



CHAPTER-4: IMPACTS OF THE IMPLEMENTATION OF PROPOSAL ON THE ENVIRONMENT

This section identifies, predicts and evaluates the environmental impacts of the activities of the proposal. The identified impacts have been classified under the beneficial impacts and adverse impacts. These impacts have been further classified into construction phase and operation phase. Using the provisions as given in National EIA Guidelines (NPC/IUCN, 1993), the impacts have been predicted and quantified, where possible and then evaluated again by using the scoring system. The impacts have been evaluated in terms of type of impacts as to direct or indirect; in terms of magnitude as high, medium or low; in terms of extent as to regional, local or site specific; and in terms of duration as to short term, medium term or long term. For the impact evaluation, the matrix method with numerical ranking is used for the quantitative ranking of the predicted impacts. The numerical scale mentioned in the National EIA Guidelines, 1993 has been adopted for this project. The numerical scale is as:

Magnitude	Score	Extent	Score	Duration	Score
High	60	Regional	60	Long term	20
Moderate	20	Local	20	Medium Term	10
Minor (low)	10	Site Specific	10	Short Term	05

The impact which will occur inside the project is termed as Site Specific and which goes up to ward and Municipality/Rural Municipality level is termed as Local and which goes up to district/province level is termed as Regional. The combined score up to 45 is termed as Insignificant; 45-75 is termed as Significant and beyond 75 is termed as Very Significant impact.

4.1. Beneficial Impacts

Apart from the residual impact of overall development of the project along with the initiation of such a large-scale road upgradation project there will be many direct benefit associated with the project. This project has proposed for the upgradation of the Imiliya and Chandrauta hat bazar as well as has also proposed to establish two universal public toilets in along the settlement of the road alignment. Apart from that physical effort the project will provide livelihood support/enhancement training to the project affected peoples which will support for the economic support of the peoples. Furthermore, there are many beneficial impacts of the project as mentioned below.



During Construction Phase

1. Generation of huge Employment opportunities

It is estimated that 462,000 labors including 56,000 skilled, 400,000 unskilled & 6000 Semi-skilled human resources will be required for the project. This project could create numerous job openings, boost local employment and stimulate economic growth. Priority for employment will be given to local people. Additionally, increased employment can lead to higher local income levels, benefiting families and contributing to community development and the growth of local businesses. Overall, the project not only enhances infrastructure but also supports local economic and social progress.

The impact is expected to be direct, high in magnitude, regional in extent, medium term in duration and thus overall impact is very significant.

2. Improved transport facilities and international connectivity

The road project will significantly enhance transport facilities and international connectivity by improving infrastructure, reducing travel time, and lowering transportation costs. This will facilitate trade and commerce, giving local businesses better access to national and international markets, while also attracting more tourists, boosting economic growth. Improved connectivity will foster cross-border collaboration and cultural exchange, and better access to international ports.

The impact is expected to be direct, medium in magnitude, regional in extent, long term in duration and thus overall impact is very significant.

3. Enhancement in technical skills

The road construction project will mobilize the number of semi-skilled and unskilled workers from the project affected communities. These workers will have the opportunity to develop into fully skilled laborers in areas such as masonry, gabion wire weaving, foundation wall construction, bar binding for structures and bridges, and bio-engineering work. These skills will not only provide long-term employment opportunities for locals but also contribute to the development of local human resources.

The impact is expected to be direct medium in magnitude, regional in extent, medium term in duration and thus overall impact is very significant.



4. Opportunities of new income sources

In addition to labor opportunities, the road project can stimulate local businesses such as tea stalls, small eateries, and shops, enabling residents to expand their enterprises. The increased demand for local products like vegetables, dairy, and meat will create new income-generating, significantly boosting the local economy. As a result, a substantial portion of the project's expenditures will flow into the community, enhancing economic activity and growth.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

During Operation Phase

5. Reduced travel time and cost

Upgrading a 2-lane road to a 4-lane road can significantly reduce travel time and cost. With the increased capacity, traffic can flow more smoothly and at higher speeds, which helps to alleviate congestion, especially during peak hours. This improved traffic flow leads to shorter travel times, allowing drivers to reach their destinations more quickly. Additionally, with shorter travel times, vehicles consume less fuel ultimately results in lower fuel costs and reduced maintenance expenses. Thus, expanding a road to four lanes not only enhances travel efficiency but also results in considerable savings for both individuals and businesses.

The impact is expected to be direct, medium in magnitude, regional in extent, long term in duration and thus overall impact is very significant.

6. Enhanced economic activities, trade and business

The increased road capacity facilitates better access to commercial and industrial areas, making it easier for businesses to operate and for customers to reach them. Improved road infrastructure can stimulate regional economic growth by attracting new businesses and investments, leading to job creation. Additionally, faster and more reliable transportation lowers overall costs for businesses, potentially leading to reduced consumer prices and increased profit margins. Moreover, enhanced connectivity makes a region more competitive, fostering business expansion and driving economic development specially at major junctions like Imiliya, Dumara, Kharendrapur, Chandrauta etc.



The impact is expected to be direct, medium in magnitude, regional in extent, long term in duration and thus overall impact is very significant.

7. Increased potential of industrial development

The proposed road project can significantly increase the potential for industrial development by improving access and connectivity. With a larger and more efficient roadway, industries can transport raw materials and finished products more easily and cost-effectively, attracting new businesses to the area. Such easy access to transport sector also paves the way for local small-scale enterprises.

The impact is expected to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significant.

8. Improved traffic facilities and resting places

With the increased road capacity, there is more opportunity to incorporate additional infrastructure elements, such as rest areas and service facilities. These resting places provide essential services for travelers, including restrooms, food, and fuel, which improve overall comfort and safety.

Additionally, the expansion allows for better traffic management features, such as dedicated lanes for turning, improved signals, and enhanced road marking and parking as well, which contribute to smoother and safer driving conditions. Improved traffic flow and reduced congestion also lessen the likelihood of accidents and delays, making travel more pleasant and efficient for everyone.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

4.2. Adverse Impacts

The likely adverse impacts during construction and subsequent operation and maintenance in terms of physical, chemical, biological, socioeconomic, and cultural aspects have been identified and appropriate mitigation measures are recommended. The potential adverse impacts of the project implementation have been summarized in following sub headings.



4.2.1. Socio-economic Environment

Construction Phase

1. Road safety concerns as well as potential road accident

The upgradation works initially increase road safety concerns and the potential for accidents leading to the situation of injuries, handicraft as well as casualties. During construction, construction activities, increased vehicles machines as well as reduced visibility, deteriorated road condition, open construction sites, altered traffic patterns, lane closures etc. can create illusion/confusion and discomfort conditions to the drivers. Similarly, transportation of heavy construction equipment and presence of workers on or near the road can also pose safety risks. Furthermore, unsafe road crossing behavior/practice may also lead to have road accidents.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is very significant.

2. Land acquisition & property/assets and their management issues

No land acquisition will be required for the project. The proposed road project will affect a total of 53 private structures (table 2.3), 82 public structures (table 2.4) and 1202 public utilities (table 2.5). Out of all private affected structures, only 5 are fully affected families who have to loss their house for road upgradation.

The impact is expected to be direct medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significant.

3. Temporary land requirement and loss of standing crops/production/productivity

Eventhough the land area is under the ownership of DoR, temporary land may be required for the establishment of temporary camps, stockpiling of construction materials, operation of crusher, batching and asphalt plants beyond the RoW.

Similarly, for the project activities may loss standing crops in the temporary acquired land. The impact due to temporary land acquisition will be change in the quality of land in terms of fertility.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.



4. Impact on existing social and cultural practices

During the upgradation of road, the influx of workers from diverse backgrounds will have to stay together in temporary accommodations which can lead to some challenges. The presence of individuals from different regions or cultural contexts may result in differences in social norms, communication styles, and daily practices, potentially causing conflicts or misunderstandings.

The impact is expected to be indirect, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

5. Health and sanitation of workers as well as community health

Workers in infrastructure projects face numerous hazards, including physical risks from heavy machinery, heights, electrical tools, water work, and falling objects, as well as exposure to dust, noise, and vibrations. They also encounter chemical hazards during tasks like earthwork and bridge construction. Without adequate PPE, they are at increased risk of accidents, respiratory problems, and eye injuries. Poor living conditions in temporary camps can lead to diseases like dysentery and cholera, while migrant workers often experience mental stress from harsh work environments and harassment.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

6. Pressure on social services (drinking water, health, school, bank, electricity etc.)

The influx of construction workers can increase the demand of existing social services, such as utilization of drinking water, healthcare facilities, electricity supply, health, school, banking service etc. This increased demand can exacerbate existing water supply issues and lead to competition for limited resources. It can create disputes between the workers and the locals for resources utilization.

The potential project impacts resulting in social services is direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significant.

7. Impact on religious and cultural sites

There are shiva temple-Imiliya, Diar of Tharu community-Dumara, small shiva temple at Champapur (personally made), supadeurali temple-after Jawai khola at the turning and mothorasa at Chandrauta that have religious value. Similarly, US and DS of the Bel River has been using as cremation sites by the locals. Among them Diar has significant religious value that has to be shifted



from the ROW. There is old tree of peepal as well that has mith that there was obstruction while constructing the EWH due to presence of some supreme power in the location. The Diar was established by the Tharu prist then only construction work was succed in the area. Other sites donot have significant value. Supadeurali and Motherasa are out of the RoW hence will not be damaged however the small shiva temple personally made in memory of family member at Champapur will also be required to dismantles for the project.

The magnitude of the impact is high, with local exposure and long-term influence hence is significant impact for the project

8. Issues on infrastructures such as drinking water supply pipelines, irrigation channel, transmission lines, telephone lines etc.

There are 35 number hand pumps and drinking water supply pipelines in either side of the Imiliya, Dumara, Kharendrapur, Bankatti and Chandrauta and Shivapur section. There is also crossing of irrigation canal at between Kharendrapur and Supadeurali temple called Nahar chowk. Similary, distribution lines of electricity along both sides of the road whichcontains transformers electric poles, solar and internet poles. Altogether there are 1003 electric poles (cement 805, metal-193 & wooden-5), 154 dedicated poles for internet and 21 poles for solar lamp, handpumps 24 transmitter along the road that has to be relocated. Transmission lines and telephone lines may need to be moved or repaired, leading to interruptions in electricity and communication services. Due to damage/obstruction on those infrastructures there could be disturbance in services of the infrastructure especially there could be water deficit condition as well as cut down of the services that has to be addressed by the project.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

9. Issues related with Gau Samrakshan Kshetra near Bel River

Along the road, there is a Gau Samrakshan Kshetra that has been operating by a prist of Hindu religion from tharu community. It is located towards south in the mid part of the forest towards south. Grazing area of the cow has extended towards north where cow has to cross the road to access the forest to graze. During construction, there will be minimal obstruction on the movement of the cows. Apart from the disruptions to the movement of livestock might occur, noise and dust pollution could affect their movement.



The impact is direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

During Operation Phase

1. Issues related with creation of dead traps

Road upgrading often involves the excavation of materials from quarry or borrow areas, which can lead to the creation of "dead traps" or dangerous pits if not properly managed. These open pits pose safety risks for both humans and wildlife, as they can fill with water, becoming drowning hazards, or collapse, causing accidents. Without proper rehabilitation or filling of these areas after construction, they may remain as permanent hazards, negatively impacting the landscape and community safety. In the similar manner people in these areas has been using cycle as the means for the local transport. If the highway doesnot have cycle lane there could be huge chances of having accident of those cycliers. Furthermore, due to lack of traffic rule they could also have road accidents.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is very significant.

2. Impact on religious, cultural, and historical assets

There are Shiva temple, Devi mandir, as well as other religious structure of Hindu at different locations along the road. Similarly, a Musjid/Madarasa in Chandrauta exists along the road sides which might get affected after construction of the road as there will be mobility of high-speed vehicles. The road acts as barrier as there will be median of the road. It can obstruct people to reach those religious sites and can have road accident.

The impact is expected to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is very significant.

3. Issues on community resources and utilization

The project construction can strain community resources and affect their utilization. Increased demand from construction activities and workers may lead to shortages of essential resources like water and energy, while disrupting the use of community infrastructure such as parks and public

spaces. Additionally, the economic impact of construction can shift focus and strain local services, potentially increase prices and affect accessibility.

The impact is expected to be direct, medium in magnitude, site specific in extent, short term in duration and thus overall impact is moderately significant.

4. Issues related with Gau Samrakshan Kshetra near Bel River

Along the road, there is a Gau Samrakshan Kshetra that might be impacted during the operation and maintenance phase, fatality might occur during crossing of cattle due to high speed of vehicles.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

4.2.2. Physical and Chemical Environment

Construction Phase

1. Issues related with maintaining the RoW and prevention from encroachment

After the construction, the RoW can be possible to encroach by local people for different purposes such as vegetables and fruit sales stalls etc. The encroachers will construct permanent or temporary structures within the RoW. Encroachment of RoW will increase of accidents, undesired landscape aesthetics and reduces overall road capacity.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is very significant.

2. Impacts associated with operation of project components e.g. Crusher plant, batching plant, workshop, asphalt concrete plant etc.

The operation of crusher plant, batching plant will release dust particles, similarly, operation of those machines as well as mobility creates persistent loud noise and there is also possibility of leakage of lubricants. All those consequences will result into air pollution, noise pollution and soil pollution locally. If the crusher plant is established near the water sources, it can cause water pollution too. Lack of using PPE will directly affect the health of labors.

The impact is expected to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is very significant.



3. Construction of bridges/drainage structures

The proposed road upgrading project involves construction of bridges (2 Major bridges and 6 minor bridges, 1 VUP, 2 PUPs & 1 FOB) and culverts (64 box culverts and 7 pipe culverts), side drains, retaining structures, and other protective works. Altering the natural drainage patterns could change the flow of surface runoff, potentially causing temporary inundation and flooding during the monsoon season. River diversion will be necessary for constructing the bridge pier foundation, which may increase sedimentation and alter the river's morphology. Additionally, direct disposal of construction materials into water bodies could adversely affect aquatic life by further increasing sedimentation. Two major bridges and six minor bridges will be constructed in different section of the road alignment. Construction of the bridges and crossdrainage structure could impose point source impacts. Following impacts are envisaged for the bridge construction works.

- River diversion and filling for insitu bridge construction works increases risk of inundation in Imiliya settlement north of the highway.
- Potential of the bank cutting towards the agriculture land in Imiliya at DS side.
- Risk associated with of contamination of aquatic ecosystem due to soil particles and chemicals cement, oil, fuel etc.
- Potential of waterlogging due to damage of the existing side drains specially at Imiliya section as well as Chandrauta section of the road.
- Potential of changes of river morphology and poor water flow management increase erosion and can increase flood risks.
- Displacement, cultural site disturbance, and visual intrusion affect communities and heritage.
- Dust, emissions, and noise from construction specially at night time creates nuisance to settlement.
- Improper disposal of construction waste can contaminate land and water.

The impact is expected to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is very significant.

4. Impacts associated with construction camps establishment and operation

The establishment of workforce camp sites and stockpiling areas can significantly impact local communities. Increased traffic from construction vehicles transporting materials to and from these



sites can lead to higher congestion and safety concerns on local roads. The operation of heavy machinery and construction activities will likely generate considerable noise and dust. Moreover, the influx of construction workers may place additional strain on local resources such as water and sanitation, potentially affecting their availability and quality for residents. The construction materials if not properly stored or stockpiled will lead to dust pollution, siltation and pollution of surface water. This in turn will disturb adjoining community, private property.

Furthermore, solid waste generated from the camp is one of the sensitive issues for the project to be addressed.

The impact is expected to be direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.

5. Impacts on air quality, construction noise and vibration

Construction activities results air water and noise as well as vibration issue along the road. It not only creates stress to the atmosphere but also pressurize to the settlements as well as surface and underground water sources if could not be managed properly. If excavation of the existing road was done prior to construction of adjacent new alignment the issue will be not only degrade the transport network but also creates affinity to multiple adverse environmental consequences. The associated issues

Air Pollution: During construction, activities like excavation, quarry operations, and the operation of crusher and asphalt plants can contribute to air pollution along the proposed road alignment. These activities primarily produce dust particles and smoke, which can significantly degrade air quality. The major sources of energy required is diesel, petrol and kerosene. Burning of such fuels would results in environmental pollution due to emission of Sulphur oxides (SOX), Nitrogen oxides (NOX), Carbon dioxide (CO₂). Furthermore, vehicular movement and machinery operation emits smoke and fine particles. Air pollution will cause inconvenience to local people residing close to the construction sites. Apart from the mentioned causes improper planning of road pavement, random scarification, inappropriate impose of dust control measure can contribute significantly for release of the dust particle.

The impact is expected to be direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.



Noise Pollution: During the construction phase, noise levels will rise significantly due to increased vehicular traffic, machinery operation, crushing plants, and material transportation. Constant exposure to high noise levels can negatively affect wildlife, the health of workers, and nearby communities. Noise emissions from construction machinery and quarrying operations may disturb local residents and workers.

The impact is expected to be direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.

Vibration: During construction, large machinery and equipment, such as construction vehicles, generators, compressors, and pumps, will be utilized. These machines generate vibrations that will be felt by nearby settlements. While the vibrations may cause temporary disturbances, they are localized and unlikely to cause structural damage to buildings or walls adjacent to the road.

The impact is expected to be direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.

6. Risk associated with road safety

Road upgrading can increase safety risks if not properly managed, especially during construction. The use of heavy machinery and construction equipment on busy roads raises the chances of accidents, while not having enough safety barriers can put workers and the public in danger.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is moderately significant.

7. Impacts due to quarry/borrow site operation

The operation of quarry and borrow sites can have adverse impacts, including dust generation that degrades air quality, noise and vibration disturbances from machinery and blasting, and potential water pollution from sediment runoff and chemical spills. Soil erosion and land degradation may occur due to the removal of vegetation and topsoil. Additionally, heavy trucks used for transporting materials may cause traffic congestion and safety hazards on local roads.

The impact is expected to be direct, medium in magnitude, site specific in extent, long term in duration and thus overall impact is moderately significant.



8. Loss of productive soil

During construction activities it is expected to effect on about 43 ha fertile land including forest and agriculture land. Similarly, about 10.6 ha of private land has to be leased for the project facilities. Assuming 15 cm top soil and collection of about 75% of the top soil is fertile, it is estimated that 60.3 Ton of fertile soil will release from the project. Hence, there is possibility of loss of this huge quantity of topsoil due to if project could not handle it properly.

The impact is assessed to be direct/indirect, high magnitude, local in exposure for mid term in duration thus overall impact is significant.

9. Impacts on surface and ground water contamination

Widening a road can degrade water quality through leakage from stored construction materials and improper management of camp waste. These leaks can contaminate both surface and groundwater. Increased runoff from expanded paved areas can also carry pollutants into nearby water bodies.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

10. a) Impacts of Occupational safety and health implements and its use

Workers on road widening projects face physical hazards from heavy equipment, working at heights, electrical equipment, and other risks like trips, falls, and exposure to dust, noise, and vibrations. Health issues can arise from poor sanitation and living conditions at temporary accommodation sites, including inadequate food, personal safety, and hygiene. Without proper personal protective equipment (PPE), workers are at risk of accidents, respiratory problems, eye irritation, and diseases from unsafe water and unhygienic conditions, while mental stress may increase due to local harassment and unfavorable work environments.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

b) Community Health and safety

Road construction can pose adverse impact on community health and safety by generating air and noise pollution, increasing the risk of respiratory problems and stress. Additionally, it can lead to traffic hazards, accidents, and disruptions in access to essential services like healthcare. Improper



waste management during construction may also contaminate water sources, posing further health risks to local residents.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

11. Drainage, soil erosion and sedimentation problem in the river & nearby settlement

Widening a road can alter drainage patterns, leading to increased runoff and potential flooding in nearby areas. The land at Imiliya and Chandrauta section are relatively at low land. Existing drainages are not functional specially west of Chandrauta. Apart from that the construction process may cause soil erosion, as disturbed soil and removed vegetation make the area more vulnerable to erosion. This eroded soil can lead to sedimentation in nearby rivers, degrading water quality and harming aquatic habitats.

The impact is expected to be direct/indirect, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

12. Impact associated with hazardous, non-hazardous and liquid waste

During the construction phase, non-hazardous waste will be generated mainly from the camps and offices which include food waste, paper and plastic, etc. Most of wastes will be food waste. Open dumping of the such waste can lead to ground water contamination by the generating leachate. In addition, surface water may be contaminated by the run off from the waste dump especially in the rainy seasons.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

13. Impact associated with spoil from construction work as well as demolition waste

During road upgradation, construction spoil and demolition waste can cause significant environmental and health issues. There will be demand of 1,45,652 m³ of filling materials where there will be release of 1,06,242 m³ of materials from cutting activities in the existing road. Improper disposal of refused materials/spoils leads to soil and water pollution, dust emissions, and potential contamination with hazardous substances. It can also result in land degradation, blocked drainage systems. These materials pose health risks to workers and nearby communities,



including respiratory problems and injury hazards. Additionally, unsightly waste dumps harm the area's aesthetics.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.

14. Impacts associated with land use change

The road width is designed as 50m in urban area, and 24m in rural and forest area. The ownership of RoW's land has already been transferred to MoPIT/GoN. However, the 50 m RoW (25m on both sides from centre line) of road is almost clear and the existing formation width of the road is 8 to 12m.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is insignificant.

15. Green House Gas (GHG) Emission and reduction of oxygen production

Road construction contributes to greenhouse gas (GHG) emissions through various activities, including site clearing, subgrade preparation, material production, transportation, construction, supervision, and maintenance. The GHG emission from construction phase considering the material quantities required for the proposed GC road has been estimated to be 44,754 tons of CO₂. Apart from the fuel used during the actual pavement placement, energy is required to produce and refine materials, transport materials and equipment, and eventually to dispose of the roadway which is estimated to be 338.39 tons of CO₂. Hence, total of 45,083.39 tons of CO₂ has been estimated to be emitted due to road construction.

Due to loss of 9808 no. of trees, 2,45,200 tons of CO₂/year will not be absorbed from the atmosphere. Similarly decrease in oxygen production due to loss of 9,808 trees has been estimated to be 77,32,627.2 Tons/year.

The impact is expected to be direct, low in magnitude, regional in extent, short term in duration and thus overall impact is less significant.

Operation Phase

16. Impacts due to emission, sound level and glare effect

The upgraded road surface is anticipated to reduce dust and noise pollution from traffic on the asphalt-paved road. However, the rise in vehicle numbers and increased commercial and industrial



activities along the highway will likely lead to higher levels of emission as well as noise. Similarly, use of headlight of the vehicles with increased number will create glare effect. It can affect the locals for long period having chronic effect on their health. This influx of new residents can further impact water sources due to higher consumption and potential additional pollution.

The impact is expected to be direct, medium in magnitude, regional in extent, long term in duration and thus overall impact is very significant.

17. Blockage of Cross Drainage cause Inundation/ Impact on drainage system

Road upgradation can block or disrupt cross drainage systems, leading to water flow obstruction and causing inundation or flooding in surrounding areas. Improper design or failure to install adequate size of the drainage structures can accelerate inundation issues, especially during heavy rainfall. Cross drainage structures like Kanchhaniya which has defined corridor either side are also facing inundation issue similarly longitudinal drains west of Chandrauta and either side of Imiliya settlement are essential to improve its size so that further inundation will be prevented. If could not addressed it into the design of the project it can lead to water logging, soil erosion, and long-term damage to both infrastructure and nearby settlements.

