



CHAPTER -THREE

3. DETAIL DESCRIPTION OF THE PROJECT

Gorusinghe- Chandrauta road is of great importance which will support capacity, quality and safety improvements of the EWH. The project is of service delivery type for upgrading existing 2 lanes national highway into 4 lanes including construction of bridges and culverts. The road width is designed as 50m in urban area, and 24m in rural and forest area. Widening and improvement components will include pavement upgrading, geometry improvement, junction improvements, in urban areas service roads including cycle lanes, footpaths, pedestrian crossing (overhead bridges/underpass) on both sides of the road, wildlife crossings designs, construction of new bridges, drainage improvement, retaining structures; slope protection and stabilization, other off-road works, and bus bays and installation of adequate road safety measures etc.

Gorusinghe - Chandrauta road is of great importance to upgrade in to 4 lanes which will support capacity, quality and safety improvements of he EWH.

3.1 Project Location and Accessibility

The project is extended from Gorusinghe to Umeri/Shivapur Chowk about 5.05 km west from Chandrauta (Junction of Krishnagar road). It connects western Nepal with the capital Kathmandu through the highway and air links (via the Gautam Buddha International Airport). The proposed section is located in Kapilvastu district of Lumbini Province. The project starts at east of the Belwagurdawa Bridge at (Chainage 640+000) i.e continuation of Butwal -Gorusinghe section and terminates at the near Shivpur crossing at Chandrauta (Chainage 659+200). The project area lies between 27°39'27.50" N, 82°59'47.15" E. The road passes through the Kapilvastu district under municipality of Buddhabhumi and Shivraj via settlements of Imiliya, Dumara, Champapur, Kharendrapur, Bankatti, Chandrauta, Shivpur etc. The location map of proposed road alignment is shown in the Figure 3-1 and 3-2.



Initial Environmental Assessment (IEE) for Upgrading Goringhe-Chandrauta (19.2 Km) Road and Associated Bridges



Figure 3-1: Google Earth map of project area (Source: Google earth, 2024)

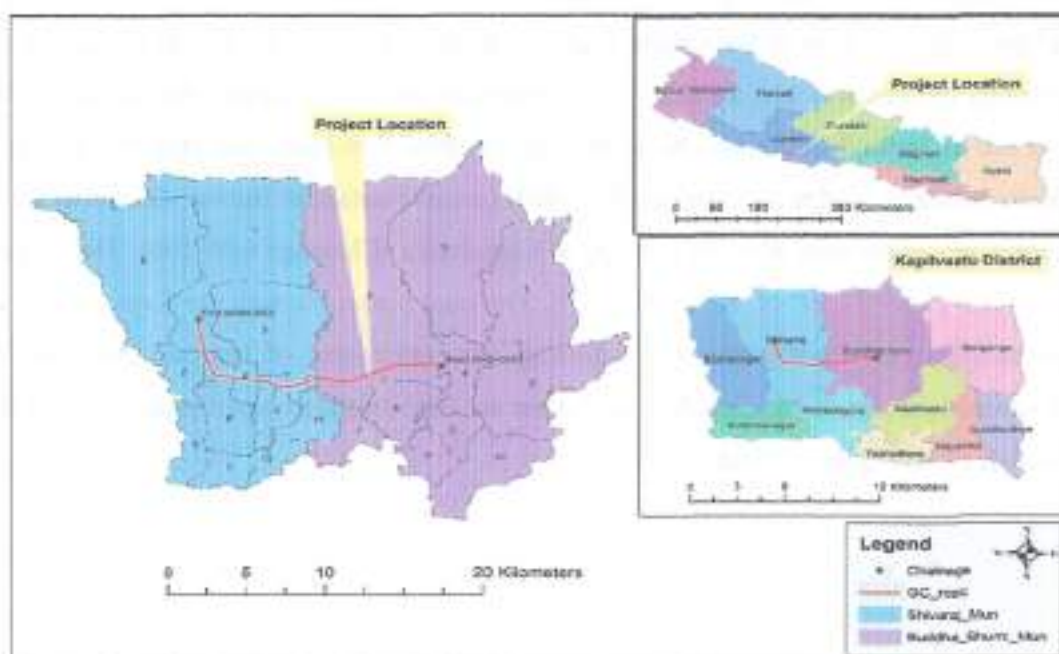


Figure 3-2: Location map of project area (Source: Department of Survey, 2076)



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

3.2 Key Features of the Project and Design Considerations

The detail salient features of the proposed upgrading section of the road project are listed in *Table 3.1*

3.1

Table 3-1: Salient Features of the project

Description	Features	
Name of the project	Upgrading of Gorusinghe-road (19.2 km) section of EWH to four lane standards	
Province	Lumbini	
District	Kapilvastu	
Affected municipality	Buddhabhumi Municipality and Shivraj Municipality	
Geographical Location		
Geographical features	Terai	
Geology	Plain/ Rolling	
Climate	Tropical /Sub-tropical	
Altitude	100 m-150 m msl	
Total length	19.2 km	
Start and End of the road	Chainage and GPS	Political boundary
Starting point	Belwagurdawn Nadi (CH 640+000) GPS: 27°39'27.50" N, 82°59'47.15" E	Buddhabhumi Municipality, ward no. 9
End point	Umari/Shivpur Chowk (CH 659+200) GPS: 27°41'24.59" N, 82°50'22.45" E	Shivraj Municipality ward no.1
Road standard	National highway	
Right of Way	25 m each side from central line (50 m RoW)	
Construction width	Upto 50 m in urban settlement, 24 m in forest and rural areas	
Existing Carriage way width, shoulder	Two-lane facility (7 m carriage way) without paved shoulders and earthen shoulders	
Design speed	100 Kmph in plain terrain and 80 Kmph in rolling terrain	
Design period for operation	20 years	
Surface type	Bituminous	
Type of work	Upgrading of the Road	
Cross section		
Carriageway width of	Rural and forest area - 24.0 m	
Structure	Urban area- 50 m including entire utilities area at the edge	
Width of Footpath cum drain	2.0 m (Both Side)	
Cross Drainages (Culverts and bridges)		
Total bridges	2 Major bridges and 6 Minor bridges, 1 VUP, 2 PUPs & 1 FOB	
Culverts	64 box culverts and 7 pipe culverts	
Total width of cross drain	24 m for culverts	
Structure	20 m for bridges	
Earth Works (Cutting and Filling)		
Cutting quantity (m ³)	1,06,242	



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

Description	Features
Filling quantity (m ³)	1,45,652
Structures (Masonry, RCC and RE walls)	
RCC Retaining wall (m ³)	1,569.0
RE Retaining wall (m ³)	10,567
Project Cost and Duration	
Estimated Grand total	NRs. 5,68,45,10,641.00 (with VAT)
Project Cost	
Cost Per Km	NRs. 296,068,262.55
Project Duration	3 yrs construction and 5 years PBMS and 3 months post PBMS

Source: Design Report of GC Road Section, 2025

3.2.1. Key Features of the Proposed Road

Altogether, following three types of cross-sections are proposed to upgrade the existing road (Figure 2, 3 and 4).

- Cross-section for rural areas
- Cross-section for urban areas
- Cross-section for rural area without drain and footpath specially at forest
- All three types of cross sections are shown in the figure 3-3, 3-4 and 3-5

