Environmental Assessment Report

Initial Environmental Examination for Bhairawaha Bypass Road
Project Number: 44143
August 2010

NEP: Subregional Transport Enhancement Project

Prepared by Department of Roads, Ministry of Physical Planning and Works for the Asian Development Bank (ADB).

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Acronyms

ADB	Asian Development Bank
amsl	Above mean sea level
BBY	Bhairahawa Bypass Road
CBO	Community Based Organization
CBOs	Community Based Organizations
CDC	Compensation Determination Committee
CFC	Community Forest Committee
CFUG	Community Forest Users Group
CITES	Convention on International Trade in Endangered Species
dB	Decibel
DBST	Double Bituminous Surface Treatment
DDC	District Development Committee
DDP	District Development Profile
DFO	District Forest Office
DHM	Department of Hydrology & Meteorology
DOR	Department of Roads
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Act
EPR	Environmental Protection Rules
ESA	Equivalent Standard Axle
GESU	Geo-Environment and Social Unit
GoN	Government of Nepal
ha	hectare
HH	Household
IEE	Initial Environmental Examination
LCF	Local Consultative Forum
LFB	Local Forums of Beneficiaries
m	meter
MOE	Ministry of Environment
MPPW	Ministry of Physical Planning and Works
NGO	Non-Governmental Organization
NRs	Nepali Rupees
NTFP	Non-Timber Forest Product
PAPs	Project Affected Peoples
PWD	Public Works Directives
RCSP1	Road Connectivity Sector I Project
RMP	Road Master Plan
ROW	Right of Way
SBST	Single Bituminous Surface Treatment
SPAPs	Severely Project Affected Peoples
SRN	Strategic Road Network
STDs	Sexually Transmitted Diseases
TESU	Traffic Engineering and Safety Unit
TOR	Terms of Reference
VCDP	Vulnerable Community Development Plan
VDC	Village Development Committee
3R	Recycle, Re-use and Reduce

I. NAME AND ADDRESS OF THE INSTITUTION PREPARING THE REPORT

A. Name of the Proposal

1. Name of the Proposal is ''*Initial Environmental Examination of Bhairahawa Bypass (BBY) Road Construction Works in Rupandehi District, Lumbini Zone, Western Development Region of Nepal*.

B. Name and Address of the Proponent

2. The Proponent is the Ministry of Physical Planning and Works, Department of Roads, Project Directorate (ADB). The Department of Roads (DoR) is the leading agency for road development under Ministry of Physical Planning and Works (MPPW) and is responsible for translating government policies for the road sub-sector into the provision of services. The services it provides include planning, design, construction and maintenance of the Strategic Road Network, and provisions to ensure a reasonable level of service for all road users. The name and address of the Proponent is presented hereunder.

RCS1P, Subregional Transport Enhancement Project (VO4)

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Ministry of Physical Planning and Works
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II. EXECUTIVE SUMMARY

A. Objective of the Proposal

3. The objective of the proposal is to construct Bhairahawa Bypass (BBY) Road following the design standards developed for Feeder Roads by the Department of Roads (DoR). The BBY is also referred to as the Belahiya-Basantapur Road constituting new alignment of 3.34 km. The upgrading of the Bhairahawa-Parasi-Bumahi road has been subject to full economic feasibility and environmental studies as part of preparation of Sub-regional Transport Facilitation Project. The BBY Project is intended to complement this, by providing a new route that will enable traffic from the ICD to reach the Bhairahawa-Parasi-Bhumahi road without needing to pass through the town of Bhairahawa. The road construction works include earthworks / embankment fills, cross drainages (slab and pipe culverts), gabion and masonry works, sub-base and base laying, Bituminous pavement (DBST), river training works on small streams, plantation of road side avenue trees, and bio engineering (seed sowing) on embanked slopes. The Subproject after completion will result in a two-lane, DBST surfaced road.

B. Relevance of the Proposal

4. The subproject was classified as Category-B as provided in the ADB Safeguard Policy Statement (2009) based on screening of likely impacts and subproject location which does not pass through or located near any national park, wildlife sanctuary, reserved forests, or any other ecologically sensitive or protected areas. No archaeological/protected monument is located in the project vicinity. An IEE study is required as referred to ADB Environmental Screening Checklist and the Environmental Classification presented in **Annex 1** of this report.

5. An IEE study has been carried out for upgrading of Bhairahawa-Parasi-Bhumahi road as per GoN EPA and EPR. The proposed BBY road is considered to be within the influence area of Bhairahawa-Parasi-Bhumahi road. A full Land Acquisition and Resettlment Plan (LARP) have been prepared which will be updated and implemented accordingly. Thus, the background data from IEE study of Bhairahawa-Parasi-Bhumahi road has also been used where applicable while preparing this stand-alone IEE document for BBY road to comply with ADB requirements.

C. Anticipated Impacts by the Proposed Subproject

6. The proposed road passes through cultivated, barren and pasture land. A total of 9.1124 ha of land have to be acquired for the construction of 3.34 km new road. Besides, the impacts associated with the raised embankment are likely to alter the land use pattern of the subproject.

7. Some of the beneficial impacts will be on human life, income generation from employment during the construction phase and increased income from easy access for selling of agricultural products during operational phase. Most importantly, the bypass road will provide direct access from ICD to the east west highway minimizing congestion at the Bhairahawa – Parasi intersection and will reduce costs, travel times and processing times for cross border commercial traffic. Reduced costs of access to and from the border and reduced custom clearance times in turn will reduce the cost of import and export thereby enhancing profitability of export industries in Nepal.

8. Potential adverse impacts due to the proposed subproject are disfiguration of landscape by road embankments, fills and quarries, acquisition of land for roadway

construction. Alteration of surface water hydrology of waterways crossed by roads could result in increased sediment in streams affected by increased soil erosion at construction site if design is inappropriate. Water pollution could result from waste disposal and stockpiling of construction materials if not properly managed. Air pollution due to dust particles and vehicle emissions, pollution of water, poor sanitation, work site accidents, social conflicts and other pressures on the local communities are the possible impacts during construction. During the operation stage, soil erosion on embanked slopes during monsoon rain could occur. Cross drains may cause erosion of adjacent agricultural fields during the monsoon period if not maintained properly. The identified impacts are temporary associated with construction phase which can be mitigated. Adequate cross-drainage structures are provisioned in the design to avoid alteration of surface water hydrology by maintaining flow and course of stream, nala and small irrigation ditch. The mitigation measures such as bio-engineering (seed sowing) for stabilization of embanked slopes and the restoration of the visual environment, road safety and occupational safety and hazards mitigation will be included in the detailed design. Mitigation measures for sanitation and health, pollution control, construction hazards and social and economic impacts are recommended and will be implemented during the subproject implementation.

D. Recommended Actions

9. This initial environmental examination (IEE) ascertains that the subproject is unlikely to cause any significant environmental impacts. Few impacts are attributable to the proposed subproject, all of which are localized and temporary in nature and can be easily mitigated with minor to negligible residual impacts. No additional studies or need of undertaking detailed EIA is envisaged at this stage.

III. DESCRIPTION OF THE PROJECT AND SUBPROJECT

C. The Project

10. The proposed loan and grant (the Project) will improve the country's road network totaling about 195 km, (i) providing north-south link of the country's north eastern region to the east-west highway (EWH); and (ii) improving major international trade corridors in the country in conjunction with customs systems enhancement. The capacity of road sector and customs institutions will also be strengthened. The project will expand connectivity with remote areas and enhance the capacity of major international trade corridors to develop economy of project areas as well as integrate the project areas more effectively with their primary markets in India, and further to third countries, by enhancing the capacity of roads and customs clearance.

D. Rationale

11. Nepal's transport infrastructure mainly consists of roads and civil aviation. Roads carry about 90% of all passengers and freight within the country. The road network has been expanded by 15% in the past 5 years from 17,182km in 2003/04 to 19,758km in 2008/09. However, Nepal continues to lag behind its neighbors in road infrastructure, with an estimated road network of low density at 0.7km per 1,000 people compared with 6.5km in Bhutan, 4.7km in Sri Lanka, 3.0km in India, 1.9km in Bangladesh, and 1.7km in Pakistan. In some parts of the country, there is no provision of road transport at all and 6 district headquarters in the hill and mountain areas remain without road access. In others, there is only partial access because of seasonal road closures and limitations on the vehicle types that can operate. This limits access of many communities in Nepal to national and regional markets.

12. Nepal's economy highly relies on foreign trades. The ratio of total trades to GDP is about 50%. While GDP growth between 2001/02 and 2008/09 is about 4%, the growth in exports and imports is about 5%. Trade taxes are some of the major sources of government revenue in Nepal, e.g., about 22% of the total government revenue in 2005. Nepal needs to improve its transport network and transit logistics not only to integrate the remote areas of the country, but also to provide enabling environment for integrating the country into the regional and global market. SAARC[1] Regional Multimodal Transport Study (SRMTS)[2] identified priority transport corridors among SAARC countries from the South Asia regional perspective.

13. Poor connectivity is a major development constraint for Nepal. Inadequate feeder roads worsen the isolation of remote rural areas, mostly in northern hilly regions. These remote areas with high poverty incidence are required to be linked to markets in the country and further extended to those in neighboring countries. The north-south link could also be a potential transit route connecting India and PRC. In addition to the connectivity issue of remote hilly areas, there is also growing congestion at major international trade corridors, especially EWH and road sections around the borders due to rapid increase of vehicles in Terai areas. This congestion is due to low capacity and poor conditions of roads and limited capacity of customs clearance. The Government is required to expand connectivity of remote areas and, at the same time, to enhance capacity of major international trade

[1] South Asian Association for Regional Cooperation
[2] SAARC Secretariat. 2007. *Regional Multimodal Transport Study*. Kathmandu. (prepared under ADB RETA 6187: Promoting South Asian Regional Economic Cooperation)

corridors including EWH and border roads, and customs systems. To address these constraints, the Government developed and has been implementing the Priority Investment Plan (PIP 2007-2016) and the customs modernization plan.

14. The road sector development strategy under the Nepal's Three Year Interim Plan (TYIP, 2007/08-2009/10) includes (i) improving roads for the development of the dense and border area settlements and for the increase to accessibility to hitherto unserved remote areas with economic potential, and (ii) developing the east-west highway as the Asian Highway and the regional trade route in accordance with the concept of developing road networks for promoting South Asian regional development. The strategy provides adoption of the planned road asset management system for sustainable, reliable and safe road transport operations by preserving the existing road asset through prioritized implementation of repair, maintenance, rehabilitation and reconstruction of roads and bridges.

15. Project roads include: (i) the Salleri-Okhaldhunga and (ii) Okhaldhunga -Harkapur roads (100 km), which provides the remote north-eastern hilly areas with a north-south connection to EWH and further south to the Siraha border; (iii) the Khadbari-Chainpur road (44 km), which provides one of the unconnected district headquarters with a motorable road, and will make a planned north-south transit route connecting India at the Bitranagar border point and PRC at the KImathanka border; (iv) the Bhairahawa bypass (3.5 km), part of SAARC Road Corridors 10, connecting Kathmandu with Lucknow in India, which also complements India's ongoing Integrated Customs Posts Program; and (v) the Belbari-Chauharwa road (47 km), which is along EWH around border areas and part of the SAARC Road Corridor 4, facilitating subregional traffic through its Kakarvitta border post and India, to Bangladesh. Project roads have been selected based on environment, resettlement, social and economic impacts; and project readiness. The capacity enhancement of trade facilitation will also help reduce congestion of border areas by further speeding up clearance by using information technology and reducing and simplifying customs documentation and procedures.

16. The project will support government’s development in addressing the two issues: expand connectivity with remote areas and enhance the capacity of major international trade corridors. It will develop economy of project areas as well as integrate the project areas more effectively with their primary markets in India, and further to third countries, by enhancing the capacity of roads and customs clearance. The Project is relevant to achieving results of the Country Strategy and Program (2010-2014), enhancing global-local connectivity to facilitate regionally balanced economic growth; as well as the Regional Cooperation Strategy and Programs (2006-2008), improving South Asia subregional connectivity and facilitating intraregional trade in South Asia. The Project is included in the Strategy and Program (2010-2014) and the Regional Cooperation Operation Business Plan (2009-2010) as a national project with regional implications.

17. The project has been designed in coordination with other development partners to ensure equitable geographic coverage and avoid overlaps, and continues ADB's consistent engagement to improve road connectivity and capacity, and facilitate cross-border traffic in parallel with capacity development support, including road safety, social aspects, overload control, road asset management. The project has substantially enhanced project readiness, e.g., ADB project appraisal on all project roads is based on detailed design prepared by the consultants engaged by the government.

E. The Subproject

1. Salient Features

• **Subproject**	Bhairahawa Bypass Road.
• **Development Region**	Western Development Region
• **District**	Rupandehi
• **Municipality / VDCs**	Siddharthanagar Municipality; Bagaha and Basantapur VDCs.
• **Total Length**	3.34km
• **Road Standard**	Feeder Road Standard of DOR
• **Right of Way**	30m (15m on both side of the center line of the road)
• **Formation Width**	13m
• **Surface Type**	All weather pavement sealed with DBST
• **Type of Work**	New Construction

2. Type of Goods to be Delivered

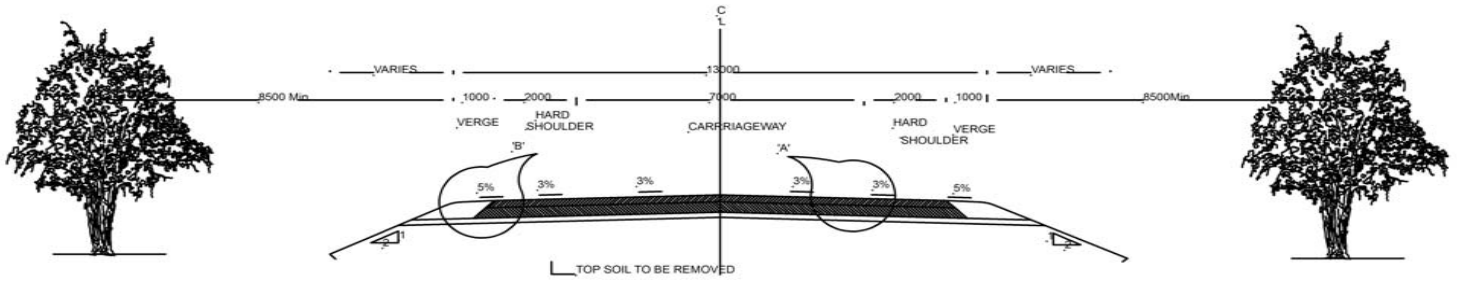
20. The final output of the Subproject is a finished, bituminous sealed, all weather road intended for completion of construction within eighteen (18) months.

3. Proposal's Capacity

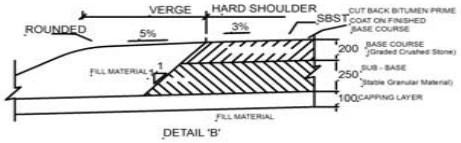
21. After construction activities, the road will be 13m wide with 7m carriageway, 2m hard shoulder and 1m verge on either side (***Refer road section in the next page***). The road is anticipated to serve traffic levels from 777 vehicles per day in 2012 (the year of opening) to 1327 vehicles per day after ten years. The cumulative ESA over 10 years for a double lane road is estimated at 6.27 million.

4. Materials to be Used

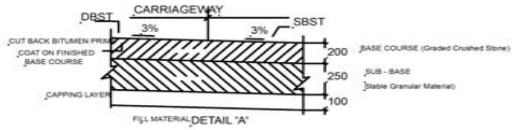
22. The major materials to be used in the Subproject works are presented in **Table 3.1**.



TYPICAL CROSS SECTION



DETAIL 'B'



DETAIL 'A'

NOTES:

1) All dimensions are in millimeters unless stated otherwise.

2) The carriageway crossfall of 3% shown is for normal cross-section.

Crossfall varies for superelevated cross- sections as indicated in the horizontal curve data and the road cross-section drawings.

3) Verge and embanked slope to be seeded.

Table III.1 Summary of Estimated Quantities of Materials

Item Description	Unit	Quantity
Earthwork Excavation	cu.m.	1,413
Earthwork in filling for Road Embankment	cu.m.	42,199
Boulders for soling, random rubble masonry, dry rubble masonry and gabion boxes.	cu.m.	4,429
Concrete M10/40	cu.m.	74
Concrete M15/20	cu.m.	42
Concrete class M25/20	cu.m.	49
Gravel as filter material	cu.m.	74
Slab Culvert	RM	20
Reinforced concrete pipe (NP3, 90Ø; NP2, 60Ø)	RM	195
Reinforcement steel	MT	8
Formwork materials	sq.m.	549
Gravel materials for sub base	cu.m.	15,526
Base materials	cu.m.	8,244
Bitumen for DBST	lit	85,445
Aggregates for DBST (20mm & 14mm)	MT	1556

Source: Detail Design and Cost Estimate.

