

Government of Nepal
Ministry of Physical Planning and Works
DEPARTMENT OF ROADS
GEO-ENVIRONMENT AND SOCIAL UNIT
Babarmahal, Kathmandu, Nepal

FINAL REPORT

Initial Environmental Examination of Dhalkebar–Janakpur–Bhitthamod Road Upgrading Project



March 2007

Submitted by:



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We are particularly thankful to Mr. R. P. Pathak, Unit Chief of the Geo-Environment and Social Unit. We would similarly like to appreciate the cooperation received from Engineer Mr. Badri Pd. Sharma for giving us all technical inputs needed for the study.

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Full Bright Consultancy (Pvt.) Ltd.
Kathmandu
March, 2007

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ABBREVIATION

a.s.l.	Above sea level
ADT	Average daily traffic
BOQ	Bill of Quantities
CBO	Community Based Organization
CBS	Central Bureau of Statistics
Ch	Chainage
CITES	Convention on International Trade in Endanger Species
COI	Corridor of Impact
DBST	Double Bituminous Surface Treatment
DDC	District Development Committee
DFO	District Forest Office
DJJB	Dhalkebar–Janakpur–Jaleshwor–Bhitthamod Road
DOR	Department of Roads
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMAP	Environmental Management Action Plan
EPA	Environment Protection Act
EPR	Environment Protection Regulation
ha	Hectare
GESU	Geo-Environment and Social Unit, Department of Roads
GON	Government of Nepal
IEE	Initial Environmental Examination
KM, km	Kilometer
MPPW	Ministry of Physical Planning and Works
NGO	Non Governmental Organization
NPC	National Planning Commission
NRS	Nepal Road Standards
NRs.	Nepali Rupees
POSDCORB	Planning, organizing, staffing, directives, co-ordination, reporting and budgeting
RAP	Resettlement Action Plan
ROW	Right of way
TOR	Terms of Reference
vdp	Vehicles per day
Yr.	Year
° C	Degree Celsius

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1 NAME & ADDRESS OF INSTITUTION PREPARING THE REPORT

1.1 NAME OF PROPOSAL

The Name of the Proposal is "**Initial Environmental Examination of Dhalkebar – Janakpur – Bhitthamod Road Upgrading Project**" in Dhanusha and Mahottari districts.

1.2 PROPONENT AND ADDRESS

The proponent of the " Dhalkebar – Janakpur – Bhitthamod Road Upgrading Project " in Dhanusha and Mahottari districts is Government of Nepal, Ministry of Physical Planning and Works, Department of Roads.

Name and address of the proponent is as follows:

***Government of Nepal
Ministry of Physical Planning and Works
Department of Roads
Geo-Environment and Social Unit (GESU)
Babar Mahal, Kathmandu, Nepal
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Fax: 4257409***

1.3 REPORT PREPARING INSTITUTION

The present report on the "Initial Environment Examination of Dhalkebar–Janakpur–Bhitthamod Road Upgrading Project" has been prepared for the Project Proponent by:

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2 SUMMARY OF THE PROPOSAL

2.1 OBJECTIVES OF THE PROPOSAL

Government of Nepal has requested grant assistance from the Asian Development Bank towards the cost of rehabilitating and upgrading of the Dhalkebar–Janakpur–Bhitthamod Road linking East – West Highway (EWH) to Janakpur of Dhanusha District, Jaleswor of Mohattari District and Bhitthamod at Indo-Nepal border.

The total length of the proposed section is 42.94 Km. The average formation width of the present road is 5–6 m including 3 to 4 m bituminous surface. This one-lane road is proposed for addition of one more lane making two lanes with a carriage way of 7m and 1.5m shoulder in both sides. In addition to lane addition, the project will include culvert widening, shoulder improvements, pedestrian's walkways, side drainage structures and bus laybys. The road rehabilitating and upgrading of this road has been planned to accommodate a smooth uninterrupted traffic flow and to increase the transactions of goods between Southern parts of Nepal and Indo – Nepal Border. The proposed widening will be done within existing 50 m ROW and hence acquisition of new land is not necessary.

The main objective of this Initial Environmental Examination is to ensure that the highway rehabilitation and upgrading option proposed is environmentally sound, sustainable and contribute to the development of environmental assets. The main objective of this study is to carry out an IEE Study of the Dhalkebar–Janakpur–Bhitthamod Road in accordance with the Environment Protection Regulation, 1997 (amended, 1999).

2.2 ANTICIPATED IMPACTS OF THE PROPOSAL

2.2.1 Impact on Land Use

The upgrading works for the Dhalkebar–Janakpur–Bhitthamod Road takes place within the 25m ROW and no new land acquisition is required. Thus no agricultural or forest land use will change due to the commissioning of the proposal.

2.2.2 Impact on the Environment, Impact on Human Life, and Population Pressure

The commissioning of the proposal shall have both the beneficial and adverse impacts on the Environment, human life and population, which are discussed below:

2.2.2a Positive Environmental Impacts

The primary benefits of road upgrading/widening will be improve access, which will result in overall economic development of the surrounding areas. Following the upgrading/widening of the road, traffic is projected to increase by 7% annually.

Social development benefits will result from improved access, including economic stimulation and employment generation. Local people currently experience access

problems due to current road conditions. Improved road and access will therefore be a significant benefit of road upgrading/widening.

Upgrading/widening of this Road may also contribute to (a) improved access to Janakpur and Jaleshwor (b) possible improvement in the urban development; and (c) improvements in the position of vulnerable social categories and groups, through the creation and stimulation of income-generating opportunities and a reduction in social and economic disparities.

Another benefit that will be derived from road upgrading will be the overall improvement of the road condition. The construction of additional drainage structures, repair of the existing drains and appropriate protection measures, will stabilize most road side slopes and thereby significantly reduce damage to the road structures and agricultural land.

2.2.2b Adverse Environmental Impacts

Some adverse environmental impacts are likely to result from the proposed upgrading/widening of road works however, there will be no population displacement. With proper mitigative plans, the adverse impacts can be made to a minimum.

There will be no change in land use, since the road will be upgraded and widened under the existing ROW and no additional acquisition of land is necessary, except for the purpose of intersection development works.

Ecological degradation that may occur during road upgrading, or be induced by the resulting additional traffic, which is anticipated to be minor. Bioengineering, vegetation establishment on bare or semi-bare land will directly offset this loss of vegetation. Additional long-term, road-induced ecological degradation is likely to be limited. No protected areas or identified sites of ecological significance are located within the vicinity of the road.

The disposal of excess material from construction can potentially create a significant environmental impact unless it is correctly managed. Detail design team should include quantity of disposal material in Bill of Quantities to suitable disposal locations to ensure that uncontrolled tipping does not damage private and public land and vegetation. Maximum fill disposal should occur in floodplain borrow pit voids created by the extraction of road upgrading material.

Minor adverse impacts (e.g. noise, vibration and air quality) will occur, either during upgrading/widening or from the additional traffic resulting from road upgrading/widening. To reduce its impacts, roadside arboriculture needs to be emphasized.

The mitigation measures to be incorporated into design stages include provision of safe location of quarry sites, borrow pits and safe disposal of spoil and construction waste. Likewise, during the construction stage, important considerations include work camp and labor camp location and operation, stockpiling of materials, combustible, and toxic

materials, and management of stone crushing plant. Similarly, during post-construction stage, things to consider are installation of road safety measures.

The proposed road upgrading/widening project will be conducive to the proper management of traffic plying in this section. Social development benefits will result from improved access, including economic stimulation and road construction employment. Therefore, the proposed project does not impart major environmental impacts and the conduction of a full scale EIA is not necessary.

3 DESCRIPTION OF THE PROPOSAL

3.1 BACKGROUND

PROJECT BACKGROUND

The 42.94 Km section of Dhalkebar– Janakpur – Bhitthamod road has been the main route connecting East - West Highway and serves the population of Dhanusha and Mahottari districts to get connected to the rest of the country and also towards India at Bhitthamod . The proposed section of road for rehabilitation and upgrading starts at Dhalkebar (Tinkune) in Dhanusha district and connects Janakpur and Jaleshwor Municipalities and ends at Bhitthamod at Indo-Nepal border. The average formation width of the present road is 5 m including 3.5 to 4.0 m bituminous surface, which is found to be in a poor condition for most sections of the road. The road has numerous entry and exist points along the road. Within the project section of 42.94 Km, there are nine bridges and 25 culverts.

The initial 2 km of the road at Dhalkebar VDC is in fairly good condition but the majority of the road section is in poor condition. The Aurahi bridge which lies in the centre of the three VDCs (Sakhuwa Mahendranagar, Hariharpur, Nakatajhijh) was collapsed in 2059 B.S. and hence travelers are using a nearby bypass road to cross the river. In the rainy season this road can hardly be used because of maximum discharge in the river. Many culverts along the road are found to be not working in proper condition and the presence of many waterlogged areas at both sides of the road section from Ramdaiya Bhawadi VDC to Janakpur can be seen. The traffic level, which is higher than the road capacity, has contributed towards the substantial decrease in vehicle running speed and hence increases in total travel time.

3.1.a Type of Proposal

The present proposal is of the type for Upgrading/widening of the National Highways from present one-lane road to two-lane bituminous road for 42.94 km from Dhalkebar to Bhitthamod . Brief Description of road section is given in the following Table 3.1.

Table 3.1: Salient Features of the Road Section under study

Name of Highway	Dhalkebar–Janakpur–Jaleshwor–Bhitthamod Road
Type of road as per DOR classification	National Highway
Right – of – Way (ROW)	25m from Road's Center Line on both sides
Total Road Length	42.94 Km
Length to be widened	42.94 Km
Existing formation width	5 m
Existing Carriage way width	3.5 - 4.0 m
Existing surface	Black topped
Altitude Range	171.50 – 61.0 m

Average Gradient (%)	1 %
Physiographic regions	Terai
Topography	Plain terrain
Climate	Sub-Tropical

3.1.b Nature and Type of Goods to be Delivered

The proposal includes civil works such as earthwork in filling, base, sub-base and wearing coat laying, shoulder slope protection, gabion works, cross drainage works. The project after completion will result in a two-lane, Double Bituminous Surface Treatment (DBST) road from Dalkebar to Bhitthamod.

3.1.c Proposal's Capacity

After the road is upgraded to a two-lane, DBST surface standard from Dalkebar to Bhitthamod, it is expected that the volume of traffic in the Dalkebar to Janakpur Section will increase from the present 1895 vpd to 4567 vpd and similarly in the Janakpur to Jaleswor Section from 2248 vpd to 5417 vpd, assuming 7% annual growth.

3.1.d Materials to be used

The following is the estimated quantities of materials to be used in the planned project.

Earthwork in Filling	119 000 m ³
Sub-base course material	94 500 m ³
Base course material	67 500 m ³
Bitumen	1268 000 lit
Concrete	1900 m ³
Reinforcement steel	55 Ton

3.1.e 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 be treated with caution.

3.1.f 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. However, the large workforce in the work camps will have the tendency to use firewood, which needs to be prohibited and use of kerosene or gas encouraged.

3.1.g 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 15,000 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.

3.1.h Resources required for the implementation of the Proposal

The detailed estimate of costs for the entire 42.94km road length has not been carried out. The estimated cost for Dhalkebar to Janakpur (25km) is estimated at NRs. 400 million. In this proportion, the cost for the entire 42.94km is estimated to be approximately NRs. 672 million.

3.2 IEE REQUIREMENT AND RELEVANCY

As per the provisions under Schedule 1 of the Environmental Protection Act 1996, and the Environmental Protection Rules 1997, an Initial Environmental Examination (IEE) is necessary in order to assess the environmental consequences of the proposed upgrading/widening of the Dhalkebar – Janakpur – Bhitthamod Road. The IEE Report is prepared by the proponent based on the approved Terms of Reference (ToR) in accordance with the provisions of the EPA 1996 and EPR 1997.

3.3 ADOPTED PROCEDURE

This IEE study has been carried out in accordance with the EPR, 1997. However, the National Environmental Impact Assessment Guidelines (1993), Manual for ToR and Report for IEE, 2004 was also followed in the study. The IEE of the Project has identified the impacts physical, biological, socio-economic and cultural environment. Local people and stakeholders were contacted and interaction meetings were held to gather the local beneficiaries' perception towards the proposed Project.

The following methods were used in particular:

Desk Study

Relevant reports and documents were reviewed during the desk study phase. Similarly, policies, laws, strategies and guidelines, resource profiles and key component reports like physical, biological, socio-economic, cultural and environmental conservation were also reviewed as required. Number of questionnaires and checklist for Focus Group Discussion and data collection on physical, biological and socio-economic and cultural environment within the project area were also developed.

Public Notice

A 15 day's Public Notice seeking the written opinions from the concern people and institution in conducting the IEE study was published in a National Daily Newspaper Himalaya Times on 06/08/2063. A copy of the Public Notice was forwarded to all concerned VDCs, District Development Committee, schools, hospitals, health offices and

concerned line agencies including NGOs within the project areas as per the provisions made in EPR, 1997 (Rule 7.2). Feedbacks and comments for the implementation of the Project were collected from all concerned agencies and has been attached in the Report.

Field Study

A multi-disciplinary team visited the project area for updating/verification of the baseline information on physical, biological, socio-economic and cultural environment of the proposed project, the anticipated environmental impacts and practical mitigation measures while implementing the specified activities. Interaction meetings, Focus Group Discussions and key informant interviews were undertaken with local people and measurement of infrastructures were also carried out.

3.4 DETAILED PARTICULARS OF THE AREA WHERE THE PROJECT IS TO BE IMPLEMENTED

3.4.a PROJECT LOCATION

Dhalkebar – Janakpur – Bhitthamod road is located in the Central Development Region of Nepal and lies in Dhanusha and Mahottari Districts. The study area covers Janakpur Municipality of Dhanusha district and Jaleshwore Municipality in Mahottari District. Although this road contributes to the economic development of the country as a whole, the following municipalities and VDCs of the two districts receive direct benefit from the proposed project.