The impact is expected to be direct, high in magnitude, site specific in extent, long term in duration and thus overall impact is very significant.

18. Impacts associated with barrier effect and aesthetics

During construction, continue transport and, storage of construction materials can cause barrier for human and livestock movements. This also create unsightly appearance, disrupting the natural environmental condition of the surrounding area. Furthermore, operation of the dedicated fourlane highway will create barrier effect to the community. It will be difficult to cross the highway and the the risk of collusion increases as the number of high-speed vehicles increases on the road. Apart from the common barrier effect of the highway, existance of Imiliya hatbazar towards north together with schools towards south of the chowk has increased potential of road accident.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is very significant.

19. Increased carbon emission due to use of excessive fuel in construction works

Widening a road leads to increased carbon emissions due to the higher fuel consumption of construction machinery and equipment. The expanded use of vehicles, generators, and heavy



equipment during the construction process significantly boosts fuel usage. This, in turn, contributes to higher levels of carbon dioxide and other greenhouse gases, impacting air quality and contributing to increased greenhouse gases.

The impact is expected to be direct/, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significant.

20. Impacts due to glare effect of high-speed vehicles and road accidents

After project completion, the glare effect from high-speed vehicles on the improved road can lead to visibility issues, increasing the risk of road accidents. The enhanced road surface may result in higher traffic speeds, amplifying the glare and making it harder for drivers to see, which can lead to more frequent and severe accidents.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

4.2.3. Biological Environment

Construction Phase

1. Loss of forest (forest type and available plant species)

Proposed width of the 4-lane highway to be widened to is 24 m in the forest area. All the activities will be carried within the Right of Way, which falls into the jurisdiction of the DoR. Altogether 9808 trees of 72 species were recorded from the RoW of the proposed road section. There are 46 species (covering 9138 individuals) will lose above 10 individuals where 126 individuals of 26 species recorded similarly, 544 individuals of other species shall be removed for the extension of the road. Sal, Asana, Rohini etc. species have maximum loss of trees as presented in table below. The details of each tree including coordinate, dBH, height, and tree quality obtained through census survey within RoW are presented in Annex XVII of the report.

Table 4-1: Details of tree loss from the RoW

SN	Species	Number	SN	Species	Number
1	Sal	2060	24	Sirish	57
2	Asana	1338	25	Kimbu	56
3	Raini/rohani	1082	26	Tiju	56
4	Bajhi	648	27	Simal	55
5	Ramun	556	28	Jhingat	55
6	Sisahu	335	29	Dabdabe	54
7	Aap	241	30	Bar	52
8	Khayar	212	31	Tik	48



Initial Environmental Examination (IEE) for the upgrading of Sorsinghe-Chandrauta (19.2 Km) Road and Associated Bridges

9	Barro	209	32	Kadam	42
10	Botghayaro	204	33	Khirro	39
11	Neem	187	34	Epil	38
12	Bakaino	174	35	Dumri	31
13	Kushum	165	36	Bhalayo	31
14	Asiddha	132	37	Bhellar	23
15	Pyari	122	38	Lichi	22
16	Rajbrixa	110	39	Kumbhi	19
17	Mauwa	97	40	Palas	18
18	Bel	95	41	Sital chini	17
19	Amba	90	42	Taki	16
20	Dhamila	89	43	Ashoka	12
21	Kajrauta	89	44	Panan	12
22	Karma	77	45	Swami	11
23	Pipal	62	46	Others	670
		Total			9808

Source: Field survey, 2025

The impact is direct, high in magnitude, local in extent, short term in duration and hence it is very significant.

2. Obstruction on mobility and potential risk of accident/fatality of wildlife due to construction ignorance

Construction work can increase the risk of roadkill. As the road expands, it disrupts wildlife habitats and increases vehicle traffic, leading to more frequent animal crossings. The loss of forest cover and fragmentation of habitats force animals to navigate new or unfamiliar areas, raising the likelihood of accidents with vehicles. Additionally, the increased vehicle speed and volume associated with a larger road further elevate the risk of collisions with wildlife. Clearing trees within the right-of-way in forest blocks will degrade wildlife habitat. Besides the forests, species rely on streams, culverts, trees, climbers, and other pathways for movement. Removing these during construction could disrupt wildlife movement.

The impact is direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.

3. Possible impact on aquatic ecosystem

The extraction of sand and gravel from rivers can impact the free movement of aquatic species. The physical presence of construction activities and equipment can obstruct or alter the natural flow of water, disrupting migration and movement patterns of aquatic life. Additionally, if the disposal of spoil and the accidental spill of materials, chemicals, and oils make in to the rivers it can deteriorate

the quality of stream and river water. This contamination can harm aquatic species by affecting their health and habitat, potentially leading to declines in population and biodiversity.

The impact is expected to be direct, medium in magnitude, regional in extent, short term in duration and thus overall impact is very significant.

4. Issues related with tree cutting and management of logs

During road upgradation, tree cutting and log management can lead to several impacts. Safety risks arise from potential accidents during tree felling, log transport, or handling, endangering workers and nearby communities. Improper storage or handling can result in log damage, decay, or theft. Non-compliance with Occupational health and safety (OHS) standards can expose workers to health hazards due to inadequate training or lack of protective equipment. Additionally, tree cutting contributes to environmental impacts like habitat destruction and biodiversity loss. Poorly managed log transport may cause spillage, road obstructions, and further safety concerns.

The impact is expected to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is very significant.

5. Impact on Avifauna

Construction phase will have certain impacts on the avifauna. Cutting down of trees species together with old trees growing along the road side will reduce bird habitat, foraging and roosting trees. Increased people mobility and noise during construction might disturbed the bird species and affect their behaviors.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

6. Risk of increasing forest fire

The accumulation of cut trees, branches, and leaves poses a significant fire risk, especially during the dry season, if proper precautions are not taken. These piled materials can easily ignite and spread if left unattended. The risk of fire increase if construction workers have smoking habits. Additionally, occasional camp firing and picnic activities may also increase the chance of forest fire. Further, frequent fire in the forest has been damaging the road structures sopecially road furniture structures as well as guiding fences that will be affected by the fire also.



The impact is expected to be direct, high in magnitude, site specific in extent, short term in duration and thus overall impact is very significant.

7. Illegal Trade and Poaching of Wildlife

The presence of construction workers is likely to lead to increased hunting and poaching of wildlife, such as deer and wild boar. Some workers may be tempted to hunt birds and other animals, either intentionally or opportunistically. This potential for poaching and trapping during the construction period could negatively affect the local wildlife population.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is insignificant.

Operation Phase

8. Disturbance to wildlife due to light and noise during vehicular movement and barrier effect.

Increased light and noise from vehicular movement can disrupt natural behaviors, such as feeding and breeding, making it difficult for animals to thrive in their habitats. The expansion also creates a barrier effect, where wildlife movement and migration are obstructed, leading to habitat fragmentation and reduced access to essential resources. These disturbances can significantly impact the health and survival of local wildlife populations.

The impact is expected to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is very significant

9. Disturbance to the roadside vegetation

Widening the road can disturb roadside vegetation, leading to several negative effects. The expansion often involves clearing of plants and trees, which can reduce air quality by increasing dust and pollution from construction activities and increased vehicle emissions. Additionally, the removal of vegetation disrupts natural water absorption and retention, potentially leading to lower water availability for remaining plants and causing stress to the roadside flora.

The impact is expected to be direct, medium in magnitude, local in extent, medium term in duration and thus overall impact is moderately significant.

10. Depletion of forest resources

During the operation phase, the loss of trees from the right-of-way (RoW) can have adverse effects. This loss also impairs essential ecosystem functions, such as water regulation and soil stabilization, increasing the risk of soil erosion and sedimentation in nearby water bodies. Additionally, the reduction in forest cover decreases the area's ability to sequester carbon dioxide, contributing to higher levels of greenhouse gases and climate change. Local communities that depend on these forest resources for their livelihoods and cultural practices may also face negative impacts due to the diminished availability of resources.

The impact is expected to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.



Table 4-2: Summary of project implementation impacts on environment

Environmental Impacts	Type of Impact				Score		Total Score	Rating
	Nature	Magnitude	Extent	Duration	Magnitude	Extent		
A. Beneficial Impacts								
Generation of huge Employment opportunities	D	H	R	MT	60	10	130	VS
Improved transport facilities and international Connectivity	D	M	R	LT	20	20	100	VS
Enhancement in technical skills	D	M	R	MT	20	10	90	VS
Opportunities of new income sources	D	M	L	MT	20	10	50	SG
Reduced travel time and cost	D	M	R	LT	20	20	100	VS
Enhancement in economic activities, trade and business	D	M	R	LT	20	20	100	VS
Increase potential of industrial development	D	M	L	LT	20	20	60	SG
Improve traffic facilities and resting places	D	M	L	MT	20	10	50	SG
B. Adverse Impacts								
a. Socio-economic Environment								
i. Construction Phase								
Potential increase in road safety concerns as well as road accident	D	H	L	LT	60	20	100	VS
Land acquisition and property/assets and their management issues	D	M	L	LT	20	20	60	SG
Pressure on social services (drinking water, health, school, bank, electricity etc.)	D	M	L	LT	20	20	60	SG
Loss of agricultural land/production and productivity	D	M	L	ST	20	5	45	SG
Impact on existing social and cultural practices	I	M	L	ST	20	5	45	SG
Health and sanitation of workers as well as community Health	D	M	L	ST	20	5	45	SG
Issues on infrastructures such as irrigation channel, transmission lines, telephone lines etc.	D	M	L	ST	20	5	45	SG
Risk of Gender Based Violence	D	M	L	MT	20	10	50	SG

Environmental Impacts	Type of Impact			Score			Total Score	Rating
	Nature	Magnitude	Extent	Duration	Magnitude	Extent		
Issues on community resources and utilization	D	M	S	LT	20	10	20	50 SG
ii. Operation Phase								
Issues related with creation of dead traps on quarry/borrow area	D	H	L	LT	60	20	20	100 VS
Impact on religious, cultural, and historical assets	D	H	L	ST	60	20	5	85 SG
Issues related with Gau Samrakshan Kshetra near Bel River	D	M	L	ST	20	20	5	45 SG
b. Physical/Chemical Environment/Construction								
i. Construction Phase								
Issues related with maintaining the RoW and prevention from encroachment	D	H	L	LT	60	20	20	100 VS
Impacts associated with operation of project components e.g. Crusher plant, batching plant, workshop, asphalt concrete plant etc.	D	H	L	ST	60	20	5	85 SG
Construction of bridges/drainage structures	D	H	L	ST	60	20	5	85 SG
Impacts associated with construction camps establishment and operation	D	H	S	ST	60	10	5	75 SG
Impacts on air quality, construction noise and Vibration	D	H	S	ST	60	10	5	75 SG
Risk associated with road safety	D	M	L	LT	20	20	20	60 SG
Impacts due to quarry/borrow site operation		M	S	LT	20	10	20	50 SG
Loss of productive soil	D	M	L	MT	20	20	10	50 SG
Impacts on surface and ground water Contamination		M	L	MT	20	20	10	50 SG
Impacts of occupational safety and health implement and its use	D	M	L	MT	20	20	10	50 SG
Community Health and safety	D	M	L	MT	20	20	10	50 SG
Issues of compaction and turfing during embankment Stabilization	D	M	L	ST	20	20	5	45 SG



Environmental Impacts	Type of Impact			Score			Total Score	Rating
	Nature	Magnitude	Extent/Duration	Magnitude	Extent/Duration	Score		
Drainage, soil erosion and sedimentation problem in the river & nearby settlement	D	M	L	ST	20	5	45	SG
Impacts associated with hazardous, non-hazardous and liquid waste	D	M	L	ST	20	5	45	SG
Impacts associated with spoil from construction work as well as demolition waste	D	M	L	ST	20	5	45	SG
Impacts associated with land use change	D	L	S	LT	10	20	40	ISC
ii. Operation Phase								
Impacts to air, noise and water pollution	D	M	R	LT	20	20	100	VS
Blockage of Cross Drainage cause Inundation/ Impact on drainage system	D	H	S	LT	60	10	90	VS
Impacts associated with barrier effect and Aesthetics	D	M	L	LT	20	20	60	SG
Increased carbon emission due to use of excessive fuel in construction works	D	M	L	MT	20	10	50	SG
Impacts due to glare effect of high-speed vehicles and road accidents	D	M	L	MT	20	10	50	SG
Loss of forest (forest type and available plant species)	D	H	L	ST	60	20	85	SG
C. Biological Environment								
i. Construction Phase								
Obstruction on mobility and potential risk of accident/fatality of wildlife due to construction Ignorance	D	H	L	ST	60	20	85	SG
Possible impact on aquatic ecosystem	D	M	R	ST	20	5	85	SG
Issues related with tree cutting and management of logs	D	H	L	ST	60	20	85	SG
Risk of increasing forest fire	D	H	S	ST	60	10	75	SG
Impact on Avifauna	D	M	L	MT	20	10	50	SG
Illegal Trade and Poaching of Wildlife	D	M	L	ST	20	20	45	SG
ii. Operation Phase								



Environmental Impacts	Type of Impact			Score			Total Score	Rating
	Nature	Magnitude	Extent	Duration	Magnitude	Extent		
Disturbance to wildlife due to light and noise during vehicular movement and barrier effect	D	H	L	LT	60	20	100	VS
Disturbance to the roadside vegetation	D	M	L	MT	20	20	50	SG
Depletion of forest resources	D	M	L	ST	20	20	45	SG

Note: Nature; D=Direct, I= Indirect,

Magnitude; L= Low, M= Medium, H= High

Extent; S= Site Specific, L= Local, R= Regional,

Duration; ST= Short Term, MT= Medium Term, LT= Long Term,

VS: Very Significant; SG: Significant; IS: Insignificant



CHAPTER-5: ALTERNATIVES OF THE PROPOSAL

Alternative analysis is considered as an integral part of an IEE study, which involves an examination of alternative ways of achieving the objectives of a proposed project. The alternative analysis for a road project constitutes the development of an alternative transportation network for the enhancement of safe and faster connectivity of the rural area to market centers and there by improve the economic conditions of the people living in the zone of influence. The alternatives, in this regard, could be alternative road alignment and alternative design. The study team will conduct alternative analysis considering the following issues keeping these as an option:

5.1 Project Design

There is no option to perform different alternative routes for this project as the route has already been in operation. However, project has already considered the construction approach based on construction approach and design will be assessed to avoid some significant environmental impacts like acquisition of land and property, trees felling, minimal forest loss, etc. During the detail design stage several design options were investigated to determine the most feasible options needed for upgrading the road which will be particularly based on projected traffic.

In the forest area, upgrading options for the project also include opening of new road in either the northern or the southern sides of the existing road. This will cause significance loss of natural forest and habitat fragmentation than existing road. Existing RoW of the forest has already been degraded compared to if additional road for upgrading will construct either the northern or the southern sides of the existing road. The existing road alignment is the better option rather than the proposal to construct a new additional 2 lanes road. So, further new 2 lanes road either the northern or the southern sides has not been studied.

In the similar manner, there was another option to have long term forest management through geometry improvement. It is the location between chainage 646+900 to 649+600 within the forest section following the fresh route towards south of the existing road is another alternative option. Presence of agriculture land along with the some provate structure as well as presence of hightension line and also the high meandering of the Bel and Jawai River at downstream section has discourage for this route. Furthermore, the mendate to upgrade the existing route has encourage to follow the existing route.



In this project, alternative has mainly focused on design parameters like at grade vs. elevated intersections, pavement materials, lane width and numbers, shoulder materials, maintenance or improvement of drainage and bridges type were assessed. Reduce traffic congestion, reducing idling time and speeding up the traffic, such as through measures like traffic signal optimization or encouraging drivers to turn off their engines while waiting in traffic can help to reduce localized pollution. to come up with the project design that meets environmental, financial, economic, and technical requirements. 2 alternative design options were studied and the first option (I) was selected for the project mainly due to environment, technical and financial reasons. These parameters are presented in the *Table 5-1*.

Table 5-1: Design options assessed in the details design

Design Alternative	Design Description	Significance Impact
Option-I	This option comprised of; • Intersections improvement, in existing major Bazaar Areas crossings with adequate traffic safety signage • Service lane, Cycle Lane, Footpath i.e., in the urban area, • Road width 24 m in forest area/rural area, and 50m in urban area • AC pavement in all length • Paved Shoulder in forest section, • All the bridges are RCC • Two lane additional new concrete bridges instead of entire 4 lane bridge • Replacement of 4 pipe culvert to box culvert out of 11 pipe culverts. • Service lane and drain in urban section • Pedestrian crossing of foot over bridge, underpass • Wildlife underpasses provision has considered. • Installation of traffic safety and community safety measures	• Reduce traffic congestion • If road width will be 24m instead of 50m, it will reduce vegetation loss from forest section reducing the width in forest section has significantly decrease the tree losses. • Most of the construction materials are available in Locally. • Consider Occupational health and safety of local people including different measures such as cycle lane, foot over bridge, underpass, zebra crossing, different traffic safety and community safety measures • Different traffic safety and community safety measures are proposed • Provision of wildlife underpasses • Construction of road will be done in section wise starting from first 10 km, Pavement will be scarified after completion of necessary structures in bothdise of road, and this will support to reduce dust pollution during vehicle plying on the road. • Vegetative plantation will be done in the median and roadside in the sensitive area



Design Alternative	Design Description	Significance Impact
Option-II	This option comprised of • Intersections improvement, Underpass for major intersection and remaining, • Service lane i.e., existing major Bazaar Areas, • 50 m road width in urban area • Concrete pavement in all length • Paved Shoulder in forest Section, • All additional Steel bridges • Service lane and drain, • Utility crossing HPC on Bazaar • Foot over bridge • Installation of traffic safety and community safety measures	• Reduce traffic congestion • High tree numbers loss, if upgrading works will be carried out in the entire width of RoW. • Huge quantity Steel materials need to import • Different traffic safety and community safety measures are proposed • Pavement will be scarified after completion of necessary structures in bothdise of road, and this will support to reduce dust pollution during vehicle plying on the road

Source: Detail Design Report, 2025

All the design options will have a range of environmental impacts that will require concomitant mitigation measures to ensure residual impacts are not significant. Typical during road construction related impacts will be loss of vegetation, deterioration of water and air qualities, and occupation and community health and safety are expected from all the design options.

Mitigation measures of all such impacts are carefully implemented. The most moderate significant adverse impacts of the project pertain to loss of vegetation and risk of further destruction of wildlife crossing at forest section. Option I- reducing the width has significantly decreased the tree losses; Consider Occupational health and safety of local people including different measures such as cycle lane, foot over bridge, underpass, zebra crossing, different traffic safety and community safety measures.etc. Widening the existing 2 lanes into 4 lanes, the linear barrier for wildlife to cross the road and with the projected increase in speed of traffic will significantly increase the impacts of wildlife-vehicular crashes unless mitigation measures are not implemented. Option-I is considered by reducing the road width in the forest area by 24m which also reduce forest loss and tree loss. For wildlife crossing, underpass are proposed at 4 locations., Pavement will be scarified after completion of necessary structures in bothdise of road, and this will support to reduce dust pollution during vehicle plying on the road. In Option-I local construction materials are used which reduce financial cost of the project rather than option II.



A number of site-specific options have been studied related to the upgrading of GC Road from 2-lane into 4-lane with the objective of reducing environmental and social risks, cost and impacts.

Option-I has been selected due to less significance impact rather than Option II.

Technology, Implementation Procedure, Time-schedule and Raw materials Technology: The proposed construction will utilize a combination of advanced mechanized techniques and some labor-based methods to ensure efficiency and meet project timelines. For the road and bridge construction, machines and excavators will be employed along the entire length for road formation and site clearance. Equipment including trucks, graders, pumps, vibratory rollers, water bowsers, loaders, boilers, sprayers, air compressors, hand sprayers, aggregate spreaders, pneumatic tyres, mixers, compactors, generators, bitumen distributors, tractors, and cranes will be used throughout the construction period. Crusher plants and borrow pits will be set up at designated locations to source sand, soil, and aggregates. All workers will be provided with necessary safety and personal protective equipment such as helmets, visibility vests, gumboots, masks, and gloves. Erosion control along the alignment will be managed through the use of civil engineering structures and bio-engineering techniques.

Procedure of Operation- Procedure of operation will be assessed in terms of round a year operation, seasonal operation. Types of vehicles and their specifications that are allowed to operate on the road will also be assessed in terms of need as well as demand in the area. Construction will be paused during the monsoon season, from June to August, to avoid complications caused by heavy rainfall. The energy needed for building the approach roads and bridges will be sourced from the local electricity supply in the project area. Additionally, diesel generators will be utilized during periods of power outages to ensure uninterrupted construction activities.

Time Schedule: The project is scheduled for completion within 3 years construction and 5 years PBMS and 3 months post PBM. During the rainy season, construction and upgrading activities will be halted due to flood risks and access issues. Work will be restricted mainly to the construction of side drains and other structural elements, with most excavation activities suspended. Additionally, construction will not take place at night in settlement and forest areas.

Raw Materials to be Used: The upgradation will focus on using local materials wherever feasible, and alternatives to the selected materials will not be considered. Construction materials, including stone, coarse aggregates, sand, sub base, base course, and surface dressing/asphalt



concrete chips, will be sourced from designated quarry sites. Manufactured materials like cement, steel, and bitumen will primarily be obtained from local suppliers.

5.2. Alternative Alignment

This is an upgrading road project therefore; alignment has been fixed already.

5.3. No Action Option

The No-project alternative prevents the implementation of the project. This would imply that the road section would be left in their present state with the following geometric defects:

- Presence of road hazards with limited visibility.
- Localized flooding and water overtopping due to narrow cross-sections lacking proper drainage systems.
- Water accumulation on the carriageway due to insufficient and shallow side drains.
- Absence of crash barriers, particularly along embankments in developed areas.
- No facilities for wildlife crossings, heightening the risk of vehicle collisions with animals, especially at night.
- Insufficient road furniture structures including signs to alert drivers about potential hazards.
- No pedestrian crossings as well as specific vehicle turning points available in the settlement areas.

With increasing future traffic, these defects will lead to;

- Higher risk of injuries and fatalities from road crashes due to insufficient safety measures.
- faster road deterioration and higher maintenance costs from inadequate drainage.
- Increased congestion from limited road capacity, raising operating costs and travel times, which leads to economic losses.
- More congestion and faster road wear from suboptimal travel speeds, resulting in higher fuel consumption.
- Greater emissions, and worsened air quality, impacting human health.
- Additionally, higher nighttime traffic will raise the risk of vehicle-wildlife collisions, threatening wildlife populations.

On the positive side, not upgrading the road would help preserve the trees along the right-of-way and prevent further disruption to wildlife habitats in the project area. Additionally, avoiding the project would eliminate impacts associated with construction activities, such as camp site management, occupational and community health and safety issues, utility relocations, as well as dust, noise, and vibrations from construction equipment.

CHAPTER-6: ENVIRONMENTAL MITIGATIONS MEASURES

The impact from the proposed road can be beneficial as well as adverse. An effective implementing measure will maximize the beneficial impacts and mitigates the adverse one. Consideration will be given to the positive and negative effects of the construction, operation and implementation of project in terms of nature, magnitude, extent, duration

The environmental management plan is also prepared to ensure proper implementation of measures to maximize the beneficial impacts and minimize adverse environmental impacts and to make the proposed project environmentally friendly and sustainable. EMP systematically outlines mitigation measures and assigns roles and responsibilities of management, and provides a framework for monitoring the implementation of mitigation measures for all identified impacts. It highlights about the mitigation measures to be implemented, the location and time of implementation, method of implementation and the body responsible for implementation during the pre-construction, construction and operation phase of the project. The mitigation measures and recommendations are prepared with in-depth discussion with the local stakeholders and based on the expert judgment. The adverse impacts mitigation measures are categorized as avoidance, reduction and compensation measures. The cost of mitigation measures, organizational requirement and human resources has been finalized following discussion with responsible agencies and local stakeholders to implement the mitigation measures. Environmental enhancement and mitigation cost are given in Table 6-3.