5. Energy Used

23. The energy required for the construction works will be basically fossil fuel. The laborers at the camps will need kerosene or gas for cooking purposes. Bitumen will be heated by using kerosene. The use of forest wood for heating and cooking will be strictly prohibited. Vehicles will use diesel or petrol supplied by the contractor and as the project is near around Siddhartha Municipality and Butwal Municipality, the pressure on local fuel demand will be negligible considering the small scale of project works.

6. Details of the Technology

24. Mechanized methods for specialized works will be employed, such as for crushed aggregate, sub-base and base course spreading, compacting, and finishing pavement surface with a bituminous seal. Labour - intensive methods could be used for other works such as bio-engineering (seed sowing) that can be done manually, small earthworks, constructing drains and retaining structures etc. Local people will be given priority for works according to their skill and qualification.

7. Manpower Requirement

25. The anticipated work force required for the Subproject is 10,600 person-days for skilled and 25,400 person-days for unskilled labourers respectively. The unskilled labour should primarily be recruited from among the local communities where available, giving due preference to disadvantaged groups and women.

8. Resources Required for the Implementation of the Proposal

26. The total construction cost needed for this Subproject is estimated to be NRs 178 million including VAT & contingencies (as per preliminary design assessment). The land acquisition, resettlement and compensation cost as per RAP is estimated at NRs. 71,518,700.00 as per market rate for 9.1124 ha of land which will be borne by GoN, DoR

IV. DESCRIPTION OF THE ENVIRONMENT

27. This section describes the Physical, Biological, Socioeconomic and Cultural environment of the Subproject area. The information provided in this section is based on (i) primary field studies conducted by the Consultants' Team, (ii) Public Consultation (Interaction with Stakeholders) undertaken by the Consultants and (iii) Secondary data on bio-physical, ecological, social and other relevant information. For background details, reference is also made to the IEE study of Bhairahawa-Parasi-Bhumahi Road.

A. Physical Environment

1. Alignment

28. The proposed alignment starts from Belahiya (km 0+000) of Sidhartha Municipality, crosses Bhairahawa – Sunauli highway at km 0+130 and Belahiya – Bandargah road at km 0+900 and there after traverses through Bagaha VDC (km 1+030) near Dolpur village and ends at Basantapur VDC (km 3+340) where it meets Bhairahawa – Parasi – Bhumahi road. Initially the alighment heads eatward up to km 0+500 and then runs along north-east direction. Majority of the alighment passess through cultivated land with occasional barren and pasture land. The alignment will require minor vegetation clearance at km 1+030.

29. Minor nala (stream) crossing was noted at km 1+030 and km 1+630 where slab culverts has been proposed in the design to maintain its flow and course for its draining out to Danda Nala and finally to India.

2. Geography, Topography and Land Use

30. Geographically the project area lies in Siddhartha Municipality, Bagaha and Basantapur VDCs of Rupandehi District belonging to Lumbini Zone of Western Development Region of Nepal. The location map and road alignment map is shown in **Fig. 4.1** and **Fig. 4.2.**

Figure 4.1 Project Location Map

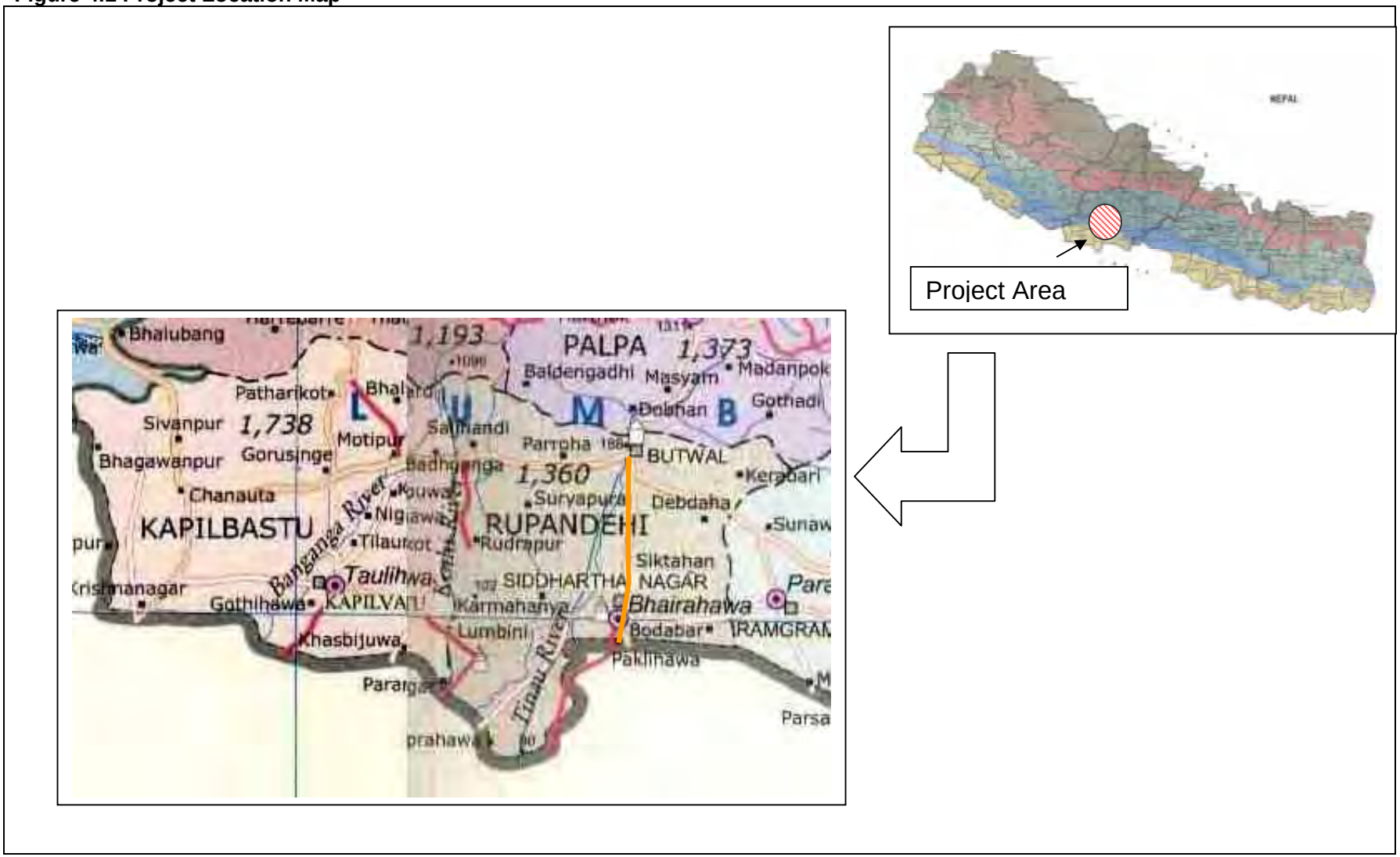


Figure 4.2: Road Alignment Map of Belahiya – Basantapur Road

31. The project area lies within Nepal's Terai region, which lies across the southern belt of the country below altitude of 500m and is primarily flat with fertile agricultural land. Using professional judgment, land use type along the project alignment can be classified as agricultural land (99.6%), rivers and riverbeds (0.1%), settlements and infrastructure (0.2%) and vegetative cover (0.1%).

32. The alignment topo map presented in **Figure 3.2** entails that there is no built up area within the proposed alignment and it passes through the plain agricultural terrain of Terai with no soil erosion problem noted within the subproject area.

3. Existing Services

33. Since the subproject is new construction of 3.34km bypass, there is no major existing services along the alignment that will need reinstatement/relocation except for electrical Transformer at km 0+140 and small irrigation ditch at km 0+700. Road side parking area under construction was noted besides the starting point of BBY. The parking area in future will facilitate vehicles for custom clearance and the subproject development will provide direct link to Bhairahawa-Parasi-Bhumahi road without needing it to pass through the town of Bhairahawa.

4. Geology and Soil

34. The project area consists of alluvial soil of Terai belt composed with fine sand, silty or clayey medium to fine sand.

5. Climate and Rainfall

35. The climate of the subproject area is sub tropical with average precipitation of 1504 mm with maximum 24 hrs rainfall of 100 mm recorded during the month of June in the year 2000. The mean maximum and minimum temperature of the project area is 30.4ºC and 18.5 ºC with absolute extreme of 40.1ºC and 4.8ºC recorded during April and January respectively. *(Source: District Development Profile, 2004)*

6. Material Sources

36. Availability of materials for construction within economical distances and their suitability for different use were investigated. During field survey, quarry sites for boulder, cobble, gravel and sand were identified. The most economic, potential and promising site which may not require significant compensation and impart less environmental degrading effects during excavation to the surroundings is noted to be the alluvium deposits of Tinau River that drains out to India parallel to Butwal-Bhairahawa-Belahiya highway on the western side. These deposits can be used as a good embankment fill, sub-grade, sub-base, base and chipping materials.

7. Hydrology

37. Rivers in Nepal fall primarily into three categories, characterized primarily by origin. Large perennial rivers that originate in the Himalayas and carry year-round snow-fed flows;

medium rivers originate in the middle hills and are perennial but have wide seasonal fluctuations; and a large number of small rivers in the Terai which originate from the southern lower hill range, and are seasonal with little or no flow during the dry season. Rivers in the project alignment are of the latter category. Minor nala (stream) crossing was noted at km 1+030 and km 1+630 including small irrigation ditch at km 0+700. The streams drains out to Danda Nala and finally to India. Groundwater also forms alternative source of drinking and household water for the subproject area.

8. Air, Water and Noise Quality

38. Air, Water and Noise pollution continually takes place on the Terai, caused by both Industrial and Vehicular emissions. Localized concentration can be noted within Siddhartha Municipality where frequent traffic congestion occurs. Generally air, water and noise quality is observed to be normal along the alignment where presently agricultural field exists with minor dust nuisance from agricultural activity and vehicles passing through nearby village roads. No external sources were noted that would lead to water pollution.

B. Biological Environment

1. Conservation Status

39. The proposed project development site is not a designated site of nature conservation interest and there are no other such ecologically important sites in the project area.

2. Forest and Vegetation

40. The original forest cover has been completely removed. Land along the proposed alignment consists mainly of farmland. Small clusters of mixed standup bamboo clumps, sissam, fruit (guava), and kadam trees were noted at km 1+030 where small nala (stream) exists. However, sisso is the predominant species of the surrounding project area followed by planted fruit trees that include Mango, Banana, Bamboo grooves, and palm trees. These somewhat supports fragmentation of the landscape and will not be affected by the construction of the road.

41. Virtually the alignment section is free from any of the Community Forest and other forest type of National significance.

3. Wildlife

42. The subproject forms a peri urban area and the habitat is disturbed with increasing settlements. Virtually no wildlife and wild animals of significance were noted within the subproject area.

4. Non Timber Forest Product (NTFP)

43. The small clusters of vegetation noted at km 1+030 basically do not possess any significant NTFP species. Further, the subproject area is free of any protected species.

5. Fish and Other Aquatic Animals

44. Occasional ponds and seasonal streams provide aquatic habitats in which small fish, frogs and a range of invertebrates are invariably found. It is likely that surface water flows in the wet season are important for the distribution of aquatic organisms.

C. Socioeconomic and Cultural Environment

45. The baseline socioeconomic and cultural environment of the subproject area is as follows:

1. Demography

46. The road alignment basically adjoins farmland with few land of commercial value. These will require acquisition according to a resettlement plan that has already been prepared by DoR in March 2010. The resettlement plan is under the process of updating.

47. The population distribution in different municipality and VDCs of the Subproject area are given in the Table below.

Table 3.2: Population Distribution in different Municipality and VDCs

Name of VDC / Municipality	2001 Census Data				
	Avg. H/H size	Total No. of H/H	Total Population	Male	Female
Siddharthanagar Municipality	5.58	9,419	52,569	26,634	25,635
Bagaha VDC	8.38	576	4,828	2,509	2,319
Basantapur VDC	7.01	946	6,631	3,404	3,227

Source: District Development Profile, 2004

2. Ethnicity

48. The subproject area comprises ethnically heterogeneous community. The major ethnic groups in the suproject district are Brahmin (15.19%), Tharu (10.57%), Muslim (8.87%), Magar (8.79%), Yadav (7.69%) and Chhetri (5.81%) whereas Chamar/Harijan (3.91), Lodha (2.89%), Gurung (2.79%), Kurmi (2.2%), Newar (2.2%) and Kami (2.1%) are the minor ethnic groups. Similarly, major religion is Hindu (85.34%) followed by Boudha (5.64%), Islam (8.69%), Kirat (0.01%), Jain (0.01%), Christian (0.21%) and Sikh (0.04%).

3. Religious/Cultural and Ritual Sites

49. No major temples or religious sites are located near the subproject alignment.

4. Education and Health Facilities

50. The literacy rate of Siddharthanagar Municipality, Bagaha and Basantapur VDC's are 70.1%, 36.2% and 37.9% respectively. Siddharthanagar Municipality's literacy rate is well above the national literacy rate of 53 percent.

Table 3.3: Educational Institute in the District

Institution	Number
Pre-Primary School	135
Primary School	439
Lower Secondary School	178
Secondary School	122
Higher Secondary School	19
Campus	4

51. The statistics of the health facilities are shown in Table 3.4.

Table 3.4: No. of Health Centers in the District

Items	Number
Government Hospitals	2
Private Hospitals	2
Primary Health Care Centers	4
Health Post	7
Sub-Health Post	58
Clinic	233
Ayurvedic Aushadhalaya	5

5. Economic Activities

52. Agriculture is the mainstay of the people of the subproject route. Variety of food crops is grown. The cash and commercial crops are negligible. The main food crops include paddy, wheat, pulses, other cereals and vegetables. These products are extensively used for household consumption. Collectively, the household incomes have been reported higher than the national poverty line of about NRs. 7,600 per capita. Household industry also contributes towards employment generation, though the majority of workers are women.

53. Apart from agricultural activities, family members are engaged in other sources of income like working in industries, doing services etc. Most of households have small businesses. Rupandehi ranks 5th in human poverty, 2001. Human poverty index of Rupandehi was 29.2.

54. Slums, squatters / landless people, movable and temporary structures were not accounted along the proposed alignment.

6. Human and Economic Development, and Quality of Life Values

55. Nepal remains one of the least developed nations in the world, with a per capita income of US$ 241 in 2001 and 39% of the total population of 23.2 million people (2001 Census) are living below the poverty line. The country also ranks 129th among 174 countries in human development index, characterized by high infant mortality, low life expectancy, low adult literacy and nutrition levels.

56. The Terai has borne an increasing influx of migrants from hills, attracted by the relatively higher levels of employment. The development of urban and peri-urban areas remains largely unplanned, with inadequate areas of land set aside for functions such as sewage treatment, landfills and flood defense. Industries have been established usually alongside approach roads to the major towns and highways. These becomes the source for high levels of pollution, while little incentive has developed (wither market or Government

driven) to invest in cleaner industry processes. Continually expanding industrial, low cost and medium cost housing perpetuate general environmental degradation and aesthetic quality of the urban and peri-urban environment.

7. Transportation

57. The subproject area possesses reliable transport facility. The total road in Rupandehi District is 299.84km. Out of that, National Highway is 70.35km, Feeder road 22.78km, Minor Feeder road 5.71km, District road 126km and Urban road 75km. Gautam Buddha Airport is at Bhairahawa which is just near to the subproject site having about ten flights daily from Kathmandu.

8. Archeological and Historical Values

58. The subproject site does not possess archeological and historical values. However, some temples exist in the subproject area and people frequently visit these temples especially during important religious occasions.

9. Market Centre

59. The nearest market centre of the Subproject area is Bhairahawa and Butwal.

V. IMPACT OF THE IMPLEMENTATION OF THE PROPOSAL ON THE ENVIRONMENT

60. Identification and prediction of environmental impacts have been made for the proposed actions/activities of the Subproject during the construction and operation stages of the Subproject. Both beneficial and adverse impacts were analyzed.

61. Potential environmental impacts on Physical, Biological and Socioeconomic and cultural aspects are identified and predicted based on the existing environmental condition with respect to the proposed subproject interventions in terms of type of impact (direct/indirect), their magnitude (low/moderate/high), duration (short term/ medium term/long term), and extent (site specific/local/regional/global).

