of shrubs and herbs of the forest areas and road side of the project area;
- Encroachment of forest and excess harvesting of fuelwood from the local forest areas
- Loss of forest land if ROW is to be maintained

**c) Socio economic Issues**

The followings issues are identified during the scoping process.

- Loss of agricultural land
- Impact on settlement area
- If temples and religious sites fall within the ROW of the road, will also need due protection during construction of the road.
- Disruption on the public utilities such as irrigation canal, water supply pipes, schools, temples, chautaris etc.
- Occupation Health and Safety issue
- Labor and construction camp operation and management
- Social conflict with external workforce and other conflicts.
- Pressure on local service, commodities, food supply for external workforce and in-migrants.
- Increase in unsocial activities including prostitution, crime, and gambling and alcohol consumption due to outside labors



## 7 IMPACT ON THE ENVIRONMENT DUE TO IMPLEMENTATION OF THE PROJECT

The identified possible impacts due to the implementation of the project are discussed hereunder this Section 7. The methods for quantification of the impacts or determining its magnitudes are discussed hereunder.

- Impact shall be discussed with quantified information of
  - Likely changes, alteration, and losses; and are further assessed based on characteristics of existing condition and sensitivity of environmental components (physical, biological, and socio-economic and cultural).
- Issues/ Impacts related to changes in land use with respect to the existing land use availability in project affected VDCs/ district shall be assessed (both construction and operation phases)
- Issues identified by the stakeholders through comments and suggestion

The Proponent shall identify significant positive and negative impacts, direct and indirect, and immediate short term and long-term impacts relating to the Physical, Biological, Socio-Economic and Cultural aspects of the environment and categorize into following categories:

<u>Category Type</u>	<u>Categories</u>
• Impact Quality	Adverse / Beneficial
• Nature	Direct / Indirect
• Magnitude	High / Moderate / Low
• Extent	DIA/IIA/Regional/National/Tran Boundary
• Timing / Duration	Short Term / Medium Term/ Long Term
• Significance	Significant, insignificant, non-significant

The Proponent shall include criteria used for magnitude, extent and duration in the EIA report. Together with descriptive presentation, they shall also present in the form of "Impact mitigation matrix" in the EIA Report.

The possible Issues/impacts identified (both beneficial and adverse) during the scoping phase and considered as scope for study during the EIA study, is given hereunder as follows and in Table 7-1.

**Table: 7-1 Matrix of Issues Prioritized for EIA Study of Beneficial Impacts**  
**Construction phase**

<b>Issue No.</b>	<b>Possible Issues Identification</b>	<b>Project Activities</b>
BC-i	Generation of Employment opportunities to locals and increase of Income	Priority will be given for locals of project VDCs for the construction of the project
BC-ii	Increase in the income level of local people through opportunity to work and income generation activities	Involvement of local people of affected VDCs during road construction, involvement of locals into other income generation activities together with various sort of business
BC-iii	Strengthening of skills and capacity of locals	Peoples of Project VDCs
<b>Operation Phase</b>		
BO-i	Shortening of Travel Time	Operation of the project
BO-ii	Shortening of Travel Distance	Implementation of road project

BO-iii	Saving of Vehicle Running Cost	Implementation of road project and other components
BO-iv	Reduction of Traffic Accidents	Implementation of agricultural development subprojects at different locations
BO-v	Access improvement for people	Implementation of road project and other components
BO-vi	Control Air Pollution	Implementation of road project and other components
BO-vii	Economical benefit	Operation of the road project

**Table: 7-2 Matrix of Issues Prioritized for EIA Study of Beneficial Impacts**

Issue No.	Possible Impact Identification	Type of Impact / Magnitude	Project Components / Activities
<b>Physical Environmental Issues / Impacts (Construction Phase)</b>			
<b>P1</b>	<b>Temporary and Permanent change in land use</b>		
P1-i	Loss of agricultural land.	Direct Local Extent / High and Permanent loss	Road width formation clearance, construction of cross drainages, retaining structures, river training works, etc.
P1-ii	Impact due to change of land use in forest area into road formation	Direct / High and Permanent loss	Road formation clearance Quarry Sites, Burrow Sites operation
P1-iii	Cumulative impact of loss of cultivated land and decrease in agricultural production	Direct / High and Permanent loss	Acquisition of cultivated land due to construction and road width formation
<b>P2</b>	<b>Impacts on air, noise and water quality degradation due to construction activities</b>		
P2-i	Air pollution and quality degradation due to operation of drilling machines, excavators, vehicle movements on unpaved roads with alteration on the level of air quality parameters like NO <sub>2</sub> , SO <sub>2</sub> , TSP and PM <sub>10</sub> .	Direct Local Extent / High and Permanent loss	Transportation generation of construction materials Activities of construction equipments and tools
P2-ii	Degradation of water qualities of existing rivers. Siltation and deposition at lower, downstream sections on river banks altering the level of pH and Suspended Solid. Surface and ground water contamination from unsanitary disposal of waste on nearby water bodies altering the BOD level.	Direct/ Local Extent	Construction of the soil disposal site, and disposal, Construction and operation of Crusher plant, Construction, upgrading and widening of the Road Construction and use of the Work,/ labor and contractors Camp
P2-iii	Impact due to noise and vibration pollution due to operation of drilling machines, excavators, vehicle movements on unpaved roads	Direct	Activities of construction equipments and tools
<b>P3</b>	<b>Impacts on Physical environment due to solid waste, soil waste &amp; Liquid waste</b>		
P3-i	Solid waste disposal issues and impacts	Direct	Construction and use of the stock yard, concrete mixing plant, storage, etc., Construction and use of the Workers' Camp Construction and operation of the water treatment plant for the turbid water from construction sites.