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

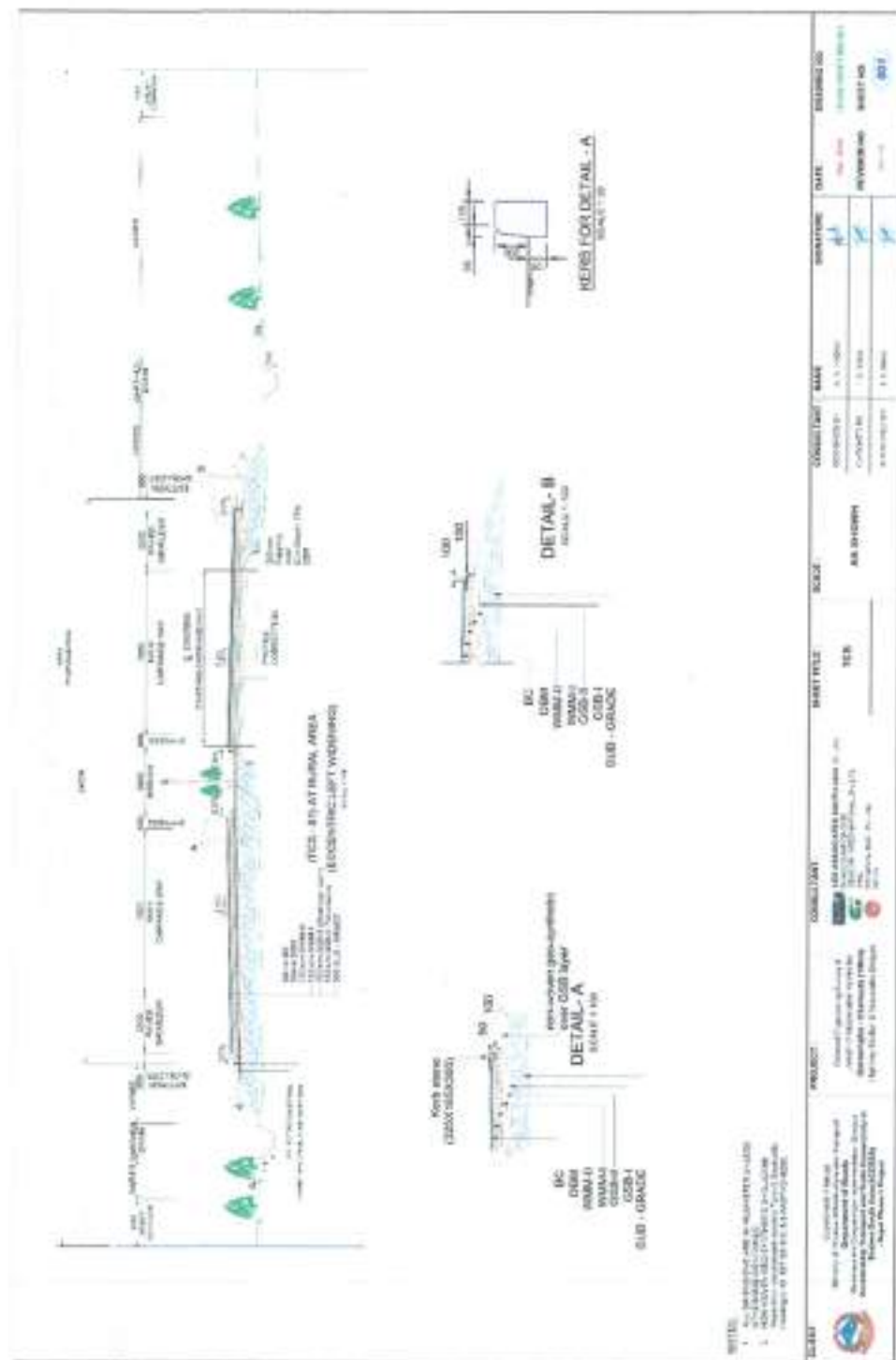


Figure 3-3: TSC of Rural & Forest Area

Source: Design Report of GC Road Section, 2025

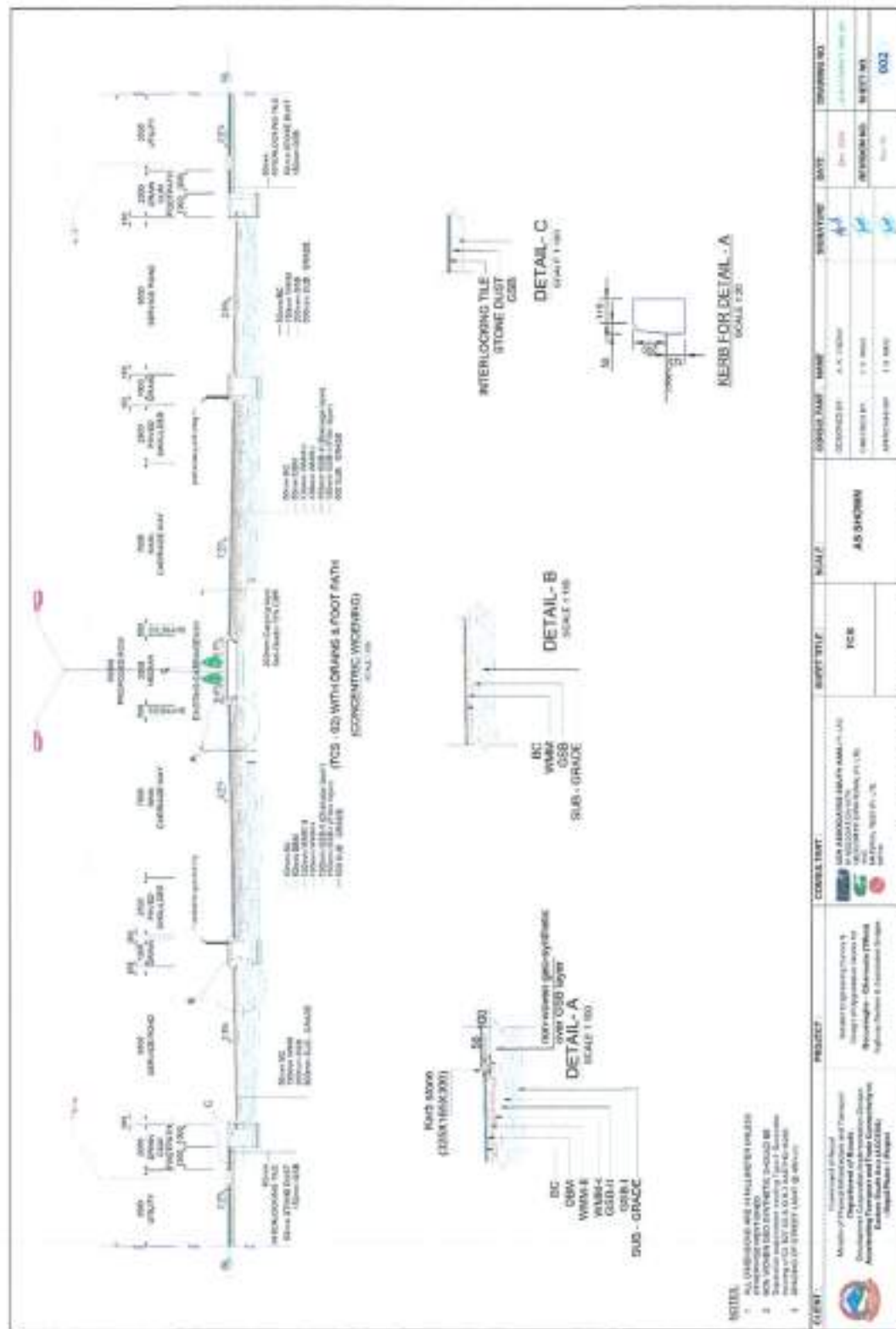


Figure 3-4: TSC with drain and foot path in urban areaSource
Design Report of GC Road Section, 2025



3.3.2 Geometric Design

Regarding geometric design criteria, the Nepal Road Standards 2070 (2013) and other relevant standards was considered while upgrading the road. Based on the standard to be followed, the following basic standards has proposed for the project road:

Table 3.2: Geometric design for project road

Sl. No.	Design Specification	Unit	Proposed Design Standards	
1	Terrain Classification		Plain and Rolling	Mountainous and Steep
	Cross Slope of the Ground	%	Up to 25 Percent	More than 25 Percent
2	Design Speed	km/hr	Plain and Rolling Terrain	Mountainous and Steep Terrain
	Desirable		100	60
	Minimum		80	40
4	Carriageway Width	m	7m	
5	Median Width	m	Plain and Rolling for 4 lane	
	Open Country with isolated Built Up Area		2.5m	
	Built up Area		1.63 Jersey crash barrier	
	Approaches to Grade Separated Structures		2.5m	
6	Paved Shoulder width	m	Plain/Rolling	
			2.5	
7	Camber	%		
	Carriageway (Flexible/Rigid)		2.5/2.0	
	Paved Shoulders (Flexible/Rigid)		2.5/2.0	
	Earthen Shoulders		3	
8	Gradients	%	Ruling	Limiting
	a) Plain and Rolling		2.5	3.3
	b) Mountainous/Steep		5.0/6.0	6.0/7.0
9	Super elevation	%	5.0 when the Curve radius is more than desirable minimum	
	Maximum in normal situation		7.0 when the curve radius is less than desirable	
10	Minimum Horizontal Curve Radius (Plain and Rolling) for 100kmph	m		
	Desirable		400	
	Absolute		360	
11	Minimum Horizontal Curve Radius (Mountainous and Steep)	m		
	Desirable			
	Absolute		80	
12	Sight Distance	m		
	Stopping Sight Distance		100 km /hr	80km / hr
	Intermediate Sight Distance			
	Overtaking Sight Distance		180	130
			360	260
13	Minimum Vertical Curve Length (SSD case)	m		
	Crest		73.6	
	Sag		41.5	



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

Sl. No.	Design Specification	Unit	Proposed Design Standards
14	Minimum Vertical Curve Length (ISO case)	m	
	Crest		135
	Sag		41.5
15	Side Slope		2H:1V
16	Design Service Volume	PCUs/	10000-60000
	For 4 Lane Road in Plain Terrain maintaining LOS B	day	
17	Widening at curve locations	m	
	Up to 40 m		1.5
	41-60 m		1.2
	61-100 m		0.9
	101-300 m		0.6

Source: Design Report of GC Road Section, 2025

There will be median of 3 m at the center which will be followed by 0.5 m Kerb shy each side. There will be 7 m dedicated formation either side for movement of vehicles in either side representing two lane each. In the similar manner there will be 2.5 m of paved shoulder either- sides and 0.5 m.

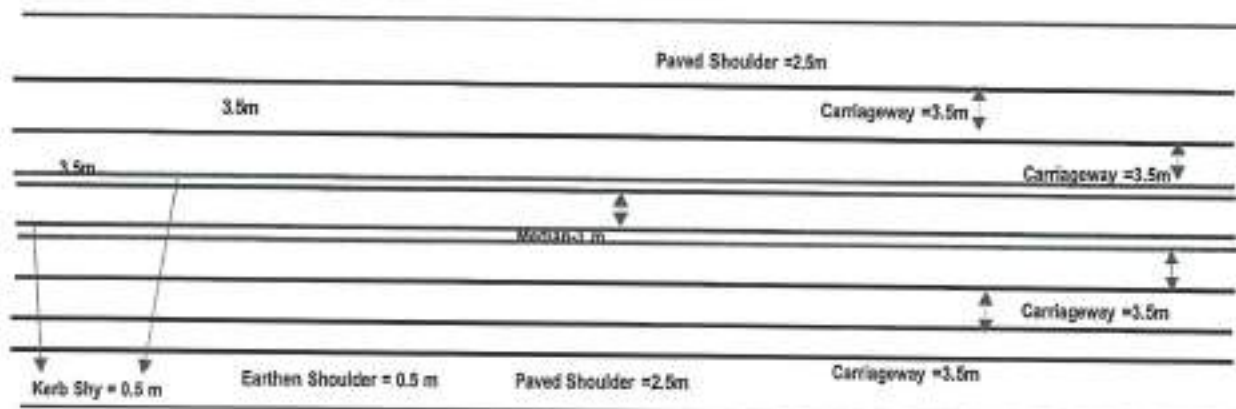


Figure 3-6: a) Cross-section of the Road without footpath



Footpath
Standard service lane
Drainage of the road catchment
Dedicated 2 lane towards east 7m
Kerb Shy = 0.5 m + Median of 3 m center of the Highway + Kerb Shy = 0.5 m
Dedicated 2 lane towards west 7m
Drainage of the road catchment
Standard service lane
Footpath

Figure 3-6: b) Cross section of the Urban Area

3.3.3 Pavement Design

Pavement has been designed to with stand the traffic volume and axle load for 20 years period. Adequate drainage will be provided below the pavement layers and sub-grade level. Pavement layers in general will consist of granular sub-base, crushed stone base and asphalt concrete. Capping layer of suitable material will also be provided in those areas, where deemed necessary. Pavement will be designed as per Pavement Design Guidelines (Flexible Pavement)-2014 (Second Edition 2021), published by Department of Roads, Overseas Road Note 31 published by Transport Research Laboratory of UK and IRC-37-2018 as well as suggestions of DoR. The bituminous surface pavement (Asphalt) will be designed to meet the expected traffic level and sub-grade strength. The design of the intersections for access to approach for other connecting roads will to be provided to ensure the safety of vehicles diverging from or merging into high-speed road. Intersection will be considered for major feeder roads, minor feeder roads, district roads. Road furniture will be provided in the form of road signs, crash barriers, road markings, delineators, foot paths, covered side drains. The pavement design for the project road will be carried out adopting various parameters. The parameters that can adopted considering provisions/stipulations made in NRS 2070 and IRC-37-2018 as well as suggestions of DoR. The following parameters has been proposed for the pavement design.