A. Beneficial Impacts

62. Beneficial impacts due to the implementation of the Proposal during construction and operation have been assessed and further enhancement measures are suggested. Local potential areas have been identified that can be promoted to enhance the local economy. They are related mainly to improving the livelihoods of the local / poor people. The likely beneficial impacts envisaged during construction and operation stages of the Proposal are:

1. Construction Stage

63. The proposed road passes through Siddhartha Municipality and Bagaha and Basantapur VDC providing easy access to nearby settlements as Chayanpur, Dolpur and Balapur. The construction works will provide different opportunities to the local people ranging from labouring to skilled work. There would also be spin-offs leading to improved farm and off-farm activities, which may ultimately benefit the local economy. The beneficial impacts of the suproject during the construction stage are summarized below.

Employment and Income

64. The first and foremost benefit that local people may expect from the construction works is employment. The construction works offer a wide range of works for unskilled, skilled and semi-skilled labourers. Local people would generate substantial incomes from unskilled and semi-skilled jobs. The amount of money that is injected in the peri-urban economy in the form of wage earnings will directly enhance the initiation of various ancillary economic activities and enterprise development. The impact is thus direct, of high significance, local but short term in nature. If the earned wage income is saved and utilized for micro-enterprises, benefits can be for long term duration.

Enterprise Development and Commercialization

65. Different types of commercial activities will come into operation in order to meet the demand of labour groups, construction crew and project team. In general, the enterprises will include food and tea shops, groceries, lodges and restaurants for serving large numbers of people. The demand for local products such as pulses, vegetables, fruits, etc. will rise during the construction period which may provide added drive for local production and marketing. This will contribute to the local economy and may help reduce peri-urban poverty. Such benefits may contribute to enterprise development which often continues to entrench beyond the construction period. This impact will be direct, of moderate significance, local and long-term in nature.

Skills Enhancement

66. The underlying policy of the labour intensive approach is to employ local specifically poor (unskilled) labour force, to the extent possible, for works that can be carried out

manually. This strategy not only provides employment opportunities for the local poor but also supports the transfer of skills and technical know-how while working in construction work such as masonry, gabion works and roadside plantation. This impact will be direct, of high significance, local and long-term in nature.

2. Operation Stage

67. A number of beneficial impacts of the Proposal are anticipated during the operational stage, some of which are indicated below:

Promotion of Green House Gas Reduction due to Newly Built Access

68. The proposed Feeder Road will offer easy, comfortable and quick access to traffic from the ICD to the east west highway that will reduce costs, travel times and processing times for cross border commercial traffic. Reduced costs of access to and from the border and reduced custom clearance times in turn will reduce the cost of import and export thereby enhancing profitability of export industries in Nepal. The local people will also be benefitted by the new access as their farm products will have easy access to market. The road will reduce traffic hazard that generally do occur at Bhairahawa thereby reducing vehicular emissions and will consequently increase fuel efficiency. This entails in reduction of CO_2 emissions. The newly proposed plantation of road side avenue trees will also add ground in natural consumption of CO_2 and emission of oxygen in the surrounding atmosphere. Though CO_2 emissions magnitude driven by transportation sector in Nepal is relatively insignificant, the newly built access itself will somehow be beneficial in fuel efficiency. This will be of direct, of high significance, regional and of long-term in nature.

Rise of Land Value

69. Road construction often leads to rise in land values along the road corridor. The agricultural land along the road alignment will turn into commercial land of higher value. Increased land values will enhance farmer's capability for borrowing loans on collaterals. Besides farming, this will provide them the opportunity to get involved in various enterprising activities that will enhance their livelihood. High value lands are easily acceptable to banks and micro-finance institutions to provide loans. This impact will be direct, of moderate significance, local and long-term in nature.

Increased Crop Productivity and Sale of Farm Products

70. The road will provide improved access to seeds, chemical fertilizer, irrigation, agriculture extension, new crop technologies and markets assisting in increased agriculture production and diversification. Agro-industries may be established in nearby areas based on local products such as raw materials. This will enhance economic activities within the area. Such impacts are direct, of moderate significance, regional in extent and of long-term in nature.

Enhancement of Social Services

71. Because of the easy access to transportation, other socioeconomic development activities including health, education, communication, market, etc will be increased. The operation of the road will also contribute to the increase in quality services in the social sector as more competent agencies and people will enter into the area to provide services. This will have indirect, of moderate significance, regional and long-term impact of the proposed Subproject.

Women Empowerment

72. Road transportation will strengthen women in particular while providing better access to schools, health centers, and markets. Women will also have direct access to women

development training institutions, offices, and various administrative line agencies located in the district headquarters. More frequent visits to such organizations due to newly built access will increase women's knowledge, awareness and confidence levels. The increase in number of NGOs/CBOs will be inevitable that focuses on women development and helps in addressing problems like HIV/AIDS, safe sex, safe motherhood, etc. The impacts are of indirect, of moderate significance, local to regional and long-term in nature.

B. Adverse Impacts

73. The Subproject activities during construction and in the operation of the road may create a number of adverse impacts on the local environment. These are discussed briefly in the following sub-sections.

1. Construction Stage

(i) Impact on Social, Economic and Cultural Environment

Table 5.1: Social, Socioeconomic and Cultural Environmental Issues and Impacts

Issues	Impacts	Direct/ Indirect	Extent	Duration	Magnitude	Initiation
Land acquisition and land use change	• Loss of land • Loss of agricultural production	D	Site	Long	H	C & O
Occupational Health and Safety, STDs and Nuisance from Construction Camps	• Health risks and hazards due to lack of adequate safety measures • Poor labour camp, unsafe water and unhygienic conditions • Health risks due to influx of outside and migrant labours • Inadequate living space for labourers	D	Local	Short	M	C
Pressure on Social Service Facilities	• Influx of outside workers exerting pressure on local services.	I	Local	Short	L	C & O
Conflict due to Influx of Construction Workers	• Spread of alcohol consumption & gambling • Potential for STD such as HIV/AIDS	D	Local	Short	L	C & O

Note:
D = Direct Impacts I = Indirect Impacts L = Low Impacts
M = Moderate Impacts H = High Impacts C = Construction Phase
O = Operation (commissioning) Phase

Land Acquisition and Land Use Change

74. The proposed subproject will require acquisition of 9.1124 ha of agricultural land. These includes around total of 180 plots. The land acquisition is estimated for full 30 m ROW. A total of 67 households and 595 populations are estimated to be affected including 319 male and 276 female. While finalizing the alignment, efforts have been made by adopting appropriate engineering designs and location specific measures to avoid the resettlement and impact on the properties and businesses. The bypass has avoided the acquisition of structural properties. The impact is loss of land together with crops and trees. Almost all of land owners possess extra lands apart from the affected ones. There is

therefore no serious problem of resettlement and relocation. Population and Family size of affected households are as follows:

Table 5.2: Family size of affected households

VDC/Municipality	HHS	Population of affected HH			Average Population Size
		Male	Female	Total	
Siddharthanagar Municipality	23	73	61	134	5.82
Bagaha VDC	28	172	153	325	11.6
Basantapur	16	74	62	136	8.5
Sub-total	**67**	**319**	**276**	**595**	**25.93**
Average					**8.8**

Source: Field Survey, 2008

75. Disfiguration of landscape and change in land use due to road embankments will be inevitable. Surface water run offs during monsoon may get affected due to new road construction. These impacts will be of direct, site specific, high in magnitude, and long-term in nature.

Occupational Health and Safety, STDs and Nuisance from Construction Camps

76. During the construction phase, the work personnel will be exposed to various health risks and hazards due to injuries to workers while working without adequate safety measures and equipment. Typical health hazards will be encountered during handling of hazardous materials, machinery movement, bitumen works etc. Other potential impacts to health are respiratory and eye diseases due to exposure to dust and emissions.

77. Health risks are commonly associated with poor labour camp conditions. Unsafe water sources and unhygienic conditions (lack of latrines and washing facilities) bear the risk of additional and often endemic diseases, such as dysentery, diarrhea, and cholera. Uncontrolled water logging and badly managed borrow pits bear the risks of spreading water borne diseases like malaria fever. Increase in STDs (HIV/AIDS), caused among others by the influx of outside and migrant labourers might pose health risks to the public. Inadequate living space and harassment may increase the stress levels for labourers, especially those who are recruited from outside the local communities. Most of the impacts related to this will be of direct, moderate significance, local and short-term in nature.

Pressure on Social Service Facilities

78. Influx of large numbers of construction crews will exert pressure on existing local social service facilities such as communication, water supply, solid waste management, health and medicine, transportation, etc. The suproject area being very near to Bhairahawa, where adequate social services are available, pressure on existing available services will be insignificant. However, the impacts will be indirect, of low significance, short-term and local in nature.

Social and Cultural Conflicts due to Influx of Construction Workers

79. The amount of money that enters into the area during construction phase as wage payment may induce local inflation. Increased income of local labourers and construction crews of the contractor can lead to negative impacts such as spread of alcohol consumption and gambling. Influx of migrant workers also bears potential for STD such as HIV/AIDS. These impacts leading possibly to social and cultural conflicts will be direct, low in magnitude, local and short-term in nature.

C. Impacts on the Biological Environment

Table 5.3: Biological Environmental Issues and Impacts

Issues	Impacts	Direct/ Indirect	Extent	Duration	Magnitude	Initiation
Vegetation and Forest Resource	• Loss of vegetation	D	Site	Long	L	C

Note:
D = Direct Impacts I = Indirect Impacts L = Low Impacts
M = Moderate Impacts H = High Impacts C = Construction Phase
O = Operation (commissioning) Phase

Vegetation and Forest Resources

80. The proposed road construction works entail clearing of small clusters of mixed standup bamboo clumps, sissam, fruit (guava), and kadam trees at km 1+030 which is not of significance. The anticipated impact is of direct, site specific, of low significance and long term in nature.

D. Impacts on the Physical Environment

Table 5.4: Physical Environmental Issues and Impacts

Issues	Impacts	Direct/ Indirect	Extent	Duration	Magnitude	Initiation
Earthworks / Slope Stability	• Soil erosion on embanked slope • Monsoon siltation on farmland	D	Site	Long	L	C & O
Drainage and Water Management	• Obstruction on surface water flows	D	Site	Long	L	C & O
Operation and Closure of Quarries and Borrow Pits	• Disruption of natural land contour, disturbance in natural drainage and scouring of river beds. • Ponding, water logging, and water pollution.	I	Local	Short	L	C
Stockpiling of Construction Materials and debris management	• Siltation and pollution from storage piles • Disturbance to private property	D	Site	Short	L	C
Air Pollution	• Localized dust emission • Localized increase in gas emissions from vehicles	D	Local	Short	L	C & O
Noise Noise Pollution	• Nuisance to local residence	D	Local	Short	L	C & O
Water Pollution	• Effect on adjoining water bodies from construction activities	D	Local	Short	L	C & O
Use of Bitumen	• Use of fuelwood to heat Bitumen • Release of Bitumen into the environment (runoff of	D	Local	Short	L	C

Issues	Impacts	Direct/ Indirect	Extent	Duration	Magnitude	Initiation
	bitumen into surface waters)					
Disruption of Public Utilities	• Disruption of Electrical Transformer • Disruption of Irrigation Ditch	D	Local	Short	L	C

Note:
D = Direct Impacts I = Indirect Impacts L = Low Impacts
M = Moderate Impacts H = High Impacts C = Construction Phase
O = Operation (commissioning) Phase

Earthworks / Slope Stability

81. The major activity associated with proposed road construction involves formation of embankment. Exposed embanked slope to rain and wind could cause soil erosion and siltation in monsoon affecting farmland as well as clogging drains, cross-drainage and irrigation canals. The impact will be direct, of low magnitude, site specific and long-term in nature.

Drainage and Water Management

82. The water bodies within the Subproject area are occasional ponds, seasonal streams and most importantly surface water flows in wet season that are basically managed for irrigation purposes. The embanked road may obstruct the natural north south wet season flow. With adequate cross-drainage structures, it is unlikely that there will be any residual adverse impacts on the environment.

Operation and Closure of Quarries and Borrow Pits

83. The construction of the proposed road works particularly embankment fill, sub-base, base, DBST, drainage, cross-drainage and other structures will require extraction of loose materials, stone, chipping, sand and aggregates. These construction materials will be brought from the established quarry sites at Tinau River and other approved sites for extraction of loose materials. Extraction activity could disrupt natural land contours and vegetation resulting in erosion, disturbance in natural drainage patterns, siltation from surface waters, water pollution, ponding and water logging. Since the major source of quarry will be the alluvium deposits of Tinau River, the direct and significant impact of quarries is not expected.

Stockpiling of Construction Materials and Debris Management

84. The construction materials if not properly stored or stockpiled will lead to siltation and pollution of surface water resulting from uncontrolled runoff of storage piles. This in turn will disturb adjoing private property. Construction debris disposed haphazardly is likely to promote erosion and soil instability, destruction of private property, crops, and irrigation system, disruption of natural drainage systems and surface water pollution. The impact will be direct, of low magnitude, site specific and short-term in nature.

Air, Noise, Vibration and Water Pollution

85. During implementation of the Proposal, there are chances of dust and vehicular gas emission due to movement of construction vehicle. This will be temporarily intense along the construction sites. Nearby settlements and construction workers may be affected by dust.

As most of the construction works will be carried out during the dry season, dust emission will be expected to be locally high. Dust will also affect the road side vegetation and agricultural crops. These including increase in vehicular emission may add ground for green house gases and though in negligible amount, would add ground to climate change issue.

86. At present, the Subproject area does not experience noise pollution. However, during construction, the increased construction activities mainly movement of heavy equipment and the operation of construction plants may cause noise nuisance to local nearby residence. There may be vibration effects along the road alignment.

87. During the construction stage, the adjoining water bodies are at risk of being affected due to construction activities i.e. surface runoffs, pollution from vehicles (oil changes/spills, fuel leaks etc) and waste from the labour camps.

88. The anticipated impacts on air, noise and water bodies will be direct, of low significance, local and short-term in nature.

Use of Bitumen

89. The proposed suproject involves DBST pavement which will require safe storage and use of bitumen. Use of fuelwood to heat bitumen and release of bitumen into environment (runoff of bitumen into surface waters) are the potential impacts likely to occur if handled inappropriately. The anticipated impact will be direct, of low significance, local and short-term in nature.

Disruption of Public Utilities

90. Electrical Transformer at km 0+140 will require removal and relocation while a small irrigation ditch at km 0+700 will require reinstatement of its inlet and outlet to maintain existing irrigation flow. The impact will be direct, of low magnitude, local and short term in nature.

1. Operation Stage

(i) Impact on the Social, Socioeconomic and Cultural Environment

Population Pressure and Impact due to New Settlement along the Road Alignment

91. Ribbon development i.e., the establishment of settlements, shops and food stalls along the road side soon after the construction of a road is a common feature. Increase in land value adjoining road is important driver for such undesired and uncontrolled development. The negative consequences of such activities are encroachment in the right of way, road blockage, delays in private and public transport, increase in local accidents, hindrance for maintenance works, reduction of the overall road capacity, etc. Such impacts are direct, of high significance, local and long-term in nature.

Social Conflicts

92. There are a number of road-induced impacts that have the potential to exert pressure on the local communities and cause potential social conflicts. New road development and connectivity can, for example, trigger or increase illegal activities such as alcohol consumption, gambling and prostitution. Businessmen from other places may come and displace the poor farmers and people of the area. Such impacts may lead to social conflicts situation with varying severity and duration. The likely impacts may therefore be indirect, of moderate significance, local and long-term in nature.

E. Impacts on the Biological Environment

Vegetation Destruction

93. The road side avenue tree plantings could be damaged by human as well domestic animal activities.

F. Impacts on the Physical Environment

Slope Stability

94. During the operational phase, embankment slopes could be destabilized due to monsoon rain, inadequate drainage works, faulty construction and inadequate vegetative measures. The stability of slopes may also be affected by human activities in the road neighborhood such as animal grazing and tethered cattle along road edge. The impacts will be direct, moderate, site-specific and long-term in nature.

Drainage and Water Management

95. Inadequate drainage structures will lead to obstruction in north-south surface water flows during monsoon, obstruction to rain fed irrigation, even newly established cross drains may cause erosion of adjacent agricultural fields during monsoon if not maintained properly.