Issue No.	Possible Impact Identification	Type of Impact / Magnitude	Project Components / Activities
P3-ii	Impact due to Soil Waste	Direct	Construction of the Road Road formation clearance, slope cutting
P3-iii	Impact due to Liquid waste	Direct	Construction and use of the Workers' Camp, Construction and operation of the water treatment plant for the turbid water from construction sites.
<b>P4</b>	<b>Impact on top soil and soil Contamination</b>		
P4-i	Impact due to soil contamination by chemical such as epoxy, sulfur, additives, admixtures, cements etc	Probable	Activities of construction equipments and tools, Construction and use of the stock yard, concrete mixing plant, storage, etc.
P4-ii	Impact and Loss of Top Soil	Direct	Construction of the Road Road formation clearance, slope cutting
<b>P5</b>	<b>Impact of Chemical upon Environment</b>		
P5-i	Chemical contamination of water bodies due to mechanical parts/ workshop/ vehicle maintenance and cleaning and mixing of its discharge into water bodies	Probable	Mechanical parts/ vehicle maintenance and cleaning and mixing of its discharge into water bodies
P5-ii	Chemical such as epoxy, gypsum, additives, admixtures, cements, bitumen etc. residues mixing in land and water bodies	Probable	From Construction materials for road site
<b>P6</b>	<b>Impacts due to Labour Camp, Contractor's Camp operation</b>		
P6-i	Temporary loss of land	Direct	Labor Camp and Contractor's camp operation
P6-ii	Solid waste disposal issues	Direct	Labor Camp and Contractor's camp operation camp activities
P6-iii	Surface and ground water contamination from unsanitary disposal of toilet waste	Direct	Labor Camp and Contractor's camp operation activities
<b>P7</b>	<b>Physical Impacts due to slope instability of embankment area and due to slope instability, landslide, erosion of hill slopes</b>		
P7-i	Impact upon slope instability of embankment slopes and hill slopes	Probable, /Medium Magnitude	Slope cutting for road width formation Excess spoil disposal Construction, excavation and widening activities Construction of the soil disposal site, and disposal, Construction of quarry site and borrow pit area,
P7-ii	Soil erosion, gully formation at new open cut sections	Probable	Slope cutting for road width formation and clearance of vegetation
<b>P8</b>	<b>Physical Impacts due to incorrect disposal of excess excavated earth material</b>		
P8-i	Direct disposal and deposition of excavated materials at the valley side of the road affecting river and vegetation cover and its loss	Direct / During construction works / Medium Magnitude	Road formation clearance, slope cutting Direct disposal of spoil into river and at its banks
P8-ii	Disruption / blockages to natural	Direct /	Excavation of the hills and

Issue No.	Possible Impact Identification	Type of Impact / Magnitude	Project Components / Activities
	drainage. (Small drainages and large drainage systems).	During construction works	road alignment for track. Direct dispose of excavated materials to natural drainages.
P8-iii	Direct disposal and deposition of excavated materials on valley side affecting agriculture and other lands	Direct / During construction works	Road formation clearance
P8-iv	Dangers of future washout during heavy rains, damage to road width	Probable	Road formation clearance and track opening
<b>P9</b>	<b>Impacts on River flow regime and river environment</b>		
P9-i	Impact due to i) Change on river flow regime, ii) Due to storing of foundation excavation material of bridges, iii) Due to temporary flow diversion during construction of bridges	Probable	Water intake for the concrete plant, other construction facilities and the Workers' Camp, Construction of the soil disposal site, and disposal, Construction , upgrading and widening of the Road,
<b>P10</b>	<b>Impact upon existing Physical Structures and Infrastructures</b>		
P10-i	Likely damage to existing highway road surface, damage to culverts etc, causing difficulty in local movements.	Probable	Road formation clearance
P10-ii	Electric poles, pylons are likely to be affected at few locations		
P10-iii	Damage to existing irrigation canals, water pipelines, local trails, etc.		
<b>P11</b>	<b>Impact due to operation of Asphalt concrete plant/hot mix plant</b>		
P11-i	Increases Air Pollution	Indirect/Probable	During the handling, transportation and heating of bitumen Use of fuel source for the heating and operation of plant
<b>P12</b>	<b>Impact/Issues due to operation of Crusher plant and Batching plant</b>		
P12-i	Local people and labor force are prone to air, noise and water pollution	Indirect/Probable	During establishment of plant near forest and public area
<b>Operation Phase</b>			
<b>P13</b>	<b>Obstruction to local movement between adjacent lands and settlement of highway alignment</b>		
P13-i	Inaccessibility between adjacent settlement and market areas	Direct	Operation of alignment without direct accessibility to people between adjacent lands
<b>P14</b>	<b>Impact of land fragmentation</b>		
P14-i	Possible fragmentation of Agricultural land with the implementation of project.	Direct/High Magnitude	Implementation of project
<b>P15</b>	<b>Impact on air, water and noise during project operation</b>		
P15-i	Impact due to noise pollution; as myriad number of vehicles will ply through the Highway	Direct	Operation of the project
P15-ii	Impact upon air and water due to generation of solid wastes	Indirect	Establishment of market areas
<b>P16</b>	<b>Impact due to and noise and Vibration pollution during project operation</b>		
P16-i	The noise from the traffic on the Approach Road shall be felt by local residents along the road.	Direct	Operation of the project Existence of new road and traffic
<b>P 17</b>	<b>Issues related to High Speed Highway operations</b>		



Issue No.	Possible Impact Identification	Type of Impact / Magnitude	Project Components / Activities
P17-i	Issue of road safety and safe driving	Direct/Low Magnitude	Operation of road and plying of large number of vehicles
P17-ii	Issues related to traffic management	Direct/Low Magnitude	Installation of traffic signals and indicators including separate traffic lane
<b>Biological Environment (Construction Phase)</b>			
<b>B1</b>	<b>Permanent loss of Forest Areas</b>		
B1-i	Loss of mature trees and forest	Direct /Low Magnitude in terms of Area	Road formation clearance
B1-ii	Depletion of NTFP resources such as chir resin, sal oleo-resin, etc	Direct/Low Magnitude	Road formation clearance
B1-iii	CFUG and LFUGs affected due to acquisition of their forest land	Direct Low Magnitude (Assuming the loss of resource in comparison to resource allocated or its availability)	Road formation clearance
B1-iv	Impact upon shrub land and loss of vegetation	Direct/Low Magnitude	Road formation clearance
<b>B2</b>	<b>Impact due to disturbance to species of flora and fauna of the forest area</b>		
B2-i	Possible depletion of threatened species	Direct/Low Magnitude	Road formation clearance
<b>B3</b>	<b>Impact upon wild animals</b>		
B3-i	Fragmentation of wildlife movement / corridor, wildlife loss, breeding area and its loss		Construction and excavation activities
B3-ii	Disturbance to wildlife by construction works	Direct	Road formation clearance Construction and excavation activities
B3-iii	Impact on Habitat of wildlife and bio-diversity of protected species	Direct	Road formation clearance Construction and excavation activities
B3-iv	Impact due to wildlife poaching, illegal tree felling and fire hazards	Indirect	Labor camp, equipment storage and workshops
<b>B4</b>	<b>Indirect impact of forest area degradation and possible loss of vegetation for timber and fuel wood by construction labors</b>		
B4-i	Pressure on forests for fuel wood in labour camps	Indirect	Contractor's camps operation activities
B4-ii	Impact on the forest resources due to increased accessibility	Indirect/ Low Magnitude	Accessibility of construction workers, smuggling and wood trafficking at the project forest areas
<b>Operation Phase</b>			
<b>B5</b>	<b>Gradual encroachment into forest areas, and loss of forest resource due to forest clearance.</b>		
B5-i	Encroachment into forest areas	Indirect	Increase in settlement areas along the existing highway road side
<b>Socio-Economic &amp; Cultural Environment (Construction Phase)</b>			
<b>S1</b>	<b>Impact due to relocation of Physical Facilities</b>		
S1-i	Disruption of physical facilities for long periods during construction periods	Direct/Low Magnitude	Road formation clearance
<b>S2</b>	<b>Impact due to arrangement/ management of material Storage and Quarrying sites</b>		
S2-i	Likely adverse impacts to local community and environment due to material storing and quarrying site	Direct/ Medium Magnitude	Selection and Construction of the stock yard, and material storing area Selection and Construction of Quarry site