This project being WB funded project, it will be sensible for the safeguard issues. Hence the project will perform environmental assessment for the WB as well based on the SPF of the bank. Similarly, ESMF as well as Baseline Report of this project for WB will also be considered so that the IEE will



also align with the WB report so that both the reports have consistency. Furthermore, other prepared documents like RAP as well as Poverty and Social Analysis report will be accessed for IEE especially in social aspect.

Table 3. 3: Pavement design for the project

Proposed Pavement Type	Flexible Pavement
Design Period	20 years
Design Subgrade	Based on outcome of field survey
Axle Load Distribution	50%/50%
Vehicle for axle load consideration	All commercial vehicles
Design Codes	NRS 2070 IRC 37-2018 (verification by IIT Pave Software)

Source: Design Report of GC Road Section, 2025

3.3.4 Bridges

The project includes two major bridges and six minor bridges where additional double lane bridges will be constructed. All the minor bridges will be dismantled and entire four lane minor bridges will be constructed. Furthermore US/DS of the existing bridge. All the design of bridges is based on the guideline provided by Nepal Bridge Standards - 2067 of DoR. All bridges have been designed for a discharge of 100 years. return period of the river Similarly, all bridges have been designed as per IRC loadings or AASHTO loadings. Details of the bridges and constriction status/modality is presented in the following Table 3.4.

Table 3. 4: Details of the bridges and constriction status

S. N	Chainage	Type	Span Arrangement	Length	Type of construction
1	640+262	MJBR	3*21.00 m	63	Additional two lane will be constructed
2	641+637	MNBR	1*7 m	7	
3	642+199	MNBR	1*10 m	10	"
4	648+157	MNBR	1*12.6 m	12.6	Additional two lane will be constructed
5	648+561	MJBR	3*21.00 m	63	Additional two lane will be constructed
6	649+257	MNBR	2*7.7m	15.4	Additional two lane will be constructed
7	650+768	MNBR	1*7 m	7	Dismantled and complete 4 lane
8	651+614	MNBR	1*7.5 m	7.5	"

Source: Design Report of GC Road Section, 2025



3.3.5 Culverts

All existing culverts will be tested for capacity adequacy and accordingly inferior culverts will be modified. New culverts have been designed for 50 years return period of flood. All together there are 6 slab culverts and 7 pipe culverts in existing road which are proposed to be 69 box and 7 pipe culverts in the final design for cross drain of the discharge.

3.3.6 Existing Side Drains

Two type of side drain exists along the road. Drainage at Imiliya and Chandrauta bazar are closed type whereas open drain exists at Dumara, Kharendrapur and west of Chandrauta to Umari chowk. Both drains are observed clogged with the wastes and earthen materials. Closed rectangular box type of side drain has provisioned along the road side. Size of side drain have been selected on the basis of 25 years return period of flood. In the major settlement there are side drains for longitudinal discharge management. In Chandrauta west section, large size of earthen side drains exists that drains its discharge into nearby cross drains. The hydraulic capacity of road side drainage has been calculated with 10% safety coefficient and 25-year flood return period. In many sections like Imiliya settlement large size of closed drains (1.5m*2m) with RCC walls has also constructed to drain the discharge into Belwagurdawa river. Existing side drains in different section of the road has been presented in table 3.5 below;

Table 3.5: Existing side drains along the road

S.N.	Drain Start	Drain End	Side	Length (LHS)	Length (RHS)
1	640+300	640+380	LHS	0.08	
2	640+300	640+600	RHS		0.3
3	640+880	641+440	RHS		0.56
4	640+880	641+800	LHS	0.92	
5	641+650	641+800	RHS		0.15
6	642+440	642+730	RHS		0.29
7	644+850	645+200	RHS		0.35
8	647+920	648+080	RHS		0.16
9	651+180	651+780	LHS	0.6	
10	653+460	654+460	RHS		1
11	653+460	654+440	LHS	0.98	
12	654+950	655+070	LHS	0.12	
13	655+500	655+580	LHS	0.08	
14	657+650	657+800	LHS	0.15	

Source: Design Report of GC Road section, 2025



3.3.7 Climate Change Adaptation Measures

The proposed hydraulic structures are designed based on the historical hydrological data and factoring climate change projections. The design accounts for 100-year return flows for bridges, 50-year return flows for culverts, and 25-year return flows for side drains. To adapt to climate change, an additional 10% flow capacity has been included for all these flows in any of the crossdrain structures.

3.3.8 Upgrading Activities

The existing road will be upgraded to an Asian Highway standard. The road width is designed as 50m in urban area, and 24m in rural and forest area. Road upgrading components include widening from 2 lanes into 4 lanes which includes Pavement upgrading, geometry improvements, construction of new bridges drainage improvement etc. The following upgrading activities has been proposed for the project implementation.

Pre- construction Phase

- Land acquisition and clearing RoW
- Relocation of Public Utilities
- Forest area clearance approval from concern ministry/department/DFO
- Clear-felling of forests within the RoW

Construction Phase

- Cutting-filling works, earthwork and formation of embankment
- Construction of miscellaneous road structures including retaining structures and drainage structures
- Traffic safety structures
- Road pavement structure construction works
- Bridge, culvert and side drain construction
- Bio-engineering
- Road painting and establishment of traffic sign
- Road side plantation, median plantation along with compensatory
- Pedestrian crossing
- Wildlife crossing
- Enhancement of public structures

Operation and Maintenance Phase

- Maintenance of road surface
- Plantation along the road

3.3 Description of Land Requirements

Currently, the road is double lane having 12 m of formation width including 7 m carriage way width, 1.5 m soulder on both sides and 1 m drain on both sides. Total land occupied by the current road has been estimated to be 23.04 ha. It has been proposed to upgrade the road to be 24m wide in forest and rural area while the road width will be 50 m in urban areas. Hence the total land area covered by the proposed formation width of the road has been estimated to be 66.766 ha. The additional land area required for the upgradation of the road project is estimated to be 43.726 ha. Land acquisition for this alignment has already been acquired by Department of Road (DoR). The Government of Nepal have announced 50 meters ROW from the center line in 1976. Hence, there is no need of permanent land acquisition for this project. However, temporary land will be required from public and private land for camp establishment, stockpiling of construction material, batching plant, asphalt plant. The details of land requirement are presented in **Table 3.6:** However, apart from the provided one the contractor can also access suitable locations for camp establishment, stockpile of construction materials, establishment of crusher etc. taking consent with the consultant. In that case, contractor has to obligate the government regulations if applied.

Table 3.6: Description of land requirement for the project

Project details	Types of land (ha)									
	Forest Area		Agricultural Land		Residential Area		River / Pond	Barren Land		Total
	G o v t.	Communi ty	Go vt	Priv ate	Govt	Priv ate		Govt	Private	
A. Permanent Land Uses										
Existing Road										
Carriageway width, drain)		9.35424		5.531904		2.575872	0.331776	5.246208		23.04
Proposed road										
Carriageway width, drain		27.10925		16.03175		7.46375	0.96075	15.20050		66.766
Additional land required										
Carriageway width, drain		17.75501		10.49985		4.88788	0.62897	9.95429		43.726
B. Temporary Land uses										
Campsite	-	-	-	-	-	-	-	-	0.77885	0.77885
Storage Area	-	-	-	-	-	-	-	-	8.46579	8.46579



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Asphalt plant	-	-	-	-	-	-	-	-	-	1.35456	1.35456
Total	-	-	-	-	-	-	-	-	-	10.59920	10.59920

Source: Detail Design Report, 2025

3.4 Construction Materials Required for the Proposal

a. Source of Construction Material and Quarry Sites and Water

The basic materials required for the road upgradation are soil, gravel and crushed rock. Gravel will be used for sub-base upgrading, crushed stones for base-course upgrading and for bituminous surfacing the existing crusher plant will be used. As the project area lies in terai region, there are some low land areas along the road. Hence, borrow materials are added to raise the low land area. and also need to manage the sufficient borrow and quarry materials in the project area. The borrow and quarry area need to be map as a part of the IEE. This study has identified the following sources for the borrow material source. Details of the available borrow pit sources are presented in table 3.7 below. Apart from the listed borrow pit and quarry sites non of the sites from the Chure range will be utilized without fulfilling necessary legal requirmenets of environmental compliance.