Road Accidents

96. Operation of the road also increase the chances of road accidents, particularly involving children. Inadequate provisions of road safety measures such as road safety signals, lack of enforcement of traffic rules, houses built adjoining road within the RoW, newly developed schools adjacent to road, etc. during operation period may invite accidents. The anticipated impacts will be direct, of low magnitude, local and long-term in nature.

Pollution of Water Resources

97. The practices connected with car/truck washing in streams, near wells and springs including repair on the road has the potential to cause local water pollution and damage to road surface by leakage/spills of fuel, lubricants and hydrocarbons that may not only affect the aesthetic value of water bodies but also have detrimental effects on the health of people and animals relying on these sources. The impacts associated with this will be of low in magnitude, locally confined and long-term in nature if vehicles plying are strictly adhered to timely maintenance and GoN emission control measures.

Pollution of Air and Noise

98. The source of air pollution in this area will be the exhaust from the vehicles using fossil fuels and vehicle fumes and any other fuel powered mechanical equipment. This will have impacts on the degradation of air quality. It is common practice for pressure horns to be used in Nepal. This is likely to increase the noise level and it may affect human beings and livestock. The impacts associated with this will be of direct nature, moderate magnitude, locally confined and long term.

VI. ALTERNATIVE ANALYSIS

99. As the scope of the proposed activity is construction of new road, alternatives in selection of alignment will be very important to avoid or minimize resettlement impacts. There could be alternatives in the implementation stage which could be selected to suit local conditions and given situations. The newly developed road will certainly have a significant impact on the beneficiaries as well as the environment. 'No Action' alternative is also discussed and presented as under.

A. No Action' Alternative

100. In the absence of the proposed BBYroad, the access for cross border commercial traffic will get worse with traffic congestion at Bhairahawa thereby increasing cost of goods, travel times and processing times. Ultimately the export industries will be affected in medium and long term. The "no action" alternative will reduce the efficiency of vehicle with regards to trips that it is supposed to accomplish while there will be increase in fuel consumption resulting in more gaseous pollution, environmental degradation and decline in quality of life.

B. Design

101. The key design alternatives relate to alternative alignments as it forms the construction of new road. Appropriate engineering designs and location specific measures have been adopted to avoid or minimize resettlement and impact on the properties and businesses. The bypass avoids structural properties thereby reducing the project-affected persons. The flexible pavement design is based on field tests and investigations. Adequate cross-drainage and drainage structures are inclusive in the design as required by hydrological assessment to give continuity to north-south wet season surface water flows.

C. Technology

102. There are many alternative construction methods for the road such as pavement construction methods; pre-cast pipe or in situ culvert construction and building techniques. For the road surface, double bituminous surface treatment DBST is applied at the road carriageway with single bituminous surface treatment (SBST) at the shoulder. Bioengineering (seed sowing) at embanked fill slopes with road side plantation of avenue trees within the ROW has been considered in the design.

D. Time Schedule

103. The construction of Bhairahawa Bypass road under RCS1P, STEP (VO4) will be implemented over 18 months commencing probably in the fourth quarter of 2010. The earth work activities of the Subproject should be avoided during monsoon period. The construction activities will be carried out during day hours only.

E. Raw Materials

104. The major source of materials identified is the alluvium deposits of Tinau River.

VII. MEASURES TO REDUCE OR CONTROL THE IMPACT OF THE IMPLEMENTATION ON THE ENVIRONMENT

105. The proposed mitigation measures will avoid or minimize the adverse environmental impacts of the Subproject activities. The mitigation measures will be of curative, preventive and compensatory types. Different measures that have been proposed for the augmentation of beneficial impacts and minimization of the adverse impacts of the proposed road construction works are as described below.

A. Benefit Augmentation Measures

1. Construction Phase

Employment Opportunities to Increase in Local Incomes and to Combat Poverty

106. The Subproject will emphasis in obtaining labour from the road influence area. The Subproject will employ local poor, vulnerable and socially excluded people (Janajati, Dalit) and women to the possible extent, without gender discrimination. Based on past experience in other Subprojects, this will divert a good portion of the total Subproject cost to local people. This will improve their economy.

107. Vulnerable groups including women headed households will be provided with the additional income restoration mechanisms to restore their livelihoods. The income restoration in terms of livelihood/skill development training for the households having loss of more than 10 percent of their productive lands is planned. However, for the budgeting purpose, all 67 households are counted. There are a number of skill development training institutions affiliated with the Council of Technical Education and Vocational Training (CTEVT) of Government of Nepal, which could be mobilized in skill development training for the income restoration of affected households. Females are exploited, dominated and lacks the participation in the local development, though they are the major contributors in the households and agriculture activities. Women are less involved in decision making in all investments and other economic activities. Gender program will be integrated into the subproject activities.

108. It is anticipated that, through adequate income generation and livelihood development programs, the earned money will be utilized in such a way that it will generate multiplier effects; for example by investing in cooperative, long-term ventures in farming and off-farming activities, crop diversification, agro-industries, cottage industries based on local resources, etc.

Enhancement of Technical Skills

109. During the road construction works, the local labourers will receive manifold skill training in construction techniques, small engineering structures and bio-engineering works. They also will receive additional knowledge in waste management, material handling and general application of environmental health and social precautionary measures. By augmenting their capacity, local people being involved in the Subproject will find it easier to find skilled manpower jobs in the future, thus securing their livelihood as an alternative/additional occupation to agriculture.

2. Operation Stage

Promotion of Small –Scale Industries

110. After the completion of the Subproject, the road will provide better access to the local farmers to sell their products to bigger markets at better prices. This will encourage local people to establish small scale industries, cultivate/harvest cash crops and expand other micro enterprises such as handicrafts. In the context of the proposed road, there is potential for promoting small-scale cottage industries based on locally available raw materials and products.

Enhancing Quality of Life

111. As a by-product of increase in productivity and subsequent increase in income levels from micro enterprises and by the gradual development of additional facilities and services in the area due to better access, it is expected that there will be an overall improvement in the quality of life of peri-urban people with reduction in travel time to social services, market areas and traveling to other parts of the country.

B. Measures to Mitigate Adverse Impacts

1. Construction Phase

(i) Physical Aspects

Earthworks / Slope Stabilization

112. Bioengineering (i.e. seed sowing) works for embanked slopes including provision for plantation of road side avenue trees have been included in the Subproject design. In addition, adequate drainage and cross drainage structures have been planned in the design in order to minimize road side scouring and erosion. Estimated cost for seed sowing is around Rs. **250,000.00** (10,020m^2x24.5). The cost of drainage and cross-drainage structures is included in the suproject design for implementation.

Drainage and Water Management

113. Adequate drainage and cross-drainage structures have been included in the design in order to maintain natural draining of north-south wet season surface water flows. The cost of drainage and cross-drainage structures is included in the subproject design for implementation as detailed below.

Table 6.1: The Details of the Proposed Cross-Drainages

S.No.	Location (km)	Description of Cross-drainage	Remarks
1	0+125	P/C Double Cell 900 dia.	
2	0+140	P/C Double Cell 900 dia.	
3	0+425	P/C Single Cell 600 dia	
4	0+700	P/C Single Cell 600 dia	Irrigaiton canal crossing
5	1+050	S/C 6m Span	Stream Crossing
6	1+300	P/C Single Cell 600 dia	
7	1+625	S/C 4m Span	Stream Crossing
8	1+825	P/C Single Cell 600 dia	
9	2+140	P/C Double Cell 900 dia.	
10	2+280	P/C Double Cell 600 dia.	
11	2+550	P/C Double Cell 600 dia.	
12	2+815	P/C Single Cell 600 dia	
13	3+210	P/C Single Cell 600 dia	

S.No.	Location (km)	Description of Cross-drainage	Remarks
14	3+300	P/C Single Cell 600 dia	

Operation and Closure of Quarries and Borrow Pits

114. Queries and borrow pit sites shown in the design drawing are to be treated as a indicative only. The contractor will be responsible to verify the suitability of all materials sources and obtain approval from the Supervising Engineer and concerned Local Bodies. Quarries and Borrow Pits shall be located away from population centers, drinking water intakes and shall not obstruct natural drainage systems. Extraction of construction materials shall not exceed more than 1.5m depth in one particular location and shall be managed as such that it does not alter natural river regime. Any ponding of surface water shall be prevented through adequate drainage. The contractual conditions for opening, operating, and closing quarries / borrow pits and the costs associated with these operations are included in the construction contract.

Stockpiling of Construction Materials and Debris Management

115. Land for the stockpiling of construction materials must be suitably selected such that it does not occupy private land/affect agricultural land without first obtaining written permission from land owners and local bodies. Stockpiles susceptible to erosion by wind and water should be covered with tarpaulins and for large stockpiles, it should be enclosed with side barriers and also covered when not in use. The site should be cleaned promptly after completion. Construction debris should be disposed at designated spoil site only, far away from water resources and efforts should be made to minimize such waste as far as possible through reuse, reduction, and recycling concepts. Specific conditions for stockpiling of construction materials and debris management are included in the construction contract.

Air Pollution

116. Water should be sprayed on the road surface as required during construction and protective equipment for the construction workers should be provided. The construction vehicles should be well maintained and should strictly comply with the GoN pollution regulation with compulsion in obtaining green sticker. Similarly, all construction plants should adhere to emission regulation. The vehicles carrying construction materials should ensure that it is well sealed and covered so as to avoid littering. The anticipated cost and specific conditions related to air pollution containment are included in the construction contract.

Noise Pollution and Vibration Effect

117. Attempts should be made to operate heavy construction equipment in the day time only. Any affect to nearby structures caused by vibration need to be monitored closely. If such problems arise, alternative methods should be employed. For the safety of construction workers, earplugs must be provided while on duty. The anticipated cost and specific conditions related to noise and vibration containment are included in the construction contract.

Water Pollution

118. Disposal of construction debris in and near water bodies and unhygienic (lack of latrines and washing facilities) labour and work camp conditions should be strictly prohibited. Spoil should be disposed off at designated spoil sites only. Provision of toilets, good drainage and water supply system with proper collection and disposal system for solid wastes should be adopted. Efforts should be made to minimize such waste as far as

possible through reuse, reduction, and recycling concepts. Similarly, the contamination of water by the use of cement, bitumen, lubricants and fuel should be avoided and strongly monitored.

119. The Contractor needs to arrange for sufficient water supplies and proper sanitation facilities for its labour force. Separate arrangements are necessary for work camp and labour camps. The anticipated cost and specific conditions related to water pollution containment are included in the construction contract.

Use of Bitumen

120. Fuel wood shall be strictly prohibited for heating bitumen. Bitumen shall be melted in heaters using kerosene, diesel or gas fuel. Bitumen drums shall be stored in designated areas, not scattered haphazardly and any small accidental spills shall be cleared up immediately. Bituminous materials shall not be discharged into side drains. Bitumen application shall be prohibited during strong wind or rainy conditions. The anticipated cost and specific conditions related to the use of Bitumen are included in the construction contract.

Reinstatement of Public Utilities / Services

121. The subproject will coordinate with concerned authorities and local stakeholders for the removal and relocation of electrical transformer at km 0+140 and reinstatement of small irrigation ditch at km 0+700. The cost and conditions associated with reinstatement are included in the project design for implementation.

(ii) Biological Aspects

Vegetation and Forest Resources

122. Road side avenue tree plantation is provisioned on both side of the proposed road alignment within the ROW at an interval of 15 m. Not less than 460 numbers of trees is provisioned for plantation which forms good compensation to the likely clearance of small cluster of vegetation at km 1+030. Estimated cost for plantation of avenue trees is around **NRs. 460,000.00** (460 nos. x 1000)

123. Fuel wood use shall be banned for construction workers. Individual cooking can be discouraged through the provision of a mess. Kerosene supply should be regular and easily available to the construction workers. The anticipated cost is inclusive in the construction contract.

(iii) Socioeconomic and Cultural Aspect

124. In order to minimize the socioeconomic and cultural impacts identified above, the following mitigation measures are recommended for implementation during the construction stage.

Land Acquisition and Land Use Change

125. The resettlement principles and assistance have been designed to cover compensation for lost assets and restore or enhance livelihoods of all categories of affected people. The acquisition and compensation will be carried out as per RAP entitlement matrix.

126. Adequate drainage and cross-drainage structures are provisioned in the design so as not to disrupt natural drainage system due to construction of new embanked road. The cost for such provision is included in the subproject design.

Occupation Health and Safety, STDs and Nuisance from Construction Camps

127. During construction phase, there is always a possibility of occupational health and safety problems. However, this risk will be minimized by adopting necessary safety measures. For this, resources have to be strictly managed and enforced during construction. Road safety measures will be an integral part of the detailed design. Protective clothing and gloves shall be provided to the labourers and measures be taken to ensure their use. Bitumen labourers are likely to get into accidents and affected by dust. Necessary protection measures and provision of masks, boots etc. be made to the workers. The anticipated cost and conditions associated with the provisions for occupational health and safety including cost for any injuries or death of workers is included in the construction contract.

128. Provision of toilets, good drainage, water supply system and proper sanitation with appropriate collection and disposal system for solid wastes shall be adopted in the labour and work camps. Efforts should be made to minimize such waste as far as possible through reuse, reduction, and recycling concepts. Similarly, the contamination of water by the use of cement, bitumen, lubricants and fuel should be avoided and strongly monitored. Strict rules and regulation shall be maintained in the labour and work camp so that any engagement in alcoholic and other bad habits are restricted. The anticipated cost and conditions associated with provisions for proper sanitation are included in the construction contract.

Pressure on Social Service Facilities

129. In order to minimize the pressure on existing local services, the labour and work camp should have adequate provision of toilets, good drainage, water supply system and proper sanitation with appropriate collection and disposal system for solid wastes. The subproject area being very near to Bhairahawa, where adequate social services are available, pressure on existing available services will be insignificant. The anticipated cost and conditions associated with the facilities are included in the construction contract.

Social and Cultural Conflicts due to Influx of Construction Workers

130. Information signboards will be placed at required places and safety measures installed as precautionary measures. Strict rules and regulation shall be maintained in the labour and work camp so that any engagement in alcoholic and other bad habits are restricted. The anticipated cost is inclusive in the construction contract.

1. Operational Stage

(i) Physical Aspects

Water Management and Slope Stabilization

131. Regular maintenance for water management structures and preserving vegetative embanked slopes shall be applied during maintenance and operation of the road. Specifically, cattle grazing and tethered cattle along the road edge shall be strictly prohibited. A system should be developed for regular rehabilitation and maintenance of such areas including assignment of responsibility.

Air and Water Quality

132. The local traffic regulating agencies shall take responsibility for encouraging the use of good condition vehicles complying GoN pollution regulation with compulsion in obtaining green sticker. Traffic management plan shall be developed especially along congested locations. Traffic control measures, including speed limits will be enforced strictly. Further encroachment and squatting within the ROW shall be prevented. For control of water quality, the Municipality / VDCs along the roadside will control haphazard cleaning of vehicles and the leakage of fuels and lubricants into water channels. The effects of chemicals resulting from vehicle leakage can be minimized by preventing their draining into the adjacent water courses.

133. The concerned agency should consider additional ways to reduce impacts including:

- Replacing older vehicles with newer, more fuel efficient alternatives.
- Converting high-use vehicles to cleaner fuels, where feasible.
- Installing and maintaining emissions control devices, such as catalytic converters.
- Implementing a regular vehicle maintenance and repair program.

(ii) Biological Aspects

Vegetation Protection

134. To reduce noise and air pollution in nearby settlements, planting of road side avenue trees has been provisioned for implementation. The concerned agency will carry out regular maintenance of road side avenue trees and its protection from human and domestic animals.

(iii) Socioeconomic and Cultural Aspects

Land Use Change

135. Municipality / VDCs shall make local communities aware of the importance of the road RoW. They must develop strategies for controlling new settlements along the road corridor and these efforts should help to establish planned settlements only upon adequate provision of basic services as water supply, sewerage, electricity, telephone etc.

Social Conflicts

136. The improved road accessibility and connectivity could lead to increased rate of social crimes such as prostitution, drug abuse, etc which can be controlled by strengthening the local communities through mass awareness.

Pressure on Local Facilities

137. Local manpower is to be given preference to the extent possible in construction works according to their availability and skills. The subproject area being very near to Bhairahawa, where adequate social services are available, pressure on existing available services will be insignificant.

VIII. MATTERS TO BE MONITORED WHILE IMPLEMENTING THE PROPOSAL

138. The main objective of environmental monitoring is to detect impact in the early phase of suproject activity in order to provide adequate corrective action before it is too late. Other objectives of monitoring are to provide feedback on the accuracy of impact prediction, effectiveness of mitigation measures and provide guidance for readjustments during suproject implementation and operation. Environmental monitoring thus helps to ensure the effectiveness of environmental mitigation measures, compliance with environmental standards and to facilitate on changes required in suproject design and operation.