Issue No.	Possible Impact Identification	Type of Impact / Magnitude	Project Components / Activities
<b>S3</b>	<b>Impact due to Private Property Acquisition for Construction</b>		
S3-i	Impact due to Land Acquisition; Approximately 14.073 ha. of cultivated land (both Khet land and Bari) will be acquired permanently.	Direct/ Medium Magnitude	Road formation clearance
S3-ii	Impact due to acquisition of houses;	Direct/ Medium Magnitude	Road formation clearance
S3-iii	Impact on landless farmers and small landholders due to acquisition of their land	Direct	Road formation clearance Contractor's camp operation activities
S3-iv	Fragmentation of agricultural land	Direct/ Medium Magnitude	Road construction activities
S3-v	Decrease in agriculture production due to loss of agricultural land	Indirect	Road formation clearance
S3-vi	Likely obstruction by marginal land holding and low income level population upon construction	Direct/Medium Magnitude	Road construction and acquisition of private land and property
<b>S4</b>	<b>Health and safety issues during Construction</b>		
S4-i	Occupational Health and Safety of labors during construction	Direct/ High Magnitude	Track opening, road widening and upgrading activities, construction of bridge
S4-ii	Health and Safety of the local people	Direct/ Low Magnitude	
S4-iii	Road safety issues during construction works	Direct/ Site Specific	Construction vehicles will ply on existing roads disturbing other local transportation and movement of the local
S4-iv	Safety issues due to handling, transporting, storing and use of toxic and combustible materials	Direct / Site Specific	Road formation clearance and upgrading/widening activities
S4-v	Gender involvement and Child labor during construction	Direct / Site Specific	Construction, upgrading and widening of the Road
<b>S5</b>	<b>Impact due to Outside Workers</b>		
S5-i	Possible impact on social, cultural and religious practices due to in-migration	Indirect	Contractor's camp operation activities
S5-ii	Impact due to pressure on social service facilities such as drinking water, school, health post etc. by influx of construction workers	Indirect	Construction, upgrading and widening of the Road
S5-iii	Degradation of sanitation and hygiene condition	Indirect	Contractor's camp operation activities
<b>Operation Phase</b>			
<b>S6</b>	<b>Impact due to Road Accidents and Road Safety</b>		
S6-i	Likely increase in road traffic accidents due to speed and flow	Direct	Increase in Vehicular movement on entire the road
<b>S7</b>	<b>Impact on livelihood Issues</b>		
S7-i	Possible impact on livelihood based on business of various agricultural products.	Indirect	No direct accessibility of people to their respective filed across the exiting Highway
<b>S8</b>	<b>Impacts due to increase population pressure, change in social behavior</b>		
S8-i	Possible increase in Smuggling and illegal activities	Indirect	Existence of new road and traffic
S8-ii	Trafficking/prostitution, import and consumption of alcoholic products could increase because of heavy flow of migrants	Indirect	Increasing number of labor workers for other opportunities and increase in outside migrants
<b>S9</b>	<b>Impact due to Land Fragmentation</b>		
S9-i	Inaccessible due to fragmentation of public and private land	Direct/Medium Magnitude	Prevention of direct accessibility into the highway



If some additional issues are found significant during EIA study, it will be considered as part of the scope of work.

Cumulative Impacts due to combined effect of two or more impacts will also be suitably analyzed and suitable mitigation measures suggested.

The EIA report will be prepared based on baseline information, project related issues, impacts of such issues and linkage with mitigation measures.

## 8 ALTERNATIVES TO BE CONSIDERED IN THE EIA STUDY

### 8.1 Alternatives of the Design

In the basic design phase, that will be performed parallel to the EIA survey, following values shall be considered in the design of road alignment, to reach the most feasible and rational alignment. The process of examination of the alternative alignment shall be described in the EIA Report as alternative ideas and comparative evaluation of them.

- A) Secure the traffic and pedestrian safety on the Project Road and vicinity.
- B) Minimize the volume of soil disposal.
- C) Minimize the number of person required involuntary resettlement.
- D) Avoid or minimize negative impacts on resource use, such as farmland, water and forest.
- E) Avoid negative impacts on local cultural and religious places and activities

### 8.2 Alternatives of Project Site

During the EIA study, any possible alternative sites for any of the project components shall be identified and its appropriateness will be studied, in view of minimizing environmental impacts.

### 8.3 Alternatives of the Technology

The technology, including the selection of the construction equipments and the operational facilities, however, may have alternatives considering following issues. The process of examination of the alternative technology shall be described in the EIA Report as alternative ideas and comparative evaluation of them.

- A) Requirement to achieve the highest standard results.
- B) Availability in Nepal.
- C) Suitability and duplicability in Nepali condition.

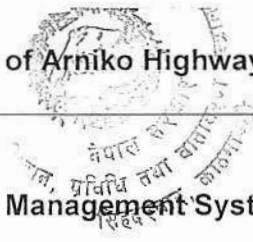
### 8.4 Alternatives of the Construction Procedure of Operation and Time-Schedule

Construction time schedule shall be further studied during the basic design phase. Following Nepali-specific conditions shall be taken into consideration formulate the most feasible and realistic schedule. The process of examination of the above condition shall be described in the EIA Report.

- A) Dry season and monsoon season.
- B) Agriculture season and off-season in the surrounding area of the ROW.
- C) Nepali calendar and holidays.
- D) Acceptability of night shift working.

### 8.5 Alternatives of the Raw Materials to be Used

Source of the raw materials for construction shall be examined in the EIA study whether to purchase from the local suppliers, to import from Japan or the third country, or to plan the Project specific sites such as queries. The process of examination of the alternative sources shall be described in the EIA Report as alternative possibilities and sources, and comparative evaluation of them.



#### **8.6 Alternatives of the Environmental Management System**

In the EIA study, institutional structure of the following monitoring activities shall be discussed and agreed on among the related organizations. The regular institutional structure for monitoring activities shall be reviewed considering the operation and management structure to formulate the most suitable distribution of responsibilities and funding.

- A) Environmental monitoring
- B) Resettlement monitoring
- C) Vulnerable Community Development Plan implementation monitoring

#### **8.7 Alternatives of Whether or Not the Risks Resulting from the Implementation of the Proposal Can be Accepted**

The proposed project is likely to cause some socio-environmental impacts or risks, as identified during the Scoping of this Project. The EIA study shall categorically study such impacts and risks and suggest if such risks will be within acceptable limits. For instance, during the period of construction, the ground water table may be decreased and the local people whose only domestic water source is ground water, may be affected. Such risks shall be studied during the EIA study.

#### **8.8 Alternatives of the Energy Source in Operation Phase**

During the basic design phase, various discussions, coordination and agreement are expected. The process of negotiation regarding the supply of grid electricity shall be described in the EIA Report to secure the stable supply of electricity that is prerequisite of road safety.