Table 3.7: Borrow pit sources

S.N.	Location/Name of Village	Co-ordinate	Material Type	Site identification				Approximate Quantity (Cum)				Available	Surrounding land/ Terrain	
				Offset	Distance from E/W Highway (km)				Length (m)	Breadth (m)	Depth (m)			Total (cum)
					BT	Grav	Eart	Tota						
1	Pirapani, Arghakhanchi	27°46'25.03"N, 83° 3'32.87"E	Soil Sample	4 km	19			23	300	70	20	420000		
2	Buddhabhumi	27°37'57.06"N, 82°57'42.02"E		-	2.3		0.8	3.1	400	200	2	160000	Agricultura	Agricultura land
3	Shivaraj	27°41'7.87"N, 82°50'2.43"E		-			0.5	0.5	380	400	1.5	228000		
4	Belgardawa Khola	83° 1'8.12" E, 27°44'28.57" N				River Source							barren	
5	Agewa Nala	82°57'18.95" E, 27°42'42.46" N				River Source								
6	Surahi Khola	82°49'16.78" E, 27°41'48.83" N				River Source								
7	Rapti River	82°45'5.29" E, 27°49'44.86" N				River Source								
8	Banganga River	83°10'57.35" E, 27°42'44.78" N				River Source								

Source: Design Report of GC Road Section, 2025



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

b. Rock and Sand Quarries

Rock quarries are found in the areas listed below they are mostly the perennial rivers originated from Chure and Mahabharat range. These quarry sites are approved by the local government and has been making tender for extraction of stone, gravel and sand from Arghakhanchhi district. As much as possible contractor shall utilize these sources otherwise can also explore the new sites complying the legal requirements or can be purchased from approved sites. Some of the sources present along the project vicinity are presented in Table 3.8.

Table 3.8: Potential Sources of Aggregate Sources

S.N.	Location	Coordinates	Methods of extraction
1	Belgardawa Khola	83° 1'8.12"E, 27°44'28.57"N	Use of local handling tools like shovel, lever, hammer, tray etc. Use of equipment, machinery like excavator, bulldozer for excavation and trippers, tractors etc for transport of materials
2	Agewa Nala	82°57'18.95"E, 27°42'42.46"N	
3	Surahi Khola	82°49'16.78"E, 27°41'48.83"N	
4	Rapti River	82°45'5.29"E, 27°49'44.86"N	
5	Banganga River	83°10'57.35"E, 27°42'44.78"N	

Source: Design Report of GC Road Section, 2025

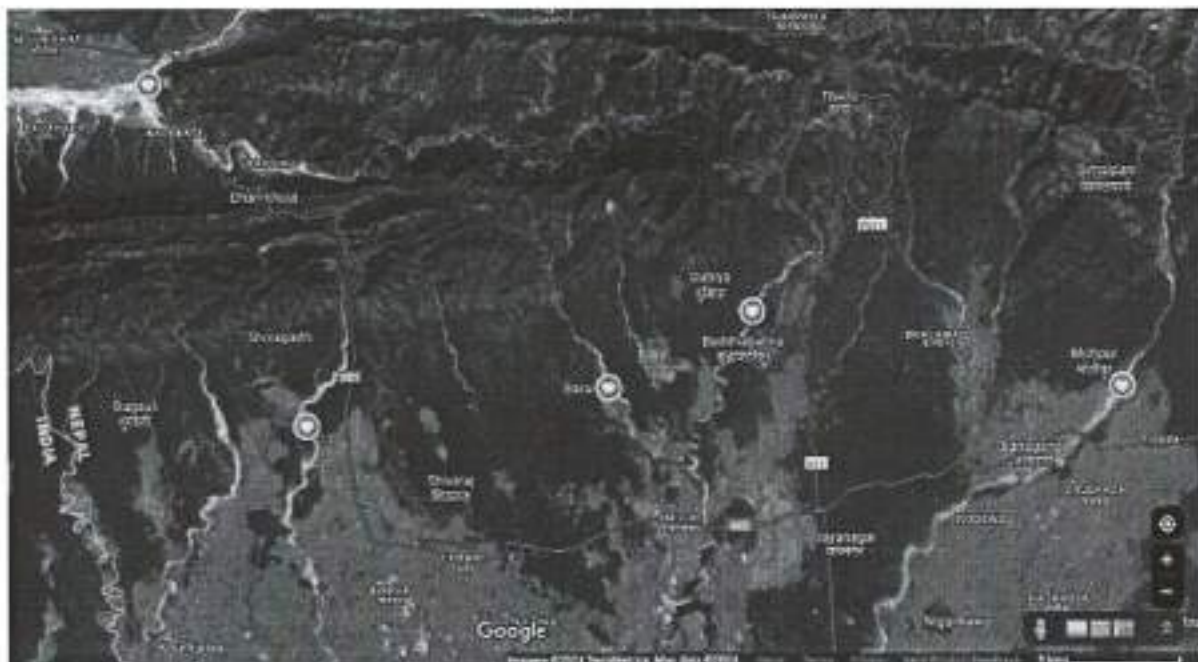


Figure 3.7: Locations of the potential quarry materials (Source: Google map, 2024)

c. Crusher plant

Crusher plant one of the most important projects components of the road projects where it contributes to feed concrete materials as well as for the bitumen works. This project either sourced crushed



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materials will be sourced from the government approved existing sources or project can install the crusher at chainage 640+000 at starting point of the project. The land is private barren land which is abandoned flood plain of Belgardawa river. It is a large open area that has been utilizing as grazing land and play ground by the locals. As the land parcel is large enough that can have potential to operate the plant at one corner of the land parcel without restricting existing land use. Furthermore, existing crushers along the road alignment can also be utilized by the project for crushing the stones for the project.

d. Water Source for Construction

It is essentials to have sufficient water for construction works, water browsing as well as drinking and sanitation works. There will be need of 0.2 - 0.5 L of water per m² area for curing and mixing purpose similarly 2-4 L water each square meter for browsing purpose. It is estimated that total 238 KL water for construction work and 24,300 KL for water browsing purpose will be required. For drinking water there is supply of deep water through pipelines in Buddhabhumi as well as Shivaraj Municipality that can be utilized and also many places have traditional practice of using shallow tube well for the drinking water supply that can be utilized after laboratory test. Water for construction and water browsing purpose will be sourced from the rivers listed *Table 3.9*.

Table 3.9: Location of Major Water Source for dust control

No.	Location	Water Source	Coordinates
1	Belgarduwa Khola	River	273928.95 N, 825949.43 E
2	Bel Nadi	River	27391.73 N, 825457.41 E
3	Jawai Nadi	River	273856.26 N, 825434.81 E
4	Construction camp/batching plant of the contractor	Underground water	650+200 or 640+000/ 650+200

Source: Design Report of GC Road Section, 2025

e. Fuel Requirements of the Project

There will be petroleum products specially diesel, petrol and kerosene for the project. It is estimated that around 960 KL diesel, 182 KL petrol and 770 KL kerosene will be required for construction of the road and bridge.

3.7 Human Resource Requirements of the Project

The work force required for the proposed road upgrading works is based on the detailed design



report. 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. Semi-skilled and unskilled labor deployment priority will be given to locals, also considering the individuals from disadvantaged groups and women as per requirements.

Stage	Skilled	Unskilled	Semi-skilled
Pre-Construction	4500	33,500	500
Construction	47,000	333,000	5000
Operation	4500	33,500	500

3.8 Existing Road Furniture and user facilities

The branch road along the road alignment is Dumra-Maharajganj, Imiliya-Maitaawa, Chauwanna-Asnaraa (North), Chauwanna-Haribarpur (South), Champapur-Dhankauli (South), Kharendrapur-Maharajganj and Samiti Chowk-Balapur Road. Altogether, there are 10 bus stops along the proposed road upgradation section as listed below;

Table 3.10: Existing Bus Stops

S. N	Chainage	Sign type	Side
1	640+550	bus stop	RHS
2	641+130	bus stop	RHS
3	641+250	bus stop	RHS
4	642+650	bus stop	RHS
5	650+820	bus stop	LHS
6	651+380	bus stop	LHS
7	652+440	bus stop	RHS
	652+800	bus stop	LHS
9	658+450	bus stop	LHS
10	659+900	bus stop	LHS



Source: Design Report of the project, 2025

3.9 Impact Area Delineation

The Zone of Influence (Zoi) of the project area has been categorized as Direct Impact Zone (DIZ), Indirect Impact Zone (IIZ) and Zone of Influence (Zoi). Description of impact zone is given in **Table 3.11**.



Table 3.11: Impact Zonation

Impact Zone	Criteria of Zonation
Direct Impact Zone (DIZ)	Right of way of the road 25 m either side of the central line of the road within following settlements as; Dumra, Barkalpur, Champapur, Kharendrapur, Kadamdiawa, Bankatti, Chanauta, Khairi, Shivpur,
Indirect Impact Zone (IIZ)	The zone between DIZ and IIZ with 300 m belt in each side of the road within following settlements as; Dumra, Barkalpur, Champapur, Kharendrapur, Kadamdiawa, Bankatti, Chandrauta, Khairi, Shivpur. In this area, physical, biological, socio-economic and cultural environment will experience impacts during the implementation.
Zone of Influence (Zol)	Project affected wards of Buddhabhumi (ward no 9) and Shivaraj (Ward no 1, 3, 4, 5) Municipality of Kapilvastu district is Zol of the project.

a. Direct Impact Zone (DIZ)

According to Road Act 2031, the Right of Way (RoW) of Highway is 50 m (25 m on either side of the road from center line). For the purpose of IEE study, the formation width of the road will be considered as DIZ. As per the design of the road this area can extend throughout the RoW i.e entire 50 m in the urban area however can be limited to 30 m in rural and forest area.

b. Indirect Impact Zone (IIZ)

Indirect Impact Zone will be the surrounding environment next to Direct Impact Zone (DIZ) of the road alignment and as well as ancillary activities like borrow pit, construction yard and stockpiling and will be affected indirectly by project activities. It will be the area beyond the DIZ and within 300 m aerial distance in each side of the road which are mostly limited to project affected ward level. The construction activities can have impacts on nearby settlements, traffic growth and other infrastructures.

c. Zone of Influence (Zol)

It is the project affected wards of Local Government beyond the IIZ where the beneficial as well as adverse project impacts can exists. Affected wards of Buddhabhumi Municipality (ward no 9) as well as Shivraj Municipality (Ward no 1,3,4,5) lies within Zol of the project.