Dhanusha District:
Dhalkebar VDC, Nakatajhij, VDC Sakhuwa (Mahendranagar) VDC, Ramdaiya Bhawani VDC, Sapahi VDC, Laxmipur Baghewa VDC, Sinur Jhoda VDC, Janakpur Municipality, Binhi VDC
Mahottari District:
Sahodawa VDC, Pipara VDC, Mahottarai VDC, Parkauli VDC, Jaleswor Municipality

Fig. 3.1: Location Map

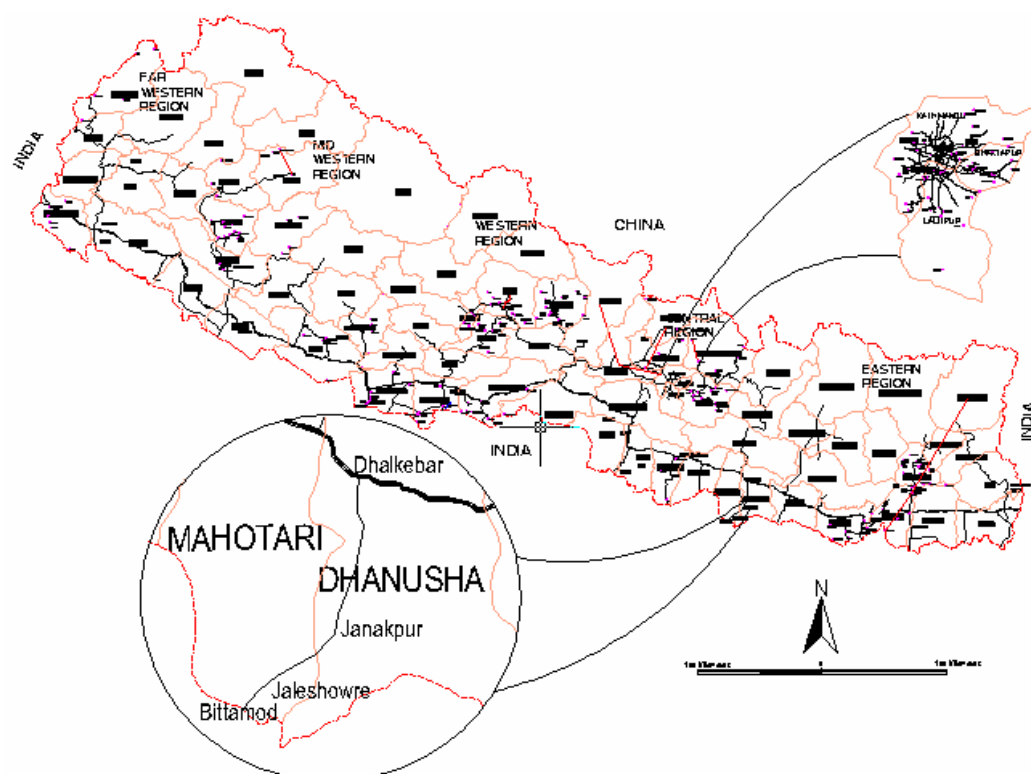
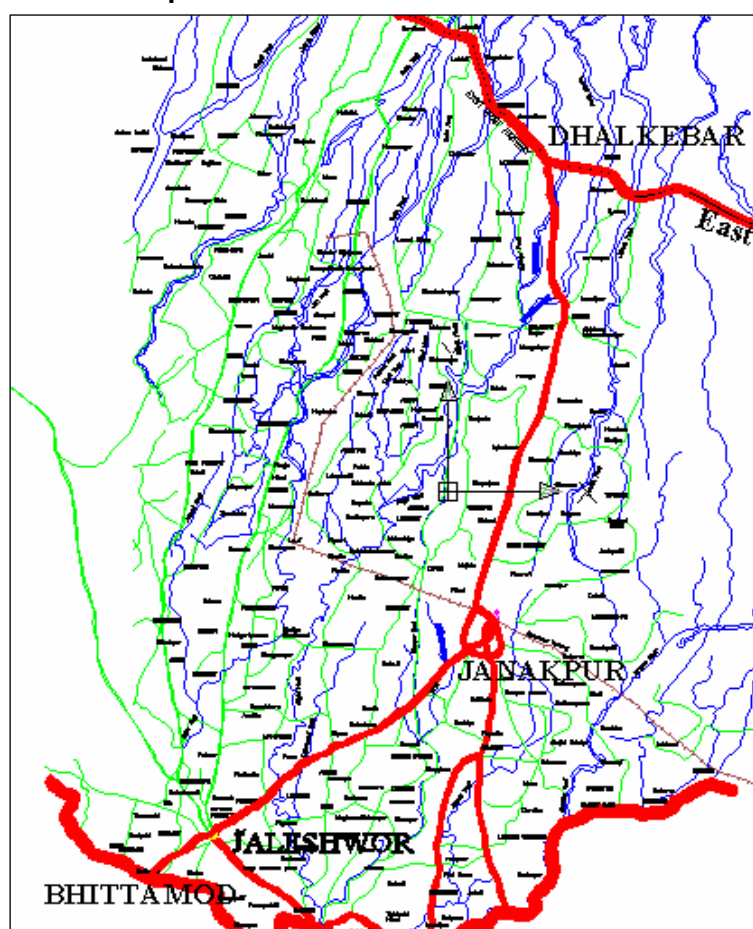


Fig. 3.2: Project Location Map



3.4.b PHYSICAL ENVIRONMENT

Physiographic Regions and Topography

Nepal is divided into five physiographic regions running along the length of country. These regions give an indication of general climatic conditions, slope stability and vegetation types; have their unique geology, elevations and slope characteristics. Thus, the region through which the road passes acts as a primary indicator of the types of initial environment.

The altitude range of each physiographic region is depicted in **Table 3.2**.

Table 3.2: Physiographic Regions of Nepal

	Physiographic Region	Altitude Range (m)	Length of road under consideration
1.	Terai	Below 300	42.94 KM
2.	Siwalik	300-700	-
3.	Middle Mountain	700-2000	
4.	High Mountain	2000-2500	-
5.	High Himalayan	2500-8848	-
			42.94 KM

Source: Department of Survey, HMG, 1988

Topography

The road at Dhakebar is at an elevation of 171.50m and the road declines at an average of 1% upto chainage 6+643 km at Aurahi Bridge site where the elevation is 122.02m. At Mujelia Junction, which is the start of Janakpur Municipality, the elevation is 79.22m at 15+500 km. At Zero Point Junction of Janakpur Municipality, the elevation is 72.80m at 24+100 km. At Jaleswor's Bhitthamod , the elevation is 61m at 42+940 km.

Climate, Hydrology and Drainage System

Hydrology

Two distinct seasons, rainy and dry seasons exists within the project area. Precipitation mainly occurs during monsoon. The Department of Hydrology and Meteorology operates nationwide network of climate, rainfall and stream flow measurement stations. The stations are basically to record agro-meteorological, precipitation and climatological data and stream flow data. The available data from the representative stations near the study area is used for the study as and when required. The precipitation data of near by station, Janakpur Airport (Index No.1111), is given in the **Appendix**.

Rainfall pattern and it's distribution are the important features for the stability of terrain. On an average Nepal gets 1700 mm of rainfall annually with range varying from 250 mm to 4000 mm.

The hydrology of the road corridor is strongly affected by the monsoon climate. Usually more than 80 percent precipitation falls during monsoon period. The rainfall data recorded by meteorological station Janakpur Airport (Index No.1111) show yearly precipitation

2008.3 mm highest in 2003 and 1307 mm lowest in 1995 between 15 years in the project area. The average yearly precipitation is 1476.63 mm.

Climate

The climate of project area is sub-tropical. The absolute maximum temperature recorded in 1999 was 40.4°C and absolute minimum temperature recorded during 1999 was 6.5°C. Average mean annual temperature is 18.6°C. The average mean annual maximum temperature recorded is 25.0°C and average mean annual minimum temperature is 11.8°C. The Climatological data of near by station, Janakpur Airport (Index No.1111), is given in the **Annex**.

Drainage System

Major rivers systems that come across the DJJB Road are shown in **Table 3.3**.

Table 3.3: Major Rivers

S.N.	Name of River	Chainage	General Features
1	Basai River	2+190	Dry season estimated min. discharge ~ 0.7 m ³ /sec Wet season estimated max. discharge ~ 5m ³ /sec.
2	Aurahi River	6+980	Seasonal river with many tributaries Dry season estimated min. discharge ~ 0.1 m ³ /sec Wet season estimated max. discharge ~ 2m ³ /sec.
3.	Dudhmati River	25+130	Dry season estimated min. discharge ~ 0.05 m ³ /sec Wet season estimated max. discharge ~ 1m ³ /sec.
4.	Ratu River	41+210	Dry season estimated min. discharge ~ 0.05 m ³ /sec Wet season estimated max. discharge ~ 1.5 m ³ /sec.

Inundation Situation

The Terai regions of Nepal are prone to inundation due to the monsoon rains. Along the DJJB Road, the initial portion of road from Dalkebar to Janakpur and from Janakpur to Jaleswor does not experience severe inundation, even though drainage problems and water logging problems can be experience along the road section, especially due to raise embankment of the road and non-functioning of the cross-drainage structures. Beyond, Jaleswor, the inundation problems are severely felt because of non-flushing of discharges from Ratu khola, due to the construction of a flood regulating dam constructed at the Indian side of the river. Thus for a minimum of four month's time during monsoon, a part of Jaleswor – Bhitthamod road section gets inundated and so a locally operated boat system used to cross this section to reach towards Bhitthamod.

Present Road Condition and Existing Traffic

The present road condition of from Dhalkebar to Bhitthamod is presented below in **Table 3.4**:

Table 3.4: Present Condition of Road

Ref.	Section	Length	Type	Present Carriageway width
HO604	Dhalkebar – Janakpur Municipality	19.1 km	BT	3.5 m
HO603	Janakpur Municipality – Dudhmati Bridge	6.0 Km	BT	3.5 - 4m
HO602	Dudhmati Bridge – Jaleshwor Municipality	12.2 Km	BT	3.5 m
HO601	Jaleshwor Municipality – Maliwada (Bhitthamod) (Nepal-Indo Border)	5.6 Km	BT	3.5 m
	Total	42.9 Km		

Existing Traffic

Existing road traffic data and its classification as per the Department of Roads, according to the study conducted by DOR in 2004 is shown in the **Table 3.5** below.

Table 3.5 : Traffic Count Data (Vehicles per Day)

Vehicle Type		Dhalkebar – Janakpur Section (H0604)			Janakpur – Jaleshwor Section (H0602)		
		Dhalkebar to Janakpur	Janakpur to Dhalkebar	Composition Percentage	Janakpur to Jaleshwor	Jaleshwor to Janakpur	Composition Percentage
Truck	Heavy	102	105	14%	36	41	5%
	Light	7	11		9	11	
Bus	Big	154	147	21%	75	80	9%
	Mini	13	10		7	9	
Car		59	48	7%	57	57	6%
Motor Cycle		229	229	30%	467	443	50%
Utility Vehicles		49	45	6%	32	36	4%
Tractor		136	160	19%	116	121	13%
Three Wheeler		17	17	2%	1	2	0%
Rickshaws		-	-	0%	103	94	11%
Bullock Cart		5	5	1%	21	17	2%
Total One Direction		770	777		924	910	
Total Both Direction		1,547		100%	1834		100%

Source: Traffic & Pavement Survey and Road Safety Audit, Road Maintenance and Development Project, DOR, 2004

Considering the seasonal variations in traffic, the following the AADT calculated according to the DOR 2004 study.

Table 3.6: AADT Data

SN	Road Link	Station Name	2001 ADT excl. MC & Rickshaw	2004 ADT excl. MC & Rickshaws	2004 ADDT	Non-motorised Vehicles		
						% Rickshaw	% Bullock, Hand-Cart	% Total
1	H0604	Dhalkebar South	1,349	1,090	1,547	0%	1%	1%
2	H0602	Dudhmati Bridge	317	728	1,834	10%	2%	12%

Source: Traffic & Pavement Survey and Road Safety Audit, Road Maintenance and Development Project, DOR, 2004

Traffic Projection

Considering an annual traffic growth rate at 7%, the **Table 3.7** below depicts the projected traffic for future years. The projected traffic volumes for this road have been based on the assumption that the whole population of the project affected will use the road after completion of this upgrading works and the road.

Table 3.7 Projected Traffic (at estimated 7% traffic growth)

Year	From Dalkebar to Janakpur Section	From Janakpur to Jaleswor Section
2004	1,547	1,835
2005	1,655	1,963
2006	1,771	2,101
2007	1,895	2,248
2008	2,028	2,405
2009	2,170	2,574
2010	2,322	2,754
2011	2,484	2,947
2012	2,658	3,153
2013	2,844	3,374
2014	3,043	3,610
2015	3,256	3,862
2016	3,484	4,133
2017	3,728	4,422
2018	3,989	4,732
2019	4,268	5,063
2020	4,567	5,417

(Vehicles per Day)

Overall Condition of Road

Road Condition

Completed in 1974, the main link between Dhalkebar and Bhitthamod (Indo-Nepal Border) is served by this road. This road also connects the EWH to the south of Dhalkebar. The average formation width of the road is 5m including 3.5 – 4.5m bituminous surface.

The general condition of road is not satisfactory and since this road seems to be the link road between Nepal and India for the commercial purpose, the road need to be upgraded and widened to 2 lanes from its present one lane.

Drains

Along the length of the road, side drains are present in a few locations only. Except Dhalkebar section, the conditions of road are worse at present. The side drains plays a vital role in the functionality and durability of any road, hence drainage structures are essential part to be considered in the upgrading of the project road.

Structures

The Right-of-Way (ROW) as determined by the DOR is 25 meters (82 feet). In general, the ROW is maintained throughout the road corridor and no permanent structures need to be dismantled. Temporary structures are found to haphazardly settled within the ROW.

The two temples, Sanktat Mochan Temple and Shiva Temple in Pipra VDC lie near to the road than others. They are at a 5m distance from the centre of the road. There are many ponds near about the property line of the road but outside the ROW, especially at Lado and Bela villages. Hence proper care has to be acquired during design and construction phase. Similarly, there are only temporary structures that lie within the 25m.

Bridges and cross drainages

There are nine bridges and 25 culverts along the proposed section, which is shown below:

Table 3.8: Bridges along DJJB Road

SN	Bridge	Chainage	Length	Breadth	Remarks
1	Basai Bridge	2+190	48.54 m	7.00 m	
2	Aurahi Bridge	6+980	195.00 m	7.00 m	Collapsed Condition
3	Dhudhmati Bridge	25+130	16.00 m	7.00 m	
4	Kutumsari Bridge	33+330	32.40 m	7.00 m	
5	Bighi Bridge	34+730	21.41 m	7.00 m	
6	Jaleshwore Zero Miles	37+330	15.00 m	9.75 m	
7	Panch Culvert	40+940	8.10 m	9.75 m	
8	Ratu Bridge	41+210	32.00 m	7.00 m	
9	Chhotka Bridge	42+440	8.10 m	9.30 m	

Section-wise Description of Dhalkebar – Janakpur – Bhitthamod Road

Section 1: Dhalkebar–Janakpur Section (25.14 Km)

The Dhalkebar–Janakpur section of the road starts at Dhalkebar junction of East-West Highway and proceeds towards the southern direction which is the main entry point to Janakpurdham. The Dhalekbar bazaar is the main market of Dhalkebar VDC, which is about 500m in length along the main road. There are about 50 households attached to the road and all of them are outside the 25m ROW from the centerline of the present road. The average blacked topped carriageway of this section is 4m in width. For 2 kms the black topped portion of the road is in proper condition. There are about 20 mango trees found on both sides of the road but most of them are beyond the ROW and need not be felled for road width extension. Most of the road embankments are higher than the average ground level. The road then passes through Basai Khola Bridge at Ch 2+190 km, which is 7.9m wide and is in good condition.