#### **8.9 Analysis of the Consequences of the Non-Implementation of the Project**

Positive and negative impacts when the Project if not implemented, shall be analyzed in the EIA study.

## 9 ENVIRONMENTAL MITIGATION MEASURES FOR ADVERSE IMPACTS AND ENHANCEMENT MEASURES

After the assessment of the prioritized issues, the Proponent shall identify ways to manage the environmental issues in the form of mitigation measures for pre-construction, construction, and operational stages. In order to avoid or minimize adverse environmental impacts, cost effective and locally suitable mitigation measures with focus on preventive, corrective and compensatory measures as applicable shall be proposed.

The mitigation measures of the issues shall be presented in the form of a log frame matrix named "Impact Mitigation Matrix" as in Table 8-1. In the EIA report, there should be clear linkage between the existing baseline condition, issues due to project implementation, impacts due to the project implementation, proposed mitigation measures and the monitoring aspects.

### 9.1 Mitigation Measures

Mitigation measures shall be presented considering the following points:

- To overcome any adverse impact by the project, the proposed measures shall be categorized as :
  - i) Avoidance, ii) Preventive, iii) Mitigative, and iv) Compensatory Measures (Since all the impacts may not need all four measures, measures shall be proposed based on the nature of environmental impacts and components of environment that is affected)
  - For Avoidance and Preventive measures, how their implementation or compliance will be ensured shall be proposed, during project construction and operation.
- Steps for necessary co-ordination that is required in implementing Preventive, Avoidance, and Mitigative Measures with – local, district and central level institutions – as well as contractor's proponent, and consultant shall be proposed.
- Implementation of proposed Preventive, Avoidance, and Mitigative Measures, which fall under the responsibility of the contractor, are ensured during construction, shall be mentioned.

### (3) Mitigation Measures in Case of Forest and Vegetation Loss

- Guidelines on Use of Forest Area for Other Purposes, 2063 (2006) shall be followed while proposing mitigation measures regarding impacts on forest and vegetation.
- In the work schedule, there is a requirement, in addition to the plantation for the lost trees/ poles in the ratio of 1:25, by the developer, on the area equivalent to the one that is occupied by the project's physical infrastructure and facilities on the land designated by the concerned district forest office; managed for five years and handed over to the concerned district forest office.
- Cost for such plantation and management for five years shall be worked out.
- In addition, the cost shall also be worked out for – tagging, cutting and pruning, and collecting, transporting and stacking.

### (4) Other Measures / Requirements

#### (a) Awareness and Training Programs

- Awareness and training programs which shall be described in the report and shall have sufficient detail to cover the target group, frequency, and program conductor.
  - Allocated cost for such program shall justify the proposed activities.

**(b) Responsibilities of Agencies**

- The study shall also review the responsibilities of the local, district and central level institutions and those affected by the project construction and propose steps to ensure necessary coordination during the project implementation.

**(c) Contractual Obligation**

- Those mitigation measures that can be or are part of contractual obligation for project construction shall be clearly identified. Mechanisms of ensuring implementation of those mitigation measures, from the proponent' part, as a compliance of contractors shall be categorically proposed.

**(d) Implementation of Mitigation Measures**

Organization chart/ Organogram for implementation of mitigation measures, with clear provision of mitigation shall be proposed.

**(e) Procedures of Lodging Complaints and Grievance Redress Mechanism**

The report shall propose:

- Procedures of lodging complaints of project affected people/ families/ institutions, and
- Grievance redresses mechanism.

**9.2 Enhancement Measures**

- Enhancement measures shall be presented with measures/ activities that will help heightening benefits accrued from the project implementation as identified under beneficial impact.
- Enhancement measures shall not be limited in stating possibilities and opportunities; instead they must be backed up with programs and activities from the proponent's side.
- Possibilities and opportunities created by the project, whose enhancement is beyond the scope of proponent's intervention, can be given with separate heading.
- Required fund shall be allotted to realize the intended enhancement.
- Corporate Social Responsibility (CSR)
  - Any activities/ measures proposed for the enhancement of living standard/ quality of life/ functioning or performance of local institutions- can be separately discussed under Corporate Social Responsibility (CSR).

**9.2.1 Enhancement Issues**

- Orientation of the EIA & EMP to authority & Contractor groups
- Water supply system in affected area (Boring, pipe line etc)
- Skill enhancement training ((Bio-engineering, slope maintaining, air pollution, Road accident awareness, Fish farming, etc)
- Plantation along the road
- Fund for environmental protection, natural resource protection (community forest and natural resources)
- Road crossing to be provided at normal crossing routes for safety of both public, cattle and road user

**9.3 Mitigation and Enhancement cost**

Costs shall be allocated for the proposed mitigation and enhancement measures according to the physical and chemical environment, biological environment, and socioeconomic and cultural environment further dividing them to construction and operation phases.



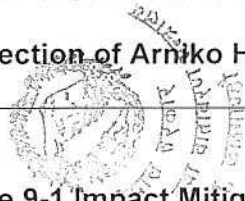
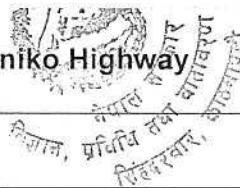


Table 9-1 Impact Mitigation Matrix

S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
<b>Physical Environmental Issues / Impacts (Construction Phase)</b>				
<b>P1 Temporary and Permanent change in land use</b>				
P-1i	Loss of agricultural land.	Road width formation clearance, construction of cross drainages, retaining structures, river training works, etc. Direct, Local Extent / High and Permanent loss	Land acquisition of the Work Area, Clearing of ROW of existing highway	Asset evaluation and compensation will be implemented as per Land Acquisition Act, 2034. Preference shall be given to the residents in the Affected Area who wish to work as unskilled labor in the Project.
P-1ii	Impact due to change of land use in forest area into road formation	Road formation clearance Quarry Sites, Burrow Sites operation. Direct / High and Permanent loss		Compensatory plantation in every appropriate places at the vicinity of project site
P-1iii	Cumulative impact of loss of cultivated land and decrease in agricultural production	Acquisition of cultivated land due to construction and road width formation. Direct / High and Permanent loss		Provide compensation and allowances to PAF and SPAFs.
<b>P2 Impacts on air, noise and water quality degradation due to construction activities</b>				
P2-i	Impact due to Air Quality	Transportation generation of construction materials and workers, Activities of construction equipments and tools Construction and use of the stock yard, concrete mixing plant, storage, etc., Construction and use of the Workers' Camp, including septic tanks, Construction of the soil disposal site, and disposal, Construction of road facilities, Construction of the temporal stand-by area/ holding parking space for construction vehicles along the District Road	Transportation vehicle on road and construction equipment at the work areas of the Project shall emit exhaust gas.	Preventive mitigation measures, such as selection of equipment and proper maintenance, will be proposed.  Preventive mitigation measures, such as spraying water at the work areas and washing the vehicles before they leave the construction sites, will be proposed.
P2-ii	Impact due to Water Quality (surface, public)	Construction and use of the Workers' Camp, including septic tanks. Construction of the soil disposal site, and disposal, Construction activities of upgrading and widening of the existing Road	Waste water from kitchen, bath and toilet shall be generated at the Camp. Culverts and bridges shall be constructed the Road. During the construction of those structures, the river water will be muddier than its original state.  The ground water discharged from the work area shall be mixed with sands and clay on site.	A list of qualified providers and products of septic tanks shall be proposed in camps and service area.  If any major water-use is recognized in the Study, maximum avoidance measures shall be designed in the Construction Plan of the bridges, culverts and water treatment facility.  Desirable communication during the Construction Phase between the Contractor, water users and community leaders (i.e. VDC secretaries) shall be proposed for information dissemination and grievance redress.
P2-iii	Impact due to Noise Pollution and Vibration	Activities of construction equipments and tools	Construction equipments and tools shall generate noise and vibration at the Work Areas.	Selection of low-noise and vibration producing type equipments and providing noise barriers at necessary locations