3.10 Project Facilities

There will be different project facilities and structures performing construction activities. It includes establishment of plants like crusher plant, batching plant, asphalt plant etc. similarly supports structures like camp sites for workers as well as staffs, storage facilities eg. Stockpiling sites and storage yards. Borrow and quarry sites etc. all those structures will be either within the proposed sites or can be newly identified by the contractor.

3.10.1 Campsite and Stockpiling

The project required skilled manpower as well as unskilled worker for accomplishing the project. Required work force as per DPR will be managed during construction. Their proper accommodation will be managed on an appropriate campsite. The campsite and stockpiling yards will be established taking consideration with minimum environmental impact. Locations of the campsites are given in Table 3.12a.

Table 3.12a: Potential locations of campsite and stockpiling

S.N.	Project facility	Chainage	Types of Land (Governmental/ Public/private)	Area required it (ha)	Distance from highway	What type of the land	Remarks
1	Camp sites (Labour camp and other camps)						
	Camp 1	640+000	Public	0.2676	Adjoining to highway	Barren land	
	Camp2	642+500	Adjacent to Forest area	0.2676	@ 150 m south of east west highway	Barren land	
	Camp 3	650+200	Private	6.667	@ 300 m south of east west highway	Old bansawari shoes factory	Barren land with a few buildings are existing
2	Stock yard/storage area						
	Stock yard1	640+000	Private/Public	1.56	Adjacent to RoW	Abandoned land	Together with Camp1
	Stock yard2	650+200	Private land	-	Adjacent to RoW	Barren land	Proposed camp3
	Stock yard 3	655+800	Private	2.00	Adjoining to highway	Private land existing crusher	Existing crusher & agricultural land
3	Crusher plant						
	Crusher plant1	640+000	Private			Private land	"
	Crusher plant2	655+800	Private			Private land	"
4	Batching plant (BP)						



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S.N.	Project facility	Chainage	Types of Land (Governmental/Public/private)	Area required it (ha)	Distance from highway	What type of the land	Remarks
	BP1	640+000	Private/Public	-	Adjacent to RoW	Abanon land	Camp 1 crusher 1 and batching and AP1 together
	BP2	650+200	Private	-			Land covered under Camp1
5	Asphalt plant (AP)						
	AP1	644+000	Private/Public	1.333	@ 200 m south of east west highway	Private	Agricultural
	AP2	655+800	Private	-	Adjoining to highway	Private land existing crusher	Stock yard3 and Asphalt plant together
7	Quarry area (QA)						
	QA1	5 km north from ch. 641+500 at dabdaba budhabhumi -9, belduha khola					

Source: Detail Design Report of GC Road, 2025

3.11 Project Construction Schedule

The project is planned to be completed within 5 years. The details of project implementation schedule are presented in Table 3.12b.

Table 3.12b: Estimated time schedule for completion of the project

Description	2025		2026				2027				2028		Year 4 to Year 8	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2		
Construction Phase - Construction Activities														
Site Clearance														
Earthwork Excavation														
Cross Drainage Structures														
Bridges Construction														
Retaining Structures														
Side and Drainage Structures														
Road Pavement Structures														
Bio-engineering														
Environmental Activities														
Traffic Safety, Painting & Road Furniture														
Defect liability period (DLP) and PBM works														

Source: Detail Design Report of GC Road, 2025



3.11 Methods Adopted for Data Collection

3.11.1 Data Requirements and Procedure for Preparing the Report

The initial environmental examination (IEE) report is prepared according to the National Environmental Impact Assessment Guidelines, 2050 B.S (1997 AD), Sub-rule (1) of rule 5 of schedule 9, Sub-rule (5) of rule 7 of schedule 11 and Sub-rule (6) of rule 7 of schedule 13 as mentioned in Environment Protection Rules, 2077 and GESU template for IEE and BES of road and Bridge 2077 was also followed for the IEE study. In the similar manner the World Bank's ESF was considered while conducting IEE. Terms of References for IEE of proposed road upgrading was approved by the Ministry of Physical Infrastructure and Transport (MoPIT) on 23-04-2081 BS (Annex I).

The IEE approach, methodology and procedure shall generally follow the provisions of the EPA, 2076 and EPR, 2077. Following approach and methodology were adopted during the IEE report preparation.

A. Data Requirements for IEE Report

The following data related to physical and chemical environment, biological environment, socio-economic and cultural environment of the project area were collected.

Data Required	Method/Tools
Physical Environment	
Topography, Land use type and classification	Topographical survey, remote sensing and GIS analysis on the topographical maps, RTK/dGPS/LiDAR for all topographic survey works, Digital Terrain Modeling using AutoCAD Civil 3D.
Hydrological-Drainage network and drainage density	Stream location survey, hydrological studies.
Geology-Rock types, seismicity and stability	Field investigation/Direct observation, Analysis of geological map published by Department of Mine and Geology.
Soil type and classification	Field observation, literature review and laboratory tests.
Soil Erosion	Field Observation, soil quality measurement using routine parameters will be done, further secondary data will be analyzed and report in IEE Report.
Sound/Noise condition	Field observation, sound level measurement and modeling will be done as per National Sound Standard 2012.
Weather and climate condition, temperature, precipitation	Secondary information from Department of Hydrology and Meteorology (DHM) and other published literature.



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Data Required	Method/Tools
Type, Volume and Source of Construction materials required	Secondary information from project engineers, feasibility/concept design report.
Information on borrow sites/tipping sites/stockpiling and camp sites	Direct field observation/Interaction with project engineers, local stakeholders and local
Traffic condition	Traffic survey, Average Daily Traffic (ADT) computation, Mode-wise Hourly Variations and Peak-hour Factor Determination (using results of volume count survey), Estimation of Commodity Distribution Factors for goods vehicles (using results of O-D survey), Estimation of Seasonal Correction Factor (SCF) etc.
Types of forest	Vegetation survey, direct field observation with the help of CFUGs.
Tree loss during site clearance	Census/Enumeration of trees in close coordination with the District Forest Offices for clearance. Calculation of timber/wood volume will be done as instructed in Appendix- 50 of the Forest Rule 2079.
NTFPs	Field study, Checklist Survey, Consultations with the CFUGs, Key Informant Interview (KII)
Information on different Physical Infrastructure (Poles, Houses, Temples etc.)	Field Study (Transect Walk) and consultation with project affected families as well as local government.
Chemical Environment	
Air Quality	Direct field observation will be done, primary data will be collected using medium volume sampler following the NAAQS, 2012.
Water Quality	Water Quality Test and available secondary information.
Biological Environment	
Vegetation analysis	Field enumeration (Using Transect Plot)/ census survey for the trees to be cleared. Similarly plot sampling will be done for keeping baseline information about the adjacent forest status. Calculation of stem volume of the tree will be done as provisioned in appendix of 9 of the Forest Rule 2079 given as: $\ln(v) = a + b \cdot \ln(d) + c \cdot \ln(h)$ or $V = \exp[a + b \cdot \ln(d) + c \cdot \ln(h)]$ Where, V= timber volume, a,b,c are the coefficient values and d=diameter at breast height and h= height of the tree. Value of coefficient will be used as instructed in appendix 9 of the Forest Rule 2079.
Fauna Environment	Direct observation, sign survey, Key Informant Interview, critical habitat screening will be carried.
Aquatic animals	Visual observation/Key Informant Interview/ Past literature for fish.
Socio-economic and Cultural Environment	



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Data Required	Method/Tools
Demographic, Economic and social services and facilities	Secondary Information from CBS, District Co-ordination Committee and Primary information of the direct impact and indirect impact area will be collected. Further, structured questionnaire survey of each direct project affected family and sampling of 20% HHs within IIZ will be done questionnaire survey will be done with them. Furthermore, Checklist survey with the women groups, stakeholders and user groups in the affected area will be done. Specific information will also be extracted using through KII.

The basic methodology as per provisions of EPR, 2077 and National EIA guidelines 1993 was followed while preparing the IEE report specially for evaluation of impacts. Similarly, provisions of Land Acquisition Act 1977 were adapted for the acquisition of property. The data required for the preparation of report, the procedures and methods adopted while preparing the report are mentioned below.

B. Desk Study/Literature Review

Available secondary data and literatures from different sources in the form of reports like detail engineering design of proposed road section, hydrological and geological report of proposed road, similar road project report, affected rural municipality profile, Central Bureau of Statistics (CBS) data 2078 and maps like; topographic maps, land use maps, land capability maps, land system maps, aerial photographs, cadastral survey maps etc. was be collected and reviewed. Similarly, published and unpublished reports pertaining to environmental standards, Acts, Regulations etc. was also collected and reviewed. In the similar manner WB reports of the projects viz. ESF, ESMF, GBV, RAP etc. was studied.