6.1. Beneficial Impact Enhancement Measures

During Construction Phase

1. Generation of huge employment opportunities

For the road upgradation work, priority will be given to local residents when it comes to employment opportunities associated with the project. Efforts will be made to actively encourage local individuals to participate in various construction-related activities. Moreover, contractors involved in the project will be specifically instructed to prioritize the hiring of local workers for all road-related tasks and operations. Furthermore, this project will support to strengthen the existing market structures and improving sanitation in Imiliya and Chandrauta settlements. The budget required for the market support has been allocated.



2. Improved transport facilities and international connectivity

Upgrading the road enhances transport facilities by allowing faster, more efficient movement of people and goods, lowering travel costs, and improving access to services. This improved connectivity attracts trade, investment, and tourism, linking local areas to international markets and opportunities.

3. Enhanced technical skills

The project will offer various skill training programs (e.g., doll and cushion making, hotel assistance, light vehicle driving, beauty services, and mobile phone repair) to people from affected households. During construction, a needs assessment will be conducted to identify required skills, and relevant training will be provided accordingly.

4. Opportunities of new income sources

Construction activities will not only increase the income sources of the local people, but will open opportunities for additional businesses such as the establishment of additional food and tea shops, groceries for serving large numbers of people. Also, the established tea stalls and shops will foster their business with the influx of construction workers in the project area.

During Operation Phase

5. Reduced travel time and cost

The 4-lane asphalt road will provide easy, safe, and quick travel, reducing traffic jams and accidents. This will make it faster and cheaper to transport goods from India to the project area and other regions. Key upgrades include widening the road, fixing dangerous spots, adding drains, bus stops, traffic signs, street lights, pedestrian crossings.

6. Enhanced economic activities, trade and business

The proposed road upgrading will improve the connectivity on the East-West Highway and the trade with the neighboring countries. The road has connecting other country via India. After 4 lanes, the transportation of goods and services from India to the project region and to other parts of the country will be cheaper, easier and faster.

7. Increased potential of industrial development

Upgrading the road improves access to industrial zones, making it easier for businesses to transport goods and attract investments. Enhanced infrastructure supports business operations and



encourages new industries to establish themselves in the area. Overall, better road connectivity creates a favorable environment for industrial growth and economic development.

8. Improved traffic facilities and resting places

Upgrading the road improves traffic facilities by widening lanes, adding traffic signals, and creating designated bus stops, which helps reduce congestion and enhance safety for all road users. Additionally, incorporating resting places such as rest areas and service stations provides safe spots for travelers to take breaks, fueling convenience and comfort during long journeys. Overall, these improvements contribute to a more efficient and user-friendly transportation system.

6.2. Adverse Impact Mitigation Measures

6.2.1. Socio-economic Environment

During Construction Phase

1. Potential increase in road safety

To minimize the risk of potential road accidents, the project will include the installation and maintenance of essential safety features such pedestrian crossing (preferably over or under, zebra crossing the roadway). Crossing locations will consider community preferences, including those related to convenience or personal safety. An overhead steel pedestrian bridge will be installed at Imiliya to provide access to the students, locals and access the Imiliya haat bazar. Additionally, the project will include the installation and regular maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities. Furthermore, speed control measures and regulations will be implemented, especially in populated areas, near schools and other public places including establishment of traffic signals, CC cameras for monitoring in the highway. Road safety awareness trainings will be provided to the drivers of project and public vehicle drivers in the area as well as to the road users including students and cycle riders.

2. Loss of property/assets and their management

Loss of the property/assets of the project affected family will be compensated as per the resettlement plan of the project. Where the Compensation Determination Committee (CDC) will determine the value and mode of compensation based on the situation at the time of compensation. The compensation fixation committee will be established as per Land Acquisition Act, 2034 B.S. to determine replacement value and compensation payments.



3. Temporal Land Requirement/Loss of Standing crops

Even though the land area is under the ownership of DoR, temporary land may be required for the establishment of temporary camps, stockpiling of construction materials, operation of batching and asphalt plants beyond the RoW. For the temporary land use, the contractor shall make agreement with the land owner including the compensation of the crop loss (if any) and reinstatement of the land.

4. Impact on existing social and cultural practices

To minimize the impact associated with the social and cultural practices due to influx of the labour from another culture counseling/ orientation will be provided to either worker to raise awareness about the importance of respecting local cultural and religious practices. Workers will be encouraged to engage respectfully with the community, honoring local customs and traditions. The project team will also work closely with community leaders to ensure construction activities align with cultural events, minimizing disruptions to local practices. Code of ethics for the worker will be prepared and the workers will be orientated to minimize the associated impacts associated with the issue.

5. Sanitation of workers as well as community health

The project will establish designated work zones to ensure the safety of workers by separating them from active traffic. In areas where road width permits, lanes may be temporarily closed, with traffic diverted to the remaining lanes. For instance, on multi-lane highways, all traffic may be re-routed to one side while construction is carried out. Where worker exposure to traffic cannot be completely eliminated, protective barriers will be installed to shield workers from vehicles, along with channeling devices such as traffic cones and barrels to clearly delineate the work zone and guide traffic safely around it.

Additionally, traffic flow will be regulated using warning lights and, where feasible, flaggers to manage vehicle movement. Maximum vehicle speeds within work zones will be reduced to enhance safety. Workers will be trained in safety protocols specific to their activities, including safe practices for night work and operations in low-visibility conditions. This will include the use of high-visibility safety apparel and the installation of proper illumination to ensure a well-lit and secure workspace during all phases of construction.

Following actions from the contractors' side will be imposed prior to construction works;



- Contractor and labour workers will be made responsible to maintain healthy sanitary and hygiene condition.
- The contractor will be made liable to strictly obey the construction related management plans that will be prepared during the time of Site specific EMAP through contractual documents.
- Provision of providing training on awareness about sanitation, hygiene, safe-sex and family planning for the workers.
- Provide sufficient care-taking staff to conduct cleaning and monitoring activities on camp site.

6. Pressure on social services (drinking water, health, school, bank, electricity etc.)

Advance notice will be given to the public before moving any structures and utilities. Necessary actions will be taken such as securing clearances and transferring funds to utility providers, to avoid disruptions for the local community and prevent upgradation delays. No disturbance in drinking water supply system will be assured prior to disruption of the existing water supply.

Community Structures: Rebuild or relocate with input from the local community and authorities, with costs included in the project budget.

Irrigation and Water Lines: Contractors will restore irrigation canals (near Kharendrapur and other locations) and water pipelines (exists along both sides of the major settlements including Imiliya, Dumara, Kharendrapur, Chandrauta), with funds set aside in engineering costs under relocation of utilities has been allocated. (Table 6-3)

Electric Poles and Power Lines: Proper coordination mechanism will be established to perform relocation of electric poles. Further NEA's site office as well as head office will be dedicatedly followed up to ensure timely receive the quotation and perform relocation works. For the purpose of relocation of those electric poles budget has been allocated.

Telephone Lines: Communication Department including ilika telecommunication office Chandrauta will be timely notified for shifting of their optical cable to the end of the RoW so that relocation can be done prior to the construction work.

Public Toilets: Coordinate with local government to relocate or rebuild the public toilet specially at Chandrauta chowk. For the purpose of relocation of those electric poles budget has been allocated.

Access Roads: Proper reinstatement of the access roads to the quarry, borrow pit as well as camp will be done if damaged by the project. No transportation of construction materials will be done



during rainy season to minimize the impact to the environment as well as minimize the impact on the access road.

Tube Wells: Relocation as well as reinstallation of the tube well will be done prior to construction work and assure no disturbance on the water use right of the local community. If needed new tube wells will also be assured before removing the existing ones. For the purpose of relocation of those electric poles budget has been allocated.

7. Impact on religious and cultural sites

All the important religious, cultural monuments that will be affected by the project activity will be relocated/reinstalled in coordination with the management committee. Following actions will be taken to avoid the impacts on religious, cultural and historic assets;

- Avoid relocation of cultural properties as far as possible specially no effect on Supadcurali temple as well as other valuable temple, musjit or other infrastructures will be made.
- If relocation is necessary, relocate after detailed consultation with local stakeholders and specially for the Diar of Tharu community at Dumara.
- It will be relocated to new area in consultation with the religious leaders as well as local government/ward office. Identify site for relocation with consensus with local people
- Relocation will be done providing the structures in better condition than than original state

Required budget will be utilized from the project cost.

8. Issues on infrastructures such as water supply pipelines, irrigation channel, transmission lines, telephone lines etc.

To mitigate any disruptions to essential infrastructure such as water supply pipelines, irrigation channels, transmission lines, and telephone lines during the road upgradation, advance notice will be provided to the affected communities. Furthermore, information will be passed through local level of grievance redressal committee about the disturbance. The damage made of the infrastructure will be promptly corrected by the project so that there will be no grievance from the community about the issue. The project team will work closely with utility providers to identify the best alternatives and solutions that will prevent these services from being interrupted. If relocation is necessary, efforts will be made to find alternative routes or systems that ensure continued access to these facilities, minimizing the impact on local communities.



9. Issues related with Gau Samrakshan Kshetra near Bel River

Coordinating with local authorities and the shelter operator to facilitate timely relocation and ensure alternative grazing areas are available before construction begins. Construction zone management involves minimizing open excavation durations, installing barriers to prevent livestock entry, and designing wildlife crossing facilities like underpasses or overpasses at key crossing points. Traffic safety is enhanced through signage, speed reductions, and along with awareness to the project drivers as well as workers on livestock safety. Dust and noise are controlled using water sprinkling, scheduling noisy activities during less sensitive times, and employing sound barriers. Furthermore, appointing a community liaison and establishing a grievance redress mechanism ensure ongoing communication and prompt resolution of livestock-related concerns during construction.

During Operation Phase

10. Issues related with creation of dead traps

Proper care will be taken at all sites where sand, gravel, or other materials are extracted to ensure safety and prevent the creation of hazardous conditions. Quarry and borrow areas will be carefully managed, and once extraction is complete, sites will be properly filled and rehabilitated to eliminate any risks. Clear sign board will be placed to warn workers and the community of potential dangers in or near these areas. During the extraction process, the work areas will be securely covered or fenced off to prevent unauthorized access and to protect both workers and the public from accidents.

In the similar manner, the wide shoulder of the highway will be made accessible for the cycling passengers. Apart from it there will be awareness campaign in the community that includes the safety aspect and precautions that has to be taken while crossing the road. Similarly, school childrens will also be awared through the awareness activities. All the schools along the road will be awared on the road safety and safe use of the highway atleast once during construction phase of the project.

11. Impact on religious, cultural, and historical assets

Due to extension of the road, there will be pressure limited space infront of the Supadeurali temple and at the motherasa at Chandrauta. To access the motherasa in Chandrauta there will be establishment of PUPs along with the VUP and vehicle speed will also reduce at ground level hence no special mitigation will be required. However, to avoid potential road accidents while crossing the road to reach the temple, warning board will be placed. Similarly, provision of zebracross will



be made for safe road crossing in the temple. In the similar manner zebra crossing and warning sign board will be placed at near bel bridge for the safety of the people to and from the crematory area.

12. Issues on community resources and utilization

To prevent issues with community resources and ensure fair utilization, resources will be used as necessary and distributed equally. The project will promote practices of reduce, reuse, and recycle to minimize waste and resource depletion. Additionally, encouragement will be given to the community to protect critical resources, helping reduce potential impacts and support sustainable use.

13. Issues related with Gau Samrakshan Kshetra near Bel River

To address the issues related to the Gau Samrakshan Kshetra near the Bel River, the IEE study recommends to use the modified box culvert as a crossing for cattle to prevent any potential accidents that may arise. Additionally, clear signboards will be placed in the vicinity to alert drivers of the potential risks.

6.2.2. Physical and Chemical Environment

During Construction Phase

1. Issues related with maintaining the RoW and prevention from encroachment

To ensure the project avoids and mitigates Right of Way (RoW) issues and encroachments during road upgrades, the project will conduct thorough boundary surveys and clearly demarcate RoW before starting construction. Demarcation pillars for RoW maintaining will be made prior to construction works. It will implement regular monitoring using GIS and drone technology, engage local communities through awareness campaigns, and coordinate with local authorities for strict enforcement.

Land acquisition for this alignment has already been acquired by Department of Road (DoR). The Government of Nepal announced 50 meter right of way from the center line in 1976, thus GoN has declared the RoW throughout the east west Mahendra Highway. Therefore, no land acquisition or compensation to the local community is required.

2. Impacts associated with operation of project components e.g. Crusher plant, batching plant, workshop, asphalt concrete plant etc.

The crusher plant will be operated during daytime hours to minimize noise disturbance to surrounding areas. To control dust emissions, transported materials will be fully covered. Waste



management on-site will be handled by segregating waste into separate bins for degradable and non-degradable materials, ensuring proper disposal. Air quality, noise levels, and vibration will be periodically monitored to ensure they remain within acceptable limits. Additionally, workers will be provided with the necessary personal protective equipment (PPE), including helmets, gloves, masks, and ear protection, to safeguard their health and safety during operations.

3. Construction of bridges/drainage structures

Following mitigations will be adopted for minimizing the flow of impact associated with the bridge constructions;

i. River Diversion & Inundation Risk (Imiliya Settlement)

- Design temporary diversions carefully to maintain adequate flow capacity.
- Bridge construction works specially construction insitu structures will be completed prior to monsoon and all the spoils will be cleared prior to monsoon.
- Asmuch as possible exsitu bridge construction and fixing will be prioritized for reducing as well as hydrological risk to the environment.
- Additional structure specially extension of the bridge towards east shall be done avoid waterlogging and avoid the threat to the settlement during monsoon.

ii. Control of Bank Cutting and Agricultural Land Protection

- Bioengineering and revetment (stone pitching, gabion structures will be constructed DS of the bridge) on exposed banks.
- Apart from the civil structures palisade and live checkdams will be used to control erosion in Belgardawa river. Similarly, brsh layring will be done to control erosion in deep embankments specially at the corssdrain areas.
- Turfing will be done at the embankment stabilization

iii. Damage to Existing Drains and avoiding the inundation towards north (Imiliya and of the highway in Chandrauta)

- Side drainans and cross drains has been ensured with sufficient capacity to hold monsoon water atleast 25 years highest flood.
- Existing sidedrains will be saved as much possible, those that has to be dismantled will be reconstructed at safe area of the road.
- Size of existing drainage has increased to cope the climate change issues further more to



avoid inundation in Chandrauta area size of Kanchhania cross drain has been increased so that it can drain water

- Temporary drainage systems or bypasses during construction will be provisioned if essential for Major bridge construction works.
- Will coordinate with local municipalities to prevent waterlogging complaints.

iv. Displacement, Cultural Sites

- Avoid heritage or cultural sites during construction period through modification in design
- If unavoidable, consult with local cultural/religious leaders and communities
- Ensure rehabilitation and relocation as per resettlement plan, follow national guidelines and community consultation
- Allocate cost for relocation

v. Air, Noise and Vibration Mitigation

- Dust, Emissions, Night-time Construction Disturbance will be minimized
- Water sprinkling and dust suppressants on access roads and construction zones will be done in regular basis at least 3 times a day or as per the requirement.
- Use of well-maintained equipment to reduce emissions will be followed.
- Nearby communities will be notified in advance about construction schedule.

vi. Proper Waste Disposal

- Develop and enforce a Waste Management Plan separately by the contractor.
- Designated waste collection and storage areas with segregation (inert, hazardous, reusable) will be ensured and workers will be made aware on the waste segregation issues.
- Licensed solid waste management companies will be contracted for hazardous and non-hazardous waste.
- Avoid dumping near rivers, drains, and agricultural lands.

4. Construction camps establishment, operation and Management

The contractor will have proposed potential sites and get approval from supervision consultant and from concern stakeholders. The Contractor will prepare detailed plan for construction camp including location (distance from settlements, drainage facility, outdoor facilities, and surrounding



areas), housing facilities (site roads, drainage, waste management and other facilities) and need to get approval from the Supervision Consultant. Basic facilities such as fire precaution, lavatories and showers, potable water supply, clean eating area, lighting, safe access, air supply, LPG /kerosene, and others will be provided. Appropriate facilities for women will be provided in the construction campsites. First aid facilities will be made available at camp sites. For emergency cases will be collaborated with municipalities level health/sub-health posts for major injury cases. Restore the site after use.

5. Maintenance of Air quality, Construction noise and Vibration

To address impacts on air quality, construction noise, and vibration, the project will ensure that stone crushing equipment and cement batching plants are fitted with dust control devices and operated according to the manufacturer's specifications. To minimize dust emissions, construction design has made in such a way that existing pavement area will not be scarified prior to construction of the new track. Similarly, to minimize dust from the area of cross drain as well as side of the upgrading area water browsing will be done at least thrice a day except at monsoon season specially at settlement areas.

The plant site has been carefully selected to be away from population centers, drinking water sources, cultivated lands, and water bodies to reduce environmental and social risks. Additionally, operations will be limited to daytime hours to minimize noise and vibration disturbances. After the completion of operations, the site will be restored to its original condition to prevent long-term environmental impacts.

6. Road safety

To mitigate and avoid safety risks during road upgrading, the project will prioritize comprehensive safety measures. Adequate signage and traffic management plans will be implemented to direct vehicles and pedestrians safely. The project will install robust safety barriers and reflective markings to separate work zones from traffic. Regular training for workers on safety protocols and the proper use of personal protective equipment (PPE) will be mandatory. Furthermore, the project will ensure the use of well-maintained machinery and deploy flaggers or spotters in high-risk areas to manage traffic flow and prevent accidents effectively. In the similar manner community members as well as students on the schools along the highway will be aware about the road safety



aspect of the highway upgradation. Required budget has been provided in the project cost under capacity building and training/orientation/awareness program.

7. Quarry/borrow site operation and Management

The project will implement several measures to mitigate the impacts of quarry and borrow site operations. Water will be sprayed regularly to minimize dust, and all transported materials will be covered to prevent spillage and reduce airborne particles. The Contractor has to mobilize adequate water sprinkling trucks. Blasting activities will be restricted to non-peak hours to minimize noise and vibration disturbances, and vehicular movement will be halted during School/office hours and at night to reduce traffic congestion and ensure safety. All site operations will be limited to daytime to further mitigate noise and disruption. Workers will be provided with personal protective equipment, including masks, helmets, gloves, and boots, to ensure their safety and well-being. Apart from the mentioned mitigations site specific plan will be prepared by the contractor for each Quarry/Borrow pit operation including its reinstatement mechanism.

8. Management of top soil

To minimize the loss of productive soil during road upgrades, land clearing will be restricted to the necessary area to avoid unnecessary soil loss, and the used land will be restored to its original state after the completion of the work. Construction will be planned for dry seasons to reduce the risk of soil erosion from rain, and regular monitoring will be conducted to detect and address potential soil loss and soil quality. Slopes and embankments will be protected using retaining walls, gabions, or terracing to prevent erosion. Additionally, fair compensation will be provided to landowners for the temporary use of their land during the project.

9. Management of surface and ground water contamination

To address surface and groundwater contamination, excavated spoils and wastes will be strictly prohibited from being disposed of in streams or water bodies. Chemicals and oil will be stored away from water sources on concreted platforms equipped with catchment pits to collect spills. Silt fencing and brush barriers will be installed to collect sediments before they are released into water bodies, preventing contamination. The collected silt and sediment will be stockpiled and potentially reused for slope surfacing during re-vegetation. Additionally, all construction waste will be collected, stored, and transported to designated and approved disposal sites to ensure proper waste management and minimize environmental impacts. Activities such as washing near water bodies will be prohibited.



10. Community and occupational health and safety

Following mitigations will be assured to minimize the impacts associated with occupational safety and health issues as well as community safety.

- Workers will be oriented and trained about the occupational hazards in work place
- Tool Box Talk and refresher training will be conducted periodically.
- Code of conduct will be prepared orient the workers
- Orientations will also be provided to create realization of importance of following the safety rules
- Adequate quantity of preventive measures like Personal Protective Equipment will be made available at the site.
- Special training will be provided to the workers prior to the types of works not popular in Nepal
- Insurance for each laborer will be proposed.
- Provide HIV test to the willing workers.
- Provide training on awareness about sanitation, hygiene, safe-sex and family planning for the workers.
- Provide sufficient care-taking staff to conduct cleaning and monitoring activities on camp site.
- Erect danger signs and signals on the hazardous area.
- Provide workers with safety gears (helmets, boots, gloves, masks, goggles, earplugs and reflector jackets).
- Orientation and training will be provided to workers on safety measures and work procedures prior to their dispatch to possible dangerous sites.
- Provide accident insurance for workforce.
- Provide routine health checkups for labours before employment and during construction works.
- Study of presence of any local communicable disease from locals to outside workers and immunize labors from outside the area before employing them.

11. Drainage, soil erosion and sedimentation Management

During the operation, the existing drainage systems will not be disturbed; if they are required to be used, alternative solutions will be implemented to ensure their proper functioning without interference. To minimize soil erosion and sedimentation, erosion control methods such as silt fences, geotextiles, gabion, and retention wall will be constructed along vulnerable areas. Vegetation



will be planted along the riverbanks and slopes to stabilize the soil. Sediment control ponds will be constructed to capture sediment before it reaches the river, and regular maintenance of drainage systems will be conducted to prevent blockages. Additionally, construction runoff will be managed with sediment traps and barriers, ensuring that sediment does not enter nearby water bodies. Specifically, the drainage size of Kanchhaniya as well as drainage at Champapur has been increased to drain the discharge.

12. Management of hazardous, non-hazardous and liquid waste

Before commencing the construction activities, the contractor will be required to prepare a Waste Management Plan including hazardous waste management and submit it to the Project office/Supervision consultant for their review and approval. The plan will cover - manage hazardous material use, storage, transport and disposal. The project will place containers of separately and adequate size and numbers for the collection of various types of wastes such as non-hazardous, hazardous and liquid from the worksites, and transport these wastes regularly to a centralized facility. Impervious concrete base and a sump will be constructed at all the fuel, waste oil and bitumen, emission and chemical storage yards. A berm will also be constructed along the periphery of the concrete platforms. Suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities will be provided to workers. Wastes will be collected and segregated into three categories: kitchen waste (organics), paper and plastic (recyclable) and garbage (non-recyclable). Three kinds of waste bins (with different colors) with adequate numbers and capacities will be placed at the campsite (kitchen, offices, and rooms) for the segregation of the waste at source.

13. Management of spoil generated from construction works and generated solid waste

All laborers will be provided with necessary personal protective equipment (PPE), including boots, coveralls, masks, and gloves, to ensure their safety and minimize exposure to hazardous materials during construction activities. A paved storage area with a containment chamber will be constructed to effectively collect and recover any oil spills, preventing contamination of the surrounding environment. Additionally, oil and grease spills, as well as oil-soaked materials, will be collected and stored in clearly labeled containers to ensure proper disposal and minimize any environmental impact.