S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
				shall be proposed. Control of work hours and days, i.e. stopping at night and weekends, near the vulnerable facilities and settlements shall be proposed
<b>P3 Impacts on Physical environment due to solid waste, soil waste &amp; Liquid waste</b>				
P3-i	Impacts due to Solid waste disposal	Construction and use of the stock yard, concrete mixing plant, storage, etc., Construction and use of the Workers' Camp, including septic tanks, Construction and operation of the water treatment plant for the turbid water from construction sites.	Bags, containers and other wastes shall be generated at the staging area and work areas.  Kitchen wastes and other types of wastes shall be generated at the Workers' Camp.  Sludge from septic tank and water treatment plant shall be discarded at designated locations.	For proper disposal of house wastes, toilet wastes, and water treatment sludge, necessary institutional coordination or budget plan for self-collection and disposal shall be proposed.
P3-ii	Impact due to Soil Waste	Construction of the labor camps, Construction and Operation of Quarry site and Crusher Plant Constructing, upgrading and widening of the existing Road	The construction work shall generate excavation material.	The disposal site(s) shall be selected to have sufficient volume for excavated material.  Careful and thorough communication shall be undertaken in the Planning Phase so that the site(s) are planned in the accepted area with sufficient safety measures and design.  The design of the site(s) shall take care of water use downstream to avoid and minimize negative impacts.
P3-iii	Impact due to Liquid waste	Construction and use of the Workers' Camp, including septic tanks, Construction and operation of the water treatment plant for the turbid water from construction sites,	Groundwater discharge is expected during the construction activities. Kitchen, bath, and toilet at the Workers' Camp shall be treated in septic tank then overflow shall seep into the surrounding soil or discharged to waste water pipe.	To achieve proper disposal quality of liquid wastes, necessary treatment measures and budget plan shall be proposed.
<b>P4 Impact on top soil and soil Contamination</b>				
P4-i	Soil contamination	Activities of construction equipments and tools, Construction and use of the stock yard, concrete mixing plant, storage, etc.	Oils and chemicals used in the construction phase may spill over at the Work Areas and the Stock Yards.	Educate/aware the workers about the negative impacts of soil contamination. Training of good handling of the oils and chemicals to avoid soil contamination. Preparation of clear guidelines of handling, recycling and discarding the empty containers or bags of the chemicals. Designation of site managers who monitors condition of stock yards.
P4-ii	Impact and Loss of Top Soil	Construction of the Road Road formation clearance, slope cutting	Loss of valuable nutrient Top Soil from the Agricultural land during the Road formation clearance and construction	Stripping and storing Topsoil Use it as valuable resource in back filling and during Bio-engineering works



S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
P5	Impact of Chemical upon Environment	Mechanical parts/ vehicle maintenance and cleaning and mixing of its discharge into water bodies From Construction materials for road site	Accidentally spill, leaks, or come in to injuries from any chemicals and hazardous use during construction work.	Hazardous chemical shall not be stored near surface water and near surface drainage system Bitumen drums should be stored at designated location and it should not be discharge in side rains.
P6	Impacts due to Labour Camp, Contractor's Camp operation	Labor Camp and Contractor's camp operation activities	Waste generation and pollution from the camps Use to surrounding and local Fire wood resources for cooking Degradation of land	Workers /camps in-charge will be trained for source segregation and handling of generated solid wastes at site. Establish solid waste collection and management practice through incineration, proper landfill and decomposing for degradable wastes in pit at camp side. Develop and implement waste management "Code of Conduct" and enforce strict penalty to violator of "Code of Conduct".
P7	<b>Physical Impacts due to slope instability, landslide, erosion of hill slopes</b>			
	Slope stability	Slope cutting for road width formation and clearance of vegetation Excess spoil disposal Construction, excavation and widening activities Construction of the soil disposal site, and disposal, Construction of quarry site and borrow pit area,	Landslides or other forms of mass instability on cut slope and filling embankment area on approach road , tunnel portal areas	Adjust the Project design to comply with the safety standards, guidelines and good examples. On cut slopes, landscaping should be carried out with bio-engineering works, prior to rainy season, with the application of top soil. New embankments should be properly compacted and exposed surfaces should be covered with vegetation to avoid slope washout. Carry out road side plantation to protect stability of slope. Rill and gully formation will be regularly monitor and maintain in critical area Provide civil engineering structures and bio-engineering measures for slope stability and on tunnel portal area.
P8	Physical Impacts due to incorrect disposal of excess excavated earth material	Road formation clearance, slope cutting Direct disposal of spoil into river and at its banks Excavation of the hills and road alignment for track. Direct dispose of excavated materials to natural drainages. Road formation clearance and track opening	Side casting, side pilling and dumping on spoil disposal site.	Adjust the Project design to comply with the safety standards, guidelines and good management of Spoil site New embankments should be properly compacted and exposed surfaces should be covered with vegetation to avoid slope washout Provide civil engineering structures and bio-engineering measures for slope stability
P9	Impacts on River flow regime and river environment	Water intake for the concrete plant, other construction facilities and the Workers' Camp, Construction of the soil	At and around bridge construction area and river diversion area.	Carefully select and decide the location and volume of the water intake to avoid disruption of important water use.