139. The National EIA Guidelines (1993) and EPR, 1997 require monitoring plans and indicators, schedules and responsibility be identified in the IEE report. The following sub-sections deal with the various components of the environmental management and monitoring programme in order to promote the full integration of monitoring activities in Suproject works and implementation.

A. Environmental Management Roles and Responsibility

140. Responsibility for environmental management associated with road construction / rehabilitation / upgrading involves number of parties, each with specific responsibilities for particular activities. The five main parties responsible for the design and implementation of mitigation measures prior to, during and following road construction are:

- MPPW
- DoR / GESU
- Asian Development Bank
- Design and Supervising Consultant
- Construction Contractor

141. Within the roads sector, the Ministry of Physical Planning and Works (MPPW) has overall responsibility for environmental safeguarding.

142. The Department of Road (DoR), as the suproject proponent, has the ultimate responsibility for the supervision of road construction and environmental management works. Implementation of the RCS1P, STEP (VO 4) will be the responsibility of Project Director, DoR Project Directorate (ADB). Geo-Environment and Social Unit (GESU) of DoR undertakes environmental assessment functions, as well as monitoring of suprojects and provision of advice relating to design of environmental mitigation and enhancement measures, and the setting of environmental quality standards.

143. The Asian Development Bank is responsible for overseeing of DoR's project management in accordance with loan conditions, the detailed road design and EMP, including periodic site visits to ensure compliance.

144. The design Consultant will prepare final detailed designs and conduct necessary environmental studies including EMP design recommendations. The superivsing Consultant will supervise the day to day activities of the construction contractor on behalf of DoR and conduct technical supervision of road layout, overseeing contract implementation and certifying works for payment. The supervising consultant will ensure effective implementation and compliance of all aspects of work as specified in EMP by the Contractor, with reporting direct to the Project Director, DoR Project Directorate (ADB).

145. The construction Contractor will be responsible for undertaking all duties and works assigned to him / her in the road construction contract, including all specified conditions in this EMP. The Contractor will work closely with the supervising Consultant to ensure that the

works are constructed to specified standards. The specific responsibility of DoR Project Directorate (ADB), Design and Supervising Consultant (DoR's representative), and construction Contractor are as follows:

DoR Project Directorate (ADB)

- Acquisition of all necessary right-of-way (ROW) land and buildings if any.
- Review and approval of detailed road construction designs.
- Obtaining necessary permits from GoN for road construction activities including liasing with various Government Intitutions (i.e. District Forest Office, District Agriculture Office, District Irrigation Office, District Adminitration Office, District Survey Office etc.) and Local Bodies (i.e. Municipality, DDC, VDC etc.).
- Review and approval of surveyed road alignment and road works.
- Review and approval of proposed ancillary work sites (including workforce camps, quarries, borrow pits and storage areas).
- Road maintenance and environmental monitoring and management following handover by the Contractor.

Design and Supervising Consultant (DoR's representative)

- Preparation of final road construction design, required environmental studies and EMP design recommendations.
- Survey and pegging of road construction design works.
- Supervision of the Contractor to ensure work to be undertaken as per road construction contract.
- Inspection and reporting of Contractor activities to ensure effective implementation of the EMP.
- Auditing Contractor works and activities against the conditions set out in EMP.
- Issuing corrective action requests and conducting follow up inspections and evaluation of corrective actions.
- Reporting all non-conformances to the Project Director, DoR Project Directorate (ADB).
- Certifying correctly constructed road works for payment.

Construction Contractor

- Construction of detailed road design works and implementation of EMP.
- Participation in site inspectons and audits undertaken by the Supervising Consultant.
- Implementation of corrective actions in response to requests made by the supervising Consultant regarding specific environmental safeguards.

B. Site Supervision, Monitoring and Reporting

146. Strict supervision of road construction activities is required prior to, during and following road construction to ensure that works are constructed inaccordance with the approved designs and that environmental impacts are fully mitigated in accordance with the EMP. A standard system of site inspections, reporting and approval shall be undertaken during the life of suproject, as described below.

1. Pre-construction Phase

147. Pre-construction inspections of each section of the alignment and all ancillary sites shall be undertaken by the supervising Consultant and Contractor. It will serve to:

- Identify site specific road construction or environmental problems.
- Identify existing services that are required to be reinstated.

- Identify construction waste disposal sites.
- Identify querries and borrow pits site for extraction of construction materials.
- Identify labor and work force camp sites.
- Plan of phasing of construction along the alignment.

148. Supervising Consultant and Contractor shall discuss and agree upon the factors listed above and document accordingly. The supervising Consultant shall review the sites pegged by the Contractor and approve them for construction where appropriate, or request the Contractor to repeg sites. The cost for inspection is included in the suproject implementation cost.

2. Construction Phase

149. The Contractor is wholly responsible for complying with all aspects in the construction contract pertaining to environmental protection provisions and must at all times during the contract term provide clear evidence that contract requirements are being met.

150. The supervising Consultant shall undertake appropriate supervisions of road works during construction, and inspections of ancillary sites during their period of use. For non-compliance activities as per EMP contract conditions, notice shall be issued for rectification accordingly and as appropriate, pay items withheld.

151. The supervising Consultant shall undertake a monthly inspection of all ancillary sites in use over preceding months, as well as any ancillary site activities currently in progress, at the end of each month in conjunction with the Contractor. If any activities are not being undertaken in accordance with the contract or EMP conditions, the supervising Consultant shall document these and specify corrective measures in the Monthly Report. The supervising Consultant shall provide a copy of the Monthly Report to the Contractor of the inspection for action. The cost for supervision is included in the subproject implementation cost.

3. Post –Construction Phase

152. The supervising Consultant shall undertake a post-construction certification inspection of each completed section of road and each rehabilitated ancillary sites. Certification shall be based upon the contract conditions and EMP conditions. The cost for post-construction certification inspection is included in the subproject implementation cost.

4. Operational Phase

153. The environmental monitoring of roads during the road operation phase shall concentrate on the major identified potential impacts of the roads, including slope stability, drainage and sedimentation. The DoR, GESU shall undertake a 6-monthly inspection of the road formation and related features over the initial year following the completion of road construction. The inspection will include a visual assessment of:

- Road surface condition.
- Embanked slope stability
- Road side structures.
- Drains and drainage lines, their stability and drainage line erosion.
- Damage from sedimentation.

154. Standard report covering above features shall be completed by GESU following each inspection.

C. Project Organization

155. As per EPR 1997, the Ministry of Physical Planning and Works is legally responsible for environmental monitoring works. The Project Implementation Unit (PIU) will carry out the monitoring of the implementation of the EMP by the Contractor through its Supervising Consultant.

156. The DoR has also established the Geo-Environmental and Social Unit (GESU) in 1991 in order to integrate environmental aspects into the road development and maintenance projects. The GESU has, inter alia, issued the Environmental Management Guidelines in 1997 and the policy document for Environmental Impact Assessment (EIA) in 2000. PIU will co-ordinate with DoR's GESU and get the additional technical assistance required for the implementation of the environmental protection measures. PIU may also seek additional technical assistance from the Ministry of Forests and Soil Conservation and the Ministry of Environment as and when necessary.

157. The DoR and MPPW will evaluate the monitoring results, as and when necessary. The subproject intends to invite an independent monitoring team to safeguard its environmental image. PIU staff will work alongside the construction and operation to ensure that the measures and requirements outlined in the EMP are carried out effectively. The Environmental Organization Structure is presented in **Figure 7.1**.

158. During Construction, MPPW, DoR/GESU, PIU will carry out internal monitoring of the environmental compliance carried out by the Contractor while the Supervising Consultant and ADB will carry out external monitoring at field level and higher level respectively. During operational phase, ADB will carry out external monitoring while MPPW and DoR/GESU will carry out internal monitoring.

D. Monitoring and Evaluation

159. For road projects, Ministry of Physical Planning and Works shall monitor and evaluate the impact of the implementation of the proposal on the environment. During the course of carrying out monitoring and evaluation of impact, if the actual impact is found higher than the one specified in the conditions prescribed at the time of approving the proposal, the MPPW shall issue necessary directives to the proponent to adopt measures to reduce or control such impact. Monitoring activities during subproject operation will focus on recording environmental performance and proposing remedial actions to address unexpected impacts.

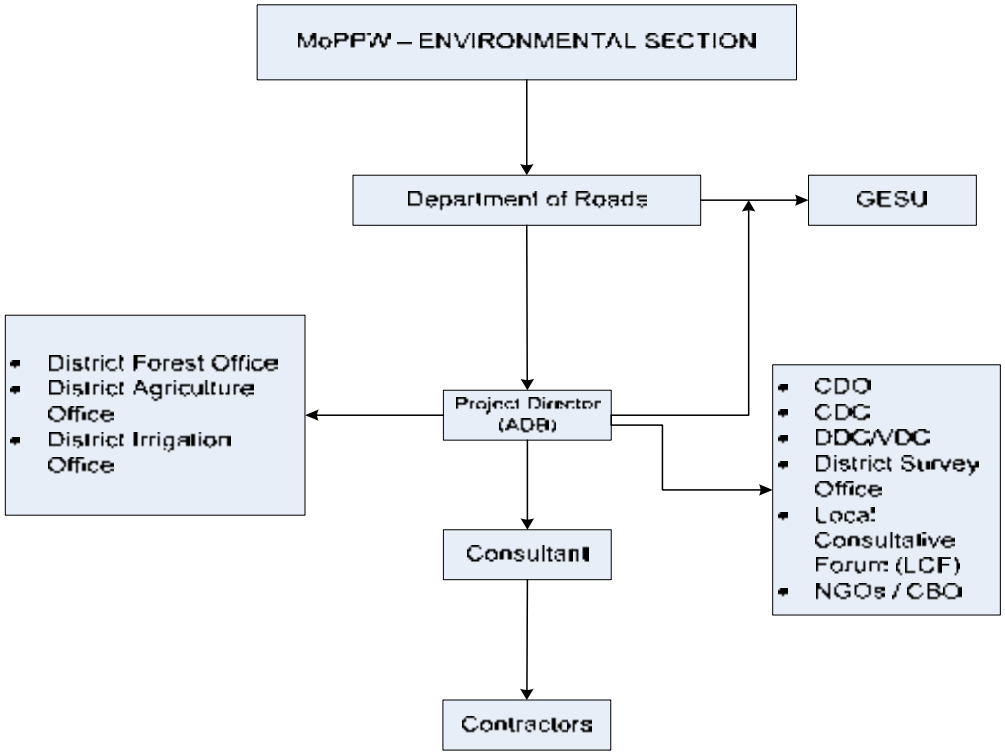


Figure 8.1: Environmental Management Organizational Structure

160. The environmental monitoring of roads during the road operation phase shall concentrate on the major identified potential impacts of the roads, including slope stability, vegetative cover, drainage and sedimentation. The DoR, GESU shall undertake a 6-monthly inspection of the road formation and related features over the initial year following the completion of road construction. Standard report covering environmental features shall be completed by GESU following each inspection. The estimated cost for environmental monitoring and evaluation during operation is estimated as follows:

Table 8.1: Cost Estimate for Environmental Monitoring

S.No.	Particular	Quantity and Unit Rate	Amount (NRs)
1	Air Quality Monitoring	2 sites x 2 times x 50,000	200,000.00
2	Water Quality Monitoring	2 sites x 2 times x 2,500	10,000.00
3	Noise Level monitoring	2 sites x 2 times x 15,000	60,000.00
4	Other Direct Observation	2 times x 75,000	150,000.00
		Total	**420,000.00**

161. The monitoring for compliance of recommended mitigation measures during construction and post-construction certification inspection of each completed section of road and each rehabilitated ancillary sites shall be undertaken by the Supervision Consultant. The cost for monitoring during construction and post-construction certification inspection is included in the subproject implementation cost.

E. Environmental Monitoring Plan

162. The following indicators, period, frequency and method are proposed for environmental monitoring during the various stages of the subproject implementation and operation.

Table 8.2: Monitoring Parameters, Indicators, Period and Frequency

Predicted Impact	Mitigation Measures	Indicator for Monitoring	Method	Period and Frequency
1. Physical Environment				
Earthworks / Slope Stability	bio-engineering (seed sowing) on embanked slopes. adequate drainage / cross drainage structures.	adequacy and quality of seed sowing. survival rate of vegetative cover. embanked slope scouring and siltation	direct observation	regular during construction phase and every six months during operation
Drainage and Water Management	drainage and cross-drainage structures constructed as per design.	no evidence of Inundation, Erosion and siltation on adjacent land	direct observation	regular during construction and every six month during operation phase
Disruption of Public Utilities	removal, relocation and reinstatement of public services as electrical transformer, irrigation canal, water supply line etc.	correct placement. no complaint from local residence.	direct observation	regular during construction
Traffic Hazard and Road Safety	adequate road safety signals. appropriate diversion and proper barricades for construction site demarcation.	smooth flow of traffic. incidence of accidents.	direct observation. data collection from traffic post.	regular during construction phase and every six month during operation phase
Operation and Closure of Quarries and Borrow Pits	finalize quarries and borrow pits sites. ensure located away from population centers, drinking water intakes. extraction shall not exceed more than 1.5m depth in one particular location. adequate drainage to prevent ponding.	No evidence of water ponding. no increased visual turbidity of surface waters. natural contour restored.	direct observation	regular during construction phase
Stockpiling of Construction Materials and Debris Disposal	avoid haphazard debris disposal. identify suitable sites for stockpiling and debris disposal with written permission from relevant stakeholders.	sufficient protection measures provided against washouts. no increased visual turbidity of surface waters.	direct observation	regular during construction phase

Predicted Impact	Mitigation Measures	Indicator for Monitoring	Method	Period and Frequency
	proper coverage of stockpiles with control on surface runoffs. correct placement of fill.	stability of spoil area. complaints from local residence		
Air quality	construction plants located at appropriate locations. road construction maintained damp by periodical spray of water. all construction vehicles to comply GoN pollution regulation with Green Sticker. ensure vehicles plying during operation complies with GoN regulation with Green Sticker.	no excess dust deposition on crops and vegetation. no complaints from local residence. monitoring of evidence issued by concerned agency. (TSPM, PM_{10}, NOx, SOx, COx) NAAQS of Nepal	direct observation measurement and analysis	regular during Construction and every six month during operation phase. air quality monitoring, two sensitive sites every three months during construction and every six months for one year during operation.
Noise and Vibration	ensure plant & equipment conforms to best practices. workers provided with appropriate ear muffs / plugs. provision of noise barriers placed in sensitive areas. works to be restricted to day hours only.	no complaints from local residence. cracks caused by vibration due to construction activities monitored closely. (1 hr Leq dB(A)) WHO Standards	direct observation measurement and analysis	regular during construction and every six month during operation. noise level monitoring, two sensitive sites every three months during construction and every six months for one year during operation.
Water Pollution	restrict debris disposal near water bodies. provision of toilets, good drainage, proper water supply and solid waste management within work and labour camps.	No siltation. monitoring of provisions. (EC, PH, DO, TSS, Oil and Grease) WHO Standards	direct observation measurement and analysis	regular during construction and every six month during operation phase. water quality monitoring, two sensitive sites every three months during construction and every six months for one year during operation.
Use of Bitumen / Combustible / Toxic Materials	restriction on use of fuel wood.	hazardous materials management procedures	direct observation	regular during construction and every six months

Predicted Impact	Mitigation Measures	Indicator for Monitoring	Method	Period and Frequency
	storage at designated areas. accidental spills shall be cleared immediately. provisions for collection and retaining leaks and spills.	implemented. no visible puddles of oil or oil contaminated soil.		during operation phase.
Disruption of Public Utilities	removal and relocation of electrical transformer. reinstatement and construction of irrigation ditch.	correct placement and reinstatement	direct observation	regular during construction
2. Biological Environment				
Vegetation and Forest Resourses	coordinate with concerned authority for proper felling and stacking of trees at designated locations. plantation of appropriate species of road side avenue trees (460 nos.)	ensure appropriate felling and stacking of trees. ensure appropriate plantation with protective measures. survival rate of trees.	direct observation	regular during construction and every six month during operation.
3. Social, Socioeconomic and Cultural Environment				
Land Acquisition and Land Use Change	adhere to acquisition and compensation in accordance to RAP's Entitlement Framework.	no complaints from local stakeholders.	direct observation	before construction
Occupational Health and Safety, STDs and Nuisance from Construction Camps	compliance with safety rules and regulations. good sanitary condition at labor and work camp. maintain discipline at labor, work camp and construction site. placement of signboards and prohibition to outsiders at risk prone sites.	no complaints from labor, workers and local residence. workers health condition assessment. number of cases of disease and roadway accidents.	direct observation	regular during construction and every six month during operation phase.
Pressure on Social Service Facilities	adequate provision of toilets, good drainage, water supply system and proper sanitation for labor and work camps.	no complaints from local stakeholders	direct observation	regular during construction.