In addition to managing construction-related waste, demolition waste will also be carefully handled to minimize environmental impact. Demolition materials, such as concrete, bricks, metals, and wood, will be segregated at the source to facilitate recycling and proper disposal.



Reusable materials will be salvaged for future use on-site or sent for recycling, reducing the overall waste sent to landfills. Any hazardous materials, such as asbestos or lead-based paints, will be carefully handled and disposed of according to safety regulations. A designated storage area will be established for the safe accumulation of demolition waste, with clear labeling for proper segregation.

14. Land use change and maintenance of greenery

The conversion of forest area as well as agriculture land will be changed into pavement area. As much possible the forest area will be regenerated into forest. Top soil will be saved into particular area along the road. It will be used for regeneration of grasses along the embankment. Similarly open land area will be planted along the highway to maintain greenery. Discussion will be made with DFO for selection of species for plantation. Budget has allocated for the purpose by the project.

15. Reduction of GHG Emission

GHG is generally emitted from the production process of construction material and fuel requirement for construction activities. The GHG emission calculation from construction phase has been done considering the material quantities required for the proposed GC road. The major materials required for construction are Soil, Aggregate, Bitumen, Cement and Steel etc. was estimated based on detailed design report. Further fuel required during construction was also estimated that can contribute to GHG emission. The emission factors as per "Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects: Due to use of petrochemicals in the construction works there will be increased emissions to the atmosphere. To reduce minization of the fuel consumption and increase efficiency of work the vehicles will be periodically maintained, new equipments with improved technology will be proiritized. Furthermore, periodic testing of air quality will be done which also shows increase in emissions in the project area suggesting essential maintenance of the project vehicles.

During Opertaion Phase

1. Maintenance and minimize air, noise and water pollution

Regular maintenance, including pothole repairs, will be carried out to maintain road quality and minimize dust caused by road degradation.

Every 3-6 months regular air quality monitoring will be carried out in the selected locations (market place, shool/hospital area) to check the air quality with national ambient air quality Standards and WHO Air Quality Guidelines. The reinstatment of crusher, ashpaht and batching plant to reduce the air quality generated from those loactions.



2. Maintenance and Management of cross drainage structures

Existing natural drainage system will not be disturbed by providing temporary measures (such as humepipe). The excess spoil will be stockpile in designated location. Bridge and cross drainage work at river/streams will not be undertaken during the peak monsoon season. All pipe culverts will be replaced by box culvert to minimize flooding, inundation, and maintain natural flow. Silt deposition will be removed from water course.

Regular monitoring of the road condition and maintenance will be necessary especially before and after rainy season. DoR has established a system of employing road maintenance staff that is responsible for routine and recurrent maintenance of roads like cleaning of cross drainage, drains and additional slope protection structures will be constructed. This practice will be continued with allocation of adequate budget and numbers of staff to the project road for maintenance.

3. Management of barrier effect and aesthetics

After completing all construction activities, measures will be taken to restore all affected areas, including construction camps, crusher plant, batching plant, and workshop to their original state. This includes removing temporary structures, rehabilitating the landscape, and replanting vegetation to match the pre-construction conditions. Efforts will be made to ensure the restored areas match with the surrounding environment, minimizing long-term visual and functional impacts. An overhead pedestrian bridge has proposed at Imiliya bazar considering mobility of students to the school as well as access to the hatbazar area making financial arrangements under project cost.

4. Reduction of carbon emission due to use of fuel and maintenance of greenery

The GHG Emission estimation for operation phase has been conducted using different variables i.e. Traffic data forecasting, vehicle type, fuel used & efficiency, vehicle speeds, Road condition etc. The emission factor is considered from "IPCC Guidelines for National Greenhouse Gas Inventories". The emission factors assume that 100 percent of the carbon present in fuel is oxidized during or immediately following the combustion process (for all fuel types in all vehicles) irrespective of whether the CO₂ has been emitted as CO₂, CH₄, CO or Non-Methane Volatile Organic Compounds (NMVOC) or as particulate matter.



Similarly, reduction of trees also reduces the absorption of CO₂ from the atmosphere which is the major causes of global warming effect and subsequent climate change. To reduce the impact of GHG Emission, plantation of ten times the trees that are felled has been proposed. Instead of that the roadside greenery maintenance (in the median of road) will reduce the amount of CO₂ released in the atmosphere.

5. Minimize of glare effect of high-speed vehicles and road accidents

To minimize the glare effect from the vehicle's dense plantation of bushes as well as decorative shrubs will be prioritized to plant into the median. Similarly, greenery will be increased along the road so that the glare effect can be minimized.

6.2.3. Biological Environment

During Construction Phase

1. Mitigation of Loss of forest (forest type and available plant species)

The road passes through forest patches comprising community and collaborative forests. In the eastern section of the project area, there are three community forests: Janachetan Community Forest, Hariyali Community Forest, and Kanchan Community Forest. These forests are located in Buddhabhumi Municipality, Ward No. 9, and fall under the jurisdiction of the Champapur Sub-Division Forest Office, which is part of the Division Forest Office, Kapilbastu (Gautam Buddha). They are managed by Community Forest User Groups and managing under their respective updated management plans. The western section traverses the Kapilbastu Collaborative Forest, managed by the Kapilbastu Collaborative Management Committee. Collaborative forest management in Nepal is a model involving the central government, local government, and forest user groups. In forest area, road width has been minimized in the design, width of road has been proposed to 24m

S.N.	Species	Sub Division Forest			Total
		Shivapur	Champapur	Kharendrapur	
1	Aamba/Belaui	38	12	40	90
2	Aanp	100	32	109	241
3	Aanya	21	147	376	544
4	Aasidda			132	132
5	Aasna		668	670	1338
6	Amala	3	4	2	9
7	Ammar		4		4
8	Arjun	1			1



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9	Asana+Bar			1	1
10	Ashoka	2	4	6	12
11	Badahar	3		2	5
12	Badhyaro		204		204
13	Bajhi		434	214	648
14	Bajhi+Pipal			1	1
15	Bakaino	66	19	89	174
16	Bar	10	12	30	52
17	Bar+Pipal		1		1
18	Barro	1	65	143	209
19	Bayar	1		5	6
20	Bel	5	19	71	95
21	Bhalayo		13	18	31
22	Chaurai			2	2
23	Chrimsa tree	2			2
24	Dabdabe	4	6	44	54
25	Dhamila/Dhamina	4	27	58	89
26	Dhupi	2			2
27	Dumri		31		31
28	Emili		3		3
29	Epil	27	4	7	38
30	Gayo		2		2
31	Goldmohar	9			9
32	Gullar			2	2
33	Harro		3	4	7
34	Jamun	19	349	188	556
35	Jhinghad	36	19		55
36	Kachari			3	3
37	Kadam	15	10	17	42
38	Kagati			3	3
39	Kajrauta			89	89
40	Kali Kath			1	1
41	Kalki	3	1		4



Initial Environmental Examination (IEE) for
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42	Karma	10	13	54	77
43	Katahar	3	1	4	8
44	Kavro	7			7
45	Kemuna		7		7
46	Khaneu	2	1		3
47	Khayar	9	128	75	212
48	Khiro		39		39
49	Khumbi		18	1	19
50	Kibhu	19	2	35	56
51	Kushum	1	61	103	165
52	Lichi	7	1	14	22
53	Masala	5		2	7
54	Mauwa		37	60	97
55	Nariwal	7			7
56	Neem	83	43	61	187
57	Palas		18		18
58	Panan		12		12
59	Parijat		4		4
60	Pipal	23	17	22	62
61	Pyari		77	45	122
62	Rajbrichya	4	44	62	110
63	Ritho		1		1
64	Rohani/Raini		429	653	1082
65	Sal		1592	468	2060
66	Sal+Bar			1	1
67	Sala	1			1
68	Salifa		1		1
69	Satisal			1	1
70	Shawmi	2	9		11
71	Simal	27	9	19	55
72	Siris	1	13	43	57
73	Sisau	152	126	57	335
74	Sitalchini	17			17



75	Tanki			16	16
76	Teak	1	12	35	48
77	Ten			9	9
78	Tiju		56		56
79	To the	1			1
80	Vellar		11	12	23
	Total	754	4875	4179	9808

Among the marked trees only essential trees will be remarked/confirmed for the cutting. The loss of trees from RoW will be compensated as per rules of Government of Nepal. A lumpsum amount of Rs. 70,495,000 has been allocated by the project which will be confirmed with the calculations from forest authority after confirmation of the trees to be cleared.

2. Mitigation on potential risk of accident/fatality of wildlife due to mobility

Avoiding the high biodiversity areas is limited by the existing road alignment and its secured reconstruction rights-of-way, as well as impact that realignment could have on existing human development and associated resettlement costs. Minimization is a preventative step achieved by design and scheduling considerations to ideally keep impacts below significance thresholds. It entails reducing the extent of the project footprint, limiting the duration of construction, or other actions such as closing a road during nighttime to minimize wildlife-vehicle collisions and traffic impact to permeability.

Static motorist alert signage will be placed in the wildlife movement areas. To reduce vehicular speeds and thus Wildlife Vehicle Collision incidence and severity, various traffic calming devices or treatments (chicanes, rumble strips in the pavement, or speed bumps/humps) will be applied in the wildlife hotspots.

Wildlife passage structures are among the most prominent and engineering-intensive forms of green infrastructure designed to address wildlife needs along highways. These structures often form the cornerstone of successful strategies to mitigate the impact of roads on wildlife. Over the past two decades, wildlife underpasses specifically constructed to enable safe animal passage have become increasingly common worldwide. These underpasses, which allow animals to cross beneath highways, can vary from large bridges and viaducts to prefabricated arches and dual-use drainage structures. Along the Gorusinghe-Chandrauta road, numerous drainage structures are already in place that can effectively and economically function as wildlife passages.



Each wildlife species has specific preferences for the design and dimensions of passage structures. However, certain species groups tend to share general preferences for structure sizes. The wildlife-friendly guidelines endorsed by Nepal (MoFE, 2022) offer recommended underpass dimensions tailored to various wildlife species and taxa. Based on field studies identifying target wildlife species and movement areas, the minimum dimensions for underpass size classes suitable for these species are outlined below.

Table 6-1 provides details of wildlife underpass including its location, type, dimension as well as targeted wildlife species referencing from the Nepal endorsed Wildlife-friendly infrastructure guidelines (MoFE, 2022).

Table 6 1: Proposed under-pass including dimension for different wildlife

Underpass Size Class	Target Wildlife Species	Type of Underpass Structure	Chainage	Underpass > 20 m Length		Remarks
				Width (m)	Height (m)	
Big Wildlife Species	Blue Bull, Tiger	Bridge	Bel Nadi (Ch.648+561) and Jwai khola (Ch.649+257)	15	4.5	Both bridges are in the wildlife hotspot forest habitat. Considered the recommended wildlife friendly activities and structure.
Medium	Common Leopard, Civet, Jackal, Fox, Spotted Deer, Hyena, Wild Boar	Bridge	Minor Bridge (648+157)	8	3	The minor bridge should make the wildlife friendly underpasses as recorded wildlife in the closest chainage 645+800 and 647+100 respectively
Small	Herpetofauna, Rabbit, Porcupine,	Culvert	Box Culverts (Ch.645+789) (Ch. 646+233)	3	2.5	These culverts are targeted for both herpetofauna and

Underpass Size Class	Target Wildlife Species	Type of Underpass Structure	Chainage	Underpass > 20 m Length		Remarks
				Width (m)	Height (m)	
	Mongoose, Leopard Cat, Rat, Squirrel, monkey		and Ch. 647+791)			other small wildlife.

The movement of Near Threatened Terai Gray Langur at the Chainage 648+900 and Rhesus Monkey also observed in the area hence has proposed to install the canopy (rope) bridge in the area. The canopy bridge installed in the east west highway located in Banke National Park was effective. Remote camera monitoring confirmed substantial use of the canopy bridges by Indian grey langurs, rhesus monkey, and Asian palm civets. This pilot study demonstrates the effectiveness, utility, and cost- effectiveness of rope bridges in providing connectivity for Nepal's arboreal mammals across highways (Karmacharya 2020).

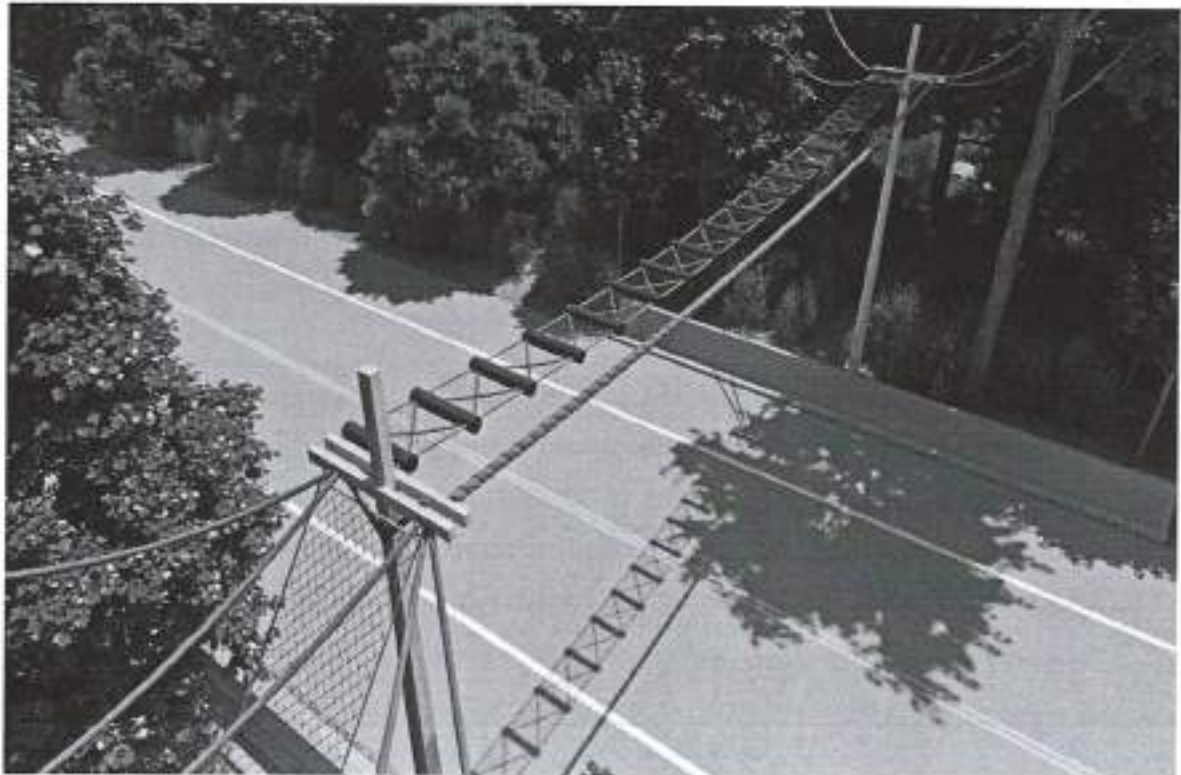


Figure 6-1: Typical design of canopy bridge



3. Reduction of possible impact on aquatic ecosystem

The detrimental effects of increased sedimentation on fish habitats are well-documented. To mitigate these impacts, strict measures will be implemented to avoid, minimize, and restore sediment-related damage. Earthworks will be avoided during the pre-monsoon and monsoon seasons in river areas, and labor camps will not be located on riverbanks. Excavation activities will prioritize canalizing the river with minimal disruption to its natural regime. Sand and gravel extraction will be limited to approved locations to maintain the river's natural flow, with immediate reinstatement of all affected areas.

To protect aquatic life, destructive fishing by construction workers will be strictly prohibited. Chemicals, bitumen, oil, and fuel will be stored on impervious floors equipped with proper drainage to prevent leaks or spills into water bodies. Construction near water bodies will be suspended during the monsoon season to minimize runoff and sedimentation. River quarrying will also be avoided to safeguard fish, aquatic species, and river ecosystems.

Campsites and worksites will include wastewater treatment facilities such as septic tanks, soak pits, and sedimentation tanks to ensure treated water is released into the environment. Regular monitoring of wastewater quality will be conducted to protect aquatic ecosystems. Machinery prone to leaking fuel, lubricants, or hydraulic fluids will not be permitted near rivers, and spill kits with trained personnel will be on hand to manage any oil spills promptly, ensuring water quality is preserved.

4. Tree cutting and management of logs

The project will ensure that all tree cutting activities are fully compliant with local laws and regulations, obtaining the necessary permits and maintaining proper documentation throughout the process. Sustainable logging practices will be followed, with a focus on removing mature or diseased trees, allowing the forest to naturally regenerate. Cut logs will be carefully managed to reduce waste, stored in designated areas to prevent environmental damage. To offset the impact of tree cutting, the project will implement reforestation and compensatory planting measures, ensuring the area is restored and biodiversity is promoted.



5. Management of forest fire risk

To mitigate the risk of increasing forest fires, several preventive measures will be implemented. Workers will be made aware of the risks associated with forest fires through training and safety briefings. Smoking passing into the forest will be strictly prohibited instead isolated safe area towards the road will be provisioned as smoking zone. Workers will be made aware about the possibilities of forest fire as well as consequences and also importance of smoking in special zone. Additionally, the use of forest wood for meeting fuel needs will be banned to protect the natural resources and minimize fire hazards. To further reduce the risk, contractors will provide alternative fuels such as kerosene or LPG for cooking, eliminating the need to use forest wood. Kerosene will also be used for safely heating bitumen, ensuring that the process is controlled and does not contribute to fire risk.

6. Reduction of Impact on Avifauna

In forested areas, the road width is minimized to 24 m to reduce the impact on trees and bird habitats. Efforts will be made to avoid clearing trees with light crowns and old trees, preserving critical areas for bird habitation. Additionally, large saplings of tree species that bear seeds or fruits, such as Simal (*Bombax ceiba*), will be planted along the roadside, especially in semi-urban and rural areas, to enhance bird habitats, foraging, and roosting opportunities. These plantings will be carried out as soon as construction work is completed to quickly restore the habitat.

Special measures, including speed reductions, warning signs, and display boards, will be implemented in forest sections to protect birds from vehicle collisions. Anthropogenic activities, such as large gatherings, will be discouraged within the forest to prevent disturbance to bird species and their natural behaviors. To further protect the habitat, the dumping of waste, chemicals, and accidental spills into nearby springs, rivers, and wetlands will be prevented, as these can directly impact avifauna.

High-speed vehicles will be discouraged to reduce the risk of bird collisions while flying at low levels. Roadside and affected area plantations will be completed as soon as possible after construction to restore and enhance bird habitats. Additionally, unnecessary noise produced during construction will be minimized through regular awareness campaigns and the installation of "no-horn" zone signs. A strict code of conduct for workers will be enforced to protect fauna, including a ban on hunting, with harsh penalties for violations, including termination of employment or contracts.



7. Reduction of Illegal Trade and Poaching of Wildlife

No workers' camps or construction facilities will be allowed to be constructed in or adjacent to forest areas. A strict code of conduct will be established for workers and employees to ensure the protection of fauna, including a ban on hunting. The project proponent will monitor the activities of the construction workers, and the contractor will be held responsible if any workers are found involved in trapping or harassing wild animals and birds. Awareness programs will be provided to workers to promote wildlife conservation. Additionally, no construction activities will be permitted during nighttime to minimize disturbance to the surrounding wildlife.

8. Disturbance to wildlife due to light and noise during vehicular movement and barrier effect.

A total of 10 awareness workshops will be conducted on topics such as forest fire prevention, wildlife protection, waste dumping prevention, speed limits, and minimizing animal collisions. Additionally, regular inspection and maintenance of water sources and pond fencing in forest areas will be carried out. Efforts will be made to improve movement corridors and maintain a proper light index in underpasses to facilitate wildlife passage. Wildlife crossing information and display boards will be installed at 1 km intervals.



Table 6.2: Environmental mitigations plan for Road Section

Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
Potential increase in road safety concerns as well as road accident	- Construction of pedestrian friendly Road/Safe Road maintaining pedestrian crossings like zebra, overpass at Imiliya, PUPs at Chandrauta. - Pedestrian Safety Infrastructures Install and maintain pedestrian crossing (Zebra, Overpass, Underpass) at community preferred locations: Construct an overhead pedestrian bridge at Imaliya chowk for safe access to local facilities. - Set up and regularly maintain traffic signs, signals and marking with a focus on pedestrian zones. - Compensation of private structures, as per land acquisition act.	During construction	Awareness training cost (table 6-3)	Project/CSC/ Contractor/ Traffic unit
Land acquisition and property/assets and their management issues	Compensation of private structures, as per land acquisition act.	During construction	Project cost	Project
Pressure on social services (drinking water, health, school, bank, electricity etc.)	Site specific LMP will be developed during project implementation phase	During construction	-	Contractor/ CSC/Project
Loss of temporary land/crops	The land beyond the RoW that will be used for the temporary structures such camp site, E&S screening and site specific ESMP will be developed with lease agreement.	During construction	Project cost	Project/CSC/ Contractor
Impact on existing social and cultural practices	Counseling sessions will be provided to workers to raise awareness about the importance of respecting local cultural and religious practices.	During construction	-	Contractor/ CSC/Project/Local Government
Health and sanitation of workers as well as community health	- Provision of Adequate toilets and sanitation and drinking water facilities at construction sites. - Awareness training to the workers will be provided on the following - Develop separate Code of Conduct (CoC) for the contractors - Ensure requirements in CoCs and signed by all	During construction	Project cost	Contractor/ CSC/Project



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	- workers. - Train project-related staff on the behavior obligations under the CoCs.			
Issues on infrastructures such as irrigation channel, transmission lines, telephone lines etc.	- Minimal damage to the infrastructure will be followed if possible - Relocation and rehabilitation as per relocation plan - Advance notice will be provided to the affected communities.	During construction	Project cost	Contractor/ CSC/Project
Issues related with creation of dead traps on quarry/borrow area	- Quarry and borrow areas will be carefully managed, and once extraction is complete, sites will be properly filled and reinstate. - Clear sign board will be placed to workers and the community of potential dangers in or near these areas.	During construction	COC	Contractor/ CSC/Project/LG
Impact on religious, cultural, and historical assets	- Relocation and rehabilitation of cultural and religious sites. - Avoid relocation of cultural properties as far as possible and will follow the mitigation hierarchy	During construction	Project cost	Contractor/ CSC/Project/LG
Risk of Gender Based Violence	- Avoid total closure of the important access to the market, water source or river as much as possible. - Code of Conduct addressing SEA/SH will be prepared and prominently displayed in contractors camp for alerting the workers about it. - Provide awareness programme about the road safety.	During construction	Project cost	Contractor/ CSC/project
Issues on community resources and utilization	- Local communities often have unequal access to construction resources like land, water, timber, and minerals. - Encouragement will be given to the community to protect critical resources, helping reduce potential impacts and support sustainable use.	During construction		Contractor/ CSC/Project
Issues related with Gau Samrakshan Kshetra near Bel River	The project will construct underpass/crossings and signage for safe crossings of cattle and helps to accidents may arise from the near the construction zone.	During construction	Project cost	Contractor/ CSC/Project

Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	- Sign board with the safety caution for speed control will be placed on either side at safe distance in the area. - Demarcation of the RoW will be done and pegging will be made - Awareness board consisting information not to encroach the will be placed. - Awareness training and TBT will be regularly conducted. - Safety personals will be appointed in CSC as well as contractors' team. - Proper PPEs will be provided and made its proper use. - Encourages to make use of the PPEs. - All the safety protocols of the project will be followed. - Proper barricade will be created at construction sites. - None of the persons will be allowed to enter the construction sites. - Risk area will be isolated and placed with the danger sign - Awareness campaign will be made to discourage entry of persons into construction site. - Provision of entry of the people with PPE into construction site will be followed. - Among the marked trees only essential trees will be felled down. - Tree loss due to clearance will be compensated through a plantation 1:10 ratio as per Forest Act, 2076 and Forest Regulation, 2079. - A total of 98,080 saplings will be planted to offset tree loss and take care for five years. - Barricade risk area especially in the Belnadi and Jwaikhola bridge construction area and in the forests. - Avoiding establishment of labour camp in the forest area from Champapur to Jwaikhola.			
Issues related with maintaining the RoW and prevention from encroachment		During operation	Project cost	Contractor/ CSC/Project
Risk associated with road safety		During operation	project cost	Contractor/ CSC/Project
Community Health and safety		During operation	Project cost	Contractor/ CSC/Project
Loss of forest (forest type and available plant species)		Construction phase	Project cost	Contractor/ CSC/Project
Obstruction on mobility and potential risk of accident/fatality of		Construction phase	Project cost	Contractor/ CSC/Project

Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
wildlife due to construction ignorance	- Restrict nighttime construction in the forest area and in Bel nadi and Jwai khola bridge. - Alert Signage will install in wildlife movement areas to increase driver awareness and reduce collision risk in the forest area from Barkapur, Champapur and Belnadi river. - Wildlife underpass will be constructed in the wildlife movement area as recommended by MoFE, 2022, guideline including tailored underpass dimensions for different species groups. - Funnel fencing in the forest area encourage to wildlife to use underpass and minimize the collision risk. - Construct the canopy bridge for arboreal mammals at the Chainage 648+900.			
Possible impact on aquatic ecosystem	- Avoiding discharge of oils, chemicals, concrete slurry etc. into the waterbody. - Earthworks will be avoided during pre-monsoon and monsoon seasons in river areas. - Labor camps will not be located on riverbanks to reduce pollution and habitat disruption. - Excavation activities will be designed to canalize the river with minimal disruption to its natural flow. - Sand and gravel extraction will be restricted to approved locations only. - Fishing by construction workers will be strictly prohibited.	Construction phase	Project cost	Contractor/ CSC/Project
Issues related with tree cutting and management of logs	- All tree cutting activities will comply with laws and regulations and taking permission from authority. - Cut logs will be handled to reduce waste and prevent environmental damage and stored in the designated area.	Construction phase	Project cost	Contractor/ CSC/Project
Risk of increasing forest fire	- Conduct awareness training and safety briefings for all workers on forest fire risks and prevention measures. - Smoking will be strictly prohibited within forest areas to prevent accidental ignition from cigarette butts or sparks.	Construction phase	Project cost	Contractor/ CSC/Project

Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	- Use of forest wood for fuel will be completely banned in the labor camp. - Minimize the disturbance in the vulture and other threatened bird nesting area during breeding season from the section Belnadi to Jwaikhola. - Regulate cattle carcass disposal to prevent vulture roadkills; ensure disposal is at least 300 meters from the road in Barkapur area. - Prohibit dumping of waste, chemicals, and accidental spills into nearby springs, rivers, and wetlands (Belgaduwa river, Brijia Lake, Hariharpur Lake, Belnadi and Jwaikhola) to protect aquatic bird species. - Conduct awareness campaigns for workers to minimize noise and disturbance to birds and no hunting them.	Construction phase	Project cost	Contractor/ CSC/Project
Impact on Avifauna	- Wildlife crime awareness training to workers and a strict code of conduct will be implemented for all workers and employees. - Hunting, trapping, harassing or harming wild animals and birds will be completely banned. - Create awareness to the workers about wild life conservation	Construction phase	Project cost	Contractor/ CSC/Project
Illegal Trade and Poaching of Wildlife	- Signage of speed limit, no horn zone and promote the use of wildlife underpass by funnel fencing and monitoring the passes. - Enhancement of wildlife corridors to support safe animal movement in the Barkapur, Champapur and Belnadi forest patches. - Lighting in underpasses will be optimized to facilitate safe and comfortable passage for wildlife. - Continuous monitoring of wildlife movement through underpasses.	Operation phase	Project cost	Contractor/ CSC/Project
Disturbance to wildlife due to light and noise during vehicular movement and barrier effect.				



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	Regular roadkill surveys will be conducted to identify high-risk zones and implement further mitigation measures.			
Disturbance to the roadside vegetation	In addition of compensatory plantation, removing dead tree and replace by new sapling with proper care.	Operation phase	Project cost	Contractor/ CSC/Project/DFO
Depletion of forest resources	- Awareness and advocacy with local community to restore the forest habitat. - Encourage and backstop for the plantation	Operation phase	Project cost	Contractor/ CSC/Project
Impact/issues to air noise and, water pollution	- Pavement will be scarified only after the completion of roadside structures to reduce dust emissions. - Regular road maintenance, including pothole repairs, will be conducted to maintain surface quality and minimize dust from road degradation. - Periodic water spraying will be done. - Construction sites in urban/semi-urban areas will be covered and fenced to reduce dust pollution and noise levels. - Crusher plants, asphalt, and hot-mix plants must be located at least 1 km away from sensitive receptors (e.g. schools, hospitals) and at least 100 meters away from water bodies or groundwater wells. - No spillage of the chemicals and pollutants to water body will be assured.	Construction Phase	Project cost	Contractor/ CSC/Project
Blockage of Cross Drainage cause Inundation/ Impact on drainage system	- Deainage size of each crossdrains has been increased by 10% as climate change mitigation. - Size of crossdrains like Kanchaniya at Chandrauta has increased - Side drains along the road has will be managed appropriately.	Construction Phase	Project cost	Contractor/ CSC/Project
Issues related with maintaining the RoW and	Clearly demarcate the RoW and ensure RoW limits are visibly marked to avoid encroachments.	Construction Phase	Project cost	Contractor/ CSC/Project

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Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
prevention from encroachment	- Conduct awareness campaigns to educate local communities on RoW regulations and the importance of preserving clear corridors in the settlement area. - Regular monitoring of RoW using GIS and drone technology to detect encroachments and ensure compliance.			
Impact/issues associated with operation of project components e.g., Crusher plant, batching plant, workshop, asphalt concrete plant etc.	- As much as possible, crusher plant will operate during daytime hours (6:00 AM to 8:00PM) to minimize noise disturbance in surrounding areas. - Incase of operation standard for sound level as of government rule will be followed. - Transported materials will be fully covered to control dust emissions during transit. - On-site waste will be segregated into degradable and non-degradable categories using separate bins. - Appropriate pollution control measures will be implemented for dust, noise and vibration control.	Construction Phase	Project cost	Contractor/CSC/Project
Issues associated with construction of bridges	Presented in separate EMP of bridge (Table 6-3)			
Impact/issues associated with construction camps establishment and operation	- First aid kits and medical facilities will be made available at all campsites. - Coordination with municipal-level health/sub-health posts for emergency or serious injury cases. - Camp sites will be restored to their original or acceptable condition after use.	Construction Phase	Project cost	Contractor/CSC/Project
Impact/issues on air quality, construction noise and vibration	- Stone crushing equipment and cement batching plants will be fitted with dust control devices. - Water spraying will be carried out during operations to minimize dust emissions. - Operational activities will be limited to daytime hours to reduce disturbance from noise and vibration.	Construction Phase	Project cost	Contractor/CSC/Project/LG



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	After operations are complete, the plant site will be restored to its original condition to prevent long-term environmental impacts.			
Risk associated with road safety	- Implement adequate signage and traffic management plans to safely guide vehicles and pedestrians in the settlement area Imiliya, Champapur, Kharendrapur, Chandrapur and Shivpur. - Deploy trained flaggers in high-risk areas to manage traffic flow and reduce the risk of accidents. - Ensure mandatory use of PPE, including helmets, high-visibility vests, gloves and boots. - Regular water spraying will be conducted to minimize dust emissions. - All transported materials will be covered to prevent spillage and airborne particles. - Site operations will be limited to daytime hours to avoid nighttime noise and disruption. - Vehicular movement will be regulated during school hours to prevent traffic congestion and enhance public safety.	Construction Phase	Project cost	Contractor/ CSC/Project/LG
Impact/issues due to quarry/borrow site operation	- Restrict land clearing to only the necessary areas to avoid unnecessary soil loss. - Restore used land to its original state after the completion of construction activities. - Protect slopes and embankments using retaining walls, gabion structures and terracing techniques. - Provide fair compensation to landowners for the temporary use of their land during project activities. - Disposal of excavated spoils and wastes into three major river and other water bodies is strictly prohibited. - All construction waste will be collected, stored, and transported to designated and approved disposal sites.	Construction Phase	Project cost	Contractor/ CSC/Project/LG
Loss of productive soil	- Restrict land clearing to only the necessary areas to avoid unnecessary soil loss. - Restore used land to its original state after the completion of construction activities. - Protect slopes and embankments using retaining walls, gabion structures and terracing techniques. - Provide fair compensation to landowners for the temporary use of their land during project activities. - Disposal of excavated spoils and wastes into three major river and other water bodies is strictly prohibited. - All construction waste will be collected, stored, and transported to designated and approved disposal sites.	Construction Phase	Project cost	Contractor/ CSC/Project
Impact/issues on surface and ground water contamination	- Restrict land clearing to only the necessary areas to avoid unnecessary soil loss. - Restore used land to its original state after the completion of construction activities. - Protect slopes and embankments using retaining walls, gabion structures and terracing techniques. - Provide fair compensation to landowners for the temporary use of their land during project activities. - Disposal of excavated spoils and wastes into three major river and other water bodies is strictly prohibited. - All construction waste will be collected, stored, and transported to designated and approved disposal sites.	Construction Phase	Project cost	Contractor/ CSC/Project/LG



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	- Chemicals and oil will be stored away from water sources. - Silt fencing and brush barriers will be installed to trap sediments before they reach water bodies.			
Impact/issues of Occupational safety and health	- All workers will be provided with necessary PPE such as gloves, boots, masks and helmets. - Regular health camps will be organized to monitor worker health and provide necessary medical support. - First aid kits will be made available on-site for immediate medical attention. - Proper sanitation facilities will be provided at worksites. - Frequent safety inspections will be conducted to identify hazards and ensure all machinery and equipment are well-maintained.	Construction Phase	Project cost	Contractor/CSC/Project
Community Health and safety	- Ensure use of appropriate PPE (helmet, gloves, boots, goggles, ear protection). - Provide safe drinking water, proper sanitation, and hygienic living conditions. - Implement fall protection systems and safety measures for work at height and near water. - Conduct regular health check-ups and ensure availability of first aid and medical support. - Provide proper training and induction on occupational health and safety. - Develop separate Code of Conduct (CoC) for the contractors and sub-contractors. - Ensure requirements in CoCs are clearly understood by those signing. - Have CoCs signed by all those with a physical presence at the project site. - Train project-related staff on the behavior obligations under the CoCs.	Construction Phase	Project cost	Contractor/CSC/Project/Local health institution/LG



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	Disseminate CoCs (including visual illustrations) and discuss with employees and workers.			
Issues of compaction and turfing during embank stabilization	- Proper compaction of the embankment - Land stabilization and erosion control - Proper spread of fertile top soil for greenery management	Construction Phase	Project cost	Contractor/CSC/Project
Drainage, soil erosion and sedimentation problem in the river & nearby settlement	- Existing drainage systems will not be disturbed during operations. - Sediment control ponds will be constructed to trap sediment before it reaches water bodies of three major rivers. - Regular maintenance of drainage systems will be conducted to prevent blockages and ensure effective flow.	Construction cost	Project cost	Contractor/CSC/Project/LG
Impact/issues associated with hazardous, non-hazardous and liquid waste	- Waste Management Plan covering procedures for use, storage, transport and disposal of hazardous materials will be implemented. - Separate and adequately sized containers will be placed at work sites to collect non-hazardous waste, hazardous waste and liquid waste. - Regular transport of collected waste to a centralized waste management facility. - Color-coded waste bins of adequate number and capacity will be placed at campsites (e.g., kitchens, offices, rooms) to enable segregation at source.	Construction phase	Project cost	Contractor/CSC/Project
Impact/issues associated with spoil from construction work as well as demolition waste	- All laborers will be provided with necessary PPE that ensure worker safety and minimize exposure to hazardous materials during construction. - A paved storage area with a containment chamber will be constructed to collect and recover oil spills. - Demolition materials such as concrete, bricks, metals and wood will be segregated at the source to facilitate recycling and proper disposal. - A designated storage area will be established for safe accumulation of demolition waste	During construction	Project cost	Contractor/CSC/Project



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
Impact/issues associated with land use change	- The conversion of forest area as well as agriculture land will be changed into pavement area. - As much possible the forest area will be regenerated into forest. - Top soil will be saved and used for regeneration of grasses along the embankment. - Open land area will be planted along the highway to maintain greenery. - Discussion will be made with DFO for selection of species for plantation. - Budget has allocated for the purpose by the project.	During construction as well as PBM period	Project cost	Contractor/ CSC/Project
Blockage of Cross Drainage cause Inundation/ Impact on drainage system	- Existing natural drainage systems will not be disturbed; temporary measures such as hump pipes will be provided to maintain flow. - Excess spoil will be stockpiled at designated locations to prevent blockage of natural drains. - Bridge and cross-drainage work across rivers/streams will not be undertaken during peak monsoon season to avoid flood risks. - Silt deposition in watercourses will be regularly removed to maintain clear flow paths. - Regular road condition monitoring and maintenance will be conducted, especially before and after the rainy season. - Constructing additional slope protection structures where necessary.	Operation Phase/PBM	Project cost	Contractor/ CSC/Project/LG
Impact/issues associated with barrier effect and aesthetics	- All affected areas (construction camps, crusher plant, batching plant, workshops, etc.) will be restored to their original state after completion of construction. - Temporary structures will be completely removed from the sites. - Landscapes will be rehabilitated, including leveling and reshaping disturbed land.	Operation Phase/PBM	Project cost	Contractor/ CSC/Project/LG



Impacts	Enhancement /Mitigation Measures	Time of Action	Resources/Cost	Responsibility
	- Vegetation will be replanted to match pre-construction conditions, supporting habitat recovery. - Restoration efforts will aim to blend with the surrounding environment, minimizing long-term visual and ecological impacts.			
Impact/issues due to glare effect of high-speed vehicles and road accidents	- Median plantation will be made - Proper greenery will be maintained along the road - Proper road furniture structure will be implemented - Division area, crossing points and zebra cross areas will be managed with proper lusture materials.	Operation Phase	Project cost	Contractor/ CSC/Project

Table 6-3: Environmental Management Plan for mitigating environmental impacts for Belwagurdawa (Ch. 640+000) and Bel bridge (Ch. 648+561)

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Physical Environment							
Site clearance and bridge construction	Change in land use pattern	- Only required land will be acquired for construction purpose. - Encroachment to private land will be avoided for temporary use - As the right bank of the Belgardawa and left bank of Bel River	Bridge construction area	Pre- construction and construction phase	No additional cost required	Contractor	CSC/PCU



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Site clearance	Disruption of public utilities (2 electric poles)	have steep embankment sufficient precaution during clearance will be taken. • Prior consent will be taken from the user's community before the public utilities are shifted. • As per the suggestion provided by the authority, the public infrastructures will be rehabilitated on nearby locality with proper co-ordination. • No impact on cremation site at right bank of the Bel River (Upstream of the bridge) will be ensured.	Entire bridge construction area	Construction phase	Project cost	Contractor	CSC/PCU/ DCID/ DoR



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Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Construction activities	Traffic congestion and Road Safety	- Fencing and lighting of construction and staging areas will be done, recognized safety practices - for the utilization of heavy equipment, and the movement of construction - materials will be implemented to avoid accidents. - Lane blockages, and vehicles entrance locations will be well signed. - Warning signs posts will be established	Bridge construction area	Constructio n phase	(EMP implementati on) NRs. 10000 for sign post	Contractor	CSC/PCU /DCID/ DoR
Operation of construction/ labour camps	Impact due to establishment of construction camps	Bio-degradable waste will be disposed in a separate pit away from the water bodies. The pit will be reinstated along	Labour camp area	Constructio n phase	Part of construction cost	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		with the labor camp after the work ceases. - Liquid waste will be disposed in a separate ditch and disinfectant (Chlorination) will be continuously spread to avoid contamination. - Haphazard littering of solid waste by construction crews will be restricted, for this a strict code of conduct will be implemented. - Separate toilet facility will be constructed near the construction camp with the facility of septic tank. Provision of clean drinking water will be made at					



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		the construction camp. No disturbance into the shed of the cremation site from the labour camp/construction workers will be assured.					
Quarry management and river bed extraction	Impact due to operation of borrow pits and quarries	- Consent from local government (municipality or also RM as well as metropolitan city municipality and DCC etc.) will be taken prior to the use of quarry and borrow pit sites. - River bed materials will be extracted by taking necessary permission from the local bodies.	Quarry site and river bed extraction site	Construction phase	Part of construction cost	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		- Extraction of river bed materials from active channel will not be done. Removal of riparian vegetation will be avoided. - Excavator will be used only when required. Washing and cleaning of excavator in river water will be avoided. Operator will be well informed about the safe operating procedures to be adopted while extracting river bed materials - The maximum depth of floodplain extraction will be above the channel thalweg. Side slopes					



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Stockpiling of Construction materials	Impact due to stockpiling of construction materials and spoil/debris disposal	of excavation will range from 3:1 to 10:1. - Quarry sites, borrow pit area and river bed extraction sites will be rehabilitated after their use. - No extraction of the materials from the river bank near bridge will be done. - The land allocated for the storing of construction materials will be far from agricultural land and water bodies. - The permission from local stakeholders will be taken before commencing the stockpiling of the	Around stockpiling sites	During construction	Part of construction cost	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		construction materials. - Construction materials will be covered with tarpaulin during stockpiling to prevent from rain water and dust emission generated from the stockpiling site. - Construction materials will be further encircled with side barriers and covered to avoid mix up with deleterious materials.					
Construction activities	Spoil generation and likely impact on water and soil	5-meter-high gabion structures will be built (as river training) along the bank of river prior to the spoil disposal so that the	Spoil disposal site	Construction phase	Part of construction cost	Contractor	CSC/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		spoil would not get contaminate with the river water. - After the spoil is filled up to 5 meter additional two-meter spoil can be adjusted at each site by making a sloppy surface (Toe wall) of 60° on the river side. - As soon as the spoil disposal gets completed the site will be planted with trees					
Bridge construction	Obstruction to natural drainage pattern	- Project will not scour the river bed unnecessarily - River flow diversion will be done whenever/if necessary - Minimum disturbance will be done during construction	Bridge construction area	Construction period	No additional cost required	Contractor	CSC/PCU/ DCID/ DoR

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Bridge construction	Meandering of the river towards the agriculture land in Imiliya	Spoils generated during the excavation will be disposed-off immediately	Bridge construction area and DS of the bridge	Construction period	Cost of the structure has included in project cost during design	Contractor	CSC/PCU/ DoR
		- Deposit used for the bridge construction will be disposed off immediately after completion of the bridge works. - Gabbion structures will be established for protection river cutting and erosion control. - Bioengineering using live check dams/palisade will be done for sustainability. - Additional discharge culvert will be added towards east of the existing bridge to minimize the					



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Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Construction activities	Air and noise pollution	upstream inundation in Belgardawa river. - Construction equipment and vehicles will be regularly examined and maintained in proper condition - Water will be sprinkled along access road at least two times a day to reduce the dust emission. - Proper protection works like -fencing by CGI Sheets or walls will be done at excavation and disposal sites - Construction materials will be properly covered during conveyance. Enforcing vehicle	Bridge construction area	During construction period	No additional cost required	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		speed limit using signals and speed breakers. - Workers will be encouraged to use masks. Concrete mixer, vibrator, etc. will be maintained in proper condition. - Sound producing equipment will be preferred to use only in daytime. Earplug will be provided to the worker involved in equipment operations.					
Bridge and approach road construction	Degradation of water quality	- Disposal of soil, sludge and other waste directly into water bodies will be avoided. - Prohibition of activities like washing- cloth, dish,	Bridge site	Construction phase	No additional cost required	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		etc. by construction workforce near water bodies that contribute to water pollution will be prohibited. - Oils and chemicals used in construction vehicles and machineries will be handled properly to avoid the contamination with the water bodies. - Separate toilet facilities will be provided to the construction crew with proper septic tank facilities. - Liquid waste generated within the camp site will be disposed safely without releasing into the water bodies					



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		Accidental spillage of the oil, grease and other chemical substances will be captured immediately without allowing them to contaminate the water bodies.					
Bridge and approach road construction	Soil erosion specially cutting at right bank DS from bridge	- Minimize cut slope activity in design to the extent possible - Cutting activity at right bank will be maintained handling - Retaining structure along with bio-engineering will be applied - Approach road construction will be supplemented with the bio-engineering measures on fill slopes	Quarry site and river bed extraction site, foundation work site and approach road	Construction phase	No additional cost required	Contractor	CSC/PCU/ DCID/ DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Construction activities	Occupational health and safety hazards	• Minimum damage of vegetation will be ensured during construction • Proper protection using gabian structures as well as stone piling and bioengineering stability of the embankment will be assured.	Bridge construction area	Construction phase	NRs. 150,000.00 allocated for safety gadgets	Contractor	CSC/PCU/ DCID/ DoR
		• Workers will be oriented properly about the associated hazards and necessary safety measures. • Construction workers will be prior informed about the emergency procedures and any other relevant safety measures • Safety equipment such as helmets,					



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		boots, gloves, safety belts, safety glasses and masks will be provided to the workers. - Contractor will arrange the First Aid Kit Box and standby medicine for workforce during working period and emergency situations. Warning signs, posts, barriers and guards will be installed to restrict access of unauthorized persons to construction sites. - Only authorized person will be allowed to operate heavy machinery and equipment. - Temporary drinking water supply and					



Initial Environmental Examination (IEE) for
Upgrading the Gurusinghe-Chandrauta (19.2 Km) Road and Associated Bridges

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		latrine pit will be established at site. • Dust control will be done by spraying water on access road and other construction areas.					
Transportation of construction materials	Air pollution and environmental nuisance	- The construction materials will be transported by covering it with tarpaulin. - Vehicles carrying construction materials will not be parked nearby the sensitive public places and market areas. - No construction materials will be stored in front of the shed of the cremation site in Bel river.	Project influence area	Construction phase	Project cost	Contractor	CSC/PCU/ DCID/ DoR
Bitumen heating	Air, water and noise pollution	Bitumen heating will be done at least 100 m	Around bitumen	Construction phase		Contractor	CSC/PCU/ DCID/



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		away from the nearby settlements and public places. • Bitumen storage will not be done on nearby fertile land and water sources. • The excess bitumen will not be discharged into the drain structure while overlaying on the sub-base material. • Use of bitumen will not be done on the rainy condition. • Workers will be provided with necessary protective equipment such as face mask, gloves etc. • Bitumen heating place will be reinstated after the works completed.	heating place				DoR



Initial Environmental Examination (IEE) for
Upgrading the Goringhe-Chandrapur (19.2 Km) Road and Associated Bridges

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Use of chemicals and hazardous materials	Contamination of soil due to leakage of spent lubricants and paints	- Storage of chemicals including hazardous materials will be done on safe place and the storage facility will be sealed. - The facility will be well protected from strangers and scavengers. - Paints will be applied only where required. Accidental leakage of paints and chemicals will be strictly regulated. - Contaminated containers, packaging materials and worn plastic will be disposed of in separate spoil disposal areas	Bridge construction area	During construction phase	No additional cost required	Contractor	CSC/PCU/ DCID /DoR