The road then enters Nakatajhij VDC for about 1.5 km length. The embankment of the road is higher than ground level. The width of the road is not uniform throughout the road length because of its poor condition. Most of the blacktopped layer have disappeared and

the sub-grade material have been exposed. At Viswokarma chowk, there is a Viswokarma Temple which is at 21 meters from the centerline of the road. The road at this chowk is 14 meters in width. Flood water is trapped at both sides of the road due to the embankment of the road and there is a need for the construction of pipe culverts and vented causeways to solve water logging problems.

For a length of about 800m, the road enters Sakhuwa (Mahendranagar) VDC. This VDC is a market-oriented VDC mainly for agricultural products, which facilitates people from Hariharpur, Nakatajhig, Sakhuwa, and Sapahai VDCs. The population in this area is highly dense as compared to other areas. The condition of blacktopping is in a very poor state. Nepal Telecom, NEA, FPAN, NOC, offices are located in this area. Electricity poles are attached to the roadside. Among them 15 poles lie within 7 meter distance from the centerline of the road and need to be shifted for accident prevention. Aurahi Bridge at Ch 6+980 km over Aurahi river has been damaged due to flood on 2059 BS and nowadays reconstruction work of the bridge is in process. After crossing the bazaar area, the road is leveled and some Pipal trees are found in both sides of the road but they do not lie within the ROW.

The road then passes through Ramdaiya Bhawani VDC and the condition of road within this VDC is also very poor. Water logging problem exists on both sides of the road.

The road then passes through Sapahi VDC for 1.5 km. No major environmental issues are observed within this section. The road then passes through waterlogged area of about 10-15 meters when it enters Laxmipur Baghewa VDC. The main market is Laxminiya bazaar and adjacent to Sinur Jhoda VDC. The road gets waterlogged in both sides as it enters Sinur Jhoda VDC, upto Mujheliya Chowk of Janakpur Municipality.

The road then enters Ward Nos. 7, 8, 13 and 14 of Janakpur Municipality. Durga chowk, Pidari chowk, Ramananda chowk, and Zero Point Chowks are the major junctions that lie along the road. Ramananda chowk is the main entrance for Ram Janaki Mandir. Around 1.5 km length of road passes through the market area. The road condition within this section is not too bad, as there are only few potholes. The ROW at this section is also clear and no dismantling of permanent structures or relocations are needed. However, side drains of adequate sizes are necessary to solve drainage problems.

There is one pond near Pidari Chowk adjacent to the road which is within the 25m width from the centerline of the road. A small strip of the pond has to be filled and new wall need to be constructed while extending the road so the whole pond should be renovated to rebuild its banks by permanent structures.

Section 2: Janakpur–Jaleswor Section (12.2 Km)

The road then passes through the Dudhmati River of Janakpur Municipality, which is 1 km from Zero Point Chowk. The road passes through Binhi VDC and enters Mahottari district at Sahodawa VDC. Chandani chowk lies in the center of the road. Two Mahadev temples (Ward no. 3 & 6) are located but their relocation is not necessary. The road width is 4 meter and the road condition is fairly good with few potholes.

The road then passes through Pipara VDC for 1.5 km length. The Shiva Chowk is the main market of this area. Mainly thatched roof houses and some concrete buildings can be found in this area. Shiva temple and Sankat Mochan temple are close to the road. Although both of the temple's boundary wall lies inside 25m from the center of road, the temples do not lie within the road proposed extension width. One pipal tree at 7m from the road center need to be cut down in this area. Within this section, side drains are needed to protect road surface from water logging problem.

The road then passes through Mahottarai VDC for 1.5 km length of the road. The road section is plain and straight, and the condition is also good. There are mango trees and pipal trees along both sides of the road, but do not fall within the extension width.

The road then enters Parkauli VDC, which is adjacent to Jaleshwor municipality. The bazaar is located on both sides of the road. The buildings are not attached in the right of way. Parkauli bazaar and army barrack are waterlogged areas and during rainy season waterlogged depth maybe up to 1m. Exit points are needed for the logged water in the rainy season. As a solution, vented causeway of adequate length is to be decided in consultation with the barrack.

The road then passes through about 5 km length with Jaleshwor Municipality. While entering to the Municipality one road is diverted to the main market and another to Bittamod. The road width is 6m and blacktopped condition is fairly good. One pond and bus park is attached to the road near Balibhadra chowk.

Section 3: Jaleshwor–Bhitthamod Section (5.6 Km)

The Jaleshwor – Bhitthamod road starts at Jaleshwor Municipality and proceeds towards south-west direction towards Bittamod which is also the Indo-Nepal border. The initial section of the road is in fair condition, whereas the later section of the road is in a poor condition. The flushing out of flood water of Ratu river does not occur efficiently in the Indian side and thus causes much inundation of the entire road section during the monsoon season. There is a 10 m long causeway built in 2059 BS at 2.0 km from Balibhadra chowk, but this causeway does not function properly and is in a ruined state. During the rainy season, the water from Ratu river passes over this road up to 1m in depth and no vehicle can pass and the travelers have to use boat for a period of 4 months. After the flood has subsided, the road section is seen to be filled up with sand and soil.

One custom office building and Durga Temple's wall lies within 7 meter from the centerline of the road and thus these two structures need to be relocated while extending the road. According to related members, there is no objection for their relocation. The head of local police said that they will provide necessary support if necessary while conducting the project. A temporary bus park is attached nearby the road. According to locals if the road extension project is carried out the parking system of bus have to be improved.

The people have strongly recommended the re-naming the road as Dhalkebar - Maliwada instead of Bhitthamod , since Bhitthamod is a town inside India and is not a Nepali town.

3.4.c BIOLOGICAL ENVIRONMENT

Vegetation and Forestry

Protected Forest Areas

There are no protected forest areas or any other preserved areas within the proximity of this road.

Roadside Trees

There is no such big forest that lie near the vicinity of the project road. But rows of trees are seen on both sides of the road, which retains an aesthetic view of the road. There are total of 40-50 such trees along the roadside that lie inside the ROW of the road but not needed to be felled down except one pipal tree in Pipara VDC.

The majority of trees are of Mango (*Magnifera Indica*) and Pipal (*Pipar Longum*) is seen to exist on both sides of the road on Dhalkebar, Nakatajhijh Pipra and Sakhuwa Mahendranagar VDCs but they don't lie within the proposed widening of road width. In general, the road project if implemented does not directly affect the aesthetic view of the road.

Fauna and Wild life

No endangered species inhabit the project area. Only some common birds are found to inhabit the existing few number of trees. Besides domestic animals like cows, goats, buffaloes etc., different species of snakes are also found.

Rivers and Ponds

The rivers that come across the project are seasonal rivers that have minimum discharge during the dry season. The river discharge improves as the monsoon season arrives. The Aurahi River being the larger river having bigger catchment area has more discharge than other small rivers. Because of dry nature of the rivers, there are very few biotic inhabitants and much less fish in the river. In addition, the practice of discharging raw sewerage into the river and ponds has also deteriorated the natural water environment. Biotic environment is not affected due to the proposed widening of the road. The Dudhmati river is also polluted by human practice of direct discharge of sewer lines.

There are numerous small and big ponds in the two districts. Some ponds exists near the road, but are not affected by the proposed widening of the road.

3.4.d SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

Dhalkebar–Janakpur–Bhitthamod road is located in Dhanusa and Mahottari districts. The socio-economic and cultural environment within the road section is discussed here.

Demography

The total population of the Dhanusha district is 673,517 and the population of Mahottari district is 638,354 as per 2001 Census data. Population density of Dhanusha and Mahottari districts is 570 and 552 persons/sq. km. respectively. The combined population of affected VDCs is 826,885. The average household size is about 5.68, which is higher than the national figure of 5.44. The population of male and female is 49.52% and 49.68% respectively.

Table 3.9 shows the population composition of the VDCs adjacent to the Dhalkebar–Bhitthamod road.

Table 3.9: Demographic Composition of Municipalities and VDCs

S. N.	Name of Municipality and VDC	District	Total Households	Population		
				Total	Male	Female
1	Dhalkebar VDC	Dhanusha	1,772	9,912	4,780	5,132
2	Nakatajhijh VDC		1,162	7,190	3,484	3,706
3	Sakhuwa Mahendranagar VDC		2,337	13,789	6,607	7,182
4	Ramdaiya Bhawadi VDC		1,069	5,775	2,785	2,990
5	Sapahi VDC		1,220	7,539	3,580	3,959
6	Laxmipurbagewa VDC		1,118	6,727	3,122	3,605
7	Sinarjoda VDC		1,347	8,086	3,822	4,264
8	Janapur Municipality		13,734	74,192	34,084	40,108
9	Bindhi VDC		916	5,707	2,759	2,948
10	Sahodawa VDC	Mahottari	983	5,531	2,843	2,388
11	Pipara VDC		1,389	7,884	4,124	3,760
12	Mahottari VDC		1,611	9,815	5,185	4,630
13	Parkauli VDC		856	5,136	2,756	2,380
14	Jaleshwore Municipality		3,680	22,046	11,583	10,463
	Total		33,194	189,329	91,514	97,515

Source: CBS, Population Census 2001.

Settlements Pattern

All the permanent settlements along the entire road length are outside the ROW which is 25m from the centre line for National Highway category of road. The settlements have developed as ribbon settlement along the main roads especially at the road junctions and have been developed as bazaar areas. Such settlement development rates along the main road has been noticed to be very fast because the main road is also considered to be of commercial value, and almost all the houses along the road have rented shops in the ground floor and are used as residential purposes for upper floors. This type of commercial cum residential buildings are seen in dense form at the Dhalkebar area. The similar development of building settlements exist at Mahendranagar Bazar. The settlements along the adjoining lateral roads are in the growing stage. These areas are at Durga Chowk, Pidari Chowk, Ramananda Chowk. The agricultural land adjacent to the main roads of these areas has been turning into residential and commercial plots.

Economic Activities

Mixed type of economic activity can be seen along the road alignment. The people residing along the main and lateral roads are in business and mostly retail markets for food and daily commodities etc. These businesses are run by the house owners or have been rented. Since a large number of vehicles ply along this road, a number of petrol pumps have been operating along this road. The majority of people are engaged in commercial activities; in addition, others are engaged in agricultural activities, administrative jobs, technical and semi-technical jobs.

Agriculture and Land Holding

Agriculture has been the main economic activity in both the districts of Dhanusha and Mahottari. According to the respective district profiles, the area of agriculture land in Dhanusha is 7,731 hectares, which is 65.78% of total area and in Mahottari district; the agricultural area is 61,723 hectares, which is 61.60% of the total area. The average land holding of the population in these two districts is approximately 1 hectare.

Market Centres

Market centers have developed where the settlements have developed. Along the Dhalkebar–Bhitthamod road, the market centers are seen where the concentration of the residents are high. The Dhalkebar area has a high concentration of people and is also the main market area. Other market centers are Mahendranagar Bazar, Durga Chowk, Pidari Chowk, Ramananda Chowk, Parkauli Chowk. The widening and upgrading of the road will definitely affect the commercial activities at these market centers.

Directly Affected Infrastructures

Houses

The existing buildings are outside the 25m ROW. However custom office building's compound wall in Jaleswor Municipality is 7m from the centre of the existing road and will be affected. There are no structures, which need to be dismantled during the construction phase.

Temples and Shrines

Ram Janaki Mandir of Janakpurdham and Jaleswor Mahadev of Jaleswor are two very famous temples in the two districts. Ram Janaki Mandir is famous not only among the hindu communities of Nepal but also famous in Northern Indian states, and yearly pilgrimage in large numbers gather at the temple. There are few other smaller temples within the districts.

No temples need to be relocated for road widening works. 2 Mahadev temples in Sahodawa VDC, Sankat Mochan Temple and Shiva Temple in Pipra VDC and, Durga temple in Jaleswor Municipality are close to the road but only their boundary walls needs to be relocated.

The relocation of Temples and shrines are sensitive cultural issues and need to be sensitively addressed and decision reached through the general consensus of the local people.

The renovation of the Temples and shrines are to be performed by taking the service of qualified architect in consultation with the local residents and renowned persons.

Public Water-sources

Within the project area, the supply of piped potable water is scarce. The local people depend on other sources such as water from tube-wells and ponds. There are many such public ponds on which the public depend for water. A small portion of one of the ponds which lie near the project road in Pidari Chowk in Janakpur Municipality need to be filled up during the construction phase of the road.

3.5 Other Matters

3.5.a Manufacturing Processes

Since the project is a road-upgrading project, it does not possess any manufacturing works

3.5.b Details of the Technology

The technology to be used for upgrading works will be a combination of mechanized method and labour-based. The specialized works such as surface laying, compacting, bituminous laying will be done employing mechanized equipments and other works such as earthworks, gabion, culvert, side-drains construction, slope stabilization works will be carried out manually.

3.5.c Other necessary matters

Project Component and Major Activities

The proposed road rehabilitation and upgrading works includes standard 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 components and activities for the proposed project includes:

- Widening of road surface from the present 1 lane to 2 lanes
- Widening of bridges and culverts
- Construction of shoulders, side drains and bus laybys
- Embankment stabilization works

Besides these, new side drains and repair of existing side drains will be necessary to improve road surface drainage. Embankment will be needed to be stabilized with most appropriate mitigation measure. Bioengineering measures will be undertaken in most of area to embankment slope.

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 material from quarries and borrow pit
- Material crushing and storage
- Workforce camps

Major Works

The proposed road upgrading works is limited within the right of way (ROW) and hence there should be no land acquisition. Earth works for embankment, sub grade, sub base and base course and wearing coat are the major works of the project. Some slope gabion masonry works at certain sections may be necessary. Drainage works has been included to the extent of rectifying all deficiencies in the existing drainage systems. Existing major cross drainages structures need to be repaired where they have been damaged. Additional major and minor cross drainages should be installed where existing drainage is inadequate.