F. Promotion of Green House Gas Reduction

163. CO_2 is emitted by the large number of operating automobile vehicles, machines, hot mix plant's, crusher plant's etc. during construction. Poor vehicle upkeep may aggravate CO_2 emissions. Whilst CO_2 emissions during road construction is short term and location specific, vehicle upkeep of other party during operation phase is also the major air polluting cause. Though CO_2 emissions magnitude driven by transportation sector in Nepal is relatively insignificant, with newly built road, air quality will be improved as a result of reduction in traffic congestion and waiting times when vehicles are kept idling. Traffic congestion due to cross border commercial vehicles is a routine activity noted in the town of Bhairahawa. The mitigation measures recommended and as summarized below is designed to promote in reduction of Green House Gas.

- Newly proposed planting(s) of road side avenue trees.
- The subproject will ensure that Stone crushing equipment / hotmix plant should have in-built mechanism for the absorption of gases and shall be operated as per Manufacturer's Specification.
- The subproject will ensure that all construction vehicles to comply with GoN Pollution Regulation and possesses Green Sticker for operation.
- The Local Traffic Regulating Agencies during operation phase should take responsibility to ensure use of good condition vehicles complying GoN pollution regulation with Green Sticker.

G. Grievance Redress Mechanism

164. Public dissent, especially amongst local stakeholders is obvious and common to surface upon the road stretch where its activity is undertaken and continued without suggested environmental safeguards being correctly respected most notably during material extraction, locating cross outfall drainage over private land and draining out hazardous spills over the private land without consent of the landowner, and finally, creating inconvenience to the locals (littering arable land, dust hazard, noise pollution etc.) because of inappropriate construction practice.

165. The concern/grievances from local/affected people may come up related to inappropriate implementation of various components of EMP. These issues can be easily addressed through acknowledgement, evaluation and corrective action and response approach. To resolve grievance from public or stakeholders concerning the subproject will be directed to the PIU. For local stakeholders' convenience, this mechanism will be affected by establishing mandatory "grievance register book" at the Office of PIU. The register book will delineate i) date of grievance registered ii) name / address of grievance lodger (stakeholder) iii) nature of grievance being lodged and iv) location / site of fault works requiring corrections.

166. Firstly, it will be assessed if the grievances are genuine or suggestion is acceptable. Accordingly, response will be given within 15-30 days by the concerned PIU in consultation with the Supervising Consultant. In case the PIU through Supervising Consultant is unable to resolve the issue, the matter will be forwarded to the Geo-Environment and Social Unit, DoR. The corrective action will be carried out as per the response or action plan indicated to the stakeholder. The outcome shall also form part of quarterly report to ADB. Grievance redress mechanism shall be translated in Nepali language and posted to the respective VDC/DDC/Municipality office by DOR at least 30 days prior to commencement of construction works.

H. Public Consultation and Disclosure

167. An IEE study was carried out for upgrading of Bhairahawa – Parasi – Bhumahi Road under Sub-Regional Transport Facilitation Project (STFP), ADB RETA 6139. In accordance with EPR, 1997 and its amendment, a public notice was published in a National daily newspaper, Kantipur on 2060.12.28 BS (10/04/2004 A.D.) and public consultations were carried out during preparation of the IEE in the areas concerned including the villagers, Municipality / VDCs / DDC representatives and other stakeholders. The copy of public notice and suggestions from concerned Municipalities is presented in **Annex 2** and **Annex 3** respectively.

168. The Bhairahawa Bypass (BBY) subproject is intended to complement above road, by providing a new route that will enable traffic from the ICD to reach the Bhairahawa – Parasi – Bhumahi road without needing to pass through the town of Bhairahawa. Since, BBY is located within the influence area of Bhairahawa – Parasi – Bhumahi road, no separate ToR and IEE study report is required to be prepared for approval from the Ministry of Physical Planning and Works (MPPW), GoN.

169. Thus, the present study focuses on review of IEE study of Bhairahawa – Parasi – Bhumahi road, field visits to BBY site and preparation of site-specific reports and documents, including updating the baseline to 2010, and the IEE and EMP, as stand-alone documents which comply with ADB Environmental Assessment Guidelines and GoN requirements.

170. Consequently, field visit was made and consultation was carried out with the local stakeholders. The list of persons contacted and issues raised are kept in **Annex 4.** Major issues raised were employment opportunity for the locals, compensation for the affected land, adequate cross-drainage structures so that natural irrigation system is not altered etc. The issues raised during public consultation were addressed in the preparation of the IEE report. The IEE report will be accessible to interested parties and general public through information center of MPPW, DoR/GESU and PD/ADB including DoR website.

I. Environmental Management Plan

171. This Environmental Management Plan (EMP) delineates key issues likely to arise from Subproject implementation, and proposes mitigation measures, including monitoring schedule and responsibility. The EMP also outlines environmental management roles and responsibilities, road design and construction management of different activities, site supervision, monitoring and reporting, records, audits and corrective measures, improvement proposals, and cost estimates for mitigation measures. The EMP is detailed in **Table 7.3** below and shall form a part of Bidding Document.

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Table 8.3: Environmental Management Plan

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implementation	Supervision
[A] Environmental Enhancements						
1. Construction of road through settlement areas	• Construction of drainage and cross-drainage will improve health and sanitation of settlement area.	Settlement areas	Construction	Construction contract	Contractor	SC, PD/DoR
2. Road side amenities	• Installation of bus bays as per designs. • Erection of road furniture - e.g., traffic signs, speed zone signs as per design. •	Throughout road corridor	Construction	Construction contract	Contractor	SC, PD/DoR
3. Cultural properties	• Enhancement of all cultural properties	Throughout road corridor	Construction	Construction contract	Contractor	SC, PD/DoR
[B] Pre-Construction Stage						
1. Land and property losses / acquisition	• Initiate all necessary land and property acquisition procedures prior to the commencement of any related work. • Adhere to the land acquisition procedures in accordance to Land Acquisition and Resettlement Plan's Entitlement Framework.	Throughout road corridor	Design/Pre - Construction	As per RAP entitlement matrix	PD/DoR SC	PD/DoR
2. Permits	• Obtain necessary permits for commencement of roadwork and provide a copy to the Contractor. • Obtain written permission from landholders, Municipality, DDC and VDC under the Local Self-Governance Act, 1998 prior to commencement of various activities related to construction work and provide copies to the Supervising Consultant.	Throughout road corridor	Pre – Construction	Subproject preparation cost Construction contract	PD/DoR, SC Contractor	PD/DoR SC, PD/DoR
3. Worksite survey, Pegging and	• Conduct layout survey of the proposed road	Throughout road corridor	Pre - Construction	Construction contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
approval	construction works. • Locate, peg out and seek approval from the Supervising Consultant for each ancillary site prior to the commencement of related activities. • Inspect and approve, if correct all ancillary sites.					
[C] Construction Stage						
C1. Physical						
1. Earthworks / Slope Stabilization	• Seed sowing on embanked slopes • Plantation of road side avenue trees. • Adequate drainage cross drainage structures	Throughout road corridor	Design & Construction	~**250,000.00** for seed sowing (10,020m^2x24.5)	Contractor	SC, PD/DoR
2. Drainage and Water Management (Drainage, cross-drainage, gully protection etc.)	• Suitably sized side drains, cross-drainage structures will be constructed as per detailed design. • River training works to avoid depth and side erosion of stream beds. • Standpipes and public water supplies should not be used to extract water for construction works, without prior permission of VDC. • Public shall be consulted regarding location of drainage outfalls. • Care shall be taken not to disrupt or contaminate the irrigation water supply or local public water supplies.	Throughout road corridor. River training works specifically at km 1+030 & km 1+060.	Construction	Construction contract	Contractor	SC, PD/DoR
3. Operation and Closure of Quarries and Borrow Pits	• Locate and peg quarries and seek approval from the Supervising Consultant. • Obtain permission/license for extraction of materials from Stakeholders, Municipality, DDC or VDC as appropriate. • Locate extraction sites restricted to small areas; preferably on existing quarry sites and sites without any tree cover; away from dwellings, archeological, religious or cultural sites; sites which will not alter	Location of selected quarries and borrow pits proposed during construction	Design & Construction	Construction contract	Contractor -	SC, PD/DoR -

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	river flow regime and possess water logging problem in future; and sites where effects will be temporary. • Restrict all extraction activities to approved sites with operations to the hours of 7:00 – 18:00. • Prevent ponding of surface water through adequate drainage. • Restore the site maintaining natural contours and vegetation.					
4. Construction Debris Management	• Locate disposal sites on stable ground without excessive slope; that avoids water courses and wetlands; that will not promote instability and result in destruction of property, vegetation and local services. Preferably permissible sites are abandoned quarries in order to restore original contour. • Identify, peg and seek approval from supervising consultant for permissible disposal sites. • Obtain permission from local stakeholders, Municipality, DDC, VDC where required as appropriate. • Restrict disposal at approved locations with correct placement. • Where required, apply bio-engineering measures for vegetative cover to prevent surface erosion. • Measures will be taken to prevent earthworks and gabion works from impeding rivers, streams, water canals, or drainage system.	Location of selected construction debris disposal sites.	Construction	Construction Contract	Contractor and SC	SC, PD/DoR
5. Stockpiling of Construction Materials	• Locate, peg and seek approval from the supervising consultant for the use of stockpile sites. • Stockpile should not be located on water courses; should not be within 50m of schools, hospitals or public standpipes; and should not affect locals and their properties.	Location of identified stockpiling sites.	Construction	Construction contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	• Obtain written permission from landowners and local bodies for stockpiling on their land. • Stockpiles subject to erosion by wind or water should be covered with tarpaulins. For large stockpiles, it should be enclosed with side barriers and also covered when not in use. • Provide intervening vegetated buffer to control any un-expected run-off. • Clean area properly after completion.					
6. Fill operation	• Survey and peg toe of earth embankments. • Fill shall be carried out in layers no deeper than 150mm and appropriately compacted before applying next layer. • Cut and fill slopes shall be protected using conventional civil engineering structures in conjunction with vegetative stabilization measures as per design to avoid erosion problem.	Throughout the road corridor	Construction	Construction Contract. Cost of seed sowing on embanked slope is mentioned above.	Contractor	SC, PD/DoR
7. Reinstatement of Services	• Inventory of all services to be reinstated. • Locate and reach agreement with affected landowners and local people / end users (Municipality, DDC, VDC) regarding services (i.e. irrigation canal, water supply lines, standpipes, drainage ditches and walking trails, electrical poles, paved crossings to be maintained, temporarily cut and reinstated including timing and location of cuts and reinstatements. Obtain written permission from affected landowners / local people regarding temporary cessation of services. • Works shall be planned with timing to avoid / minimize impact to cultural festivals. • Moving of religious structures shall be done based on the results of public consultation.	Throughout road corridor. For paved crossings at km 0+130, 0+900, 3+340. Relocation of Transformer at km 0+140. Irrigation crossing at km 0+700.	Construction	Construction contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implementation	Supervision
8. Use of Bitumen	• Fuel wood shall not be used for heating bitumen. Bitumen shall be melted in heaters using kerosene, diesel or gas fuel. • Bitumen drums should be stored in dedicated areas, not scattered along the road and any small accidental spills should be cleared up immediately. • No bituminous material shall be discharged into side drains. • Bitumen shall not be applied in strong wind or rainy conditions.	Throughout road corridor.	Construction	Construction contract	Contractor	SC, PD/DoR
9. Stone Crushing Plant / Hotmix Plant / Batching Plants	• Locate, stake out and seek approval from Design Supervision Consultant for stone crushing plant. • Locate plant site away from population centers, drinking water intakes, cultivated lands and sensitive ecosystem preferably at least 500m from settlement and habitation. • Obtain permission from local stakeholders, Municipality, DDC or VDC as appropriate. • Stone crushing equipment / cement batching shall be fitted with dust control devices and operated as per Manufacturer's Specification. • Hotmix Plant should have in-built mechanisms for the absorption of gases. • The plant shall be operated during day time. • Restore the site maintaining natural contours and vegetation after use.	Location of selected Plant sites.	Construction Stage	Construction Contract	Contractor	SC, PD/DoR
10. Air Pollution	• Stone crushing plant / Hotmix plant / Batching plant shall be appropriately located at least 500m from settlement & habitation fitted with dust suppression equipment. • Road construction area shall be maintained damp by periodical spray of water.	Project area, Crusher Plant sites.	Construction	Construction contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	• Delivery vehicles will be covered. • Mixing equipment will be well sealed and equipped as per existing standards. • All construction vehicles should comply with Motor Vehicles and Transportation Management Act as amended and have green sticker for operation. • Provide temporary hoardings where required to minimize dust impact on locations of temples and other cultural sites. • Provision of speed control measures in settlement and working areas to limit traffic speed. • Air pollutant parameters (TSPM, PM_{10}, SOx, NOx, COx) will be monitored regularly during construction. Conforming NAAQS of Nepal.	One location at Siddharthanagar Municipality and one in Bagaha VDC. (i.e. sensitive sites)	Every three months.	For air quality monitoring **~600,000.00** (2 sites x 6 times x 50,000)	Through approved monitoring agency	SC, PD/DoR
11. Water Pollution (Hazardour Materials, Combustibles and Toxic Materials Management)	• Hazardous materials shall not be stored near surface waters sources • Used lubricants and oils shall be collected and recycled or disposed off site. • Plastic sheeting shall be placed under hazardous material storage area to collect and retain leaks and spills. • Contaminated runoff from storage areas shall be captured in ditches or ponds with an oil trap at the outlet. • Contaminated and worn plastic sheeting shall be packed into drums and disposed off site. • Explosives shall be used as per the prevailing GON regulations. • Water Quality (EC, PH, DO, TSS, Oil and Grease) Monitored regularly during construction. Conforming WHO standards.	Project area Two sensitive sites (preferably stream crossings at km 1+030 and km 1+630)	Construction Every three months	Construction Contract ~ **30,000.00** (2 sites x 6 times x 2500)	Contractor Through approved monitoring agency	SC, PD/DoR SC, PD/DoR
12. Noise Pollution	• Ensure plant and equipment used for construction	Project area, Crusher	Construction	Construction	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
and Vibration Effects	conforms to best practices. • Vehicles and equipment used will be fitted with silencer and maintained to keep noise at minimum levels. • Workers will be provided with appropriate ear muffs/plugs specially at crusher site • Noise barriers will be placed in urban and sensitive locations i.e. schools, hospitals etc. • Cracks caused by vibration due to construction activities need to be monitored closely and alternative be sought where problem arises. • Work will be restricted to day hours specifically at urban and sensitive locations. • Noise levels (1 hr Leq dB(A) levels will be monitored regularly during construction. Conforming WHO standards.	Plant site Two sensitive sites.	 Every three months.	contract For noise level monitoring **~180,000.00** (2 sites x 6 times x 15,000)	 Through approved monitoring agency	
C2 Biological						
1. Vegetation and Forest Resources	• Identify and seek approval from SC for clearance of vegetation. • Plantation of road side avenue tree on both side of the alignment. • Fuel wood shall be banned for construction works.	Throughout road alignment	Construction	Construction Contract ~**460,000.00** (460 nos.x1000)	Contractor	SC, PD/DoR
C3 Socioeconomic and Cultural						
2. Labour Camp Location and Management	• Locate, peg and seek approval from SC for labor camp sites. • Camps shall not be located near settlements; near water supply intakes; or sites that affect the access by local people to drinking water. • Camp shall not be in the vicinity of landslide and flood plains. • Provide and maintain proper drinking water, sewerage and waste disposal facilities at the camps.	Locations of selected labour camps.	Construction	Construction Contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	• Ensure no wood is burnt by any worker on or off site. Camps shall be provided free of cost, with electricity and regulator & adequate fuel supplies of LPG or Kerosene. • Prohibit workforce from poaching wildlife and cutting trees. • After use, sites shall be cleared and restored to near natural or stable conditions with vegetative cover. • Restrict working hours from 7:00 to 18:00.					
3. Work Camp Location and Operation	• Locate, peg and seek approval from SC for work camp sites. • Camps shall not be located near settlements and; near water supply intakes; or sites that affects locals access to drinking water. • Camp shall not be in the vicinity of landslide and flood plains. • Provide and maintain proper drinking water, sewerage, waste disposal including first aid unit medical facilities at the camps. • Used oil, lubricants shall be recovered, re-used or removed form site. • Explosives, oil, petrol, and grease shall be managed according to Provisions of this Management plan. • After use, the site shall be cleared and restored to near natural or stable conditions.	Locations selected for work camps.	Construction	Construction contract	Contractor	SC, PD/DoR
4. Occupational Health and Safety (Safety, Accident Risks and Health)	• Adequate lighting and safety signal devices be installed for work safety. • Adequate warning signs and safety barriers will be provided for work safety. • Protective clothing including helmets, masks, boots, gloves, ear plugs and goggles should be provided for workers safety.	Project area	Construction	Construction Contract	Contractor	SC, PD/DoR