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
PBM and Operation Phase		- Containers will be recycled/reused or managed properly - Accidental leakage of fuels, grease, lubricants and other hazardous materials will be recovered quickly and managed safely in designated area.					
	Bridge operation	Impacts due to Slope Instability	Bridge area	During operation phase	DoR annual maintenance budget	Contractor until defect liability period	CSC/PCU/ DCID/ DoR
	Bridge operation	Issue of scouring of bridge	Bridge area	During operation phase	DoR annual maintenance budget	Division Road Office	CSC/PCU/ DCID/ DoR

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		- Re-pointing of loose mortar, re-facing of spalled screed. - Prevent scouring of bridge by preventing over extraction of riverbed materials					
Bridge operation	Air and noise pollution	Speed limit will be placed in both banks of the bridge	Bridge area	During operation phase	No cost involved	DoR	CSC/PCU/ DCID/ DoR
Biological Environment							
Construction Phase							
Bridge construction	Loss of vegetation (one Bar and one pipal tree towards west bank will be lost)	Compensatory plantation will be done as per rules of Government of Nepal	Bridge construction area	During construction period	Included in project cost	DoR	CSC/PCU/ DCID/ DoR
Site clearance	Biomass and wood stock generation (0.28 cu. m. of wood	Timely hand over the generated wood volume to DFO	Bridge construction area	During construction period	Included in project cost	DoR	CSC/PCU/ DCID/ DoR

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	stock will be generated)	Budget for compensatory plantation has been allocated as per rules of Government of Nepal					
Construction activities including excavation and dredging of river channel	Disturbances on aquatic lives	- The river channel will be disturbed only in required extent. - Spoil will be safely managed soon after their generation. - Haphazard disposal of garbage into the stream channel will be prohibited. - Chemicals used in construction activities will be handled carefully and stored in fallow land away from the riverbeds.	Bridge construction area	During construction phase	No additional cost required	DoR	CSC/PCU/ DCID /DoR



Initial Environmental Examination (IEE) for
Upgrading the Gorusingho-Chundramthi (19.2 Km) Road and Associated Bridges

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		Illegal fishing activities by the construction crews will be regulated.					
PBM and Operation Phase							
Bridge operation	Disturbances on the under-bridge wildlife movement	- Bridges have adequate height and openings - Regular maintenance of bridges - As much as possible existing poles and shrubs will be saved so that will maintain greenery for the crossing. - Wildlife friendly environment will be maintained specially the right bank of the Bel River will be developed as wildlife crossing corridor hence gabion structures as well as	Bridge area	During operation period	Annual maintenance budget	Division Road Office	CSC/PCU/ DCID/ DoR/DFO



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		terrace will be maintained.					
Socio-economic and Cultural Environment							
Use of local resources during construction by project	Stress on Public Utilities and Facilities (In the abandon land at left bank of Belgardawa will be in pressure)	- The contractor will manage utilities like communication, lighting and cooking energy, drinking water supply, etc. within the camp so as to avoid the pressure on local services. - Local people will be consulted to build consensus on sharing the community infrastructures such that it will not significantly affect the local people. - The contractor will be responsible for reconstruction and rehabilitation of damages due to their	Entire project area	During construction phase	No additional cost required	Contractor	CSC/PCU/ DCID/ DoR



Initial Environmental Examination (IEE) for
Upgrading the Gorusingh-Chandrauta (19.2 Km) Road and Associated Bridges

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		activities; any damage to existing road in project location will be controlled and rehabilitated.					
Bridge construction	Loss of public properties/infrastructures (2 electric poles in either bridge)	As per the suggestion provided by the authority, the public infrastructures will be rehabilitated on nearby locality.	Entire bridge construction area	Construction phase	NRs. 140,000.00 for rehabilitation of services	Contractor	CSC/PCU /DCID/ DoR
Bridge construction	Social and cultural conflicts due to influx of construction workers	Code of conduct for all the construction crew will be enforced and they have to strictly follow the code. As per the code the workers will not be allowed to involve in any kind of conflicts and any of the workers are found guilty, they will be punished as per the code.	Project influence area	During construction period	Not applicable	Contractor	CSC/PCU/ DCID/ DoR
Bridge construction	Pressure to crematory site	The access road to cremation site will not	US of the Bel bridge	During construction	No additional cost required		CSC/PCU/ DCID/



Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	(tap in cremation site can exert pressure from workers to use drinking water) in Bel Bridge	be used by the project for any transportation. - Workers will not be allowed to use the crematory shed at any time and season. - Workers in Bel bridge will be alert not to use the tap while there are peoples for crematory purpose.					DoR
PBM and Operation Phase	Bridge operation	Population pressure and impact due to new settlement along the road alignment	Bridge area	Operation period	No additional cost required	Division Office	CSC/PCU/ DCID/ DoR
						Road	

Initial Environmental Examination (IEE) for
Upgrading the Gorusinghe-Chandrauthi (19.2 Km) Road and Associated Bridges

Activity/ Impacts	Adverse Environmental Impacts	Mitigation Measures	Affected Location	Schedule	Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
		proper regulatory mechanism					
Bridge operation	Impacts of increased Road Traffic	Information signboards will be placed as precautionary measures and traffic rules and regulations should be strictly enforced.	Bridge area	Operation period	Maintenance cost	Division Office	CSC/PCU/ DCID/ DoR
Bridge operation	Impacts off road and bridge safety	Appropriate road safety measures, such as the installment of traffic signs, speed breakers, marking, and others, should be conducted near the bridge site.	Bridge area	Operation period	Maintenance cost	Division Office	CSC/PCU/ DCID/ DoR



9. Environmental Budget

Cost estimation for the proposed mitigation measures and enhancement measures on physical, biological and socio-economic and cultural environment of Gorusinghe-Chandrauta road and bridge is given in Table 6-5.

Table 6-3: Environment mitigation and enhancement costs

SN	Mitigation and enhancement activities	Estimated cost (NRs)	Remarks
A	Capacity building Training (Tool Box talk sessions /labour force leaders, affected person/local stakeholders)	1,500,000	Covered by BoQ item
B	Budget for environmental-related civil works that included in the project cost		
	Cost for tree cutting		Covered by BoQ item
	Bio engineering works and turfing	26,346,920	Covered by BoQ item
	River training and protection works		Covered by BoQ item
	Community safety structure (such as footsteps, approach to property, boundry wall, culvert etc)		Covered by BoQ item
	Wild animal crossing		Covered by item in BoQ
	Drainage management work		Covered by item in BoQ
	Installation of road safety signs/		Covered by item in BoQ
	Road Furniture and Traffic Safety Measures		Covered by item in BoQ
	Pedestrian overhead crossing		Covered by item in BoQ
C	Budget for the environmental mitigation, compensation and monitoring to be included as BOQ items in the contract		
i	Mitigations and compensation		
	Fencing in forest area	18,553,452	Covered by BoQ item
	Funnel fencing	3,289,065	Covered by BoQ item
	Implementation of EMP	5,000,000	Covered by BoQ item
	Compensatory tree plantation	70,495,000	Covered by BoQ item
	Compensation of damaged public and private structure, loss of standing crops	16,649,755	Covered by BoQ item
	Public utilities relocation/shifting		Covered by item in BoQ
ii	Monitoring cost for compliance		
	Air and noise quality monitoring	1,800,000	3*4*3=36*50000, Covered by BoQ item 8.1
	Water quality monitoring	600,000	5*4*3=120*10000, Covered by BoQ item 8.1
D	Monitoring of wildlife activities using camera traps road kill survey	3600000	Two years (@150000 per month)
E	Monitoring through Ministries Departments and Local bodies	500000	
	Total Cost	148,334,192	

Source: Design Report of the Road, 2025



CHAPTER-7: ENVIRONMENTAL MONITORING

According to EPR, 2077, the project proponent will be responsible for overseeing environmental monitoring. To assess the effectiveness of the mitigation measures for the Upgrading of Gorusinghe- Chandrauta road Project, following three types of environmental monitoring will be conducted.

7.1. Environmental Monitoring

A. Baseline Monitoring

Baseline monitoring is essential for compiling and maintaining a database on environmental conditions before project implementation. During this phase, the focus will be on collecting field data to establish baseline environmental conditions, which are crucial for finalizing the design and cost of mitigation measures. This becomes particularly important if the project faces delay due to unforeseen issues. The data gathered prior to project implementation will enable a comparison with information collected during construction monitoring activities.

B. Compliance Monitoring

Compliance monitoring involves the continuous measurement of specific environmental quality indicators or pollution levels to ensure that the project adheres to government environmental protection standards. This process covers the responsibilities of both the project proponent and the contractor. Typically, compliance monitoring is conducted on-site. The detail is given in Table 7.2.

C. Impact Monitoring

Impact monitoring involves measuring physical, biological, socio-economic, and cultural parameters within the project area during construction and operation phases to detect environmental changes resulting from project implementation. This process includes actual measurement of the environmental impacts of construction activities, such as regularly taking water quality samples to evaluate pollution levels in the river from construction camps after mitigation measures have been applied. Impact monitoring entails the scientific collection, analysis, and interpretation of data, along with a follow-up on mitigation efforts. It is intended to evaluate the actual impact compared to the predicted impact and to assess the effectiveness of mitigation strategies. The detail is given in table 7-1.



Table 7-1: Environmental monitoring cost

Description	Quantity	Rate (per month) NRs	Amount (NRs)
Environmental Specialist	36 (Months)		Included in Supervision consultant cost
Sociologist	36 (Months)		Included in Supervision consultant cost
Safety Inspector	36 (Months)		Included in Supervision consultant cost
Field sampling and Lab Tests monitoring			
Air and Noise quality monitoring	900,000	50,000	900,000
Water quality monitoring	1,200,000	10,000	450,000
Wildlife movement monitoring	2 (years)	1800,000	3,600,000
Sub-Total Costs for Environmental Monitoring Works			5,700,000
Monitoring Costs by			
Geo-Environment and Social Unit, DoR/MoPIT/Local and Provincial Government	500,000		500,000
Sub-Total Costs for Monitoring Agencies			500,000
Total Estimate			6,200,000

7.2. Organization Setup for Monitoring

The Department of Road (DoR) under the Ministry of Physical Infrastructure and Transport (MoPIT) is the primary agency responsible for the development and execution of strategic road projects. The Geo-Environment and Social Unit (GESU) serves as the main entity for managing and monitoring environmental and social risks. This chapter provides details about the institutional arrangements for implementing and monitoring the Environmental Management Plan (EMP).

Ministry of Physical Infrastructure and Transport (MoPIT)

The Ministry of Physical Infrastructure and Transport (MoPIT) is the parent agency of the Department of Road (DoR) and is tasked with reviewing and approving Basic Environmental Studies (BES) and Initial Environmental Examinations (IEE) for projects in the public works and transport sector, as required by the Environmental Protection Act. MoPIT also reviews Environmental Impact Assessment (EIA) reports before forwarding them to the Ministry of Forests and Environment (MoFE) for approval. Additionally, MoPIT is responsible for authorizing the



Project Implementation Unit (PIU) to begin preliminary actions for land acquisition, a function managed by the environment and social section within the planning, monitoring, and evaluation division of MoPIT. The Ministry is also charged with overseeing project supervision and conducting periodic evaluations.

**Ministry of Forest and Environment, Department of Forest and Soil Conservation and
Division Forest Offices:**

These bodies play a key role in obtaining permits for tree felling and tree felling related work required for the project, transferring ownership of forest areas required for the project, and monitoring forest areas in the project area.

Department of Road (DoR)

DoR is directly accountable for managing the environmental and social risks of individual projects throughout their implementation. DoR has five (5) deputy directorships /branches that develop and implement projects. These are:

1. The Planning and Design Branch, which develops and implements all GoN-funded roads;
2. The Bridges Branch, which is in charge of the development of bridges
3. The Maintenance Branch, which is in charge of the repair and rehabilitation of roads and bridges
4. The Development Cooperation Implementation Division, which handles donor- funded projects and,

As the project is World Bank funded, a Project Management Unit (PMU) under DCID will be created to implement this project.

DCID/Project Management Unit (PMU)

The Development Cooperation Implementation Division (DCID)/Project Management Unit (PMU) oversees donor-funded projects. DCID/PMU is responsible for organizing the implementation of Environmental Management Plans (EMP) in line with donor agreements. They typically prepare their own Environmental Assessments (EA), RAPs, and other Environmental and Social (E&S) Risk Management Plans using hired consultants. DCID ensures that the EMP is integrated into bidding documents and civil work contracts, establishes procedures to monitor implementation progress, oversees EMP implementation through monthly reports, verifies compliance, and maintains a



Grievance and Redress Mechanism. DCID is supported by dedicated Environmental, Social, and Gender Equality and Social Inclusion (GESI) Experts, along with supporting consultants.

Geo-Environment and Social Unit (GESU)

The Geo-Environment and Social Unit (GESU) is the focal point for environmental and social risk management at the DoR. GESU conducts compliance monitoring of projects and interacts with the PIU. Its role is crucial in environmental and social analysis, stakeholder participation in planning and implementation, and enhancing project efficiency, effectiveness, and sustainability. GESU is supported by a dedicated Environmental Inspector, Social Officer, Engineers, and consultants.

Construction Supervision Consultant (CSC)

The Construction Supervision Consultant is responsible for overseeing the implementation of environmental and social mitigation measures as outlined in the EMP and for monitoring the construction contractor's compliance. They prepare periodic monitoring reports for submission to the DoR, DCID/PMU, and the World Bank. Their duties include preparing monthly monitoring reports, identifying and following up on corrective actions, conducting regular site inspections to verify monitoring reports and identify unforeseen environmental impacts, ensuring contractors address non-compliances within a specified timeframe, and organizing stakeholder consultation workshops. The consultant's team includes an Environmental Safeguard Expert, a Social Safeguards Expert, and an Occupational Health and Safety Officer to assist the PMU directly.

Contractor

The Contractor is primarily responsible for implementing and internally monitoring all environmental and social management measures related to the project's design and construction. They must develop a Contractor's Environmental and Social Management Plan (CESMP) based on the project's EMP, addressing all relevant aspects of the construction phase and revising it as needed for approval by the SC and PMU. The Contractor has sole responsibility for all activities on sites under its control throughout the construction period, including those of subcontractors employed or contracted directly or indirectly. Thus, the Contractor must ensure compliance with project plans, permits, approval conditions, and any other legal requirements. They must employ qualified Environmental, Social, Health and Safety (ESHS) to supervise ESHS performance and ensure adequate staffing and resources appropriate to the scale and timing of work and potential ESHS risks. The Contractor must also submit monthly reports to the SC/PMU on the status of EMP implementation and carry out corrective actions as directed by the SC/PMU.



7.3. Monitoring Plan

The following table identifies the specific compliance monitoring activities. Phase-wise/chronological details are provided for the methods, schedules, responsible implementing agency and the responsible monitoring agency. The compliance monitoring refers primarily to the pre-construction and construction stage of the project.



Table 7.2 Environmental Monitoring Plan for road upgrading works

Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
A. Baseline Monitoring						
Ambient air quality	Test report produced	High and low volume air sample	Settlements inside DIA	24 hrs/once prior to start of construction	DCID	PCU/Supervision consultant
Noise level	Test report produced	Noise level meter	Settlements inside DIA	15 minutes for 4 different time zone	DCID	PCU/Supervision consultant
Water Quality	Lab report produced	Laboratory analysis	Water bodies inside DIA	15 minutes for 4 different time zone	DCID	PCU/Supervision consultant
Vegetation status	Observation report	Walkthrough survey	Forests area inside DIA	15 minutes for 4 different time zone	DCID	PCU/Supervision consultant
Movement of wild lives	Observation report	Walkthrough survey	Forests area inside DIA	15 minutes for 4 different time zone	PMU	PCU/Supervision consultant
Socio-economic status of Project affected people	Key informant survey	Walkthrough survey	Settlements inside DIA	15 minutes for 4 different time zone	DCID	PCU/Supervision consultant
B. Compliance Monitoring						
1. Socio-economic Environment						
Employment to	Number of projects	Interaction with	Settlements inside DIA	Periodically	Contractor	PCU/MoPIT/LG



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Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
Project affected people	affected employed people	project affected people, recording		during construction phase		
Restoration, rehabilitation of infrastructures damaged by the subproject activities	Continued services by the facilities and functional public life	Site observation; records; Public Consultation Meetings; Photos	DIA	Once in a month during construction phase	Contractor	PCU/MoPIT/LG
Involvement of local labours in construction activities	Number of local labours employed in project	Inspection at construction site, interaction with local people	Settlements inside DIA	Periodically during construction phase	Contractor	PCU/MoPIT/LG
Worker's sanitation, Occupational health and safety	Incidence of communicable/non- communicable diseases at labour camp, safety gears usage by labour, medical checkup camps, shelter, drinking water and toilet facility	Site inspection, interaction with labours	Labour Camp sites	Periodically during construction phase	Contractor	PCU/MoPIT/LG
Pressure on social service	Number of labours depending on local social	Site observation, interview with	Settlements inside DIA	Periodically during	Contractor	PCU/MoPIT/LG



Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
facilities	infrastructures like forest, water supply lines, health posts, etc.	local peoples		construction phase		
Social Conflict	Number of days lost due to conflict, bandhs at project level etc.	Interview with contractor, site consultant, locals	Settlements inside DIA	Periodically during construction phase	Contractor	PCU/MoPIT/LG
2. Physical Environment						
Slope protection	Bioengineering methods used at recommended sites	Walk through survey	Road Construction sites	Before award of construction completion certificate	Contractor	PCU/MoPIT/LG
Extraction of material from recommended quarry sites and borrow pits	No cases of material extraction reported from unauthorized sites	Walk through survey, interaction with local peoples	Quarry sites and borrow pits	During construction phase	Contractor	PCU/MoPIT/LG
Control of dust emission	Dust level at construction site, water sprinkling practice observed	Use of sprinkler tank, interview local about dust problem	Settlements inside DIA	During construction phase	Contractor	PCU/MoPIT/LG



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Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
Spoil dumped in safe tipping sites	Spoil dumped in sites recommended by project manager	Interaction with project manager, and local people, Walkthrough survey along road alignment	Tipping sites	During construction phase	Contractor	PCU/MoPIT/LG
Erosion protection measures used in material stockpiling area	Erosion protection measures used (grassing), bunds constructed, adequate drainage provided	Visit to material stockpiling area, observation	stockpiling area	During construction phase	Contractor	PCU/MoPIT/LG
Road Safety	Use of signal boards (speed limit, men at work, danger etc.) during upgrading, safety passage provided to vehicles	Walkthrough survey observation, interaction with locals	Road Construction sites	During construction phase	Contractor/Do R	PCU/MoPIT/LG
Measures to protect environment from air & noise pollution	Dust level and noise level at work sites, major settlements and sensitive spots like health centers and schools	Testing, Observation of good upgrading practices and discussion with residents and	work sites, major settlements and sensitive spots	Once in a month during construction	Contractor	PCU/MoPIT/LG



Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
Measure to protect water bodies from pollution	Visual observation of open defecation and waste disposal around water sources near construction sites; Parameters like pH, hardness, DO etc.	workers Site inspection, test of site-selected samples of water at laboratory	water sources near construction sites;	Once in six months during construction	Contractor	PCU/MoPIT/ LG
3. Biological Environment						
Spoil disposal in forest and water bodies	Spoil dumped in forest, and sensitive areas	Walkthrough survey observation	Nearby forest and water bodies	During construction period	Contractor	PCU/MoPIT/ DFO/MoFSC/ LG
Compensatory plantation done	Number of trees planted	Visit to re-plantation area	Compensatory plantation sites	Before issuing of construction completion certificate	Contractor	PCU/MoPIT/ DFO/MoFSC/ LG
Use of firewood	Use of firewood by labour, and bitumen heating	Inspection, interaction with local, community forest and labour camp	community forest and labour camp	During construction phase	Contractor	PCU/MoPIT/ DFO/MoFSC/ LG



Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
Disturbing, illegal killing, poaching of wildlife	Cases of disturbances, illegal and hunting and poaching	Interaction with CPUG, locals, inspection of labour camp area	Nearby forest and water bodies	During construction phase	Contractor	PCU/MoPIT/ DFO/MoFSC/ LG
Measures to avoid pressure on forest and wildlife	Use of firewood or fossil fuel by upgrading crew, events of hunting and killing of wildlife/fishes	Inspection and interview with local people	Nearby forest and water bodies	Once in a month during construction phase	Contractor	PCU/MoPIT/ DFO/MoFSC/ LG
C. Impact Monitoring						
1. Socioeconomic and cultural Environment						
Change in economy	Numbers of people employed by the project during construction, numbers of women in work forces	Records kept by the project management, discussion with stakeholders	Settlements inside DIA	Once in a year during operation phase	DCID	PCU/MoPIT/ LG
Trade and Commerce	Numbers of shops increased or decreased rental houses and land spaces.	Records, interviews, observations, photos	Settlements inside DIA	Once in a year during operation phase	DCID	PCU/MoPIT/ LG
Change in	No. and extent of new	Observations,	Settlements inside DIA	Once in a	DCID	PCU/MoPIT/ LG



Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
socioeconomic Structure	settlements/types and ethnic groups; nos and extent of new businesses; nos and extent of new services and utilities, social conflicts.	interview with local people, DCC Police and RM records		year during operation phase		
Ribbon settlement	Congestions to road users no. of accidents, RoW encroachment.	Records, observations.	Settlements inside DIA	Once in a year during operation phase	DCID	PCU/MoPIT/ LG
2. Biological Environment						
Forest and vegetation	Numbers of trees, presence of ground vegetation, signs of illicit logging and extraction of NTFPs	Observations, DFO records, photos; interview with UGs/ CFUGs members	Forests area inside DIA	Twice a year during operation phase.	DCID	PCU/MoPIT/ DFO/MoFSC/ LG
Wildlife	Wildlife hunting trapping and poaching by work force, trade of wildlife, road accidents inflicting wildlife.	Interview with local people/ DFO/CFUGs members, photos, observations.	Forests area inside DIA	Twice a year during operation phase.	DCID	PCU/MoPIT/ DFO/MoFSC/ LG



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Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
3. Physical Environment						
Slope stability and erosion	Inclination, slope failures, causes; drainage facilities such as catch drain, side drains and functionality of cross drainage structures; fresh gullies and erosion; success/failure of bio-engineering solutions	Site observation, photos discussion with people and technicians.	Construction sites	Continuously during operation phase	DCID	PCU/MoPIT/ LG
Bio-engineering of disturbed slopes	Re-vegetation through bio-engineering application on disturbed slope; establishment of nursery.	Site observation; inspection of nursery and its production rate, photos, measurements.	Disturbed slopes	Continuously during operation phase	DCID	PCU/MoPIT/ LG
Water quality	Observation of open defecation and waste disposal around water sources near construction sites.	Visual observation, measurement of water, sample using field kit.	Water sources near construction sites.	Twice a year during operation phase	DCID	PCU/MoPIT/ LG
Air/Noise	Dust in ambient air and	Visual	Settlements inside DIA	Twice a year	DCID	PCU/MoPIT/ LG

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Parameters/ Issues	Verifiable Indicators	Verification Methods	Place	Schedule	Implementing Agency	Responsible Monitoring Agency
quality	Noise level	inspection / measurement		during operation phase		



7.4. Grievance Redress Mechanism

A grievance redress mechanism (GRM) will be implemented to receive, assess, and facilitate the resolution of concerns, complaints, and grievances regarding the project's social and environmental performance from those affected. This mechanism will tackle issues through a process of acknowledgment, evaluation, and corrective action. The GRM aims to offer a dependable avenue for expressing and resolving concerns linked to the project, serving as an effective method for addressing the issues faced by affected individuals.

a. First Level GRM-Site Specific

The contractors and supervision consultants on site serve as the first and most immediate point of contact for quickly resolving grievances. Before any construction work begins, the DCID/Project Management Unit (PMU), Site Project Office (Project Manager) will organize local community meetings to inform residents. If any complaints arise, they can be immediately addressed and resolved on site by the contractors, consultants, and Site Project Office. The Site Project Office's address and phone number will be made available to those in the project-affected area and at construction sites. Anyone with a grievance related to the project can contact the office to file a complaint. The Site Project Office will have a dedicated safeguards focal person responsible for handling and resolving complaints. This person will document the complaint and work to resolve it with the contractor within 1-2 days if it remains unresolved at the field level. The Site Project Office may seek the assistance of the consultant safeguards specialists (the environmental specialist or social safeguards specialist) to resolve the issue. The Site Project Office safeguards focal person will notify the DCID/PMU safeguards focal person that a complaint was received, and whether it was resolved. The safeguards focal person of site project office will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location, and (v) how the complaint was resolved.

b. Second Level- Project level

If the grievance is unresolved from the project office, the Site Project Office will forward the complaint to the DCID/PMU. Grievances will be resolved through continuous interactions with affected persons, and the DCID/PMU will answer queries and resolve grievances regarding various issues including environmental or social impacts. Corrective measures will be undertaken at the field level by the DCID/PMU within 7 days. He/she will fully document the following information:



- (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location and (v) how the complaint was resolved.

c. Third Level GRM- Department Level

If the grievance remains unresolved, the PMU's project director will activate the third level of the GRM by referring the issue (with written documentation) to a Grievance Redress Committee (GRC) constituted by the EA (MoPIT/DoR), which will be based on review of the grievances, address them in consultation with the PMU, Site Project Office and affected persons. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 15 days.

d. Fourth Level GRM- Court of Law

In the event that a grievance is not addressed by the contractor, Project Office, PMU or MoPIT/DoR, the affected person can seek legal redress of the grievance in the appropriate courts, the fourth level of the GRM, which is the formal legal court system. The GRM however does not prevent affected persons from seeking legal redress at any time.