Table 3.13: List of maps studied

Map Type	Scale
Topographical Maps, Department of Survey, (Published Date 1997)	1:25,000
Geological Map of part of Kaplibastu District	1:50,000
Satellite Imagery, Google Earth Imagery	Google Map, 2021

C. Field Study and Site Investigation

IEE team visited the project area on August 2024 to collect information and also verify the baseline information on Physical, Biological, Socio economic and Cultural environment of the Proposed project. The multidisciplinary study team includes environment expert, biodiversity expert, social



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expert etc. were mobilized for field assessment soon after the completion of the desk study and receiving approval on Terms of Reference from Ministry of Physical Infrastructure and Transport (MoPIT). An extensive review of the secondary information, the analysis and interpretation of field observation made during the field visit was the main bases utilized to gather baseline information and assess the potential impacts on the local environment. Primary levels of information were acquired using questionnaire, checklists, datasheets and site observation. The consultant collected and analyzed existing environment to anticipate adverse impacts by incorporating suitable mitigation measures with implementation of Environment Management Action Plan for both construction and operational stages of the project. The following methodology was adopted to assess the local environment during field study:

I. Physical and Chemical Environment

The study team carried out the data collection and assessment in the proposed project area by using approved checklists and questionnaires (**Annex VI**). The survey was performed within the aerial distance of 300 m, affected ward of the Municipality to collect information regarding existing land use to know about land use practice, planting niche, cropping pattern and yield of the agricultural crops, potential quarry sites, disposal area, camp area etc. and soil conservation measures practiced in the area.

a. Land Use

Land use map was created to visualize the land use pattern of the project area. For the study topographic sheets of the project area developed by the Department of Survey were used. These maps were then verified and updated through field-based surveys and cross-referenced with Google Earth images. Geographic Information System (GIS) tools were used for altitude variations and analysis of physiological and topographical variables data.

b. Hydrology

The road alignment's intersections with rivers and streams (Belgardawa and Bel River) were studied and documented during field visit. Both perennial and seasonal rivers in proposed project section were identified. GIS was used to delineate river catchments and calculate their areas, and checked by overlaying them on Google Maps. River discharge data for all rivers along the GC road were collected from the detailed engineering report.



c. Climate

The temperature and rainfall data from Department of Hydrology and Meteorology (DHM, 2024) were used for the climate analysis. The climate data were collected from nearest station of Bhairahawa Airport Station (Station No-705) and Taulihawa Station (Station No-716). Temperature and rainfall data were analyzed to determine climatic condition of the Project area.

d. Geological Characteristics

The geological investigation includes study of relevant maps with 1:10,000 scale, reports and walkover survey to verify the physical characteristics, embankment stability, erosion, seismicity and land inundation and other threats of the proposed road alignment. For Additional information regarding existing status of the area was documented by the inquiry of the local people. The tools used to collect the information was Focus Group Discussion (FUG), direct observations, measurements of physical parameters, interview with key informants and collection of recorded information at field level offices.

e. Air Quality

Field visit for air water and sound measurement was performed in 22nd-23rd of Mangsir, 2081 (Table 3.14a). Air quality in the area was explored using Medium Volume sampler three sites. Air quality publicing parameters like particulate matters PM_{2.5} and PM₁₀ similarly oxides of sulphur, nitrogen and carbon were collected as base line information. Representative air pollution in the area was identified taking samples from three sites viz.

Table 3.14a: Sampling sites for Ambient air measurement

Site	Location	GPS
M1	Imiliya	N27°39.593' E082°59.607'
M2	Jwai Khola	N27°38.900' E082°54.609'
M3	Chandrauta	N27°38.959' E082°51.859'

f. Noise Quality

Average sound level in the area (representing settlements, market places, schools' and public places) was accessed using sound level meter. All the baseline was measured based on the related national guidelines. The noise level has been measured for 24 hours using Digital Sound Level meter. Equivalent noise levels due to traffic at the receivers are estimated using Federal Highway



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Noise model. List of sampling sites, its GPS position, minimum and maximum level of sound level as well as equivalent noise level has provided in table below and certificate of laboratory are presented in **Annex II** of the report;

Table 3.14b: Area of sound measurement

SN	Name of area	Imaliya	Jawai River	Chandrauta
1.	GPS	N27°39.593' E082°59.607'	N27°38.900' E082°54.609'	N27°38.959' E082°51.859'
2.	Start time	2024-11-24; 10:30	2024-11-24; 10:30	2024-11-25; 10:30
3.	End time	2024-11-25; 10:30	2024-11-25; 10:30	2024-11-26; 10:30

Noise Level Calculation Formula

The most commonly used parameters for measuring highway noise are the equivalent noise level (L_{eq}), minimum noise level (L_{min}), and maximum noise level (L_{max}).

Equivalent noise level (L_{eq}): The equivalent noise level (L_{eq}) is a measure of the average sound energy over a specified period of time (Day and Night).

To calculate L_{eq} , the following formula is used:

$$L_{eq} = 10 \log_{10} [(10^{10} + 10^{10} + \dots + 10^{10})] \text{ dAB}$$

Minimum noise level (L_{min}): The minimum noise level (L_{min}) is the lowest sound pressure level observed during the measurement period.

Maximum noise level (L_{max}): The maximum noise level (L_{max}) is the highest sound pressure level observed during the measurement period.

Further, the recorded data were analyzed based on National Ambient Sound Quality Standard, 2012 and WHO Standards, 1999.

g. Water Quality

A total three water samples from either site of the major rivers where bridges will be constructed were collected. Routine water quality parameters were examined and analyzed, out of which pH, Electric conductivity and turbidity were measured in situ whereas samples were preserved at 70% ethanol for the further laboratory analysis. samples will be further analyzed in the the laboratory of Lumbini Agro Environment Pvt. Ltd. The water sample collection date, time and results with



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standard value guidelines are clearly stated in the water quality report (ANNEX II). The water quality parameters and method used for water quality analysis is presented in 3.15.

Table 3.15: Parameters measured for water quality assessment

S. N.	Parameters	Test Methods
1.	pH at 17°C	Electromeric, 4500 - H ⁺ B, APHA
2.	Electrical Conductivity, (μ S/cm)	Conductivity Meter, 2510 B, APHA
3.	Turbidity, (NTU)	Nephelometric, 2130 B, APHA
4.	Total Hardness as CaCO ₃ , (mg/L)	EDTA Titrimetric, 2340 C, APHA
5.	Total Alkalinity as CaCO ₃ , (mg/L)	Titrimetric, 2320 B, APHA
6.	Chloride, (mg/L)	Argentometric Titration, 4500 - Cl ⁻ B, APHA
7.	Ammonia, (mg/L)	Direct Nesslerization, 4500 - NH ₃ C APHA
8.	Nitrate, (mg/L)	UV Spectrophotometric Screening, 4500 - NO ₃ ⁻ B, APHA
9.	Nitrite, (mg/L)	NEDA, Colorimetric, 4500 - NO ₂ ⁻ B, APHA
10.	Calcium, (mg/L)	EDTA Titrimetric, 3500 - Ca B & 3500 - Mg B APHA
11.	Magnesium, (mg/L)	
12.	Iron, (mg/L)	Direct Air - Acetylene AAS, 3111 B, APHA

h. Source of Construction Materials

The sources of construction materials were identified through field investigation. During field survey, the potential sources of these materials were identified in and around the alignment area. Further information was collected consulting with local bodies.

i. Public Properties/Utilities

During field survey, detail public properties/utilities were recorded with chainage in the format. Public properties/utilities found during field survey was such as public water tank, water taps, water supply pipe, public toilet, passenger waiting shed, resting place (*Chautara*), religious structures, solar street lights, telephone pole, transformers, electric pole (concrete), electric pole – steel, irrigation canal etc.



j. Identification of Spoil Disposal Sites, Camp Sites and Material Storage Sites, Crusher plant, Asphalt Plant Sites

The sites required for the project activities were identified through field-based survey, interaction with project engineers and local stakeholders. Similarly, the spoil unsuitable for filling road embankment will be used for the land formation process taking approval from the consultant.

Chemical Environment

Apart from the other pollution effects, petro-chemical pollutants are more possible to spell due to improper utilization, handling and leakage during construction of the proposed bridge. There may have adverse effect especially on the aquatic environment of the major rivers (Belwagurdawa River and Bel River) through leakage of fuel, lubricants, oil, and cement during the road construction and other different chemical products like acid and dry cell battery during construction phase. Once discharged into water bodies and soil, petro-chemicals may have the effects of micro-organisms and other creatures in the surrounding. Thus, these aspects will be addressed by documenting existing sensitive areas where such chemical impact can affect.

ii. Biological Environment

A team comprising biodiversity experts, field surveyors, and assistants conducted the biodiversity study, covering various seasons to gather the data on wildlife. The methodology for collecting biodiversity data was developed in alignment with ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Relevant studies conducted by the World Bank were also referenced.

The expert's team conducted walk-through surveys along the road alignment and forest areas within the ROW, DIA, and IIA, documenting vegetation and wildlife observations on-site. During the walk-through observations, the team documented signs indicating the presence or absence of wildlife, such as footprints, borrows, den, pellets, feeding signs, and other evidence of causalities. Also consult with the local people who regularly visits to forest to collect fodder and grazing livestock regarding the wildlife they encounter and road crossing of wildlife.

a. Flora Survey

Vegetation and forest type in the adjoining forest, their distribution as well as occurrence of protected species, ethno-botanical and cultural value were recorded. All the factors as well as measurement units was followed as provided in the rule. The number of trees, poles and saplings



were followed as mention in the Forest Rule, Appendix 50. Similarly, the baseline of the existing forest was reported through standard sampling and review of the management plan of the community forests as well as collaborative forest that exists along the road.

To identify a tree, species name was recorded and it was numbered. All the tree species were categorically measured at breast height for diameter, height and GPS coordinate were recorded. Trees were classified on sapling, pole and trees based on Diameter at Breast Height (DBH). Tree species with DBH more than 10 cm is categorized as tree (as per approved ToR). The distribution of trees along the alignment (within RoW), both side of the road were counted and recorded in the data sheets. Measurement of tree position (Longitude and Latitude) of all the trees growing within RoW was taken. The study team calculate the number of trees to be cleared for the upgradation works through tree inventory (Annex XVI). Volume, biomass and Carbon content of a trees was calculated on the basis of volume equation and biomass as per Forest Regulation.

Rare and Endangered Species: Tree data collected from the forest of the project area were compared and verified to the list published by IUCN Red Data List, CITES and List of Endangered, Rare and Threatened Plant Species. The secondary published documents were also referred for information on the conservation status of the tree species.

b. Fauna Survey

Primary data was gathered through direct field observations. Additionally, secondary information on the faunal diversity of the project area was obtained from published literature, stakeholder and public consultations. Methods such as transect surveys, point count survey and direct observations were employed, focusing on wildlife biodiversity, including mammals, birds, herpetofauna, and fish species.

c. Mammals

Approaches such as direct observation of animal tracks along the roadside, roadkill surveys, and analysis of animal movements (Smith and Ree, 2015) were employed to study mammals in the project area. Field surveys and interactions with local forest users were integral to this assessment. A transect survey was conducted, considering a 1-kilometer distance (500 m on either side of the road), where wildlife movement to and from the highway was most likely.