Associated Activities

A number of activities associated with the rehabilitation and upgrading works should be undertaken at ancillary sites away from the road corridors. These activities may include:

Extraction of materials from quarries and borrow pits: construction materials, primarily for road gravelling should be excavated from quarries and borrow pits generally located in close proximities to the specified roadwork. Stone should be sourced from currently excavated materials, riverbeds and other adjacent safe.

Materials crushing and storage: the crushing and storage of construction materials should be in close proximity to work sites. Identified sites along the roads shall be reserved for these purposes and these activities should be restricted to the reserved sites.

Workforce camps: despite the use of some local labor, temporary workforce camps require to establish along the road to provide living quarters in close proximity to work sites. The location and number of camps required shall be determined based on daily traveling times to/from the work sites. Thus to reduce the environmental problems caused by the labour workforce, the employment of local labours as far as possible is to be emphasized.

4 IMPACTS OF THE IMPLEMENTATION OF THE PROPOSAL ON THE ENVIRONMENT

4.1 BACKGROUND

The Dhalkebar–Janakpur–Bhitthamod rehabilitating and upgrading road project will have significant positive impacts by increasing traffic capacity of the road and encouraging smooth and safe journey. The Project will definitely create employment opportunities during construction stage and enhance the socio-economic activities in the operational stage. The Project is also likely to contribute to regional development and provide a dependable all-weathered transportation facility through the proposed route. However, the Project will also generate some adverse environmental impacts during its construction and operational stages.

The magnitude of the project-induced impacts may vary to be high, medium or low and such impacts may be of site-specific, local, regional or of national nature. Furthermore, some of the impacts may be short-term, particularly related with construction stage, medium-term and long-terms. The following sections describe the likely beneficial and adverse impacts with benefits augmentation and adverse impacts mitigation measures of each impact identified or predicted.

4.2 BENEFICIAL IMPACTS

The road project after implemented will definitely provide dependable traffic flow from Dhalkebar to Bhitthamod. The project activities are likely to generate employment opportunities, promote trade and business, increase agricultural and livestock production in neighboring districts and enhance social services. Importantly, the project provision of better transportation facility to the local people encourages them in accelerating economic activities along the road corridor.

4.1.1 Construction Stage

During the construction stage of the rehabilitating and upgrading road project, the following beneficial impacts are likely to occur in qualitative terms.

Employment Generation and Increase in Income

During the construction stage, one of the major beneficial impacts of the road is the creation of employment opportunity. Based on preliminary estimate to widen 42.94 Km road to two lane road width, approximately 15,000 person-days of skilled and 4,500,000 person-days of unskilled manpower is estimated to be necessary. The part of required labor force could be supplied locally. Since, large numbers of local people have gained experience of road construction works during the construction and maintenance of this road at earlier stage; they will have better opportunities for employment. However, some skilled labors and technicians required can be hired from outside. While employing the local people, priority should be given to the project-affected families/people and the employment should be given in the gender-balanced manner to the extent possible.

Increase in Trade and Business

For the considerable period of time, a large number of workforces of different categories will reside at different locations of the project area during the construction stage. Since, the workers will have good purchasing power, they will regularly demand for different types of food, beverage and other daily necessary items. Many local and outside people may operate a number of shops and restaurants around the vicinity of the construction sites to meet the increasing demands. This will definitely increase local trade and business in the area. As a result, local people conducting these businesses shall significantly benefit from the project.

Increase in Agricultural and Livestock Products Production

The significant increase in local demand for various food products such as vegetables, meat and dairy products during the construction period will motivate people in producing excessive vegetables and other products as well. This kind of impact enhances the economical condition of the people of residing in project area.

Development of Social Services

Increased employment opportunities, trade, business, and agricultural income directs a considerable amount of money into the local economy in the area. This will logically increase the income level of the individual household and the local body of the area. In the situation when the sizeable amount of resources is at their disposal, it is possible that some money may be spent by individuals as well as local bodies to improve the present state of social service such as education/school and healthcare services.

4.1.2 Operational Stage

The qualitative beneficial impacts that are likely to occur when the project road is in operation are as follows:

Improved Transportation Facility and Decrease in Transportation Cost

The rehabilitating and upgrading of the road benefits the people by providing wider road transportation facility. The transportation of goods would become cheaper, particularly the vegetables and livestock. Importantly, the journey will be comfortable, wear and tear of the vehicles will be less and fuel & maintenance cost of the vehicles will also be less which results in increase in private savings.

Improvement in Trade and Business

The improved road surface will ensure continuous and smooth flow of products and commodities. It is envisaged that trade and business activities will be further promoted not only in this area but also expanded to other areas having links to this road.

Increase in Tourism Sector

Ram Janaki Mandir of Janakpudham and Jaleshwor Mahadev of Jaleshwor are the holy temples mainly famous in Nepal and India. Due to its cultural, religious and historical importance, these temples are the main attraction for religious tourists. Hence the road

improved transportation will help to promote these areas as tourism points and benefit the local economy.

Increase in Economic Activities

The integration of the local economy with the national markets will be possible by the improved transportation facilities and will help in exploiting the potentialities of the new production to its full extent. Availability of safe and quicker access between trade points of Nepal and India will also increase. The multiplier effects of commercial agricultural production and agro-based industries will also lead to growth of several other economic activities as well.

Enhancement of the Social Service

This project will increase the availability of safe and quicker access, development of economic center, and increase in the economic level which improve school education and promote higher education outside the project area. Similarly, the local people may spend more on health care, sanitary facilities, education facilities and other social services.

4.3 BENEFITS AUGMENTATION MEASURES

The implementation of the following measures is insisted to the extent possible, to augment the above beneficial impacts on the environment.

- The Project should provide opportunities to the interested local people in getting involved in construction activities. The Project will employ, at least, over 80 per cent of the unskilled workers during the construction period if the local people are interested to work as laborers.
- The Project should encourage its staff and the construction workers to consume the local products in order to support local the farmers and producers and promote their trade and business, e.g. vegetables, livestock products, seasonal fruits etc.
- The Project should supervise and instruct the contractor so that the local people receive a acceptable rates of wages or as negotiated during the bidding.
- The Project should prepare and disseminate public awareness materials on the impacts of road on natural resources and their conservation needs, and also effects of environmental pollution so as to encourage the local people to take necessary precautionary measures. The information materials will be widely disseminated along the road corridor.
- The project should also ensure adequate road safety measures such as provision of "Road Under-construction", "Caution", "Drive Slow" Signs and enough lightings for nighttime, to minimize traffic accidents at construction sites.
- As there is a possibility of pressure on social service facilities by the construction workers, the project should allocate some fund to provide additional social services facilities.

4.4 ADVERSE IMPACTS

4.3.1 Construction Stage

During the construction stage of the proposed road, the following adverse impacts are likely to occur in qualitative terms.

Impact on Physical Resources

Effect on Change in land use

Impact and Significance:

The widening/upgrading works of road formation and side drain construction will be in existing ROW, therefore will not require additional land. Site-specific major works, such as intersection improvement, bank stabilization and drainage improvement, will generally require some additional land. The major component of the project is the earth filling necessary for road width widening and borrow pits for earth and gravel need to be identified. The extraction of earth from nearby areas will cause depression in the ground surface will result in water logging problems.

Mitigative Measures:

Borrow pit sites must be chosen from areas where it will not cause water logging problems in future and according to the availability of suitable gravel material and their proximity to the associated roadwork. For quarries, where alternative sites are available, the lowest value production land must be selected. Site selected for borrow pits must be lands where the effect will be temporary and generally involve lower value land. Again, the total area involved shall be relatively small, and the sites shall be rehabilitated soon after use.

Operation of the Quarry Site

Impact and Significance:

The Preliminary study estimated that the construction of road would require about 119,000 m³ of earthwork in filling, 94,500 m³ of sub-base and 67,500 m³ of base course material and 1,268,000 lit. of bitumen for surface dressing. The excessive quarrying of materials will cause negative environmental impacts. And operation of crushing plants will also pose serious environmental concerns.

Mitigative Measures:

The selection of quarry site should be done so that its environmental implications are minimal. The aggregate crushing plants should be away from settlement areas and pollution control mechanisms need to be installed. The bitumen mixing plant needs to be established where its effects are minimal to the surrounding inhabitants.

Stockpiling of Construction Materials

Impact and Significance:

The construction materials needs to be stockpiled before its application at the site. If large amounts of the construction materials such as earth, gravel, aggregates, sand etc. are

stored for a long period near by the construction site it may cause negative environmental impacts and also occupy some land.

Mitigative Measures:

Land for the purpose of stockpiling construction material must be suitably selected such that it does not occupy private land and effect the agricultural lands.

Air Pollution

Impact and Significance:

The construction activities like aggregate crushing and bitumen heating will generate significant amount of dust and smoke and pollute the air. Bitumen heating emits considerable amount of gases such as SO_x and NO_x, which will have adverse impact in the environment. Though such pollution will be for the short term and temporary, the level of pollution may be significant. Similarly, operation of the construction equipment and the heavy vehicles will generate air pollution by their emission. However, they will be for the short term during the construction phase only.

Mitigative Measures:

Bitumen mixing plants need to be established away from human settlement and bitumen mixing plant having in-built mechanism for the absorption of gases will be environmentally conducive.

Noise Pollution and Vibration Effect

Impact and Significance:

The road construction activities are likely to increase noise level during operation of the heavy construction equipment beyond acceptable limits. The operation of the heavy construction equipment is likely to cause vibration in the vicinity of the construction site. Such construction is likely to develop damages or cracks due to the vibration caused by the operation of the heavy equipment, which need to be monitored and checked, especially near bazaar areas.

Mitigative Measures:

During construction, attempts have to be made to operate heavy construction equipment away from the settlement areas as far as possible and possibility of cracks due to vibration need to be monitored closely. If such problems arises, an alternative method has to be employed and the affected people must be suitably compensated. For the safety of the construction workers, the masks, earplugs etc. must be provided while on duty.

Relocation of Temples / Shrines

Impact and Significance:

No temples or shrines need to be relocated for road widening works. Two Mahadev temples in Sahodawa VDC, Sankat Mochan Temple and Shiva Temple in Pipra VDC and, Durga temple in Jaleswor Municipality are close to the road but only their boundary walls needs to be relocated. However, because of the cultural sensitivity, the local people may react negatively when proposed to alter the boundaries of the temples, even though on

preliminary survey, the local people have not voiced any of their major concerns on this issue.

Mitigative Measures:

The Temples and shrines are sensitive cultural issues and need to be sensitively addressed and decision on how to alter the boundaries of the temple should be reached only through wide general consensus of the local people.

Effect on Water Quality

Impact and Significance:

At present, there are tube wells are functioning and are a main source of water supply for drinking as well as daily uses and the construction works will not affect them. However, during the construction period, a large number of construction workers would be mobilized. Road construction site is near by densely populated areas and there will be extra pressure on drinking water and the sanitary facilities. If the proper sanitary condition is not maintained in the labour camps and work camps, water may get contaminated and water borne diseases may increase.

The water quality may get degraded if the construction materials such as bitumen, cement slurry, oil, diesel etc. are leaked into the water bodies. Similarly, the construction activities may require some hazardous material, which will be stored in the proper place and disposed off safely after usage. Furthermore, haphazard disposal of solid and liquid wastes from the construction camps will likely degrade the soil and water quality.

It is likely the earth work in embankment may affect the ground water flow of the springs and /or wells in the vicinity of the construction area.

Mitigative Measures:

The Project must instruct the Contractor to avoid any water related problems during construction works. The Contractor needs to arrange for sufficient water supply for its labour force. It should ensure that local water supply should not get contaminated by use of cement, bitumen etc. The project should make provision for restoration of water supply lines in tender document if it gets disrupted during construction works.

Generation of Solid Wastes

Impact and Significance:

Since large number of construction workers live nearby road corridor during construction period, the quantity of solid wastes produced will also be significant.

Mitigative Measures:

The timely and proper disposal of the solid wastes will be the responsibility of the Contractor. The Contractor should build solid waste disposal collection and facilities along the way.

Use of Bitumen

Impact and Significance:

Bitumen is a hazardous material, which is used for road surface dressing during construction and maintenance period. It has also environmental consequences during its heating and mixing with aggregates before its application as surface dressing material. This mixing plant will cause air and dust pollution and should be located away from the settlement areas. Bitumen spillage is also a major problem when it is being handled.

Mitigative Measures:

Adequate care is necessary in handling bitumen. It should be stored in a confined place in order to minimize or avoid contamination with water sources in case of spillage. Bitumen is applied at high temperature, leading to a considerable risk of burns to the laborers. Protective clothing and gloom should be provided to the laborers and make ensure to use of it.

Bitumen bleeding due to excessive application rates could be contributing cause of accidents during operation. Good road maintenance practice requires bleeding problem to be resolved as soon as possible by spreading 6 mm sized chips over the affected area and rolling in them.

Effect on Irrigation Channel

Impact and Significance:

The proposed road widening work will not affect any of irrigation channels and the adverse impacts are insignificant.

Effect on the Transmission Line and Telephone Line

Impact and Significance:

The proposed road widening work will not affect any transmission lines. Some of the locations distribution lines which need to be relocated. In Sakhuwa Mahendranagar VDC, there are 15 electric poles, which need to be relocated. There are no telephone poles passes through the ROW of the road.

Mitigative Measures:

Prior to the relocation of the electric/telephone poles, consultation with the local people have be to be made so that it does not cause any problems to the nearby people.

Water logging and Inundation

Impact and Significance:

There are areas along the present road where water logging is seen, especially in the Dhalekbar – Janakpur section. The water logging problem is more severe in the months just after the monsoon seasons. The major causes of water logging are due to inefficient operation of cross-drain structures. Some of the places within the project area are prone to excessive inundation. Inundation is mainly due to the obstruction of natural water flow after the construction of embankment while the road was constructed and the non-proper functioning of the drainage outlets. Some of road sections at Nakatajhijh VDC (Ch 5+000), Sakhuwa (Mahendranagar) VDC, Ramdaiya Bhawadi VDC, Sapahi VDC and the

section between Jaleswor Municipality and Bhitthamod (Ch 41+000 to Ch 43+000 Km) are highly inundated in rainy seasons. The water from Ratu River passes over the Jaleswor– Bhitthamod road section up to depth of 1 m and no vehicle can pass and the travelers have to use boat for a period of about 4 months. As the flood subsides after the rainy seasons, the road section is seen to be filled up with sand and soil.

Mitigative Measures:

Enough number of cross drainage structures need to be constructed and any blockage and improper infrastructures should be renovated to avoid water logging problems. To avoid this inundation problem due to Ratu River flooding, the Project should conduct a detailed study on the existing condition of natural waterways and the drainage system and the infrastructures constructed to bypass the water.