7.5. Permits and Approval

The administration and legal section of the project office shall be dealing with such issues like; obtaining permits and getting approval of plans from the relevant authorities. Hence, no plan is required for such one-off activities. The permits for quarry sites and crusher plant also be required if new crushers and quarry has to be established. The relevant permission and approvals of Quarry site operation, Tree cutting, Crusher establishment, Borrow pits and construction materials management, solid waste disposal sites, relocation of utilities, clearance of land, Location of storage yards, labor camps, and construction sites, identification and selection of materials sources, waste and spoil disposal locations, stockpiling locations, and impairment of cultural and historical area etc will require permits and approval.

7.6. Crucial Environmental Plans

1. Erosion Abatement and Watershed Management Plan

Continuous water sprinkling on exposed dusty cut surfaces during the dry season will help reduce erosion caused by wind. Likewise, installing CGI barricades along the edges of the excavated areas will prevent the topsoil from flowing into nearby water bodies. Covering the cut surfaces with tarpaulin sheets, sowing grass seeds, and placing small meshed nets will also help conserve the topsoil.

Contractors Environment focus person will prepare the plan and submit to TL office for necessary procedure. The ES, under CSC, will be responsible for review and feedback in the provided the



necessary plans to counteract erosion and manage the watershed effectively. The associated costs have been included in the EMP.

Any irregularities in this matter must be reported by EMC supervisors to the team's hydrologist, geologist, and environmental experts. The EMC will then propose corrective actions to the Environmental Division of the proponent. Following field verification, the Environmental Division will approve the proposal and instruct the contractor to undertake the necessary mitigation measures to reduce erosion and improve watershed conditions.

2. Muck / Spoil Site Management Plan

Muck generated particularly from road-cutting sections must be managed with great care to minimize potential adverse impacts. Once dumped at designated sites, the muck should be spread in 500 mm thick layers and compacted according to specifications.

The layering shall be done in presence of Supervision Consultant (SC), acting as the construction supervisor, holds the primary responsibility for this activity. They must report any discrepancies to the project authority. The CSC and contractor in consultation with the project office will correct those issues upon receiving directives from the DCID/DOR.

3. Top Soil Saving and Management Plan

- The topsoil removed during road site preparation shall be carefully stored and used to spread and managed in areas designated for plantation as it is nutrient-rich soil will support better growth of planted trees, shrubs and herbs.
- Topsoil will also be used for nursery development to cultivate saplings or seedlings for future plantation activities.
- The contractor must ensure that topsoil is not dumped in locations where it is unnecessary. The CSC will be primarily responsible, while the proponent will closely monitor the contractor's compliance.
- Contractor shall provide site specific top soil management plan prior to begin road construction works specifically ground clearance and grubbing.

4. Pollution Abatement Plan (Pertaining to: Water Quality; Air Quality; and Solid Waste)

The Pollution Abatement Plan is considered essential for effective environmental management and compliance in any large-scale development project.

Mitigation measures, monitoring methods, responsibilities, frequency of monitoring, and associated costs have already been detailed in earlier sections. The plan, as illustrated in Figure 7.3 below, is self-explanatory.

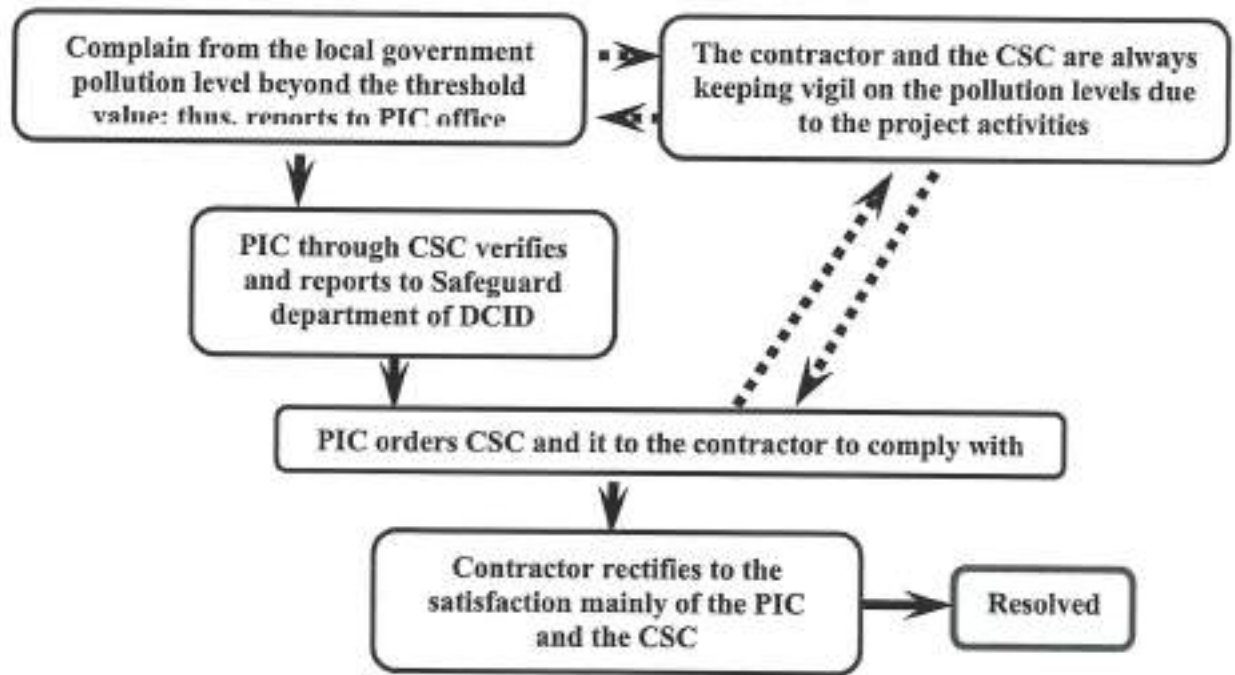


Figure 7- 1: : Flow Diagram of Pollution Abatement Plan

LEGEND:

Reporting/ Instruction:

Coordination:

5. Toxic and Hazardous Chemical Handling and Management Plan

The toxic and hazardous chemical management plan is necessary for a better environmental management plan to be functional. Bitumen, Accelerator chemicals, Petro- chemical, Oil, Grease, Silica etc. are the main chemicals that shall be used in various stages of construction of the project. The above-mentioned chemicals will be stored in separate stores as per their nature. Accelerator Chemical and Silica can be stored in the same store with cement. Rest of the others can be stored separately in another one. Any spillage and leakage of such chemicals shall readily be cleaned/ removed immediately. The used oils shall be stored separately and shall be sold to the scavengers. The Environmental inspector of the CSC are basically responsible to ensure the compliance as mentioned above. The ES will oversee such activities and report of non- compliance to the TL and suggests for its compliance. The TL will instruct the contractor to comply with immediate effect.



6. Demobilization and Rehabilitation Management Plan

The project after completion of the construction activities shall reinstate the temporarily occupied spaces used for worker's camp, construction material preparation/ processing sites, sheds, warehouses, quarry sites, borrow pits etc. Site clearance activity shall be carried out by the contractor to bring back the outlook of the used spaces to original form. Removal of construction wastes and debris, filling, turfing, protection work if required etc. shall be the possible activities to be done by the contractor and the CSC will ensure the compliance as per this plan. The CSC will be overseeing the activities for their appropriateness and compliance to this plan as well. The ES will report to the CSC TL for the non-compliance- if any. The contractor will separately provide demobilization and Rehabilitation plan for either project facilities and approve from the ES of CSC.

7. Occupational Health and Safety (OHS) Management Plan

OHS is an area concerned with protecting the health, safety and welfare of people engaged in work or employment. The goals of Occupational health and safety programs is to foster a safe and healthy work environment. OHS may also protect co-workers, family members, employers, customers, and many others who might be affected by the workplace environment. All organisations have a duty of care to ensure that employees and any other person who may be affected by the companies undertaking remain safe at all times. Moral obligations would involve the protection of employee's lives and health. Legal reasons for OSH practices relate to the preventative, punitive and compensatory effects of laws that protect worker's safety and health. OHS can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs.

The contractor and the project proponent are responsible to ensure adequate provision of OHS. It includes provision of First Aid Kits at each work station and clinic with doctor and nurses at each of the workers' camps. All the employees/ workers must have the PPEs available for them during the work. All the employees and workers must have Insurance and Medical cover provided by the contractor and the project proponent should have a provision of this cost in the Environmental cost.

8. Tree Felling Plan

The project proponent will be responsible for the control felling of trees to ensure that no trees outside the road alignment are felled illegally and will monitor felling process on a regular basis.



After getting official approval from the concerned ministry the proponent should work in close coordination with Divisional Forest Office Kapilvastu and CFUGs as and Collaborative forest to develop tree felling plan schedule and proceed as following:

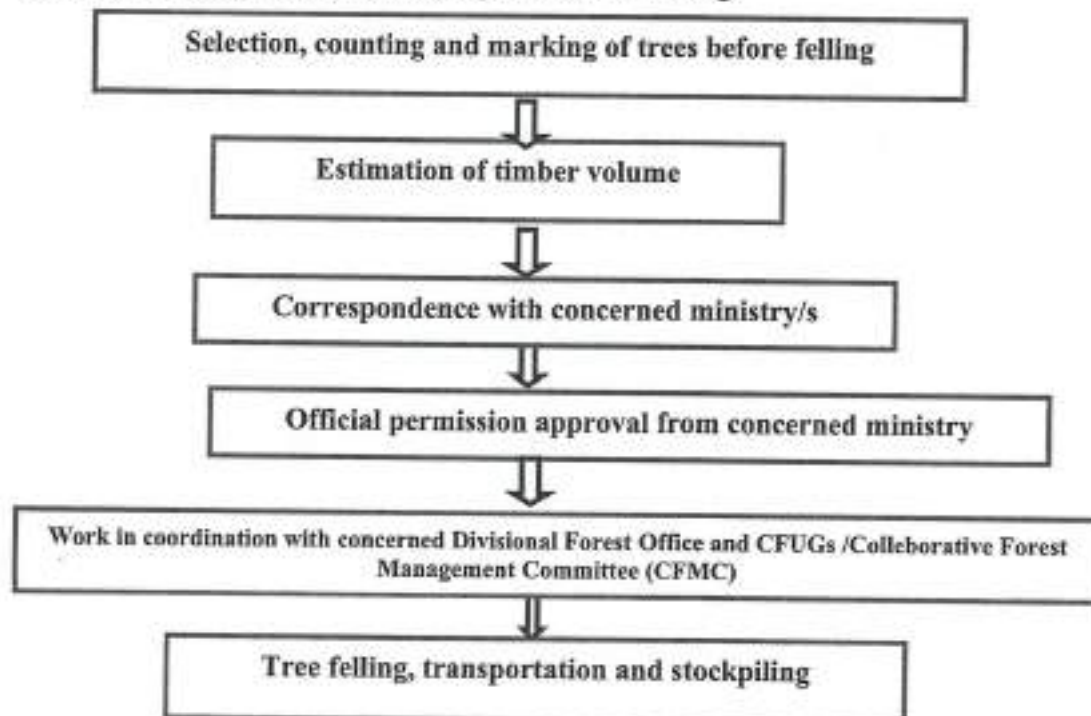


Figure 7- 2: Flow Diagram of Pollution Abatement Plan

The construction camp has to be run by the contractor and supervised by the DSC. The contractor should be responsible for cooking gas, food items, electricity, water supply, waste management, transportation, security, medical, recreational facilities, orientation of the workers, fuel supply, maintenance of vehicles/ quarters/ warehouses, safety of employees/ workers/ stored construction materials and other miscellaneous provisions/ items.

The CSC primarily and the project proponent in an overall manner will supervise the Camp management activities of the contractor. Rules to run the camp management will be made by the project proponent in coordination with the CSC and the contractor. The local security agencies and the political players shall also be involved if need arises.

9. Forest Encroachment Control Plan

Temporary settlement development, by the local community, along the constructed highways is a common practice in Nepal. Such constructed highway does not only provide easy and better access, and business opportunities to the local community but is also responsible for forest destruction due



to encroachment by constructing new sheds and houses. It is most likely that the same problem will also occur all along the road alignment during construction and will flourish well during operation phase of the road. Therefore, the proponent will implement "Forest Encroachment Control Management Strategy 2068" as endorsed by the Ministry of Forest and Soil conservation, Government of Nepal.

Occurrence of forest encroachment problem can be envisaged in different ways for different purposes. Establishment of local market may occur due to better business opportunity and development of settlements due to better access along the road alignment. Whatever may be the cause of encroachment, ultimately forest resources will be adversely affected due to increased demand on timber and fuel wood. Therefore, following actions will be taken by the project proponent to stop/ prevent forest encroachment:

- Coordinate and work with concerned DAO and DFO to control and prevent the types of forest encroachment as mentioned in the strategy,
- Construct local body of representative of LG, DFO, CFUGs, CFMC, Nepal Police etc. to monitor forest encroachment in time.
- Control vehicular movements during the construction phase in coordination with Divisional Transport Management Office, Traffic Police and local bus/ truck committees,
- Coordinate with CFUGs to prevent settlement development along the road alignment,
- Conduct awareness programs in local communities to prevent encroachment,
- Develop alternatives to promote local business and livelihoods opportunities,
- Provide barbed wire fencing along the road near sensitive floral and faunal habitats,
- Ban on market visit for the workforce of road construction,
- Evacuate any illegal settlement developed during or after the road construction in coordination with DAO, DPO and DFO,
- Ban on uncontrolled grazing in forest areas.

10. Traffic Management Plan

It is one of the busiest highways of the nation. Hence there is essence of preparation of traffic management plan before starting construction activity in the road section. The EFP of contractor along with support of CSC-ES will prepare and submit the traffic management plan to RE. It will



include timing of vehicle movement, rerouting of vehicles through different rural roads, location of diversions and so on, so that the nuisance of traffic obstruction will be minimize.

11. Emergency Preparedness and Management Plan

The types of emergencies that the project might face prominently include; landslides during construction, fire hazard in the camps and the nearby forests, floods in the local rivers causing damage to the project and the workers and earth- quake which might happen anywhere- anytime. A contingency plan has to be made for the relief and response if any emergency situation would arise out of the aforementioned causes. The Nepal Red Cross Society (NRCS) and the local security bodies will be coordinated by the plan. Some items like; Tent, Bucket, Mugs, Cooking Utensil sets, adequate amount of cooking gas/ kerosine, sets of cloths, sets of hygiene kits (Soap, tooth brush, tooth paste etc.), sets of First Aid kits etc. shall be prepositioned at the district head quarter with some vendor in coordination with the NRCS. An Ambulance and Fire- fighting Truck laced with the support employees at each of the project site offices shall be ensured by the project proponent. There is no need of prepositioning of the heavy machineries as the contractor will be having those in ample quantities. The following Figure 7-3 shows the flow digram of the Emergency Preparedness and Management Plan:



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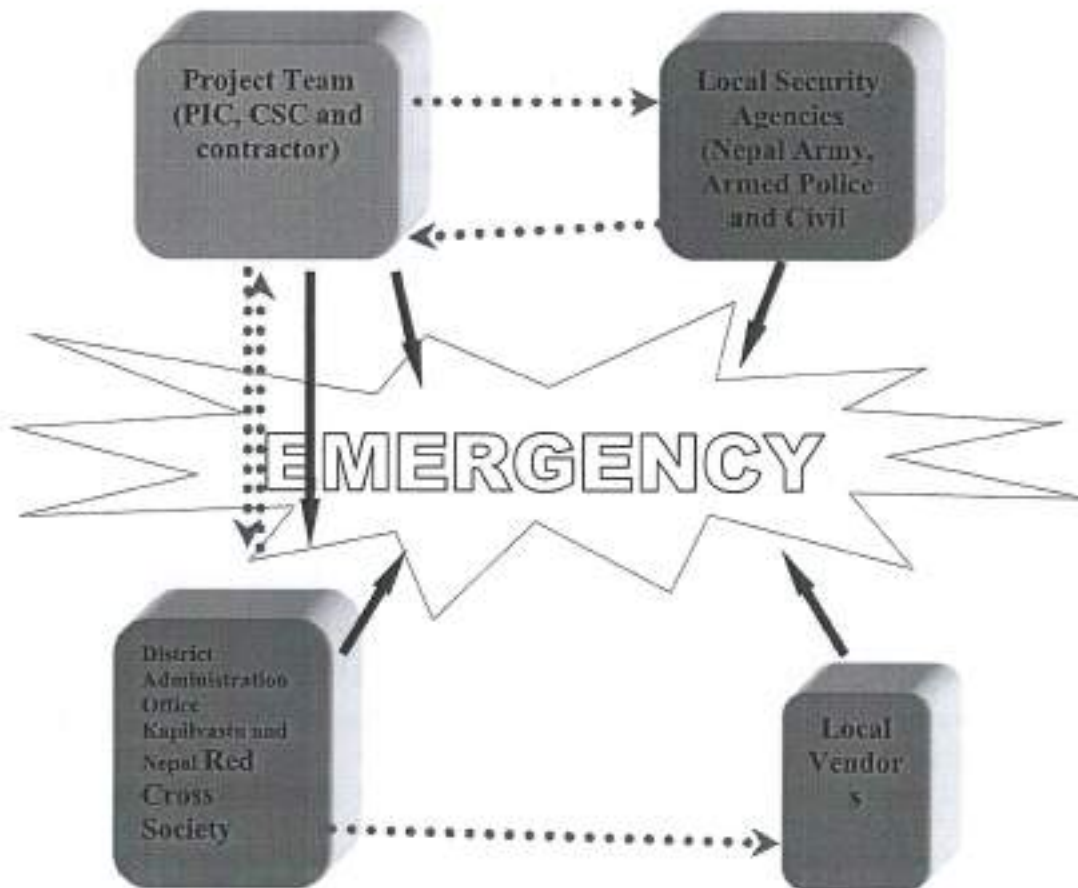


Figure 7- 3: Emergency Preparedness and Management Plan

LEGEND:

Line of Coordination>

Coordinated Action ———>

12. Fire Management Plan

The proposed Fire Management Plan will help prevent, control and mitigate any fire related accidents either due to the construction related activities within construction areas or in the natural plant communities occurring naturally or accidentally. The risk of forest fire is defined as “the chance of the forest fire igniting, spreading and causing damage to assets within the community or reducing the biodiversity of area with inappropriate fire regimes” (Great Lakes Council, NSW, Australia, 2006). The project proponent will implement “Forest Fire Management Strategy 2067” to prevent and control the forest fire as endorsed by the Ministry of Forest and Soil conservation, Government of Nepal.



Risk of fire due to project

Various reasons may cause accidental fire within the project area as well as in surrounding forest areas due to the construction related activities. Therefore, to avoid any kind of accidental fire hazard, special care and attention will be provided for fuel management (storage, refueling and transportation). Following criteria will be considered while constructing fuel storage and refilling sites for construction purposes:

- Construction of storage and refueling facilities away from forest area in barren land,
- Fuel quantity,
- Proper design for storage and refilling facilities to ensure no leakage,
- Size of combined risk areas (away from settlement and forest area), and
- Provision of enough modern fire fighting equipments,
- Education and awareness program

Non formal education program is a very important program for education and awareness raising activities to prevent, control and mitigate fire hazards for local communities and work force. Therefore, wildfire awareness and education should be promoted in the local communities and if possible, awareness should be combined with education helps to reduce the risk of accidental human ignition. Similarly, separate awareness programs should be promoted for workforce and their families in the labor camps. All education and awareness programs should be developed in coordination with DFO, DDC and NGOs of the concerned districts and implement with the help of VDC offices in the highly affected areas. Various reading materials such as posters, leaflets etc. should be developed with the help of DFO and distributed in local communities and schools. Project should also train local community regarding fire combating techniques with simple tools and get involved in controlling any forest fire occurring in project area.

- Fire control in project facilities
- Following methods are suggested which should be implemented in case of fire incidents in project facilities such as offices, residences etc:
- Do not store fuel near or within office premises or residence areas,
- Install fire fighting equipments (Dry Hydrants) and provide training to all project staffs,
- Develop and implement evacuation plan,
- Post placards clearly marking "fire escape route" and emergency staging area" and keep the area clear of all materials, especially hazardous and inflammable ones,



- Install a direct phone line with nearby Fire Department,
- Install siren in required locations (camps, Storage, crusher area and major working areas etc) and post "No Smoking" sign in all fire hazardous areas,

Some other preventive measures to be followed in fire incidents, as follows:

- New road construction should be required to create fire safe access, including fuels reduction along the roadway,
- A pre-plan and a fuel modification project should be implemented for all new roads,
- Thinning or mowing along critical new road corridors should be completed prior to home construction,
- Develop "Shelter in-Place" means to remain inside a home, business, or other permanent building,
- Provide and maintain fuel reduced areas to help prevent the spread of fires and reduce fire intensity,
- Create and/or maintain existing fire advantage lines to provide access for fire fighters,
- Liaison with adjoining communities and DFO for monitoring and management of adjacent zone for forest fire risks and fuel hazards,
- Provide a refuge area for fire fighters, visitors and residents in the event of a fire.