Sign surveys were conducted to identify evidence such as pugmarks, footprints, hoof marks, scats, pellets, dung, and scratches on tree trunks. Roadkill surveys were performed sequentially after the sign surveys, incorporating consultations and studying available evidence. Records of mammal presence in the project area were documented and verified with reference to "The Status of Nepal's Mammals: The Red List Series" (Jnawali et al., 2011) for conservation status.

In addition to fieldwork, consultations were held with forest officials (from Division Forest Offices and Sub-Division Forest Offices), Local Forest Management Groups (Community Forest User Groups and Collaborative Forest Management Groups), and other stakeholders to gain a better understanding of key aspects of mammal activity and habitat use. Visual observations of mammals were made using both the naked eye and 10x42 binoculars and photographed by Nikon COOLPIX P1000 camera. Night time surveys also included driving along the road at a slow speed of 25 km/hr to document animal crossings.

d. Avifauna

The bird survey was conducted using the Mackinnon's Species Richness Counting Method (Bibby et al., 2000) to assess species richness, abundance, and distribution. Each bird species encountered whether seen or heard was recorded along with individual counts during the survey period. The survey covered the road, a 1 km buffer zone around the road, dumping sites, wetlands and other key areas. The recorded bird data were categorized and analyzed based on the following criteria:

- 1 IUCN Red List status (global and national) for Critically Endangered, Endangered, and Vulnerable species.
1. CITES listing.
2. Protection status
3. Presence of nesting colonies.
4. Migration status.

The "Birds of Nepal: An Official Checklist" (2022), published by the Department of National Parks and Wildlife Conservation and Bird Conservation Nepal, was used as a reference to prepare the bird species list for the project site.

A total of 9 vantage points were established along the 19.2 km road at intervals of approximately 2 km (road distance). A minimum of 30 minutes was spent at each vantage point to record all observed bird species along with their respective numbers. Wherever vantage point was found unsuitable, the nearest appropriate location was selected instead. Birds were observed by 10x42 binoculars and photographed by Nikon COOLPIX P1000 camera.



e. Herpatofauna

Amphibian and reptile survey was carried out by the combination of stationary point surveys and transect surveys, focusing on representative habitats throughout the proposed project area. Also visited the nearby wetlands and swampy areas. Efforts were made to assess the status of reptiles and amphibians in the study area, including species identification, territorial distribution, areas of concentration, and habitat conditions

Capture and Release method applied for sample collection of herpetofauna. Frogs and toads were captured using Insect Mesh Net for short span and released back after taking photographs for further identification process. While in the case of reptiles, photographs of directly observed creatures during survey taken for its identification. "Herpetofauna of Nepal-A Conservation Companion". For Turtles, "Turtles of Nepal: A Field Guide for Species Accounts and Distribution" (Aryal, P.C. et al., 2010) were followed for identification.

f. Fish

Net fishing and indigenous ways of fishing (trapping and angling) used for fish sample collection. Fish survey involve a combination of direct sampling, observation, and local people consultation to assess fish diversity, abundance, and habitat conditions. A fish survey was conducted by visiting rivers, streams, and other water bodies within the project area. Consultations were held with local fishermen, and fish samples were collected during their catches. Nearby wetlands were also surveyed but excludes the farmed fishes.

iii. Socio-economic and Cultural Environment

Information related to socio-economic and cultural aspect of the project influence area including population distribution, ethnicity, employment facilities, education status, health and hygiene and sanitary, settlement pattern, market centers, migration patterns, land value, household income, accessibility condition, vulnerability, service centers, availability of labor, religion and religious events and other infrastructures (schools, government offices and banks) etc. conditions was collected. During the course of data collection, the sample of households in the influence area was selected.

Project affected families who lost their land and property was identified through census survey. Color mark along with numbering were placed at the area from which the structure has demolished



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for the upgradation. Valuation for compensation was done through CDC that has been extracted in the RAP was also used for the IEE study. Furthermore, status of gender equity and social inclusion in the area were identified.

The primary data were collected from a household survey. Further, all 50 HHs which are affected by the Gorusinghe- Chandrauta road upgrading project have been surveyed. The questionnaire for household survey was prepared in Nepali language to make respondents easily understand the issues. Besides, Focus Group Discussion, Public Consultation and Key Informant, Interviews through checklists were also used to gather all the relevant information (**Annex VI, VII and VIII**).

a. Consultation Meetings, Public hearing and

Altogether 11 consultation meetings with the concern stakeholders of the project area were conducted to obtain their opinions and suggestions. Consultations had carried out with various key institutional and community stakeholders, including municipal authorities, Forest Authorities, and Forest User Groups, and local peoples. Through these consultations, project concepts and objectives were disclosed and noted their ideas, suggestions, and concerns used to inform the project design. Minutes of consultation meetings are given in **Annex VIII**.

b. Public Hearing, Notice and Recommendations

According to Rule 3 (5) of the EPA 2076, and Rule 6 of EPR 2077, a public hearing regarding to the project development and operation was held in 18th and 19th Poush 2081 (2nd and 3rd of January 2025) in each municipality, after approval of the ToR. Prior notice about the public hearing was made through official letter of DCID followed by the public notice in the newspaper mentioning the project features and date, time and place about public hearing in project area was announced by advertising it on Arthik Abhiyan national daily newspaper. The notice was pasted in public places, as well as notice board of Buddhabhumi municipality, Shivraj municipality as well as affected ward offices. Representative of local stakeholder were gathered to inform about project activities. The CFUG's and local representative were also invited for the discussion about the project. The issues and suggestions received during public hearing was noted, analyzed and included in the IEE study. The public notice for public hearing is attached in **Annex IX**. Details of the Pulic hearing including the minutes is attached in **Annex X**. Details of the public hearing program has provided in annex XI of the report. The feedback and suggestions received from the participants during public hearing are



summarized and listed below;

Summary of Public hearings

Prior to the public hearing, a notice was published in the Arthik Dainik National Daily on 26th December .2024 .Additionally, notices were displayed in public areas, and letters were issued from DCID and were dispatched to stakeholders as well as relevant authorities, ranging from the district level to the project affected locals. To ensure broader outreach, the notice was also broadcasted on Shivraj FM 106.8MHz. The first public hearing program, focused on the project area within Buddhabhumi Municipality Ward No. 9, was held on January 2, 2025, in the conference hall of Buddhabhumi Municipality, Buddichowk, Kapilvastu. Biodiversity Expert of the study team had conducted the program whereas project engineer from the Project Incharge (PIC) office, Department of Roads, provided an overview of the project. The session included a detailed presentation by Environment expert of the consultant study team, followed by an open floor discussion. Most participants actively engaged in the discussion, raising questions and providing suggestions. The discussion session was moderated and minuted by Social Expert of the study team. Environment Safeguard Expert and Social Safeguards Expert from Department of Roads-Development Cooperation Implementation Division also participated into the discussion. Furthermore, design issues were also assisted by the consultants Team Leader for the project construction supervision and Resident Engineer for the Butwal-Gorusinghe road construction project phase-I.

c. Summary of the public issues and redressal status

All the issues raised during public hearing were compiled and categorically grouped together and their addressal status in the report were prepared as presented in table 3.16 below;

Table 3.16: Summary of Public hearing issues and addressal status

SN	Issues	Redresal section/Response
1	Existing highway should be demolished only after the new lane is constructed and operated.	Addressed in section 6.2.2 issue no 14.
2	Cyclelane and utility duct must be provided along the road.	Impact associated with road safety and need of cycle lane has included in section 4.2.1 (Issue no 1 of operation phase) and mitigation has addressed in section 6.2.1.
3	There shall be pedestraian overhead crossing for pedestraian at Imiliya chowk.	It has been added into the design report



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SN	Issues	Redresal section/Response
4	The length of bridge in Belgardawa River (640+000) be extended by 50 to 60 meters on the east side of the road as it is cutting the agriculture land.	It is under discussion and will be finalized as per the provision of DoR and national governing laws. However, a culvert has been provisioned towards east for discharge of the flooded water.
5	Extrenal drainage for storm water management shall be provisioned for discharge of the US/DS discharge into the cross-drain structure.	Provisioned as per the designed report (section 4.2.2 (2) of operation phase)
6	Inundation problem west of Chandrauta Chowk shall be addressed and size of the culvert in Kanchhania stream shall be increased.	There will be side earthen drain in the semiurban road section. The size of the culvert has been increased into the design.
7	Water supply pipelines piled along the highway shall not be disturbed without assuring uninterrupted water supply.	Mechanism of relocation and maintenance has been assured section 4.2.1 (7) for the impacts and section 6.2.1 (7) for the mitigation issues
8	Extension of six-lane highway should be done to Buddhabhumi campus chowk (642+600) in the Imiliya section and further extended to the Sub division in the Chandrauta section.	In between Imiliya and Umari Chowk project has increased the stretch of the 6-lane highway. However, extension to 6-lane from Umari chowk to Sub division is beyond the scope of the project.
9	Management of hatbazar at Imiliya and Chandrauta area.	Issue has been addressed at section 6.2.2 (3) for operation phase.
10	Project shall support to the community for the livelihood and income generation activities including improvement of hatbazar at Imiliya and chandrauta and also give priority to the local workers in construction.	Project has arranged to improve the hatbaar at Imiliya and Chandrauta along with the road construction. Similarly pedestrian overhead bridge has proposed at Imiliya Chowk considering the safety aspect
11	Dilema of central line of the road at Imiliya, Chandrauta and Balapur mode shall be properly addressed and damage to the structures due to shift in the central line has to be addressed through joint verification with land revenue and nahi office prior to construction.	It was committed that proper verification will be done prior to road construction and compensation for the lost structures will be made available.
12	Barkalpur and Champapur area has not traced out the road alignment into cadastral map due to which people have been paying revenue	Project will make arrangements to take the action of handover of the land to projects name in support of the locals.