Safety Measures

During the construction phase, a number of construction vehicles will be plying on the road and accidents are likely to occur. Hence, informatory signboards will be placed for the precautionary measures.

Impact on Biological Resources

Loss of Trees

During road widening, only one road-side trees in Pipra VDC (Pipal tree) should be felled which lie only 7 m from the centre of the road. There are total of 40-50 such trees along the roadside that lie inside the ROW of the road but not needed to be felled down. The majority of trees are of Mango (*Magnifera Indica*) and Pipal (*Pipar Longum*) are seen to exist on both sides of the road on Sakhuwa Mahendranagar VDC but they don't lie on the present project road width.

Effects on Social Services and Cultural Resources

a. Drinking Water Facilities

The existing drinking water facilities will more or less meet the local demand for drinking water. In addition, the existing drinking water facilities will be inadequate for large number of workforce in the vicinity during the construction phase. Thus, separate arrangement is necessary for work camp and labour camp.

b. Education

The existing educational establishments are not located within the ROW but are located near to the ROW. Even though the project does not directly cause inconvenient to the schools, their access may be inconvenient when construction work is in progress.

c. Health and Sanitation

The haphazard disposal of construction waste will adversely affect the sanitation environment in the area and this problem need to be minimized through regulatory measure and public awareness programs.

d. Occupational Safety

During the construction stage, a large number of work forces will be employed. They are likely to be affected by the dust, gas emission and increased noise level. There is a possibility of minor and/or major accident while working in such areas.

e. Cultural Resources

The proposed road widening passes near by five temples/shrines, which need not be completely relocated but their boundary walls need to be shifted. Even though these temples have importance in the local people, they will consent to the alteration plan to make the road widening project possible. However, a detailed consultation is required for this plan.

4.3.2 Operational Stage

Collectively, a long term significant benefit will be developed through the proposed project. This is considered as a key to the socio-economic development of the country.

There will be no adverse impacts on the local economy. However, the market will be competitive and the urbanization and semi-urbanization effect may lead to the high cost of living. The sale of agricultural plots will rise and they will convert into residential and commercial areas. Some industries that are located near the road may also have the tendency to relocate to other places and develop their properties as commercial areas. The expectation that the road will be widened has already affected the private land developers and has already started the residential plot development schemes. The local inhabitants may find it difficult to adjust in this new dimension of development.

After the widening of the road, the ribbon settlement along both sides of the road will be inevitable. The high concentration and population density along this road shall raise social issues and concerns.

As there will be plenty of economic opportunities after the operation of the road for the local people are living in harmony, there will be no socio-cultural adverse impacts in the area.

However, the road may pose some adverse impacts on the environment at the operational stage, such as increase in traffic accidents due to higher vehicular speed, which must be controlled by putting up speed limit signs and enforcing them.

4.5 MAGNITUDE, EXTENT & DURATION OF ENVIRONMENTAL IMPACTS

Table 4.1 enlists the likely environmental impacts from the proposed Project with respective magnitude, extent and duration. In general, the Project does not have significant negative environmental impacts.

Table 4.1: Environmental Impacts with Respective Magnitude, Extent & Duration

Adverse Impacts

	Type of Impact	Magnitude	Extent	Duration	Direct / Indirect
Construction Phase					
A. Physical					
1	Air Pollution, Noise and Vibration due to Construction	Moderate	Site specific	Short term	Direct
2	Impact on natural drainage system, water logging	Moderate	Site specific	Short term	Indirect
3	Water quality deterioration due to construction disposals, bitumen etc.	Moderate	Local	Short term	Direct
4	Extraction of construction materials	Moderate	Site specific	Medium term	Direct
B. Biological					
1	Vegetation / Trees loss due to construction	Minor	Site specific	Medium term	Direct
C. Socio-Cultural Environment					
1	Loss of land due to construction	Minor	Site specific	Long term	Direct
2	Loss of standing Agricultural crops due to construction	Minor	Local	Short term	Direct
3	Health hazard to local people due to construction workers	Moderate	Local	Short term	Indirect
4	Occupation, health and safety issue during project construction	Minor	Local	Short term	Indirect
Operation Phase					
A. Physical					
1	Air Pollution, Noise and vibration due to traffic	Minor	Local	Long term	Indirect
2	Pedestrians' interference with high-speed traffic	Major	Site specific	Long term	Direct
B. Biological					
1	Loss of vegetation during maintenance works along ROW	Minor	Site specific	Short term	Direct

Beneficial Impacts

	Type of Impact	Magnitude	Extent	Duration	Direct / Indirect
C. Socio-Economic					
1	Increase in land value nearby ROW	High	Regional	Long term	Direct
2	Increase in house construction & settlement near ROW	High	Local	Long term	Direct
3	Impact in existing economic standard of local people	Moderate	Regional	Long term	Indirect

5 ALTERNATIVE ANALYSIS

5.1 BACKGROUND

Alternative analysis has been considered as an integral part of the IEE study. The technical feasibility, economic viability and environmental acceptability govern the alternative analysis. The IEE study team has made the assessment on the environmental impact assessment and economic viability of different alternatives as No action (present width stage) and upgrading to wider (two lane) bituminous surface.

5.2 NO ACTION ALTERNATIVE

This alternative avoids the widening /upgrading of the road to 2 lanes bituminous surface, thereby limiting the potential development of the area and maximizing the traffic congestion. However, the environmental degradation is likely to continue due to the increase in traffic as well as development of temporary structures along roadside. The economic development in the project area vicinity will not be achieved.

In view of the need for ensuring continuous traffic flow in the proposed section, 'No action' alternative has been rejected. This rejection is rather based on economic and development aspects than the environmental issues.

5.3 IMPLEMENTATION OF PROPOSED PROJECT

Dhalkebar Junction – Bhitthamod (Indo-Nepal Boarder) section is 42.94 Km is a part of Sindhuli Rajmarga, which has been proposed to be widened. The estimated average daily traffic volume is 1,895 at present and is expected to grow to 4,567 by year 2020. The average formation width of this road section is 5 m including 3.5m bituminous surface (one lane traffic) and the majority of the road section's condition is poor. To tackle increasing traffic, rehabilitation and widening of this road section is necessary. There are nine bridges and twenty five culverts that also need to be widened.

The IEE study team carried the detailed alternative analysis of the road in order to select the best alternative from environmental viewpoint for the proposed rehabilitation and upgrading of the road. In the feasibility stage of the Project similar type of alternative analysis has been made based on the technical feasibility and economic viability in order to select the best alternative. The present IEE will assist in determining the scope of the Project, mitigation measures and implementation arrangements that should be incorporated into the Project design and implementation plan.

Compared to the no action alternative, this alternative has beneficial impacts and few adverse impacts as well. With the implementation of the Project, the mobility of people and goods will be easier and it will contribute to the socio-economic development of the influenced areas. It will increase the living standard of the people by generating

employment opportunities during construction stage and enhance socio-economic activities in the operational stage. The Project is also contribute to regional development and provide a dependable all-weathered transportation facility.

However, the Project will also generate some adverse environmental impacts during its construction and operational stages, which are very small in magnitude, such as, noise and air pollution by bitumen use and by increase in traffic volume, water pollution due to debris, construction wastes and dust, oil, greases from vehicles. Considering its benefits, the nature and magnitude of the adverse impacts, they can be considered insignificant and can be minimised by adopting appropriate mitigation measures.

Project Site and Route

Since the present proposal is for upgrading and widening of the existing road, there is no possibility for alteration of the route.

Time Schedule

The schedule for construction works should be arranged such that the rainy season as well as agriculture season should be avoided. Working during the agriculture off-season would be most appropriate since the local people could be involved as construction labours.

Material to be used

The Project will mainly include a labour-based approach, particularly in earthworks. Materials to be used are boulders for gabion and dry walls, coarse aggregates of different sizes for sub-base, base course and concreting and fine aggregates. These materials will be sourced from nearby rivers. Caution shall be taken to avoid excessive retrieval of construction materials only from one source to prevent adverse impacts to natural environment.

5.4 THE BEST ALTERNATIVE

This analysis recommends rehabilitating and upgrading existing alignment. The following chapters document the impacts identified and/or predicted for both construction and operational stages and propose mitigation measures to minimize the impact, environmental monitoring and auditing aspects to make the road project environment-friendly to the extent possible.

6 IMPACT MITIGATION MEASURES

In general, the proposed road upgrading/widening project will create surface-related environmental impacts, which are comparatively low in magnitude. Incorporation of mitigation measures in the detail design and tender document and subsequent implementation should mitigate most of the likely environmental impacts. The above adverse impacts could be mitigated if not avoided by implementing the following mitigation measures. The mitigation measures to be included in design phase, construction phase and operational phase have been summarized below.

6.1 PHYSICAL ASPECTS

Because of the location of the road, alignment chosen and types of environmental impacts predicted, the following mitigation measures will be implemented to avoid and/or minimize during the construction and operational stages, on related impacts on the physical environment.

Land use Regulation

Once the ROW area is brought under the management of the Project, efforts will be made to improve its ground cover and plantation will be done in accordance with the provisions of the Section 16 of the Public Road Act, 1974. This will improve the vegetation cover, increase water-holding capacity of the land system and minimize soil loss and/or water flow in the road. As water is the main enemy for road, every effort will be done to regulate land uses along the ROW to avoid and/or minimize the flow of water in the road alignment.

Road slope Protection Works

The experience of DoR reveals that the road slope protection works can be economically carried out by bioengineering treatments. As the area is a good habitat for bamboo, efforts will be made to use bamboo (*Dendrocalamus sp*) to stabilize the slopes. Furthermore, amliso (*Thysanolaena maxima*), babiyo (*Eulaliopsis binata*), kans (*Saccharum spontaneum*), khus (*Vetivera sp.*), and grasses such as *Pogonatherum sp.*, *Setaria sp.*, *Capillipedium assimile* and other indigenous plants will also be raised in appropriate places (Howell, 1999). Hence, a mix of several bioengineering treatments will be carried out to protect the road slopes by using the roadside bioengineering handbook published by the Department of Roads and DFID in 1999.

Drainage Works and its Outlet Management

Side drain will be constructed on both sides of the road in order to regulate water and minimize its effect on road system. Project will construct the drainage system by considering water collection, conveyance and disposal of surface water runoff from the road. The drainage system has been designed considering width, depth, slopes, and road alignment and protective treatment.

Erection of Informatory Signs

The road passes through a number of settlements and educational institutions. The Project will erect signposts including information on no-horn at school and health institutions, turnings, road gradients etc. to let the motorist know about the obligatory rules to be followed during driving. Such signs will also be erected during the road construction stage.

Vehicle Maintenance and Water-Spraying

During the road construction/upgrading stage, dust and gaseous emission will be high. In order to minimize possible health impacts of dust and gaseous emission, proposed road will be graveled and water spraying on the road will be done at regular interval during construction stage. Plastic sheets will be used to cover spoils. Construction equipment and the vehicles will also be routinely maintained.

6.2 Biological Aspects

Various activities of this project will have negative impacts, mainly by the loss biological organisms. These negative impacts can be reduced and be minimized during construction and operation phases by enacting the appropriate mitigation measures. Proper re-plantation of trees and greenery must be developed along the road.

Prohibition of Spoil Disposal in Streams

It is predicted that construction spoils may affect the fish spawning ground and avoiding and/or controlling the disposal of spoils in these streams will minimize it. In other words, the construction spoils will be disposed off safely at the designated spoil banks and they will be rehabilitated before the rainy season.

6.3 Socio-Economic and Cultural Aspects

In order to minimize the socio-economic and cultural impacts identified above, the following mitigation measures will be implemented during the road construction and operational stages.

Public Consultation/Counseling Services

The public show a firm commitment for co-operation for the road widening and upgrading works. The local people should be provided with various skill developments and entrepreneurship training so that they could cope with the new environment of township and economic opportunities that will be inevitably brought by the operation of the road. The Project will invite the local NGOs and CBOs for such activities.

Additional Social Service Facilities

To solve the problems of increased pressure on various social service facilities such as education, health & sanitation, drinking water etc, additional resources have to be allocated for the development of these facilities. Part of the revenue to be earned by the VDCs due to increased economic activities in the area has to be allocated for social service development.

Occupational Health and Safety

In a road construction project, there is always a possibility of occupational health and safety problems. However, this risk will be minimized by properly adopting necessary safety measures. For this, resources have to be managed and moreover its strict implementation has to be enforced during construction. In order to minimize such problems, road safety measures will be an integral part of the detail design and provision for masks, earplugs, boots etc. will also be provided to the workers to be involved in the areas having potentials to be affected by environmental pollution.

Besides, the Project will bear cost for any injuries or death of workers, if any, and the compensation will be based on the existing legal regime, particularly the Labor Act.

Community Involvement

The Proponent assumes that the community involvement in the project activities is a precursor for successful implementation of the project. Local civil services, NGOs and CBOs will be encouraged to get actively involved in the formulation and implementation of the Project and other related activities. As far as practicable, transparency will be maintained to win the trust of the local community.

The Project will continue to generate self-employment during the operational and maintenance stage. Because of all weather road facility, the vegetable growers will likely continue vegetation production in and it will greatly improve the living standard of the local people.

Following **Table 6.1** summaries the major impacts, responsible sectors for the mitigative measures to be adopted.