13. Road Side Plantation Plan

All plantation activities along the entire road alignment and disposal sites should be carried out to avoid random disposal and create hazard of failure and erosion in future. Plantation procedure should precisely follow as mentioned by Howell et al., 1991, Vegetation Structures for Stabilizing Highway Slopes – A Manual for Nepal. The required tree species should be selected with the consultation of respective Forest Offices



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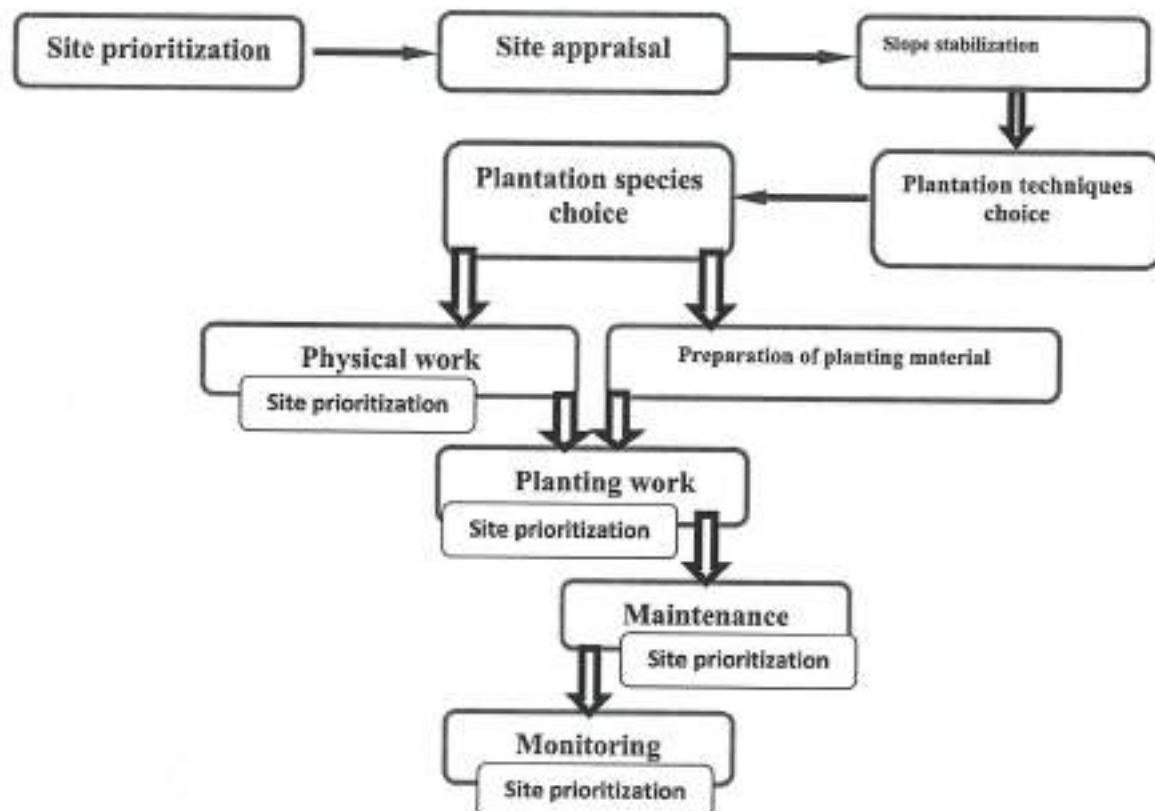


Figure 7- 4: Road Side Plantation Plan

14. Afforestation Plan in Project Area

All afforestation activities in the project area should be discussed, coordinated and implemented with concerning Division Forest Office Chandrauta, and NGOs working in the field of nature conservation, if any. Similarly, any afforestation/plantation work targeted in community forests should be planned in advance in close coordination with them with prior approval and all afforestation/plantation work should focus on biodiversity conservation and habitat protection all along the road alignment. This Road Project should also provide technical support and strengthen BZMC and CFUGs capacity for protection, utilization and sustainable management of forest in future.

The project proponent will also strengthen the capacity of the DFO and NGOs by providing necessary support such as - constructions of check posts along the road, providing simple instruments and equipments related to conservation work.



15. Reporting Requirements

The Environmental monitoring reports prepared by the ES will be made available to the project authority at the field each month. The DCID will be responsible for sending compiled half- yearly report to the MoPIT. The MoPIT can anytime visit the site to validate the report.

16. Organization of Environmental Management

Figure 7.5 outlines a number of government agencies responsible for environmental management and its monitoring in line with EPR, 2020, Rule13 (Amendment). Department of Roads, DCID under the Ministry of Physical Infrastructure and Transport (MoPIT) is the proponent of the proposed SASEC Road Improvement Project.

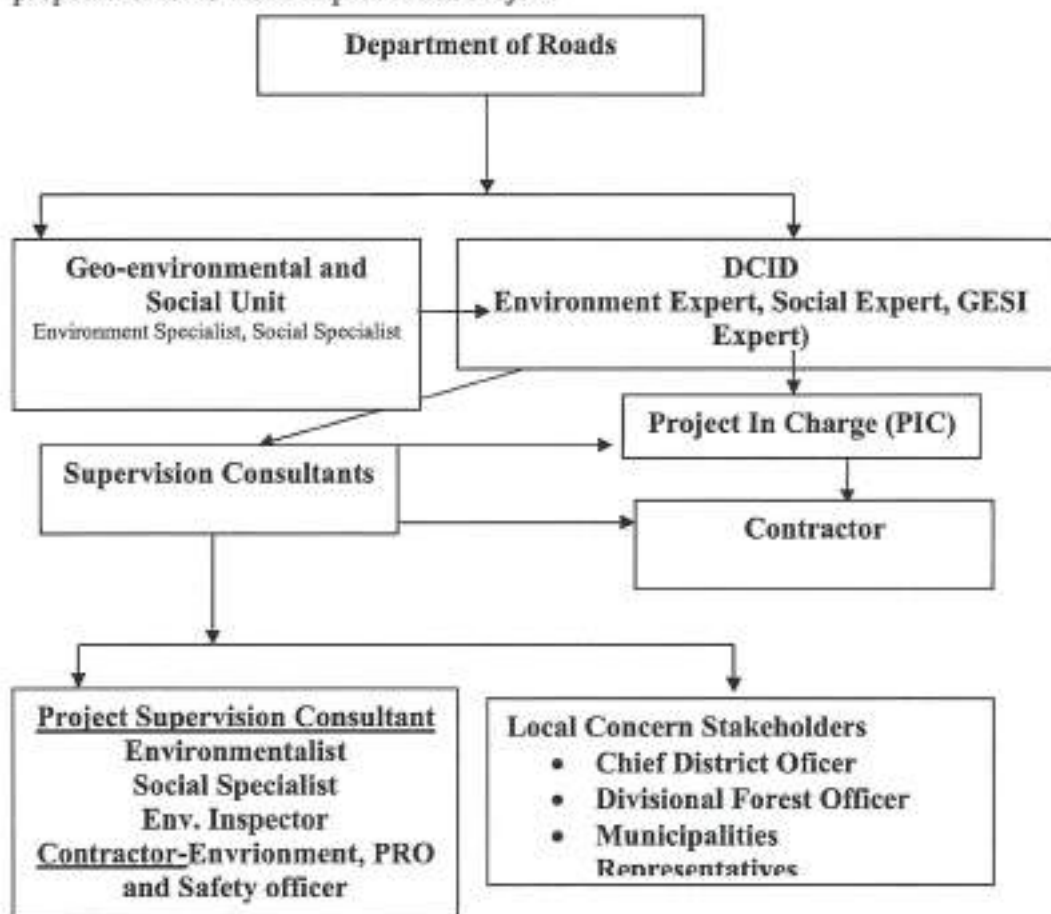


Figure 7-5: Organization Structure for EMP Implementation



7.7. Summary of Environmental Management Cost

Summary of cost estimation for the proposed mitigation measures and enhancement measures on physical, biological and socio-economic and cultural environment of Gorusinghe-Chandrauta road and bridge is given in the *Table - 7.3*

Table 7.3: Summary of Environment mitigation and enhancement costs

S.N.	Particular	Cost
A.	Environmental Enhancement Cost (Capacity building Training)	1,500,000
B.	Environmental Mitigation and Monitoring Cost (civil works that included in the project cost)	26,346,920
C	Budget for the environmental mitigation, compensation and monitoring to be included as BOQ items in the contract	
i.	Mitigations and compensation	113,987,272
ii.	Monitoring cost for compliance	2,400,000
D	Monitoring of wildlife activities using camera traps road kill survey	3600000
E	Monitoring through Ministries Departments and Local bodies	500,000
	Total	148,334,192



7.8 Social Cost and Budget

This section provides cost estimate for the implementation of resettlement plan activities based on discussion with local people, land transaction rate of concerned Land Revenue Office and evaluation rate of Department of Urban Development and Building Construction for house and structure. The final compensation rate will be determined by Compensation Determination Committee (CDC) in accordance to the provision made in Land Acquisition Act 1977.

During the inventory survey at the basis of RoW, shows that 50 various types of structures including residential house/hut, kitchen, and toilet need to be demolished due to upgrading road construction. The cost estimation is based on the house evaluation cost rate of Department of Urban Development and Building Construction of government of Nepal. The estimated cost for the houses/structures is presented below.

Estimated Compensation of Private Structure

Municipality	No. of HHs	No. of Structure	Affected Area (Square Feet)	Estimated Amount
Buddhabhumi	7	8	1771.09	1637027.00
Shivraj	43	45	6180.74	6161880.15
Total	50	53	7951.84	7,798,907.15



CHAPTER-8: CONCLUSION

The project road is part of Accelerating Transport and Trade Connectivity in Eastern South Asia (ACCESS)-Nepal located in the Western Part of Nepal in Kapilvastu District. The proposed Goringhe- Chandrauta road is an existing 2 lanes and will upgrade into 4 lanes road including all bridges from Belwagurdawa Bridge to Umari/Shivpur Chowk.

The proposed project will support capacity, quality, and safety improvements of the East-West Highway (EWH) in the proposed section. As per the DoR's EWH upgradation activity it will be further linked with Butwal-Goringhe Highway section of Asian Highway Standard. Most importantly, the upgrading of the road will reduce transportation cost and travel time and, running costs of vehicles such as fuel economy, reduction in wear and tear of vehicle parts due to better riding quality. Furthermore, Goringhe- Chandrauta road section is will support to provide better connectivity to the people of Lumbini Province and rest of the country.

Approximately 9808 trees within the right of way will be cleared for construction. The loss of trees from RoW will be compensated as per rules of Government of Nepal. The road widening will damage forest fencing, and about 12.7 km of fencing will need to be reinstated. Significant impacts during the construction phase will include the loss of 53 private structures, and 47 community structures to be affected by the project. There will also be temporary disruptions to 1202 public utilities, such as public tube wells, electric poles, telephone poles, transformers, irrigation canals, and water supply pipes, due to the project. All affected private and community structures will be compensated according to the Resettlement Action Plan (RAP) and existing laws.

The proposed upgrading of Goringhe- Chandrauta road is expected to have minimal adverse environmental impacts. Only few impacts have been identified as highly significant due to the project, and most of these are localized and temporary. After implementing mitigation measures, the residual impact will be minimal. The land use pattern of the right-of-way (agricultural and forest land) will change to asphalt road. The operation of the hot mix plant, batching plant, crusher plant, and related construction activities will significantly increase air, noise, and water pollution



during the construction phase. The widening of the road will lead to erosion of the new embankments. Additionally, constructing bridges and culverts will disrupt the river waterways and deteriorate the surface water quality of the rivers.

Most of the impacts on wildlife is identified and predicted are minimal, temporary, reversible, and short-term, mainly occurring during the construction phase. It would be beneficial to raise awareness among the local community about wildlife coexistence and encourage the regulation of illegal wildlife hunting. This effort will help reduce poaching-triggered wildlife movement around the highway periphery. All private structures will be compensated according to the Resettlement Plan (RP) and existing laws. Public structures and utilities will be relocated and reinstated in consultation with relevant stakeholders. Both workers and local residents may face health risks and accidents related to construction activities.

The environmental management plan (EMP) has been prepared to ensure proper implementation of measures to maximize the beneficial impacts and minimize adverse environmental impacts and to make the proposed project environmentally friendly and sustainable. The cost of mitigation measures, organizational requirement and human resources has been finalized following discussion with responsible agencies and local stakeholders to implement the mitigation measures. The detail mitigation measures are to be fully complied as mentioned in the EMP and EMoP. It has estimated that for the environmental purpose there will be **NRs 67,00,000** budget to ensure monitoring works for the proposed project and all the mitigation cost has been included under the project cost by the project.

Considering the overall environmental impact, the IEE for the project confirms that, with the implementation of all mitigation measures outlined in the EMP, there will be no significant residual environmental impacts. Therefore, this IEE is deemed sufficient for the project, and no further environmental assessment or EIA is required.



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Comment Incorporation Matrix; IEE- BGC Road (GC Section)

SN	Comments	Incorporation of Comments	Remarks
A	Comments from Surendra Prasad Adhikari		
1	The date of road construction and ROW (Right of Way) establishment, and the details of the Gazette, need to be mentioned.	The road construction and ROW was declared on 04/07/1977. Section 2.5. Page 5	Gazette is included in Annex XVIII
2	In 3.12.2, Dalbergia and Senegalia forests are mentioned, but in Table 3.33, the Dalbergia species is not mentioned. This needs to be clarified.	Dalbergia Sisoo included in Table 3.34, Page 66	
3	Are Sal / Sissoo protected? (Table 3.33)	Revised as non-protected, Table 3.34, Page 66	
4	Weren't tigers found in Kapilvastu?	Yes, Tigers are recorded in the Kapilvastu district in Churiya range about 10km far from project site. Mentioned in Section 3.12.2, Bullet 6, Page 75	
5	Rule 87(3) of the Forest Regulation, 2079 BS (Nepali Calendar), needs to be reviewed.	Section 3.1.2, Page 111	
6	The names of Acts and Regulations should be written exactly as they appear on the Law Commission's website.	Section 3.12, Page 101-118	
7	In the monitoring part, is there no role for the DFO (District Forest Officer)/DoFSC (Department of Forests and Soil Conservation)?	Included in EMP plan (Table 6-2), Page 174-211 and Monitoring plan (Table 7-2) & Page 218-226	
8	Data analysis as per section 3.11.2 of the Methodology was not found/observed. The data analysis should be conducted as mentioned in Table 17 of the TOR (Terms of Reference).	Data analysis was conducted as mentioned in	Included in Section



SN	Comments	Incorporation of Comments	Remarks
		Table 17 of Terms of Reference (ToR)	3.11.1, A page 29-31
9	In various places where 'Range Post' is mentioned, it should be stated/corrected as 'Sub-Divisional Forest Office'.	Range post revised to Sub-Divisional Forest Office in the report	
10	The inventory of trees and plants to be felled should be mentioned separately for community forest and Saajhedaari forests	The trees to be cut down ((9808 No.) is under Division Forest Office Gautam Buddha (Kapilvastu), Chandrauta	Included in Section 6.2.3 (1), page 165-168. Detailed inventory of trees is included in Annex XVIII
B	Comments from Tejendra Regmi		
1	A separate brief report with executive summary in Nepali language should be prepared as per EPR, 2077 Rule (7), Sub-rule (9)	Prepared	A Synopsis report in Nepali Language is included in Annex-XVI
2	Section 2.8: Project affected public infrastructures should include the proposed Sewerage Project in Imiliya. Goringhe (if), Underground caballing of NEA, water supply project	The details of water supply pipelines in this project to be affected/relocated are included in Annex V. No other Public Infrastructure of sewerage project, underground caballing of NEA is affected.	
3	Section 3.4, this section must include existing land use by the road (Carriageway, drain etc.) and required/change land due to the upgrading of proposed project	Section 3.3, page 21-24,	Included



SN	Comments	Incorporation of Comments	Remarks
	Also include ancillary facilities like land area required for crusher plant, spoil/muck disposal		
4	The report has included the estimation of carbon emission from fossil fuel use (Diesel, petrol and kerosene) is good as per IPCC guidelines and should connect it with impact and mitigation section too	Section 4.2.2, Bullet 15, Page 133 Section 6.2.2, Bullet 15, Page 163-164	Impacts due to carbon emission and mitigation measures proposed
5	Section 3.7: Manpower required should be separate as required during pre-construction, Construction and Operation phase with the categorize of skill, semi-skill & Unskilled	Section 3.7, Page 24-25	
6	Section 3.8 must include other branch road name connected with the proposed road in replace of no. of bus stop	Included in Section 3.8, Page 25	
7	Section:3.9: Impact delineation must be based on project footprint such as settlement proximity, traffic growth impacts, Development Induction (growth in other infrastructures)	Section:3.9, Page 25-26	Included
8	Section: 3.11: Methods adopted should be more scientific and must be guided by national and international standards. Also, the environment data regarding Air, Noise, Water, Aquatic life etc. required series of data so that it would be analyze, comparable and can be analyzed	Section: 3.11.1 (C), Page 33-35	Standard Methods adopted
9	Regarding Public Notice: the notice mentioned in EPR Rule 7 sub rule 2 & 3. Sub-rule 2- notice must be affix in concerned office & Sub-rule 3 must be published in newspaper -include both notice in annex accordingly	A 7 days public notice & Public Hearing notice was published in Arthik Abhiyan National Daily on 2081/10/28 & 2081/09/11 respectively. The notices are included in Annex-XII & IX	
10	Better to include recommendation letter from concerned stakeholder associated with project too. E.g. community forest, nearby health and education institute, DCS, wards etc.	Recommendation letter from concerned stakeholders associated with the project	



SN	Comments	Incorporation of Comments	Remarks
		have been collected as per EPR, 2077 and included in Annex-XIII	
11	Revised Maps with properly overlay of alignment	Location map with road alignment included in Figure 3.2, Page 9	
12	Include appropriate source in the primary & Secondary data, tables, maps with publication year & include those in reference section too.	Appropriate source in the primary & Secondary data, tables, maps Included	Section 3.12 (Existing Environmental Conditions)
13	Beside public hearing issues and addressal status, better to include the addressed matrix related to issues collected from public consultation, issues raised by recommendation letter of concerned stakeholders too.	The issues raised by the concerned authorities have been addressed in Chapter 4 and 6 in detail	
14	Section 3.12: Better to include updated data with exact source & year of publication e.g. Include projected and reference updated rainfall trend data from DHM or other relevant studies	Table 3.22, Page 54	Updated data included
15	Section 3.12 Biological Environment better to highlight of there are any important corridor and habitats of other endangered or flagship species and connect with project impacts	Section 3.12.2, Bullet 8, Page 77-78	
16	Chapter 5: The alternatives that are rejected should be explained clearly, include summary table comparing each alternative on key criteria (cost, feasibility and environmental impact & so on)	Chapter 5, Table 5.1, Page 145-147	The alternatives that have high significant environmental and social impacts are rejected which is clearly explained. Summary table comparing each



SN	Comments	Incorporation of Comments	Remarks
			alternative on key criteria included
17	Chapter 6: Environmental Mitigation measures should be directed with specific action plan. For e.g. the report reflect the mitigation measure for workers health and safety but doesn't include a specific action plan ensuring training for contractors' workers on code of conduct	Table 6-2, Page 174-175	
18	Chapter 7: Environmental Monitoring Plan should be synchronized with baseline parameter data collected during IEE study as well as impact associated within it	Chapter 7.3, Page 217-226	Environmental Monitoring Plan included
19	Overall Report: Avoid typographical errors, incorrect phrases, auto-translation and ensure clarity by removing redundancies	Avoided, Corrected and Clarified	
20	Annex: Notice published in Newspaper should be with title/Header of the newspaper	Included in Annex-IX & XII	
21	Name of the project should be same as per the project legal document	Made consistent throughout the report	
22	Coordination mechanism between Impacted Public Infrastructure Agency such as water supply, NEA, Sewerage and so on and better to put consent letter from those stakeholders too.	The project has coordinated with concerned line agencies such as NEA, Drinking Water Supply and Sewerage	
23	Name of the project is different in different section of report and legal document too- TOR approval letter, Recommendation letter	Name of the project has been made consistent throughout the report and legal document too-TOR approval letter, Recommendation letter (Gorisinghe-Chandrauta Road Section, 19.2 km)	

SN	Comments	Incorporation of Comments	Remarks
24	Annex VI: What is the relevancy of blank checklist since it is already included in TOR report	Filled Checklist during socio-economic survey is included	Annex-VI
25	Salient feature table should be with components as mentioned in approved TOR and final specification in IEE document	During the TOR finalization, the design was in draft stage and now the design has been finalized and some features have been updated in the IEE report (Salient features, Table 3.1)	
26	The information that are mentioned in Annex VII (FGD, KIT) checklist data must be presented in main report part of IEE	The information that are mentioned in Annex VII (FGD, KIT) checklist data are presented in IEE report	
27	What could be the value add for the project by IEE study e.g. Wildlife friendly infrastructure development	The provision of Wildlife friendly infrastructure development by constructing underpass and canopy bridge will enable safe animal passage. Section 6.2.3, Bullet 2, Page 168-169	
28	Issue raised and stated in Nepali language in minutes should not be misinterpreted and must be same in English language too	Issues raised and stated in Nepali during Public consultation is interpreted same in English language too. Table 3.16, Page 41-43	
29	Different length: 19km or 19.838 or? Recheck those	The road length is 19.2 km starting at Belwagurdawa Nadi (CH 640+000) ending at Umari/Shivapur Chowk (CH 659+200)	



SN	Comments	Incorporation of Comments	Remarks
30	Annex XVI & XVII should be in standard format in soft copy form (as per forest regulation 2079)	Included in Annex XVIII	
31	Table 6-3: EMP table should be as per EPR 2077 template	Table 6-2, Page 174-211	EMP table is as per EPR 2077 template
32	EMP cost should disintegrate as per issues Separate table cost for CSR, CSP, Mitigation measures, Monitoring cost	Table 6-3, page 212	EMP cost is disintegrated as per issues





Annexure for IEE study of Gorusinghe-Chandrauta Road section

LIST OF ANNEXES

ANNEX I: TOR APPROVAL LETTER AND APPROVED TOR FOR IEE STUDY

ANNEX II: LAB REPORT OF AIR, WATER & NOISE

ANNEX III: SELF-DECLARATION OF EXPERTS WITH CVs

ANNEX IV: DETAIL LIST OF AFFECTED PRIVATE STRUCTURES

ANNEX V: DETAIL LIST OF PUBLIC STRUCTURES

ANNEX VI: CHECKLISTS AND QUESTIONNAIRES USED FOR SURVEY

ANNEX VII: CHECKLISTS FOR KEY INFORMANT INTERVIEWS

ANNEX VIII: MINUTES OF CONSULTATION MEETINGS

ANNEX IX: PUBLIC DEEDS AND NOTICE FOR PUBLIC HEARING

ANNEX X: MINUTES OF THE PUBLIC HEARING

ANNEX XI: SUMMARY REPORT OF PUBLIC HEARING

ANNEX XII: PUBLIC DEEDS AND NOTICE FOR IEE

ANNEX XIII: SUGGESTIONS AND RECOMMENDATIONS FROM STAKEHOLDERS

ANNEX XIV: TOPOGRAPHICAL MAP SHOWING THE ROAD ALIGNMENT

ANNEX XV: PHOTOGRAPHS RELATED WITH THE STUDY

ANNEX XVI: SYNOPSIS REPORT IN NEPALI LANGUAGE

ANNEX XVII: GAZETTE

ANNEX XVIII: TREE INVENTORY OF RIGHT OF WAY