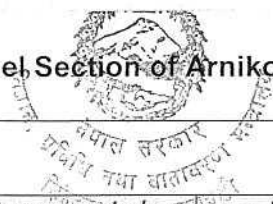
S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
		disposal site, and disposal, Construction, upgrading and widening of the Road,		<p>Establish good communication and understanding with the water users before the commencement of the construction works.</p> <p>If the impact is found significant, mitigation measures, such as provision of alternative water source, shall be discussed with the water users.</p> <p>Regular supervision and maintenance of the mean discharge facilities to avoid clogging.</p>
P10	Impact upon existing Physical Structures and Infrastructures	Road formation clearance	Along the entire road alignment where widening and upgrading works is underway.	<p>1) Road Facility</p> <p>Identified important / priority crossings shall remain either as underpasses or bridges, no matter the size of the existing passes.</p> <p>Plan to make the relocation works swiftly so that its users do not suffer unnecessarily long.</p> <p>Contractor should make own temporary arrangements for water, electricity, energy and sanitation for their work-force.</p> <p>Employ local work-force to reduce pressure on use of social service facilities.</p> <p>2) Water Supply</p> <p>If it is found that the planned water intake affects significantly to the existing water use in Detailed Design Phase or Construction Phase, consider developing alternative water source(s) to minimize the impact to acceptable level.</p> <p>Respect the social value and provide the access to important and popular water use spots by providing road crossings and other facilities that will benefit the water users.</p>
P11	Impact due to operation of Asphalt concrete plant/hot mix plant	Road Surfacing activities	Along the entire road alignment where widening and upgrading works is underway.	<p>Asphalt plant metal crusher activities should be controlled in place in downwind of close sensitive receptor away from schools and religious places etc.</p> <p>Site should be at least 500m away from sensitive area</p> <p>Temperature of the Hot-mix plant should be controlled at appropriate level.</p>
P12	Impact/Issues due to operation of Crusher plant and Batching plant	Road construction work	Crusher and batching plant area	<p>Should be placed away from forest and residential area</p> <p>Installed and operate in a sound proof area</p>



S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
				Identify owner of plant site, local people, Municipality, DDC VDC and get approval. Sit and operate Stone crushing equipment with dust control devices and operated as per air quality standards.
<b>Biological Environmental Issues / Impacts (Construction Phase)</b>				
B1	Permanent loss of Forest Areas	CONSTRUCTION PHASE : Clearance of forest trees	Clearance of Suryamode Perungo Community forest trees of about 3 ha at Sanga Bhanjayng of Palase / Sanga area.  Although there is low possibility of finding protected flora species in the Work Area, detailed field survey has never been done in the area, and it is worth studying at least for the academic record of the flora condition of the area.	Avoid disturbance of habitat of the individual found in the Work Area.  If avoidance is not feasible, save the found individual and transplant in the nearest, and the most similar environment at suitable timing.
B2	Impact due to disturbance to species of flora and fauna of the forest area	CONSTRUCTION PHASE : Clearance of forest trees for Road formation	Clearance of Suryamode Perungo Community forest trees of about 3 ha at Sanga Bhanjayng of Palase / Sanga area.  Although there is low possibility of finding protected vegetation types in the Work Area, detailed field survey has never been done in the area, and it is worth studying at least for the academic record of the vegetation condition of the area.	Avoid disturbance of the vegetation found in the Work Area.  If avoidance is not feasible, consult with local experts of the vegetation for possible measures of conservation.  All legal procedures and formalities for the felling of trees will be carried out  Awareness campaign will be carried focusing on labor and local population to avoid pressure on forest
B3	Impact upon wild animals	Clearance of forest trees for Road formation Construction and excavation activities	Clearance of Suryamode Perungo Community forest trees of about 3 ha at Sanga Bhanjayng of Palase / Sanga area.  Although there is low possibility of finding protected fauna species in the Work Area, detailed field survey has never been done in the area, and it is worth studying at least for the academic record of the fauna condition of the area.	Avoid disturbance of habitat of the individual found in the Work Area.  If avoidance is not feasible, consult with local experts of the species for possible measures of saving the individual.
B4	Indirect impact of forest area degradation and possible loss of vegetation for timber and fuel wood by construction labors			
B4 -i	Pressure on forests for fuel wood in labour camps	Contractor's camps operation activities	Suryamode Perungo Community forest	Specify appropriate sites/location for establishment of labor camps  Contractor shall provide kerosene stove and make necessary arrangement to regular supply of kerosene at construction site.
B4 -ii	Impact on the forest resources due to increased	Accessibility of construction workers, smuggling and wood trafficking at the	Suryamode Perungo Community forest	Widely publicize that illegal hunting and poaching is punishable by law and offer prize

S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
	accessibility	project forest areas		money to those who help in preventing such illegal activities Educate the workers and develop and implement Code of Conduct on the use of forest resources, sanitary practices, relationship with local community and importance of wildlife and enforce strict penalty to violator of Code of Conduct
<b>Biological Environmental Issues / Impacts (Operation Phase)</b>				
B5	Encroachment into forest areas	Along the Forest area	Suryamode Perungo Community forest	Encourage and support local communities and authorities in illegal harvesting of forest resources and encroachment the forest area for settlement. CFUGs/LHFGs will be supported to conserve and manage their CFs/LHFGs according to operational plans The project have proposed a habitat management project as an enhancement measures of the forest and its ecosystem
<b>Social and Cultural Environmental Issues / Impacts (Pre-Construction Phase)</b>				
S1	Impact due to relocation of Physical Facilities	Road formation clearance	At and around bridge construction area and river diversion area.	Coordinate with local agencies (Electricity, Telephone, Water-supply, Sewer) on the plan to relocate the facilities prior to commencement of works with permanent locations such that relocation and capacity increase will not be required in near future Plan to make the relocation works swiftly so that its users do not suffer unnecessarily long Provision for temporary water supply, electricity during relocation process Plan properly in consultation with local people for relocation of water spouts, temple / shrines / monuments / etc.
S2	Impact due to arrangement/ management of material Storage and Quarrying sites	Selection and Construction of the stock yard, and material storing area Selection and Construction of Quarry site	Examine whether the material storing and quarrying site c are acceptable in budgetary aspect and environmental condition	Identify material storage sites such that it does not affect the local environment and people residing around the site Construct barbed fencing around the site Make sure during transportation, storing and re-loading, the material does not produce dust pollution. If excessive dust is produced, water spaying will be required Quarry sites should be identified such that it does not cause adverse impacts to the environment. After completion, the quarry sites must be suitably