Table 6.1: Impacts, Mitigation Measures and Responsibility

Environmental Elements Parameters		Type of Impact	Proposed mitigation measures	Responsibility
Physical Environment	Air, water, noise and vibration	• Increase air pollution due to operation of heavy equipment, vehicular movement and bitumen heating at construction stage • Increase in noise pollution due to operation of heavy construction equipments and crushing plants	• Ensure water spraying during sub-grade preparation and gravelling works • Use pollution-free bitumen mixing plant • Undertake construction activities in day time • Install crushing plants away from settlements	Project/ Supervision team / Contractor
		• Change in water quality and impact on river system by leakage of hazardous material	• Store and locate bitumen plant and fuel filling stations away from water sources. • Strict control while handling, transportation & application of bitumen to avoid spillage & overuse	
		• Cracks due to vibration while using heavy construction equipments	• Avoid heavy vibrating compaction near settlements • Monitor for possibility of cracks closely and alter methods if problems arises	
		• Wear and tear of pavement surface increase dust and smokes of vehicles during operation stage	• Allow only vehicles meeting emission standards, restrict speeds and educate road users for maintenance of vehicle. • Plant trees within ROW to provide barrier effect to nearby settlements	
	Traffic accidents	• Increase in traffic accidents involving pedestrians due to increased vehicular speeds during operation stage	• Provide speed limit signs and road safety signs • Educate drivers & pedestrians on safety road rules • Provide speed breakers, zebra-crossings, traffic lights and street lights	Traffic police/ Local Authority
Bio - Physical Environment	Drainage and Cross drainage works	• Improper and insufficient cross drainage causes water-logging and inundated areas	• Provide sufficient cross drainage structures, check dams • Protection of natural gullies, and drainages • Regular cleaning & maintenance during operation stage	Design Team /Project/ Supervision team / Contractor/ DOR
	Use of Quarries and Stock piling of materials	• Loss of vegetation, improper operation of quarries may invite flood and disturb river flow and river cutting in case of river quarry • Possible leakage of hazardous materials	• Proper operation quarries, reclaiming the quarries and stockpiling yards after use, • Restrict the quantities of quarries and depth in case of river • Avoid leakage or dispose the hazardous materials safely	Supervision team / Contractor

Environmental Elements Parameters		Type of Impact	Proposed mitigation measures	Responsibility
Socio- Cultural environment	Establishment of Labor Camps & Workforce	• Cause pollution by generation of sewage and solid waste • Might use forest-wood as fuel • Affect existing social balance	• Contractor to provide safe disposal of wastes • Contractor to provide kerosene/gas fuel for cooking • Employ local manpower as labours • Contractor to closely watch for possible social frictions & disturbances	Contractor
	Shifting of Temples/Shrines boundaries	• Possible disagreement for alteration of temples /shrines boundaries	• Public consultation with local people on how boundary alterations can be done • Project to improve temple/shrines surroundings	Project
	Use of outside workforce	• Possible conflicts between workforces and local residents, transmission of other cultural practices and loss of economic opportunity of local residents	• Contractor to ensure maximum use of local workforce and allow use outside workforce only if required skilled manpowers are not available locally	Contractor
	Resettlement and urbanization along Road	• New settlement along ROW and causing congestion	• Encourage planned settlement and discourage ribbon settlement along the road	Project/ Supervision team/ DOR/ Local Authority
		• Settlement growth and encroachment in ROW	• Regulate settlement along road and compliance to ROW • Demarcate ROW clearly and use ROW for planting trees to safe guard it	
		• Increase in solid waste generation and improper discharge of wastewater	• Regulate management of solid waste disposal • Regulate wastewater disposal	
		• Increase in road accidents	• Strict enforcement of traffic rules	
	Economic Activities	• Possible loss of production base such as agricultural land, commercial use of ROW and change of economic structure	• Public consultation with local people on how to minimize losses • Provide alternative opportunities for economic activities	Local Authority
	Health, sanitation and Social service facilities	• Deterioration of health or sanitary conditions due to the population increase • Impact on social service facilities such as schools, medical institutions and drinking water facilities	• Discourage concentration of people in road side areas • Use signs to warn traffic of school and hospital areas • Provide additional drinking water facilities to labor force	Project/ Local Authority

7 ENVIRONMENTAL MANAGEMENT PLAN AND MATTERS TO BE MONITORED

7.1 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) is a structured way of working with the issues, particularly the impacts evaluated as significant. The EMP should define technical work program, including details of the required tasks and reports and necessary staff skills, supplies and equipment; a detailed accounting of the estimated costs to implement the plan; and planned implementation of the plan, including proposed staffing, schedules of participation and inputs of different agencies.

This EMP of the Dhalkebar–Janakpur–Bhitthamod Road Project follows the basic concept of management i.e. the POSDCORB and this has been fitted into environmental management. This concept focuses the inclusion of *planning, organization, staffing, directives, co-ordination, reporting and budgeting*. Within this broad framework, the following sections describe to address 5W (What, how, where, when and who) for the implementation of benefit augmentation and mitigation measures, environmental monitoring works in this chapter. It also includes the budget estimates, organizational structure, staffing and reporting requirements, including necessary co-ordination during the project construction stage. In a nutshell, EMP guides the project management in such a way that the environmental protection measures are adequately implemented, effectiveness of such measures are monitored and environmental auditing is carried out to know the project performance on environmental ground.

7.1.1 Implementation Plan of the Environmental Protection Measures

The benefits augmentation and mitigation measures as included in Chapter 6 will be implemented as follows.

Benefits Augmentation Measures

A number of benefits augmentation measures have been proposed in Chapter 6. They will be implemented as follows.

Table 7.1: Plan for the Implementation of Benefits Augmentation Measures

S N	Activity	Location	Time	Method	Estimated Cost (NRs.)	Responsibility
1	Employment of local people	Project area	Construction period	Inclusion in Contract document and recruitment	No cost	Project and Contractor
2	Full payment of wages to worker as per contract document	Project area	Construction period	Observation and inquiry	Include in supervision cost	Supervision Consultant / DOR

S N	Activity	Location	Time	Method	Estimated Cost (NRs.)	Responsibility
3	Public awareness	Settlement areas	Pre - and Construction stage	Pamphlet distribution, interaction meetings	250,000	Supervision Consultant / DOR
4	Fund allocation for shifting of infrastructure	Whole section	Construction stage	Shifting of Electric line / boundary walls	Include in design	Contractor as per BOQ / Design Team
5	Road widening	Settlement areas	Construction stage	Bus lay-by construction technology	Include in design	Contractor as per BOQ
6	Supply of road safety signs & lightings	Work sites	Construction stage	Procurement and Supply	500,000	Contractor
Total					750,000	

Adverse Impacts Mitigation Measures

In order to mitigate the predicted environmental impacts, a number of mitigation measures have been proposed in Chapter 5 of this report. These mitigation measures will be implemented in a phased manner during the pre-construction, construction and operational stages. All preventive, corrective and compensatory measures have been included in the following table in different components of the environment.

During the pre-construction stage public awareness activities will be launched.

Table 7.2: Plan for the Implementation of Mitigation Measures

SN	Activity	Location	Time	Method	Estimated Cost (NRs.)	Responsibility
Physical Aspects						
1.	Effect due to Material borrow pits	Borrow pits	Construction stage	Select site where no water logging problems shall arise	Include in design	Contractor, Project
2.	Operation of the Quarry Site	Quarry sites	Construction stage	Operate away from settlements, employ pollution control methods	Include in design	Contractor, Project
3.	Stockpiling of Construction Materials	Stockpiling sites	Construction stage and post-construction stage	Select site away from settlements, private & agriculture lands. Clean area promptly after completion	Include in design	Contractor, Project
4.	Air, Noise Pollution & Vibration	Project area, crushing plants, bitumen	Construction stage	Water spraying, crushing & mixing plants away from settlements.	Include in design	Contractor, Project

SN	Activity	Location	Time	Method	Estimated Cost (NRs.)	Responsibility
		mixing plants		Protective measures for workers		
5.	Shifting of Temples / Shrines boundaries	Project area	Pre and during construction	Acquire approval from local people prior to works. Offer area improvement by project	500,000	Project, Contractor
6.	Water Quality, Solid Wastes Management	Project area	Construction stage and post-construction stage	Avoid material spillage, provide water for construction workers, manage disposal of solid wastes	Include in detailed design and project cost	Project, Contractor
7.	Erection of informatory signs	Settlements, schools and turnings	Construction stage and post-construction stage	Preparation and erection at essential places	250,000	Contractor, Project
Biological Aspects						
8.	Tree Plantation	ROW of Project area	Post-construction stage	Plant trees in the ROW area	500,000	Contractor
Socio-economic and Cultural Aspects						
9.	Public consultation / counseling	Settlement areas	Pre-construction stage	Launch counseling among roadside dwellers & communities	250,000	Project
10.	Occupational health and safety	Construction site	Construction stage	Provide safety gears to workers. First aid kits at site office	100,000	Contractor
Total					1,600,000	

7.1.2 Estimated Budget for EMP Implementation

The Project will launch environmental enhancement and protection measures in a phased manner during the construction stage. The cost for environmental protection measures has been estimated and included in the project cost, the Proponent assures that adequate cost of the implementation of the environmental protection measures and environmental monitoring will be included in the Project cost.

The Project will implement the environmental benefits augmentation and mitigation measures and the total cost is estimated at Rs. 2,350,000. **Table 7.1** and **7.2** are indicative cost for each mitigation measure is estimated at the current price. This does not include the cost required for engineering construction works, which is a part of standard engineering practice. The Dhalkebar–Janakpur–Bhitthamod Road Project will be responsible for overall mitigation measures related with road engineering aspects.

7.1.3 Organization and Staffing For EMP Implementation

In order to implement the environment management which includes the implementation of the environmental protection measures and conducting of the environmental monitoring works, the Project shall establish an Environmental Unit (EU) as an organ of the Project Management Office (PMO). As this is a small level of Project, the proponent considers that a small unit, in-charge of environmental affairs of the Project will be sufficient.

The Department of Roads (DOR) has also established the Geo-Environment and Social Unit (GESU) in 1991 in order to integrate environmental aspects in the road development and maintenance project. The GESU has, *inter alia*, issued the Environmental Management Guidelines, in 1997 and the Policy Document for EIA incorporation in 2000. This EU of the Project will co-ordinate with DOR's GESU and get the additional technical assistance required for the implementation of the environmental protection measures (EPMs). The EU may also seek additional technical assistance from the Ministry of Forests and Soil Conservation and the Ministry of Environment, Science and Technology as and when necessary.

The EU of the Project will be made responsible to:

- Incorporate benefits augmentation measure, and mitigation measures, and mitigation measures in the detail design, to the extent applicable, and even modifying the final design of the Project to ensure the incorporation of EPMs;
- Facilitate the inclusion of environmental requirements and budget in the contract document;
- Prepare necessary monitoring format(s);
- Conduct environmental monitoring, both compliance and impact monitoring, independently;
- Monitor construction contractor's performance of environmental aspects;
- Carry out environmental record keeping during the construction and operational phases of the Project;
- Prepare and distribute environmental monitoring report(s);
- Participate in environmental acceptance of completion of the road construction from the contractor officially; and
- Facilitate environmental monitoring co-ordination meetings and intermittent supervision along the road alignment, if such co-ordination mechanism is established by the competent government agency.

The EU staff will work alongside the construction and operation personnel to ensure that the measures and requirements outlined in the EMP are carried out effectively.

7.2 ENVIRONMENTAL MONITORING

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 projects with regulatory standards, and the degree of implementation and effectiveness of the environmental protection measures (Lohani et al, 1997). 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 Planning and Works (MPPW) in this case- is the legally responsible monitoring agency. This Rule also empowers MPPW 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. With these considerations, the following sub-sections describe the types of monitoring, parameters, locations, schedules and responsibilities for monitoring.

7.3 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 monitoring* and *impact monitoring*.

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 IEE report and the construction stage or a change on environmental quality is noticeable. Baseline information of the reference sites should also be collected for future comparison.

Compliance Monitoring

The compliance monitoring is essential in order to ensure that environmental protection measures and other requirements 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 mitigation measures and verify the impacts predicted and actual level of impacts occurred in the field. Furthermore, this type of monitoring helps to increase understanding of cause-effect relationships between the human activity and environmental changes (Lohani et al., 1997).

In sum, environmental monitoring approaches to verify the accuracy of 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 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 land and house acquisition, relocation of temple, Relocation of infrastructures (Electric line, telephone line, water supply line) and temporary acquisition of private land;
- Regular supervision of spoils loading, transportation and dumping at designated site(s);
- Regular supervision on materials handling at earthworks, and stockpiling of construction materials;
- Procedures for safe storage and use of bitumen and toxic materials;
- Regular water spraying to arrest construction related dust and vehicle maintenance to minimize gaseous emission;
- Inquiry on the usage of pressure horn in settlements, health and educational institutions;
- Rehabilitation of drinking water and irrigation schemes, and/or their re-location;
- Drainage management;
- Provision for occupational health and safety measures;
- Launching of skill training, and public awareness activities; and
- Other conditions set-forth during the approval of the IEE report, if any.

Although, the environmental monitoring is not the responsibility of the Proponent, based on the provisions of the existing environmental laws, the Project has planned to monitor the compliance of the technical specifications as an in-built practice. In order to guide the compliance monitoring, a monitoring team is proposed. This monitoring team will comprise of the representative each from MPPW and DoR. This team will make necessary site visits to oversee the compliance monitor.

Impact Monitoring

Impact monitoring is generally carried out to determine 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 of explosives and toxic wastes on the local environment, including the utilization of cash compensation, to the extent possible etc.

7.1.1 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 low natural variability and broad applicability. In this context, the following indicators will be monitored during the project construction and operational stages of this road Project.

Physical Parameters

During the construction stage, total quantity of disposal materials and their spoil bank reclamation activities, disturbance to natural slope, implementation of type-based slope protection measures, provision for adequate drainage facility such as catch drains, side

drains, and water diversion above the road slope failure sites and its channeling will be monitored as and when necessary. Furthermore, 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-horn signs at settlements, education institutions and road bends will also be monitored at regular interval. These parameters will be monitored at road alignment area.

During the operational stage, the number of vehicles using the road, frequency of damage of road due to water accumulation and landslide, air quality, and noise level will be monitored.

Biological Parameters

The Project will monitor the actual loss of the number of trees, and effect to biotic environment in the ponds and rivers.

Socio-Economic Parameters

This Project will provide employment opportunity to a number of construction workers. However, the Contractor may employ the outside laborers to accomplish the assigned work in time, thereby exerting additional pressure on environmental resource. Hence, the Project will monitor the percentage of local construction laborers according to the type of work, number of women employed, number of outside laborers and their dependants.

The Project will also monitor the type of compensation provided to the locally affected people, if any, and type and extent of damage to local infrastructures such as, electric line, telephone line, drinking water pipes, irrigation schemes, and rehabilitation of such facilities will be monitored. Furthermore, the Project will monitor the frequency of illness of the construction workers and cases of respiratory diseases, type and number of accident, availability of first aid and emergency services and awareness of the workers and roadside people on occupational health and safety.

During the operational stage, the Project will monitor changes in socio-economic conditions of the local people.

7.1.2 Monitoring Locations, Schedules and Responsibilities

Timing for environmental monitoring depends on the nature of parameters. It can be done regularly or intermittently. 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.

As per the EPR of 1997, the Ministry of Physical Planning and Works 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 Roads. In any case, the Project will carefully monitor activities of the contractor(s) and the supervisory consultant(s). The DOR and MPPW will evaluate the monitoring result, as and when necessary. The Project intends to invite an 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 environment-friendly.

A summary of monitoring parameters, location of monitoring, schedules and responsible agencies, including monitoring methods is presented in **Table 7.3**.