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	• At every work place, a readily available first aid unit including an adequate supply of dressing materials will be provided for emergency preparedness in case of accidents. • Maintain health care system at construction camps including regular visits by trained medical staff for routine check up of workers and avoidance of communicable disease. • Strict rules and regulation be maintained in the labour and work camp to avoid alcoholic and other bad habits. • Electrical Equipment will be checked and certified regularly. • Provide and install all road signs as per design. • Impart road safety education to all villagers, schools, clubs and drivers of construction vehicles. •					
[D] Operation Stage						
1. Water Management and Slope Stabilization	• Maintenance of drainage and cross-drainage structures. • Preserving vegetative embanked slopes. • Cattle grazing and tethered cattle along the road edge be strictly prohibited.	Throughout road alignment	Operation	Maintenance Cost	DoR	DoR, GESU
1. Air, Noise and Water Quality	• Maintain signs and speed restrictions on the road section within settlements area to reduce vehicle speed, dust generation, and where horns will not be blown and traffic speed will be regulated. • Strict enforcement of vehicle emission standards and ensure plying vehicle have green sticker. • Maintain road side tree plantation. • Air pollutant parameters (TSPM, PM_{10}, SOx, NOx, COx, Pb). Conforming NAAQS of Nepal.	Throughout road alignment Two sensitive sites	Operation Every six months	Maintenance cost (2 sites x 2 times x 50,000) **200,000**	DoR Transport Manage-ment Department Through approved	DoR, GESU, TESU

Environmental Issues / Component	Remedial Measures / Actions	Approximate Location	Time Frame	Mitigation Cost (NRs.)	Institutional Responsibility	
					Implement ation	Supervision
	• Water quality (EC, PH, DO, TSS, Oil and Grease). Conforming WHO Standards. • Noise levels (1 hr Leq dB(A). Conforming WHO standards. • For other Direct Observation	Two sensitive sites Two sensitive sites	Every six months Every six months	2 sites x 2 times x 2,500) **10,000** 2 sites x 2 times x 15,000) **60,000** **150,000**	monitoring agency	
2. Safety Measures	• Traffic management plan will be developed, especially along congested locations. • Traffic control measures, including speed limits, will be enforced strictly. • Further encroachment and squatting within the ROW will be prevented. • No school or hospital will be allowed to be established within 50m of the road without permission from the planning authorities. • Municipality / VDCs along the roadside will control haphazard cleaning of vehicles and the leakage of fuels and lubricants into water channels. • Prevent vehicle leakage draining into the adjacent water courses.	Throughout road corridor	Operation	Maintenance cost	Local Govt. Body, DoR	DoR, TESU

Note: Cox = Oxides of Carbon. DDC = District Development Committee. GESU = Geo-environment and Social Unit. PD/DoR = Project Directoerate/Department of Roads. NOx = Oxides of Nitrogen. ROW = Right of Way. SC = Supervising Consultant. SOx = Oxides of Sulfur. TESU = Traffic Engineering and Safety Unit. TSPM – Total Suspended Particulate Matter. VDC = Village Development Committee.

IX. OTHER NECESSARY MATTERS

A. Permissions and Clearances Required for the Subproject

172. The legal framework of the country consists of several acts, notifications, rules, and regulations to protect environment and wildlife. List of required clearances / permissions related to environment has been summarized in Table 8.1.

Table 9.1: Permissions / Clearances Required for the Subproject

S.No.	Clearances	Acts/Rules/Notifications/Guidelines	Concerned Agency	Responsibility
A. Pre-construction Stage				
1	Environmental Clearance for bypass (bypass being 3.34 km urban road construction will be categorized as "B" with IEE requirement)	Environmental Protection Act 1997 and Environmental Protection Rules, 1997 (First Amendment, 1999).	Ministry of Physical Planning and Works	Department of Roads / PD, DoR (ADB)
2	Land Acquisition and Compensation	Land Acquisition Act (1997 as amended 1993)	Ministry of Physical Planning and Works	Department of Roads / PD, DoR (ADB)
3	Felling of Trees	Forest Act, 1992 (Amended in 1998) and Local Self-Governance Act, 199	Ministry of Forest	Department of Roads / PD, DoR (ADB)
B. Implementation Stage				
4	Permission for construction material quarrying (stone, cobble, sand, gravel, soil etc)	Local Self-Governance Act, 1999 and Soil, Watershed Conservation Act, 1982 and Watershed Conservation Rule, 1985.	Concerned Project and Concerned VDC, DDC and Municpality	Contractor
5	Consent to operate Hot mix plant, Crushers, Batching Plant	Local Self-Governance Act, 1999	Concerned Project and Concerned VDC, DDC and Municipality	Cotractor
6	Consent for disposal of sewage from labour camps	Water Resource Act, 1992	Concerned Project	Contractor
7	Pollution Under Control Certificate	Motor Vehicle and Transportation Management Act, 1993	Department of Transport	Contractor

B. Environmental Clearance Process

173. The procedure for obtaining environmental clearance for IEE has been depicted in **Figure 8.1.**

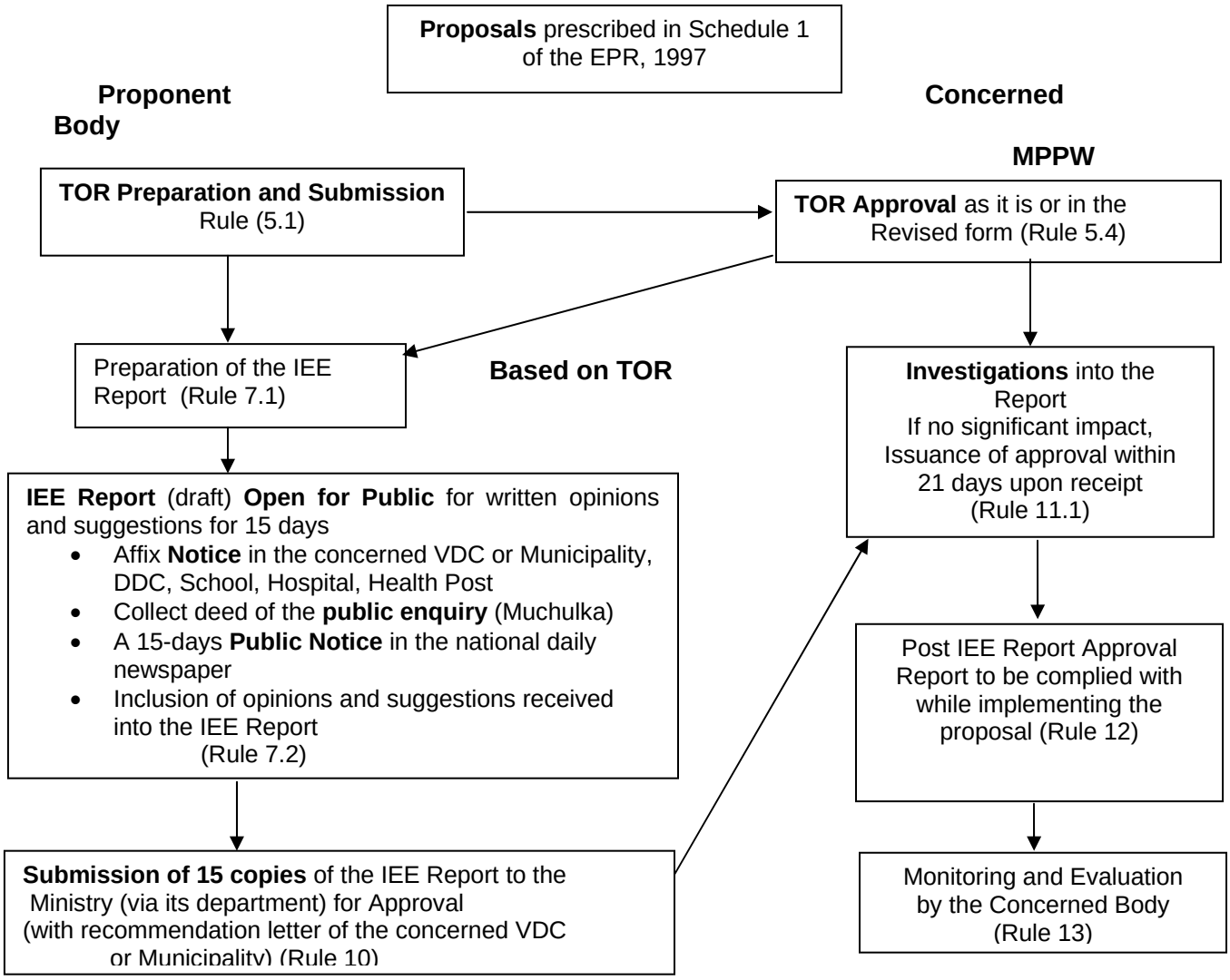

Fig. 8.1: Procedural Requirement for IEE Clearance

C. Review of Acts, Regulations and Guidelines

174. In Nepal, various instruments are in place to ease the integration of environmental aspects in development proposals. The study team has reviewed, but not limited to the following legislative provisions and guidelines of Nepal.

1. Constitution

Interim Constitution of Nepal, 2007 (as amended by the first, second and third amendments)

175. The Interim Constitution of Nepal provisions the right for every person to live in a clean environment. Article 35[5] also provions that the State shall make necessary arrangements to maintain the natural environment. The State shall give priority to special protection of the environment, and rare wildlife, and prevent further damage due to physical development activities, by increasing awareness of the general public about environmental cleanliness.

2. Plans and Policies

The Tenth Plan (2002-2007)

176. The Tenth Plan (2002-2007) has identified EIA as a priority area, and it emphasizes on environmental monitoring of the project that have underGoNe EIA process. The Plan focuses on the need for setting-up national environmental standards with the strategy of internalizing environmental management into the development programmes. The Plan has also realized to carryout Strategic Environmental Assessment (SEA) with the long term policy of promoting environmental governance. The Plan emphasized on the local participation in environment conservation, according to the Local Self Governance Act 2055, through the local bodies, make them responsible and capable to manage local natural resources.

Interim Plan (2007-2009)

177. One of the objectives of the Transport sector is to develop the identified eight trade and transit corriDoRs between neighbouring Countries India and China. Other objective of the transport sector related to the subproject is to develop and operate safe roads by suitable road safety and traffic management activities including raising public awareness on such activities.

178. The environmental strategies of the Interim Plan are to launch development programs by internalizing environmental management; mobilize non-government private sector, local agencies and the public in increasing public awareness on environment; determine and implement additional by - Laws on air, water, soil and sound pollution; and by making action plans prioritize and implement Treaties and Conventions on environment, which Nepal has enDoRsed.

179. One of the policies of the Interim Plan is to institutionalize the environmental monitoring auditing through an effective implementation of approved environmental reports (IEE and EIA).

3. Acts and Rules

Environmental Protection Act, 1996

180. The Environmental Protection Act, 1996 and Environmental Protection Regulation, 1997 (first amendment, 1999) contain several provisions to institutionalize the integration of environmental aspects in development Subprojects including road sector, and empowers Ministry of Environmentto approve EIA report. Similarly, in case of IEE level study, line Ministry, which is Ministry of Physical Planning and Works is authorized to approve the Final IEE Report. The following are the highlights of the EPA, 1996;

181. The Act recognizes the interdependence between development and the environment and shows the concerns for minimizing the impacts of environmental degradation on people, animal, and plant species and their physical surroundings. The Act obliges the proponent to undertake IEE and EIA of proposal, plans or Subprojects

which may cause changes in existing environmental condition and authorizes Ministry of Environment to clear all EIA and line Ministry for IEE study,

182. Empowers Ministry of Environment to prohibit the use of any matter, fuel, equipment or plant, which has adverse effects on the environment. The Act has provisions for polluters to compensate affected persons from polluting activities. Empowers government to provide additional incentives to any industry, occupation, technology or process, which has positive impacts on environmental conservation. It provisions to establish an Environmental Protection Fund to be used for environmental protection, pollution control and heritage conservation, and it gives the government authority to declare specific area as environmentally protected areas.

Environmental Protection Rules, 1997 (First Amendment, 1999)

183. In the process of implementing EPA (1996) effectively the Environmental Protection Rule (EPR) came into force in 1997 and was amended in 1999. The EPR contains elaborate provisions for the process to be followed during the preparation and approval of Subprojects requiring EIAs and IEEs including scoping documents, terms of reference, public consultations and hearings, and environmental monitoring and auditing. The environmental legislation empowers the concerned Ministry to monitor the environmental activities including mitigation measures and Ministry of Environment for environmental auditing. For IEE, the concerned Ministry, which is the Ministry of Physical Planning and Works in case of the road projects, is authorized to approve the Final IEE Report. The EPR also lists the types of development activities requiring IEE or EIA level Study. It also gives an outline of content of the terms of reference document, IEE and EIA report.

Public Roads Act, 1974

184. The Department of Roads may temporarily acquire the land and other property adopting compensatory measures during the construction, rehabilitation and maintenance of the public roads according to the Act (Article 14 &15). The Act also empowers the DoR to operate quarries, borrow pits and other facilities during the road construction (Article 17). In sum, the Act facilitates the acquisition of land and property for the extraction of construction materials and development of other facilities as well as to maintain greenery along the roadside with adoption of compensatory measures.

Forest Act, 1992 (Amended in 1998)

185. The Forest Act, 1992 (amended in 1998) contains several provisions to ensure the development, conservation, management and sustainable use of forest resources. The Act categories the forest into five categories viz.; state managed forest, community forest, leasehold forest, private forest and religious forest. The GoN has promoted users to manage forests in the form of community forests based on an approved work plan. The work plan should contain a list of activities that will be implemented in the community forest. It is significant that Article 27 of the Act contains provisions to take back the community forest if any activity causes significant adverse impact on environment or the users group that does not comply with terms and conditions.

186. The Act in general, prohibits the use of forest areas for development Subprojects, but its Article 68 empowers GoN to issue permission to use the required portion of forest

for development with the assurance that it does not significantly affect the environment. Based on the Forest Legislation, GoN has legally protected thirteen plant species including Khair and Sal.

Local Self-Governance Act, 1999

187. The Local Self-Governance Act, 1999 empowers the local bodies for the conservation of soil, forest, and other natural resources and implementation of environmental conservation activities. The Village Development Committees (VDCs), Municipalities and District Development Committees (DDCs) are mandated to take up the responsibilities for the formulation and implementation of a programme relating to the protection of the environment and bio-diversity, and to give adequate priority for the protection of the environment during the formulation of local level plans and programme.

Land Acquisition Act, 1997

188. The Land Acquisition Act (1977, as amended 1993) guides the compulsory acquisition of land. GoN can acquire land at any place and in any quantity by giving compensation pursuant to the Act for the land acquired for any public purpose(s) or for operation of any development project initiated by GoN institutions

Soil and Watershed Conservation Act, 1982

189. Soil and Watershed Conservation Act makes provision to control floods landslides (watershed conservation rules, 1985). The watershed conservation office is authority and district watershed conservation committee must implement watershed conservation practices and public participation for soil and land protection

Water Resources Act, 1992

190. Water resources act (1992) makes provision for the rational use of surface and underground water. The act seeks to prevent environment and hazardous effects from the use of water and prohibit water pollution by chemicals ,industries waste .water may only be used in anner that does not permit soil erosion, landslide or flood. Pollution of drinking water is prohibited under the Nepal drinking water corporation act (1989).

The Aquatic Animal Protection Act, 1961 and First Amendment, 1998

191. This Act indicates an early recognition of the value of wetlands and aquatic animals. Section 3 renders punishment to any party introducing poisonous, noxious or explosive materials into a water source, or destroying any dam, bridge or water system with the intent of catching or killing aquatic life. Under Section 4 of the Act, Government is empowered to prohibit catching, killing and harming of certain kinds of aquatic animals by notification in Nepal Gazette.