S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
				decommissioned
<b>Construction Phase</b>				
S3	Impact due to Private Property Acquisition for Construction	Clearing of ROW of existing highway Road construction and acquisition of private land and property Contractor's camp operation activities	In total, about 14.01ha of additional private land shall be acquired for ROW of the new road alignment. 361 residence houses out of which about 60% of them are used for business operation are recognized.	Asset evaluation and compensation will be implemented as per Land Acquisition Act, 2034. Preference shall be given to the residents in the Affected Area who wish to work as unskilled labor in the Project.
<b>S4 Health and safety issues during Construction</b>				
S4-i	Occupational Health and Safety of labors during construction	Track opening, road widening and upgrading activities, construction of bridge	At every activity and location of construction works, there is possibility of accident, involving the workers or the general public passing by.	Safe Preventive measures will be applied in the Project site. Special training shall be provided to the workers prior to the types of works not popular in Nepal. Provide workers with safety gears (helmets, boots, gloves, masks, goggles, earplugs and reflector jackets). Study of presence of any local communicable disease from locals to outside workers and immunize labors from outside the area before employing them
S4-ii	Health and Safety of the local people			
S4-iii	Road safety issues during construction works	Construction vehicles will ply on existing roads disturbing other local transportation and movement of the local		Preventive and safety mitigation measures will be applied to reduce and avoid accident. Fulfilling all the safety standards shall be the prerequisite of the Project Approval by DOR, and shall not be selected for evaluating issue.
S4-iv	Safety issues due to handling, transporting, storing and use of toxic and combustible materials	Road formation clearance and upgrading/widening activities	From Camps site to the Construction Site	Maintain the strict law and order situation at the site and the labour are complied to comply with the code of conduct. Workshops and chemical storage sites will not be established nearer to the water bodies and river side. Bitumen drums will be stored at designated locations and not scattered along the road. If contaminated; the contaminated runoff from storage areas will be captures in ditches or ponds with an oil trap at the outlet.
S4-v	Gender involvement and Child labor during construction	Construction, upgrading and widening of the Road	During the construction, upgrading and widening of the Road, access to the market, water source, or river (washing place) may be temporally obstructed and walking distance of homemaker may increase. Involvement of child and underage	Preference shall be given to the residents in the Affected Area who wish to work as unskilled labor in the Project without discrimination by sex. The advertisement of the recruitment shall be designed in the manner that as many local women as possible has access to the information. Strictly prohibits to involve underage and child labor on road construction work
<b>S5 Impact due to Outside Workers</b>				
S5-i	Possible impact on	Construction and use of the	Influx of workers with low	Establish and monitor Security



S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
	social, cultural and religious practices due to in-migration	Workers' Camp Employment of workers and caretakers	morale may cause increase of troubles in the vicinity of Workers' Camp.	system to avoid conflict between workers and local people. Strengthening local communities through awareness activities
S5-ii	Impact due to pressure on social service facilities such as drinking water, school, health post etc. by influx of construction workers	Transportation generation of construction materials and workers, Construction and upgrading of the Road	Daily traffic generation of the workers' movement to the Work Areas will be added on site Construction, upgrading and widening of the Road may affect access to public facilities or social services located nearby.	If the impact on the access to public facilities and services is evaluated as significant, propose mitigation plan such as minimizing the number of days of the obstruction, or flexible opening and closure of the access for the convenience of the users of the facilities and services to reduce the additional burden.
S5-iii	Degradation of sanitation and hygiene condition	Contractor's camp operation activities Increase in traffic on the existing highway	If the living environment and water source are not kept in clean condition, infectious diseases may occur among the workers and may spread to the local residents.	Appropriate preventive measures will be proposed. Special training shall be provided by the contractor to the workers prior to the types safety works plan. Propose to provide training on awareness about sanitation and hygiene for the workers. Propose to provide sufficient care-taking staff to conduct cleaning and monitoring activities on camp site.
<b>Operation Phase</b>				
S6	Impact due to Road Accidents and Road Safety	Increase in Vehicular movement on entire the road Existence of new road and traffic	Existence of improved linear Road may cause increase of self-inflicted accidents and accidental encounters between people and cars. Erect danger signs and signals on the hazardous area. Provide accident insurance to workers.	Appropriate preventive mitigation measures will be applied to reduce and avoid accident. Fulfilling all the safety standards shall be the prerequisite of the Project Approval by DOR, and shall not be selected for evaluating issue.
S7	Impact on livelihood Issues	Along the Road alignment	Local people and farmers residing on either side of the Highway	1. Local Resource Plantation will be carried out at each and every possible site along the highway alignment including at reclaimed sites and spoil disposed sites after its closure. Addressing the impact upon CFUG and LFUGs with alternative livelihood, income generation activities due to acquisition of their dependent NTFP and forest resource. 2. Agricultural Resource At least one family member of PAF and SPAFs will be provided with income generating training and opportunity will be provided for at least one family member in the construction of project. The project will encourage local people in the involvement of

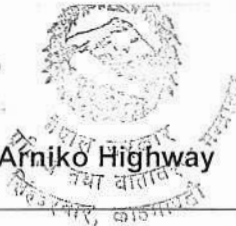
S.N	Parameters	Project Components / Activities (Size, duration etc., if available)	Selected Reason (Reason of Priority, Location of Impacts)	Basic Concept of Impact Mitigation Measures
				<p>agricultural extension services to increase local crop production and adopt better hill farming techniques.</p> <p>3. Water Resource</p> <p>Respect the social value and provide the access to important and popular water use spots by providing road crossings and other facilities that will benefit the water users.</p>
S8	Impacts due to increase population pressure, change in social behavior	Increasing number of labor workers for other opportunities and increase in outside migrants	Influx of workers with low morale may cause increase of troubles in the vicinity of Workers' Camp.	Preventive mitigation measures shall be proposed to reduce and avoid unsocial activities in the construction area, such as awareness raising education. Monitoring of such activities shall be proposed
S9	Impact due to Land Fragmentation	Prevention of direct accessibility into the highway	Local people and farmers residing on either side of the Highway	Preventive mitigation measures by providing road crossings and other facilities that will benefit local on fragmented land and road

## 10 PARTICULARS OF THE COST AND RETURNS OF THE PROPOSAL

The Proponent shall specify overall cost benefit analysis of the project. The Proponent shall evaluate return and possible manmade natural hazard in environment including cost effectiveness of mitigation measures.

The following costs shall be included:

- Cost for Environmental Mitigation Measures
- Cost for Enhancement Measures
- Cost for Other Social Support Programs and Corporate Social Responsibility (CSR)
- Cost for Environmental Monitoring and Auditing
- Total Project Cost and Total Environmental Cost
- Percentage of Total Environmental Cost to the Total Project Cost



## 11 MATTERS TO BE MONITORED WHILE IMPLEMENTING THE PROPOSAL

### 11.1 Environmental Management Plan (EMP)

After detail analysis of likely impacts due to the project activities on the local environment, a mechanism shall be included in the EIA report to augment the beneficial impacts and minimize the adverse impacts. The summary table shall be prepared for the major mitigation measures proposed and Environmental Management Plan for the effective implementation and management of the specified mitigation enhancement measures and monitoring of them. Environmental Management Plan (EMP) shall be designed to monitor the contractors work during project implementation. It helps to check contractual compliance with regard to implementing specified mitigation measures. It also helps in making periodic check on the actual environmental impacts of the project over the years following the completion of the works and compares this with those impacts anticipated at the time of project appraisal.

Mitigation measures for potential impacts due to location, design, construction shall have to be proposed. Mitigation measures shall have to be incorporated into the Bill of Quantities. These measures should be outlined in the Environmental Management Plan.

Besides elaborating the cost, responsibilities and institutional set-up needed for the implementation of the mitigation measures, the EMP shall also indicate the costs, schedule and location of monitoring and parameters to be monitored.