Table 7.3: Monitoring Parameters, Location, Schedules and Responsibilities

Parameters	Location	Schedule	Method	Responsibility
Inclusion of mitigation measures in the design and Tender document	Central office	During approval of Contract	Detailed design, Tender document preparation and review process	Project / DoR
Allocation of adequate budget for environmental protection including compensation.	Central office	During approval of Contract	Review process	MPPW
Implementation of mitigation measures	Project site	Construction stage	Site inspection, inquiry, measurement	Project / DoR
Physical parameters				
Water sprinkling	Project site	Once a week	Observation, inquiry	Project / DoR
Slope protection measures	Road Embankment	1 in 3 months	Observation	
Vehicle maintenance	Work camp	1 in 6 months	Record inspection	
Safety equipment availability	Project site	Once a year	Record inspection	
Informatory and safety sign	Settlement, school	1 in 3 months	Observation, Record inspection	
Socio - economic Parameters				
Number of construction workers	Project site	Thrice a year	Record, inquiry and Observation	Project / DoR
Percentage of local construction labours	Project site	Thrice a year	Record, inquiry and Observation	
Number of women employee	Project site	Thrice a year	Record, inquiry and Observation	
Number of outside labours and their dependent	Project site	Thrice a year	Record, inquiry and Observation	
Number of children employed	Project site	Thrice a year	Record, inquiry and Observation	
Number of tea stalls	Project site	Once a year	Observation	
Health and Sanitation facilities in camps & site office	Project site	Twice a year	Observation	
Number of children's of construction workers enrolled in the school	Project site	Once a year	School record	

Parameters	Location	Schedule	Method	Responsibility
Physical facilities in school and number of teachers	Project site	Once a year	School record	
Number of labor force using public water taps	Settlement	Twice a year	Inquiry	
Number of in-migration and out-migration	Project site	Once a year	Inquiry	
Type and number of accidents	Project site	Once a year	File record	
First aid and emergency services	Project site	Twice a year	Observation	
Public awareness	Settlement	Twice a year	Public Inquiry	
Operational Stage				
Change in the socio-economic condition of the local people	Project area	Once in three year	Study	Project

The proposed Environmental Unit will carry out the environmental monitoring works, not as a part of legal requirement, but as a commitment of the Proponent to mitigate environmental impacts to make the project environmentally sustainable.

7.4 DIRECTIVES AND CO-ORDINATION ASPECTS

Based on the existing legal regime on the environment, nature and size and also the location of the Project, the road will be constructed smoothly and will not require additional environmental directives.

The Proponent will co-ordinate with the concerned agencies, particularly with the local people to acquire the private land and properties. The Project will contact various agencies and establish function co-ordination with local and national level agencies.

7.3.1 Reporting Requirements

The Environmental Unit will prepare and disseminate through the Project the implementation status of the environmental protection measures and monitoring results quarterly during the construction period and bi-annually during the operational stage. The EU will also prepare the annual report annually and make necessary arrangement for public access on the environmental compliance report of the construction period so as to provide the concerned agencies, private sector and local people and opportunity to evaluate the environmental soundness of the Project. The report will basically focus on the implementation of the Project performance on environmental ground. The Project will also offer the environmental agencies and opportunity for review once the annual reports are prepared and made public on the compliance and monitoring of EPMs.

After the completion of the Project, the EU will prepare a report containing information on details of environmental compliance and monitoring results. Then an environmental impact report will be prepared and distributed to the concerned agencies. Furthermore, the Project will make necessary arrangement for environmental monitoring during its operation stage and make the report public.

7.5 ESTIMATED BUDGET FOR ENVIRONMENTAL MONITORING

The Project will allocate Environmental Monitoring cost for the Proponent. The Monitoring costs for 2-3 times per year at the construction site are divided as follows:

Environmental Management Expert	1.5month	@ Rs. 80,000pm	Rs. 120,000
Sociologist	1.0month	@ Rs. 60,000pm	Rs. 60,000
Logistics, Transport etc.	LS		Rs. 70,000
Total Costs for Environmental Monitoring Works			Rs. 250,000
Geo-Environment and Social Unit, DoR for Monitoring Works			Rs. 75,000
Ministry of Physical Planning and Works for Monitoring Works			Rs. 75,000
Total Estimate			Rs. 400,000

8 LEGISLATION, POLICIES, LAWS GUIDELINES, STANDARDS & INSTITUTIONS

8.0 BACKGROUND

This IEE has been prepared in accordance with GON requirements for the environmental assessment and management planning of the widening /upgrading road. 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.

8.1 CURRENT ENVIRONMENTAL POLICIES

GON has accorded high priority to the development of infrastructure, including road construction, in the current Tenth Plan (NPC, 2002). Environmental issues in Nepal are a prominent part of development projects. Inadequate terrain-specific and environmentally suitable road designs and construction practices have been recognized as causing high road rehabilitation and reconstruction costs. Recognizing this, GON has formulated a policy of internalizing environmental management in sectoral development projects and programs, including road construction. The proposed Project aims to achieve this by incorporating measures to avoid and mitigate potential impacts throughout the project's development phases (i.e. upgrading design, upgrading works and post-upgrading).

At present following Policy documents are relevant in this study.

- Policy Guidelines of Tenth Five year plan, GON, Planning Commission, 2002.
- National Transport Policy.
- EA Policy Document for the Road Sector, 2000.

8.2 CURRENT ENVIRONMENTAL LEGISLATION

The primary GON statutory of an IEE for the upgrading of the subject roads are the Environment Protection Act (EPA) 1997 and the Environment Protection Regulations 1997. The Regulations took effect on 26 June 1997, and supersede the 1993 National Environmental Impact Assessment Guidelines.

The Act and Regulations make public consultation a pre-requisite for all prescribed projects. This provision provides local people with the opportunity to voice their concerns and issues from the project scoping stage through to the approval of an IEE report.

At present the following act and regulations are relevant to this study.

- Environment Protection Act (EPA) 1997.
- Environment Protection Regulations 2054 (1997).

Under Section II Regulation 3 (relating to Appendix 1) of the Regulations, an IEE is required for the proposed road upgrading works.

8.3 RELEVANT LAWS

8.3.1 Environment Protection Act (EPA), 1997 and Environmental Protection Regulation (EPR), 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 MPPW of this Road and auditing by the Ministry of Environment, Science and Technology (MoEST) 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 Environment Protection Act (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.

8.3.2 Public Road Act 2031

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 (VDC or 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.

8.3.3 Forest Act, 1993 and its Rules 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 shall 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.

The DJJB Road Project does not pass through any forest so the Forest Act and its Rules are not attracted.

8.3.4 Labour Act, 1992

According to the Labour 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 shall also be made permanent under subsection (2).

Workers or employees engaged in any work as mentioned in subsection (3) shall 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 shall be employed in any establishment. 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.

The Labour Act shall be followed in all the works carried out under the Project.

8.3.5 Child Labour Prohibition and Regulation Act, 2000

Child Labour Prohibition and Regulation Act, 2000 was enacted in favour of the welfare of the Children's right. The section 3 of this acts facilitates the children to inborne rights. Hence the Act prohibits the organizations to involve the children under fourteen years of age to employ in the works. The Child Labour Prohibition Act and Regulation shall be followed in all the works carried out under the Project.

8.3.6 Land Acquisition Act, 1978

The Land Acquisition Act, 1978, has been enacted to integrate the laws for Acquisition of Land, 1962. The section 3 of the Act empowers the government to acquire land at any

place, for the purpose of public works by providing the required compensation to its owners. The Act obliges the government to consider the compensation for acquisition of land for the benefit of the local people.

8.3.7 Ancient Monument Act, 1957

The Ancient Monument Act, 1957, is enacted to integrate the conservation and protection of ancient monument and archeological properties. The section 3 of this Act obliges the government to identify the importance of the historical monuments, renovate those monuments and protect such places. Any works that attracts this Act shall be dealt accordingly to this Act.

8.4 RELEVANT CONVENTIONS

Although, Nepal is a Party to a number of environment-related conventions, the Project directly attracts none of such non-legally binding instruments for compliance. For example, the Plant Protection Agreement for Asia and the Pacific, Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Wetland of International Importance Especially as Waterfowl Habitat (Ramsar), International Tropical Timber Agreement, Agreement on Network of Aquaculture Centers in Asia and the Pacific, Framework Convention of Climate Change (FCC), and the Convention to Combat Desertification (CCD), to which Nepal is a Party, emphasize the natural resources management, and species conservation. It is not expected that any of the species, which are endangered and/or protected in Nepal will be affected by the construction of DJJB Project and also will not affect the natural resources of pristine characteristics. The Project will duly consider that least damage is done biological species along the road alignment, in case any endangered or rare or endemic or threatened species are noted to comply with Nepal's International obligations on natural resources and species conservation.

8.5 ENVIRONMENTAL GUIDELINES AND MANUALS

8.5.1 Environmental Guidelines

In order to integrate the environmental aspects in development projects and programs, GON has implemented some environmental guidelines. They are National EIA guidelines, 1993, and separate EIA guidelines for Forestry and Industry Sectors. Furthermore, GON has also implemented the Environmental Management Guidelines for roads since 1997.

These are the procedural environmental guideline and encourage the proponent to identify the likely impacts of the projects on the environment, propose mitigation measures, and monitoring and evaluation system for making the project environmentally sound, economically feasible (less costly) and technically appropriate. These guidelines, including the Policy document for Road Sector, 2000, facilitate the proponents to prepare the environmental assessment reports. These guidelines have been thoroughly reviewed and all pertinent issues have been incorporated during the preparation of this IEE report.

Furthermore, the DoR has issued the Environmental Management Guidelines (EMG), 1997 to integrate environmental aspects in the road projects. The EMG provides guidance to the proponent to integrate environmental mitigation measures, particularly on the management of quarries, borrow pits, stockpiling of materials and spoil disposal, camps operation, earthworks and slopes stabilization, environmental pollution etc. The Environmental Guidelines for Local Development also encourages the proponent to incorporate environmental issues during the project design and implementation.

8.5.2 Manuals

The following manuals with their recent revisions were reviewed which were relevant the present study:

- Reference Manual for Environmental and Social Aspects of Integrated Road Development, Department of roads, 2003
- Road Side Bio-engineering Reference Manual and Site hand book, Department of Roads, June 1999
- Standard Guidelines for Roads Construction and Maintenance, Department of Roads.
- Standard Specification for Roads and Bridge Works, Road Department, Ministry of Works and Transport, GON, July 2001
- Vegetation Structures for Stabilizing Highway Slopes, A Manual for Nepal, Department of Roads/ Overseas Development Administration, United Kingdom, March 1991

8.6 DEPARTMENT OF ROADS STANDARDS

DOR has issued several standards for the environmental management of road projects, including the EIA Guidelines for the Road Sector (1997), which was prepared under the broad framework of the National EIA Guidelines (1993). This publication sets out environmental assessment requirements for road construction and upgrading projects. Schedule 1 of these Guidelines, relating to the level of assessment required for different project types, is almost identical to the 1997 Environment Protection Regulations.

DOR has also issued the Environmental Management Guidelines (DOR, 1997) (EMG), which provide guidance to the Proponent on the integration of environmental mitigation measures into the project. This specifically deals with the management of quarries, borrow pits, material stockpiling and spoil disposal, camp operation, earthworks and slope stabilization, and environmental pollution. It is the main set of operational guidelines that must be complied with.

8.7 RELEVANT INSTITUTIONS

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.

8.7.1 Local Level Institutions

Services such as educational and health institutions, irrigation and drinking water facilities, which may have likely impact by the Project activities.

8.7.2 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.

8.7.3 District Development Committees

The District Development Committee of Dhanusha and Mahottari could facilitate in obtaining local people's support and educating the local people on the importance of this strategic road network. These Committees can also coordinate with district level development activities/agencies and advise the concerned municipalities / VDCs in assisting project activities.

8.7.4 District Level Development Agencies

The District Administration Office will be directly involved in land and property acquisition and compensation issues, if such issues arise. The Chief District Office (CDO) can facilitate this process as a chairperson of the Compensation Determination Committee. The CDO can also instruct the district level organizations to assist the project activities.

The District Forest Office (DFO) can assist the Project in felling down the trees to clear the road alignment, and to stockpile and sell the forest products, if required. The District Land Revenue Office can facilitate in transferring the land ownership if needed, once the proponent compensates the privately owned land and properties.

8.7.5 Central Level Institutions

Department of Roads

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 IEE report, it will be reviewed by Geo-Environmental and Social Unit (GESU) and forwarded to the Ministry of Physical Planning and Works 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.

Ministry of Physical Planning and Works

The Ministry of Physical Planning and Works 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 IEE 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.

Ministry of Forests and Soil Conservation

There are few trees required to remove along the road alignment. Co-ordination with DFO is necessary to fell down and use of these tree products. Once the District Forest Office forwards the request to through the Department of Forests, this Ministry may promptly give assent for the use of such tree product. The Ministry is empowered through the forestry laws to issue permission to cut required trees as a part of site clearance for the road project.

Ministry of Environment, Science and Technology

The Ministry may be 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.

9 CONCLUSIONS AND RECOMMENDATION

9.1 CONCLUSION

The Dhalkebar–Janakpur–Bhitthamod, 42.94 Km long road widening / upgrading from existing one lane to two lanes has been planned to accommodate a smooth uninterrupted traffic flow and to increase the transactions of goods between Southern parts of Nepal and Indo – Nepal Boarder. The proposed widening will be done within existing 50 m ROW and hence acquisition of new land is not necessary.

This Initial Environmental Examination (IEE) has assessed the potential environmental impacts of the proposed road widening/upgrading works. The proposed project does not pose any significant negative impacts on Physical environment. The minor impacts on surface water and natural drainage hydrology, disturbances to existing landscapes can be contained and mitigated through bio-engineering measures. The effect on the Biological environment is also minimal since the project does not endanger, disrupt or interfere with wild lives, endangered species of animals and plants. The road widening will not need to cut trees that are planted along both sides of the road except one tree in Pipra VDC. The biotic river environment also does not cause major negative impact due to the project.

The adverse impacts on social and socio economic life are also expected to be minimal. No additional land is required to be acquired, and no private structures need to be dismantled.

In order to minimize adverse environmental impacts, the project will implement a number of mitigation measures. They are related to bio-engineering treatments for road slope stabilization, drainage outlet management and restoration of infrastructure facilities. The project will also treat the landscape, dispose the construction material safely and erect informatory signs, to mitigate impacts likely to occur on the physical resources. Replanting of trees and maintaining green belts shall improve the biological environment along the road. To acquire the private properties for the project, compensation, readjustment and resettlement plan should be carefully worked out prior to project initiation.

In order to ensure the implementation of these environmental protection measures, an Environmental Management Plan (EMP) has been prepared, which includes 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 estimated cost for plan implementation.

9.2 RECOMMENDATION

Present study found very minimum adverse affect hence this IEE study is sufficient, no further more EIA study is necessary as per EPA 1997.