Motor Vehicle and Transportation Management Act, 1993

192. This act sets standard for vehicles emission and mechanical condition for vehicle registration by the transport management office (TMO) and the TMO can deny a permit based on environmental factor. Standard are set for petrol and diesel engine under the Nepal vehicle mass emission standard 1999.

1. Guidelines

193. Guidelines, including the draft EIA Guidelines for Road Sector, 1996, facilitate the proponents to prepare environmental assessment reports. These guidelines have been thoroughly reviewed and all pertinent issues have been incorporated during the preparation of this Report. The DoR Environmental Management Guidelines (EMG), 1997 provides guidance to the Proponent to integrate environmental mitigation measures, particularly on the management of quarries, borrow pits, stockpiling of materials and spoil disposal, earthworks and slope stabilization, location of stone crushing plants, etc. The Environmental Guidelines for Local Development also encourages the Proponent to incorporate environmental issues during Subproject design and implementation.

Environnemental Management Guidelines, GESU/DoR

194. Environmental Management Guidelines, GESU/DoR, July 1999 have been prepared as part of the program undertaken jointly by GoN and the World Bank under the Road Maintenance and Rehabilitation Project. These Guidelines are formally approved by Minister level decision on Kartik 22, 2053 BS (1997). The Guidelines are the part of operational practices for all road maintenance, rehabilitation and construction activities under DoR. The guideline consists of environmental mitigation measures to be incorporated into DOR Subprojects, procedures for public participation, and socioeconomic considerations. The environmental mitigation measures are broken down into twelve categories including (i) quarries; (II) borrow pits; (iii) spoil and construction waste disposal; (iv) work camp location and operation; (v) labour camp location and operation (vi) earthwork/slope stabilization (vii) use of bitumen (viii) stockpiling of materials (ix) explosive, combustible and toxic materials management (x) setting up and operation of stone crushing plants (xi) water management (xii) air and water pollution.

195. Implementation methods for undertaking mitigation measures for each of the activities are also given in the guideline. The Guideline suggests methods for determining how and when the public should be included in the environmental analysis. The guidelines also advise on socioeconomic impacts and strategies for reducing or avoiding the potential negative impacts and for maximizing the beneficial impacts to local residents. The socioeconomic impacts include important issues of land acquisition and compensation and other economic impacts with markets for agriculture production, agriculture inputs, nutrition, extraction of natural resources beyond replenishment, migration and influx of migrants, land speculation, illegal logging and mining, portering, etc. It also includes impacts on cultural heritage.

ADB Guidelines for Initial Environmental Examination, 2003

196. The Guidelines for IEE, 2003 clearly indicate the objectives and process for conduction of the IEE in terms of Subproject screening, preparation of Terms of Reference, desk review, field work, data analysis and interpretation (identification, prediction and analysis of impacts), mitigation measures, environmental management plan and reporting.

Guideline for Road CorridoR and Alignment Selection

197. This also indicates articulately the environmental consideration in alignment selection. This document provides the process and methods for environmentally sound road corridor selection.

Other Guidelines and Manuals

198. The following guidelines were reviewed and applied during the preparation of the report.

- Reference Manual for Environmental and Social Aspects of Integrated Road Development; MoPPWD/DoR.HMGN,2003;
- Environmental Management Guidelines for Roads and Bridges,GEU/DoR,1997
- Public Work Directives, HMGN,2002;
- Guide to Road Slope Protection Works, DoR, 2003;
- Nepal Road Statistics, 2006;
- Policy Document of DoR on Environmental Assessment in the Strategic Road Network,2000

4. Standards

199. The DoR has issued several Standards for the environmental management of road Subprojects, 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 Subprojects. Schedule 1 of these Guidelines, relating to the level of assessment required for different Subproject types, is almost identical to the 1997 Environment Protection Rules.

5. International Conventions and Treaties

200. Nepal is a signatory to many international agreements, conventions etc. related to environmental conservation such as: Convention on Wetlands of International Importance especially as Waterfowl Habitat, (1971); Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES-1973); The Convention on Biological Diversity (1992). Internalization of these Conventions and Treaties into domestic laws and policies is in progress.

X. CONCLUSIONS AND RECOMMENDATIONS

200. The proposed subproject has been categorized as Category 'B' based on environmental screening and assessment of likely impacts while the initial environmental examination ascertains that it is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed subproject, all of which are localized and temporary in nature and easy to mitigate.

The subproject proposed road corridor does not pass through or located nearby any national park, wildlife sanctuary, reserved forests, or any other ecologically sensitive or protected areas. No archaeological/protected monument is located in the project vicinity.

201. . The environmental impacts of the proposed construction of the Bhairahawa Bypass road are likely to have minimal detrimental effects on environment. Most of the significant impacts identified and predicted are minimal, temporary and short term associated with construction phase. However, seed sowing on embanked slopes is very essential and is provisioned in the design to avoid/minimize road side scouring and erosion. Road side plantation has been provisioned throughout the alignment for attenuation of noise and dust for built up receptors.

202. In general, the subproject received immense support from local people.The bypass road will provide direct access from ICD Belahiya to the east west highway avoiding traffic hazard in Bhairahawa. This will reduce costs, travel times and processing times for cross border commercial traffic. Reduced costs of access to and from the border and reduced custom clearance times in turn will reduce the cost of import and export thereby enhancing profitability of export industries in Nepal.

203. The proposed road construction works do not exceed any of the prescribed thresholds by EPA, 1996 and EPR, 1997 (First Amendment, 1999) and other relevant Acts and Regulations. Thus, an EIA study for the proposed Subproject is not required.

204. The initial environmental examination of the of the subproject ascertains that the project is unlikely to cause any significant environmental impacts. No additional studies or need of undertaking detailed EIA is envisaged at this stage. The Executing Agency shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The same shall be revised if necessary during project implementation or if there is any change in the project design and with approval of ADB.

References

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4. District Development Profile of Nepal, 2004.

5. HMGN, 2000.Environment Protection Act, 1996 and Environment Protection Rules, 1997(amended in 1999),MoPE.

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7. HMGN, 2002. Forest and Vegetation Types of Nepal. Ministry of Forests and Soil Conservation, Nepal.

8. HMGN, 2002. Nepal Biodiversity Strategy. Ministry of Forests and Soil Conservation, Nepal.

9. ISRC, 2007/08. District Profile of Nepal. Intensive Study and Research Centre Kathmandu.

10. Department of Road, Planning and Design Branch, Geo-Environmental and Social Unit, 2007. Environmental and Social Management Framework. Kathmandu, Nepal.

ANNEX 1

Environmental Screening Checklist and the Environmental Classification

Environmental Screening Checklist and the Environmental Classification

Rapid Environmental Assessment (REA) Checklist

ROADS AND HIGHWAYS

Country/Project Title: Nepal / RCS1P, STEP (VO4)

Sector Division: Road Construction with Bituminous Pavement: Bhairahawa Bypass (3.34 km)

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			
▪ CULTURAL HERITAGE SITE		X	
▪ PROTECTED AREA	☐	X	
▪ WETLAND	☐	X	
▪ MANGROVE	☐	X	
▪ ESTUARINE	☐	X	
▪ BUFFER ZONE OF PROTECTED AREA	☐	X	
▪ SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	X	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	√		Landscape will change by road embankments, cuts, fills and quarries. Adequate water management; proper operation of quarries and borrow pits/ construction waste disposal; and appropriate fill operation will minimize the impact.
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?		X	
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		X	No alteration of surface water hydrology. Small khola, nala and small irrigation ditch will maintain its flow and course through appropriate cross-drainage and outlet..

SCREENING QUESTIONS	Yes	No	REMARKS
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	√		• Risk is temporary and associated with construction phase. • Camps will be sited away from nala and river and equipped with septic tanks. • Ensure proper drinking water, sewerage and waste disposal facilities at the camps. • Plastic sheeting shall be placed under hazardous material storage area to collect and retain leaks and spills. • Contaminated runoff from storage areas shall be captured in ditches or ponds
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	√		• Risk is temporary and associated with construction phase. • Stone crushing plant / Hotmix plant / Batching plant shall be appropriately located at least 500m from settlement & habitation fitted with dust suppression equipment. • Road construction area shall be maintained damp by periodical spray of water. Vehicular speed will be controlled. • Delivery vehicles will be covered. Mixing equipment will be well sealed and equipped as per existing standards.
▪ noise and vibration due to blasting and other civil works?	√		• Risk is temporary and associated with construction phase. • No blasting is required. • Area in large is agricultural and built receptors are present in small stretch within Siddhartha Municipality. • Ensure plant and equipment conforms to best practices. • Vehicles and equipment be fitted with silencer and maintained to keep noise at minimum levels. • Workers provided with appropriate ear muffs/plugs. • Noise barriers be placed in urban and sensitive locations. • Work be restricted to day hours
▪ dislocation or involuntary resettlement of people	√		Around 9.1124 ha of land will require acquisition. Land Acquisition and Resettlement Plan have been prepared. It avoids acquisitiono of structural properties. Almost all landowners possess extra land apart from affected one. Thus resettlement impact will be minimum.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	√		• Dust could cause respiratory problems. Road construction area shall be maintained damp by periodical spray of water.
▪ hazardous driving conditions where construction interferes with pre-existing roads?		X	• This is a new road construction.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	√		• Size of construction camp is small considering the length of road. Majority of workers will be used locally and will not stay in the camps. • Camps shall not be located near settlements; near water supply intakes; or sites that affects locals access to drinking water. • Ensure proper drinking water, sewerage and waste disposal facilities at the camps.
▪ creation of temporary breeding habitats for mosquito vectors of disease?	√		Proper water management to ensure no water impounding at borrow pits, drainage ditch etc.
▪ dislocation and compulsory resettlement of people living in right-of-way?	√		A full land acquisition and resettlement plan (LARP) have been prepared. GoN, DoR is implementing LARP.
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	√		Traffic management plan implementation.
▪ increased noise and air pollution resulting from traffic volume?		X	Traffic will increase but attenuation of noise through road side plantation. GESU will coordinate with Municipality and VDCs to avoid built up areas along critical sections for noise.
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	√		• Ensure vehicles using the road comply with GON Motor Vehicles and Transportation Management Act. • Ensure standard vehicle servicing centers are established along the highway at appropriate locations.

Proposed Project Classification: Should be categorized as a **'B'** Project.

Prepared by

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Date: May 2010

Reviewed by:

ANNEX 2

Copy of The Public Notice

ANNEX 3

Comments and Suggestions Received from Concerned Municipalities and VDC

ANNEX 4

List of Persons Contacted and Issues Raised

Annex 4.1: List of Participants / Public Consultation

S.No	Name	Address	Profession	Remarks
1	Mr. Paradesi Teli	Balapur, Bagaha VDC - 8	Agriculture	
2	Mr. Bihari Prasad Sahani	Balapur, Bagaha VDC - 8	Agriculture	
3	Mr. Chandrika Kurmi	Balapur, Bagaha VDC - 8	Agriculture	
4	Mr. Ram Krishna Pandey	Balapur, Bagaha VDC - 8	Agriculture	
5	Mr. Gupta Teli	Balapur, Bagaha VDC - 8	Agriculture	
6	Mr. Janardan Chaudhari	Balapur, Bagaha VDC - 8	Agriculture	
7	Mr. Birendra Chaudhari	Parshauni VDC-7	Agriculture	
8	Mr. Nathuram Chahi	Basantapur VDC-8	Agriculture	
9	Mr. Akwar Hussain	Balapur, Bagaha VDC - 8	Agriculture	
10	Mr. Tek Bahadur Thapa	Balapur, Bagaha VDC - 8	Agriculture	
11	Mr. Keshav P. Mishra	Balapur, Bagaha VDC - 8	Agriculture	
12	Mr. Dhrub Pandey	Balapur, Bagaha VDC - 8	Agriculture	
13	Mr. Phulare Ahir	Balapur, Bagaha VDC - 8	Agriculture	
14	Mr. Santos Kumar Dune	Balapur, Bagaha VDC - 8	Agriculture	
15	Mr. Jagadish Chaudhari	Basantapur, VDC-7	Agriculture	
16	Mr. Sundara Ahir	Balapur, Bagaha VDC - 8	Agriculture	
17	Mr. Dhana Raj Chaudhari	Basantapur, VDC-7	Agriculture	
18	Mr. Raj Kumar Yadav	Basantapur, VDC-9	Agriculture	
19	Mrs. Sati Nani Pandey	Balapur, Bagaha VDC - 8	Agriculture	
20	Mr. Hari Prasad Chaudhari	Basantapur, VDC-7	Agriculture	
21	Mr. Deepak Baniya	Balapur, Bagaha VDC - 8	Agriculture	
22	Mr. Ram Lakhan Chaudhari	Basantapur, VDC-7	Agriculture	

Annex 4.2: Issues Raised

S.No	Person/Institution/Address	Major Concerns/ Issues Raised
1	Mr. Paradesi Teli, Balapur, Bagaha VDC - 8	• Employment opportunities for local people during construction. • Adequate compensation for affected people. • Adequate cross drainage to avoid hindrance to irrigation.
2	Mr. Ram Krishna Pandey, Balapur, Bagaha VDC - 8	• Employment opportunities especially for women. • Satisfactory compensation should be given to the affected people.
3	Mr. Birendra Chaudhari, Parshauni, VDC - 7	• Adequate cross drainage to avoid blockade of irrigation water. • Acceptable compensation for affected people.
4	Mrs. Sati Nani Pandey, Balapur, Bagaha VDC - 8	• Employment opportunities for male and female in equal footing. • Cash payment as a compensation for affected people.

S.No	Person/Institution/Address	Major Concerns/ Issues Raised
5	Mr. Santos Kumar Dune, Balapur, Bagaha VDC - 8	• Haphazard disposal of construction material be avoided.
6	Mr. Dhrub Pandey, Balapur, Bagaha VDC-8	• Cash payment as compensation so that we can re-invest for fertile land.
7	Mr. Ram Lakhan Chaudhari, Basantapur VDC-7	• Dust nuisance should be controlled during construction.

ANNEX 5

Checklist for Environmental Baseline / Issues

Bhairahawa ByPass
Environmental Baseline / Issues

S.No.	Environmental Baseline / Issues	Physical / Biological / Socioeconomic & Cultural	Location	VDC / Municipality	Remarks

ANNEX 6
Corresponding Outline of EIA (ADB-SPS 2009) to Sections of IEE

Corresponding Outline of EIA (ADB-SPS 2009) to Sections of IEE

Outline of EIA (ADB-SPS 2009)	Sections of IEE
A. Executive Summary	2. Summary of the Proposal
B. Policy, Legal, and Administrative Framework	8. Other Necessary Matters
C. Description of the Project	3. Description of the Project
D. Description of the Environment (Baseline Data)	3.2 Detailed Particulars of the Subproject Area
E. Anticipated Environmental Impacts and Mitigation Measures	4. Impacts of the Implementation of the Proposal on the Environment 6. Measures to Reduce or Control the Impact of the Implementation on the Environment
F. Analysis of Alternatives	5. Alternative Analysis
G. Information Disclosure, Consultation, and Participation	7.8 Public Consultation and Disclosure
H. Grievance Redress Mechanism	7.7 Grievance Redress Mechanism
I. Environmental Management Plan	7. Matters to be Monitored while Implementing the Proposal
J. Conclusion and Recommendation	9. Conclusions and Recommendations

ANNEX 7

Photographs

Bhairahawa – Bypass Photos

Bituminous Link Road leading to Sunauli Custom

Gravel Road demarcating Nepal-India Border

Starting point of Proposed Bhairahawa Bypass (BBY) Road

Road side parking area under construction for vehicles awaiting Custom clearance besides starting point of BBY Road.

Junction at Km 0+130, where BBY road meets Bhairahawa – Sunauli Highway. Requires appropriate Junction Improvement.

Km 0+140 onwards, the proposed road traverses along open cultivated field. Noted Transformer will require Relocation.

Bhairahawa – Bypass Photos

Km 0+420 viewing west, where built up compound wall structure lies near ROW.

Km 0+700 - Existing brick lined irrigation canal where 90 dia pipe culvert has been proposed.

Vegetation at Km 1+030 where Slab Culvert has been proposed for kholsi/Nala crossing.

End point Junction at km 3+340 meeting Bhairahawa – Parasi Road.

View from end point, Km 3+340 towards proposed BBY road traversing along agricultural field.

Interaction with the local stakeholders at Bagaha VDC of Rupandehi District.