The contents of the EMP shall be:

- Target-what is aimed to be achieved through management plan
- Impact Mitigation Actions
  - Elements of actions that construction contractor/ or other assigned to follow
  - Examples of specific actions to be included
- Monitoring & reporting:
  - List of Activities that require measurement and reporting
  - Identification of – parameters, indicators, methods, location, frequency
  - Identification of reporting authority to whom contractor shall report; reporting interval
- Corrective Actions and reporting
  - Identification of incidences non-compliance
  - In case of non-compliance, identification of responsible person of the contractor to take necessary corrective actions
  - Reporting in case of non-compliance
    - Cause of non-compliance
    - Actions taken for re-compliance
    - Mechanism and necessary actions to ensure compliance
- Relevant Legislation and Standard to observe and follow
- Associated Costs & its provision

The EMP Table shall contain the following information, for benefit enhancement measures and adverse impact mitigation measures respectively:





**Sample Table for EMP for Benefit Enhancement Measures:**

Activity/ Environmental Risks/Issues	Impacts	Impacts Enhancement Measures	Monitoring Schedule location	Responsible Implementing Agency	Responsible Monitoring Agency	Associated costs & its provision

**11.2 Other Plans to Be Prepared**

The following Plans shall also be prepared and included in the EIA Report.

**(1) Social Management Plans:**

- Resettlement & Rehabilitation Action Plan
- Local Area & Vulnerable Community Development Plan
- Public Health Safety Management Plan
- Public Grievances Redress Management Plan
- Permits and Approval Plan

**(2) Physical Management Plans:**

- Erosion Abatement and Watershed Management Plan
- Muck / Spoil Site Management Plan
- Top Soil Saving Management Plan
- Pollution Abatement Plan (Pertaining to : Water quality; Air quality; and solid Waste)
- Toxic and Hazardous Chemical Handling and Management Plan

**(3) Biological Management Plans:**

- Forest Clearing and its Management Plan
- Compensatory Re-plantation Plan
- Bio-engineering Plan

**(4) Construction Related Management Plans:**

- Occupational Health and Safety Management Plan
- Construction Camp Management Plan
- Construction Traffic Management Plan
- Environmental Training Plan to Project and Construction Staff
- Demobilization and Rehabilitation Management Plan
- Explosive Handling and Safety Plan

**11.3 Monitoring Plan**

The Proponent shall prepare a comprehensive Monitoring Plan for the proposed project and the Monitoring Plan shall comprise of:

- Baseline Monitoring,
- Compliance Monitoring, and
- Impact Monitoring

Each monitoring plan shall be grouped into:

- Physical Environment for construction and operation stage
- Biological Environment for construction and operation stage



- Socio-economic & Cultural Environment for construction and operation stage

Baseline Monitoring and Impact Monitoring plan shall come up with:

- parameter,
- indicators,
- location,
- methods, and
- Schedule/ frequency.

Compliance monitoring plan shall come up with:

- parameter,
- indicators,
- methods, and
- Schedule/ frequency.

The parameters and indicators shall be coherent with the proposed mitigation measures; and shall be quantified as far as possible.

The monitoring cost shall be worked out in detail, with breakdowns, and costs for field data collection, and investigations required.

#### Implementation of Monitoring Activities

- A hierarchical model for implementation of monitoring activities, with clearly assigned/ identified roles and responsibilities of project monitoring unit and contractor, shall be proposed.
- The hierarchical model shall also exhibit monitoring as well as different agencies to be consulted while carrying out monitoring activities.

#### 11.4 Environmental Auditing

The EIA study shall suggest the parameters to be audited, the auditing activities and estimate the costs for carrying out the auditing works as per the schedule mentioned in the EPR, 2053 (1997) which shall be categorized into Physical Environment, Biological Environment and Socio-economic and Cultural Environment.

The Auditing Plan shall provide the following:

- Parameter
- Indicators
- Schedule
- Locations and
- Sources
- Organizational setup to carry out the Audit Plan



## 12 RELEVANT INFORMATION TO BE INCLUDED IN THE REPORT

### 12.1 Other Relevant Information to be Included in the Report

The EIA Report shall include relevant information, references, maps, photos, tables, graphs and used questionnaires to verify the assessment and evaluation in the Report.

Such information shall be concisely presented in the main report, and detail information shall be included in the Annexes.

#### Relevant Information to be Included in the Report

Key maps, drawings and photos		* Color topographic map with Project components overlaid, with proper legends and scale.
Chapter 2	Outline of the Project	
3.2	Project Location	* Affected VDCs and their boundaries in the Map. * Project components and features.
3.3	Project Component	* Construction schedule, with a bar chart, and brief description of the work contents and machines used.
Chapter 4	Detail of the Project	
4.1	Land Requirement	* All the land required for the Project Layout, both for construction phase and operation phase shall be included. * Necessary land shall be identified by land types including forest area (government, community, leasehold, religious, private), agricultural land (khet, bari, pakho), government land, guthi land, and river/ khola/ banks/ flood plains. * Construction plan including design for temporal facilities and access roads. * Locations and designs of construction facilities: + Engineer's camp, contractor's camp, workers' camp, vehicle parking: Information described shall include; area occupied and number of sites, locations, number of staffs/vehicles to accommodate at each site, types of offices and facilities. + machine/equipment staging yard, concrete mixing yard, water intake facility, water treatment plant : Information described shall include ; area occupied and number of sites, locations, type of structures required, output capacity, waste management facility. + stand-by/parking space, + electricity generator house, and + Others
4.2	Project Layout	* Soil disposal site: Information described shall include; area occupied and number of sites, locations, estimated filling height, estimated volume to be filled, and types of filling materials.
4.3	Requirement of Construction Materials	* All the requirement of construction materials, with weight and/or volume, and their likely sources shall be described. * Cement, aggregate and roadbed material shall be procured from existing legal providers in operation located as close as possible to the Project Area. The Project shall not initiate an operation of new quarry. * Electricity for the construction shall be provided by own generator. Connection to the NEA grid for the operation phase shall be described, with back-up generator house.



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		<ul style="list-style-type: none"><li>* Toxic and/or flammable materials and their storage method shall be described.</li><li>* The use of explosives is not planned in the Project.</li></ul>
4.4	Human Resources Requirements	<p>Information described shall include;</p> <ul style="list-style-type: none"><li>* Required number of skilled, semi-skilled, and unskilled manpower, and</li><li>* Plan of recruitment from the project area and project affected families.</li></ul>

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### 12.2 EIA Report

The Proponent shall prepare and submit the EIA report in the format prescribed in the Schedule 6 of the EPR, 1997. The Proponent will make sure that all issues mentioned in this ToR and Schedule 6 of the EPR, 1997 is necessarily included.

### 12.3 Deliverable

The proponent shall submit ten (10) copies of the Final EIA Report to the Ministry of Science, Technology and environment (MoSTE) via Ministry of Physical Infrastructure and Transport (MoPIT), in accordance with the Rules 10 of EPR, 1997.

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**ANNEX: LOCATION MAPS**



# ALIGNMENT OF BHAKTAPUR - DHULIKHEL ROAD