In view of the nature of the project and the impacts predicted, types of mitigation measures proposed and cost for environmental protection measures including monitoring works, this study recommends implementing this project.

The focus group meetings held gave a good opportunity to be familiar with the feelings and aspirations of the local people. Many of their concerns and demands related with the project are incorporated in this report. Two of their recommendations are: (1) The inundation problem near the Indo-Nepal border needs to be studied in detail and its mitigative plans implemented prior to road widening at that section (2) provide a strong commitment to manage, monitor and enforce the adverse impacts mitigative measures so that the road widening/upgrading will be beneficial to the people of this communities and will be conducive to the development of socio-economic activities within the area.

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Summary of Suggestions and Recommendations received from General Public during Field Visits in December 2006.

	Issues raised	Action Taken
1	Project should maintain afforestation along ROW	Recommended in Report
2	Need to construct 2 culverts at Vishwokarma Chowk	Recommended in Report
3	Use and employ local resources	Recommended in Report
4	Timely completion of Aurahi Bridge	Included in Report
5	Employ local manpower	Recommended in Report
6	Alter Road Name to "Dhalkebar – Janakpur – Maliwada Road"	Highlighted in Report
7	Construct Entry Gate at Maliwada Nepal - India Border	Mentioned during discussions
8	Acceptable proposal for shifting of boundary walls of custom office and temples	Recommended in Report
9	Enhance religious importance of Janakpurdham	Recommended in Report
10	Construct bus lay bys at different places and sufficient bus parks	Recommended in Report
11	Proper side-drain construction along the roads	Recommended in Report
12	Increase in agricultural products and social activity and public awareness	Recommended in Report
13	Proper compensation to affected houses / landlords if need to be acquired	Included in Report
14	Maintain green belts at both sides of the road	Recommended in Report
15	Earth for road widening to be brought from other higher places	Recommended in Report

METEOROLOGICAL RECORDS

Table Rainfall Data of Janakpur Airport

Location: **Janakpur Airport**

Latitude: 26°43' N

Index No.: 1111

Longitude: 85°58' E

District: **Dhanusa**

Elevation: 90m. masl

Month	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
January	9	33	12	11	0	5	3.2	45	22
February	21	3	1	10	0	16	0	12	22
March	7	0	4	41	0	0	1	0	36
April	0	1	109	63	24	82	11	50	71
May	21	14	98	22	187	158	187	234	130
June	324	309	362	190	453	560	276	260	853
July	231	551	574	823	448	285	434	735	447
August	551	254	329	712	345	258	316	100	239
September	85	80	130	104	164	201	267	152	108
October	19	116	6	67	220	19	280	4	70
November	28	0	0	13	0	0	0	0.2	0
December	11	0	33	0	0	0	0	0	12.2
Yearly	1307	1361	1657	2055	1841	1584	1775.2	1592.2	2010.2
Maximum	551	551	574	823	448	560	434	735	853
Average	108	113	138	171	153	132	148	133	167
Zero rainfall months	1	3	1	1	5	3	3	2	1

Climatological Data of Janakpur Airport

Index No.: 1111

Longitude: 85°22' E

District: Dhanusha

Elevation: 90m. masl

Year	Mean Air Temp (°C)			Absolute Extreme (°C)		Relative Humidity Observed At		Precipitation mm
	Max	Min	Daily	Abs Max	Abs Min	8:40	17:40	
1985	30.6	18.3	24.4	40	5.0	81	75	1939
1986	30.6	19.0	24.9	39.4	5.5	76	69	1282
1987	30.6	19.6	25.1	41	2.0	79	71	2389
1988	30.8	19.8	25.3	39.5	5.5	79	72	2059
1989	30.4	18.7	24.6	42.2	5.0	75	64	1408
1990	30.1	19.4	24.8	37.4	5.0	79	69	1364
1991	30.6	19.3	25.0	39.0	6.0	76	64	1090
1992	30.8	19.2	25.0	42.0	3.8	73	60	1033
1993	30.4	19.2	24.8	37.4	5.5	71	61	1437
1994	31.1	19.7	25.4	41.2	7.0	72	61	1203
1995	30.7	19.9	25.3	42.2	3.5	76	63	1307
1996	31.0	19.8	25.4	40.0	8.0	71	62	1361
1997	30.1	19.0	24.6	40.0	5.5	73	63	1657
1998	30.3	20.4	25.3	42.4	6.5	73	66	2055
1999	30.7	20.2	25.5	40.4	6.5	74	61	1841
2000	29.9	19.5	24.7	40.0	5.6	77	61	1584
Ave. Mean	30.54	19.44	25.01	40.26	5.37	75.31	65.13	1593

Source: Department of Hydrology and Meteorology

List of Persons consulted during Field Works:

Dhaklebar VDC

Siddhi Raj Shrestha	Secretary of Dhalkebar VDC
Ram Dayal Mishra	Head master
Ram Karan Mahato	Local man
Ram Dular Mahato	VDC staff
Arjun Mahato	Local man
Rakesh K. Singh	Local man
Som Sharma	Political activist
Upendra Mahato	Hotel owner
Krishna Maya Gurung	Hotel owner
Jagdish Mahato	Ex-VDC chairperson of Dhalkebar VDC

Nakatajhig VDC

Ramprit Mandal	President Laxmi Youth Club Naktajhig
Ganesh Dev Joshi	Staff of Agriculture Development Plan, Naktajhig
Subarna Mahato	Farmer
Ramchandra Mahato	Political activist
Jug jeeban Mahato	Chairman, school management committee
Laxman Chaudhary	Farmer
Nawal Kishor Mahato	Health worker
Dharmanath Mahato	Road neighbor
Som Sharma	Teacher
Sunil Kumar Jha	Secretary Nakatajhig VDC

Sakhuwa Mahendranagar VDC

Ganesh Giri	Local businessperson
Mahendra Shah	Local political activist
Ramchandra Shah	Road neighbor
Ramu Giri	Tea shop owner
Dhaneshwor Yadav	Secretary, Sakhuwa VDC
Ramchandra Giri	Bus driver
Saroj Yadav	Political activist
Ram Kishan Yadav	Local farmer
Sudhan Chaudhary	Local businessman
Sita Ram Chaudhary	Farmer

Ramdaiya Bhawadi VDC

Kebal kanta Jha	Secretary, Ramdaiya VDC
Shree Ram Pandit	Farmer
Amosh Kumar Karma	Student
Chaudhary Mahato	Teacher
Shree Narayan Jha	Political activist
Prit Mandal	Political activist
Amir Pasawan	Road neighbor
Nara k. Mandal	Farmer
Arbinda Thakur	Businessman

Sapahi VDC

Saroj Mishra	Secretary, Sapahi VDC
Surya Narayan Yadav	Head Master, B.P. Koirala Secondary School
Shrawan Jha	Teacher, B.P. Koirala Secondary School
Anil K. Miahra	Teacher, B.P. Koirala Secondary School

Sita Chaudhary	Teacher, B.P. Koirala Secondary School
Saroj Mishra	Local businessman
Manoj Mandal	Political activist

Laxmipur Bagewa

Umesh Chaudhary	Secretary, Laxmipur Bagewa
Sankar Yadav	Road neighbor
Ram Dayal Mishra	Businessman
Karna Mahato	Political activist
Bimal K. Jha	Local resident
Chandreshwor Jha	Political activist
Deepak Mandal	Student
Hari Shankar Mishra	Teacher

Sinur Jhoda

Ram Lakhan Mahato	Secretary, Sinur Jhoda VDC
Krishna Dev Yahav	Teacher
Pramesh K. Karna	Local businessman
Akhlesh Yadav	Local businessman
Devnanda Jha	Road neighbor
Harish Pasawan	Farmer

Janakpur Municipality

Hari Ram Pandey	Acting LDO, Dhanusa District
Sambhu Mishra	Engineer, District Technical Office
Viswo Nath Yadav	Staff DDC
Birendra K Yadav	Engineer, Janakpur Municipality
Jib Chha Shah	DDC staff
Hai narayan Yadav	Local resident
Mukesh K Yadav	Lecturer, R.R. Multiple campus
Pramesh K. Jha	NGO worker
Raj K.Mahato	Police Inspector
Vishow Nath Yadav	Local resident
Ramesh Thakur	Student
Binhan Thakur	Local businessman
Uttam Hamal	Student
Kanak Bhusan Subedi	Administrator, Janki Medical College
Sarbendra Jha	Political activist
Ramesh Adhikari	Bank staff

Binhi VDC

Rishi Raj Kafle	Secretary, Binhi VDC
Dinesh Chaudhary	Assistant accountant, Binhi VDC
Sanjay Thakur	Local resident
Pitamber Sharma	Teashop owner
Arbinda Thakur	Local businessman

Sahodawa VDC

Dhruba Dev Jha	Secretary, Sahodawa VDC
Binod Mishra	Local resident
Kamalesh Thakur	Road neighbor
Rajani Shah	Teacher
Agni Kumar Mahato	Businessman

Pipra VDC

Bijaya Shah	Ex VDC vice chairman, Pirara VDC
Shiva Chandra Shah	Secretary, Pipra VDC
Binaya Jha	Local resident
Bharat K. Shah	Businessman
Ajaya Pasawan	Farmer
Sudip K. Thakur	Serviceman

Mahottari VDC

Ram Binaya Pandey	Secretary, Mahottari VDC
Manoj Thakur	Local resident
Laxmi Mishra	Teacher
Ramesh Shankar Jha	Local businessman
Tulsi Adhikari	Teacher

Parkauli VDC

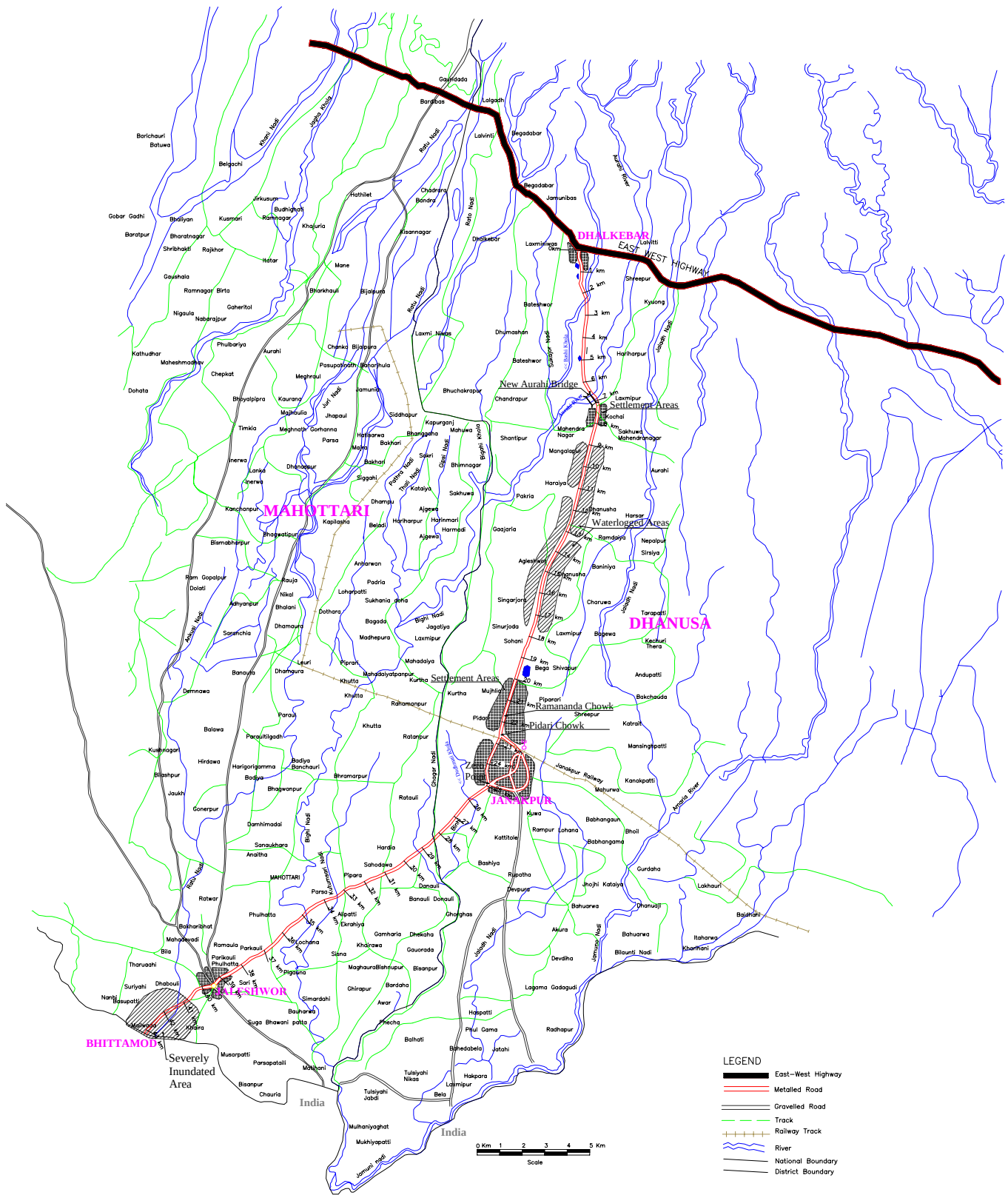
Ram Pravesh Mishra	Secretary, Parkauli VDC
Parama Nath Thakur	Road neighbor
Shiva Ji Jha	NGO worker
Sundar Jha	Teacher
Man Bahadur Tamang	Farmer
Bhishnu Dhungana	Serviceman
Som Pd. Pandey	Teacher
Deepak Mishra	Student

Jaleshwore Municipality

Bhabanath Khatiwada	Executive Officer, Jaleshwor municipality
Shambu Pd. Luitel	LDO Mahottari
Bajranga Nepali	District secretary, Nepali Congress
Bijaya K. Gupta	Social Development officer, Jaleshwor municipality
Ishwor Narayan Pandey	Social activist
Hari Raj Gautam	Officer, Custom Office
Ramesh Katuwal	Police
Subista Tamang	Police
Lakhindar Kapar	Road neighbor
Dhurba Mishra	Farmer
Bashir Anshari	Farmer
Vishwo Nath Yadav	Police-sub inspector
Devendra Pandey	Social worker

ANNEX - 1

MAPS



ANNEX - 2

PHOTOGRAPHS



Photo 01: Dhalebar Chowk



Photo 02: Road Condition at Naktajij VDC



Photo 03: Dhalebar Chowk



Photo 04: Collapsed Bridge at Aurahi River



Photo 05: Road Condition at Janakpur



Photo 06: Zero Point Chowk, Janakpur



Photo 07: Road Condition at Janakpur



Photo 08: Bazaar Area at Janakpur