SN	Issues	Redresal section/Response
	hence project shall take initiation to make arrangements to remove the land from their land ownership certificate.	
13	There shall not be storage of construction material along the road specially at the market area that deteriorates the visual as well as physical environmental condition, and also obstruct the people for their activities	Separate storage area as well as stockpiling sites will be provisioned in the project and supervision consultant will instruct the contractor to manage those materials at specified places.
14	Proper consultation shall be done to relocate the Diar of Chaudhary community at Dumara	It is committed to shift it in consultation with the priest of Choudhary community

d. Public Notice

As per the Schedule 9 of EPR, 2077, a 7 days Public Notice was published in a Arthik Abhiyan National Daily (2081/10/28) Newspaper after conducting public hearing. A public notice in format provided in **Annex XII** issued by DCID (2081/10/07) was be pasted in the project area and public places such as schools, health post and Municipality offices as well as affected ward offices and public deeds of affixing notice was prepared. After accomplishing the deeds, the public notice was published in local newspaper and provided to the stakeholders. The suggestions and feedbacks from stakeholders, locals etc. was collected, recorded, analyzed and included in the IEE report. Feedbacks and comments from Municipality and DFO, Gautam Buddha were also collected.

e. Recommendation Letter

According to the format given in Schedule 14 related to sub-rule 8 of rule 8 of Environment Protection Regulations, 2077, recommendation letters were collected from Buddhabhumi and Shivraj municipalities as well as Division Forest Office (Gautam Buddha) (presented in **Annex XIII**) and relevant issues were incorporated in the IEE report. The issues raised by the concerned authorities have been addressed in Chapter 4 and 6 in detail.

3.11.2. Data Analysis

Estimation of total wood volume, biomass and carbon content of a standing tree

According to EPR (2020) and Forest Regulation (2022), the total volume of a tree, along with its corresponding biomass and carbon value, was calculated.

Estimating wood volume: Assembling of stem and branch wood volume is the total wood volume of a tree. Stem wood volume of a standing trees can be obtained using model (i) below (Sharma



and Pukkala 1990).

$$\ln(V) = a + b * \ln(d) * \ln(h) \dots\dots\dots(i)$$

Where, a, b, c = tree-based values; d = dbh, and h = total height of tree.

Recent Forest Regulation (2022) has specified similar models for branch wood volume and corresponding biomass and carbon value estimating techniques. For biomass values Jackson (1994) together with Sharma and Pukkala (1990) was followed.

$$\text{Above Ground Biomass (AGB)} = \text{SB} + \text{BB} + \text{LB} \dots\dots (ii)$$

Where, SB is Stem Biomass, BB is Branch Biomass and LB is Leaves Biomass.

Biomasses of a trees was estimated using standard biomass equation and biomass tables, as appropriate.

The collected data were analyzed using both descriptive and statistical methods. Qualitative data of physical, biological and socio-economic and cultural environment were analyzed using software like MS Excel, GIS etc.

3.11.2.1. Impact Identification, Prediction and Evaluation

A logical, and systematic method was used for identifying, evaluating, and predicting the impacts. The impacts were identified for the project's physical, biological, socio-economic, and cultural environments. The following tools were used for impact identification:

- Checklist, Key Informant Interview
- Households Survey
- Expert's Judgement

The impacts have been predicting over a specified period and within defined area. Consequences of environmental impacts were interpreted in terms of local, regional and national contexts. The significant positive and adverse environmental impacts associated with the project components have been identified considering the impact zone. The magnitude, extend and duration of the impacts which were categorized according to the National EIA Guidelines, 1993 are given below:

1. Magnitude of Impacts

Low Impact (L): If the value of the resources could be used with no or minimum inconvenience to the public.



Medium/Moderate Impact (M): If the value of the resources could be used with inconvenience to the public.

High Impact (H): If the value of the resources reduced far below publicly acceptable level.

ii. Extent of Impacts

Site Specific (SS): If the impact is limited to the project area, then it is a site specific one.

Local (L): If the impact of the work extends to the watershed, then it is termed as local.

Regional (R): If the impact of the work extends beyond the watershed, then it is termed as regional.

National (N): If the resources are affected at national scale, it is known as a national impact.

iii. Duration of Impacts

Short Term (ST): If the impacts last for 3 years after project initiation it is classified as short term. The construction phase impacts are mostly categorized under this category.

Medium Term (MT): An impact that continues for more than 3 years but less than 20 years is considered as medium-term. The construction phase impacts which carry over 1-2 years of operation phase falls under this category.

Long Term (LT): An impact that lasts beyond 20 years is considered to be long term. The operation phase impacts are mostly categorized under this category.

Table 3.17: Characterization of magnitude, extend and duration

Impact	Category	Score
Magnitude	High (H)	60
	Medium (M)	20
	Low (Lo)	10
Extend	Regional (R)	60
	Local (L)	20
	Site Specific (SS)	10
Duration	Long Term (LT)	20
	Mid Term (MT)	10
	Short Term (ST)	5

Source: National EIA Guideline, 1992

3.11.2.2. Significance of Impacts

Significant: If the impact is considerable and changes the baseline condition it is considered significant impact.

Insignificant: If the change is so minor that baseline condition is not affected considerably it is called insignificant.

On the basis of expert judgment following scoring method will be used for the identification and prediction of significance of impacts.

Table 3.18: Categorization of significance of impacts

Category	Score
Significant (S)	Greater than 75
Moderately/Medium Significant (MS)	45 to 75
Insignificant (I)	Less than 45

Source: GESU Template for IEE of Road and Bridge Project, 2077

3.11.3. Report Preparation

The IEE report has been prepared as per the format and content given in Schedule 11 of EPR, 2020; DoR's Template for IEE of Roads and Bridge Project and approved ToR. An executive summary of the IEE report has been prepared in Nepali language for the use of local stakeholders, DCC/ Municipalities and GoN agencies.

3.12 Existing Environmental Conditions

The existing environmental conditions about the project area is discussed in the following sub headings.

3.12.1. Physical Environment

1. Topography

The proposed road section passes entirely through plain terrain (generally varies from 100-150 masl) between its start CH 640+000 and end at CH 659+200. The project road passes through Buddhabhumi and Shivpur municipality crossing through two major settlements viz Gorusinghe and Chandrautavia small built sections such as Imiliya, Champapur, Kharendrapur and Shivpur etc. The Topographical Map showing the road alignment is attached in **Annex XIV**.

2. Geology

The road alignment falls on the sediment of the Gangetic Plain (Upper Terai). The area consists of coarse sediments developing gently sloping surface toward south. Soils along the road section are mostly of recent alluvial deposits, represented by silt, clay, gravel also including boulder and cobble. Soils are mostly stable, but it is possible to occur erosion mostly along river banks. The project site is in plain areas and no slides and unstable areas can be found at this project site. The geology and soil type map are shown in figure 3-8 and 3-9 respectively.

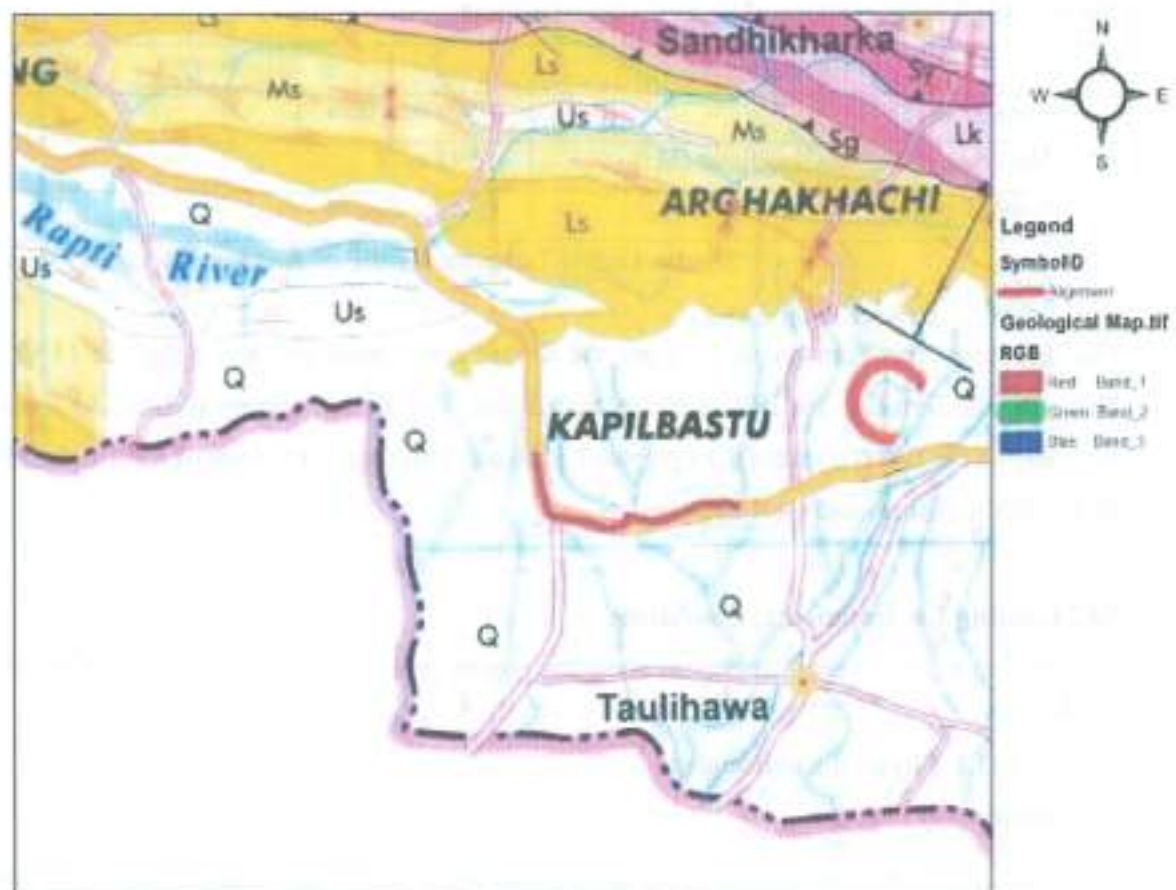


Figure 3-8: Geology map of the project area



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

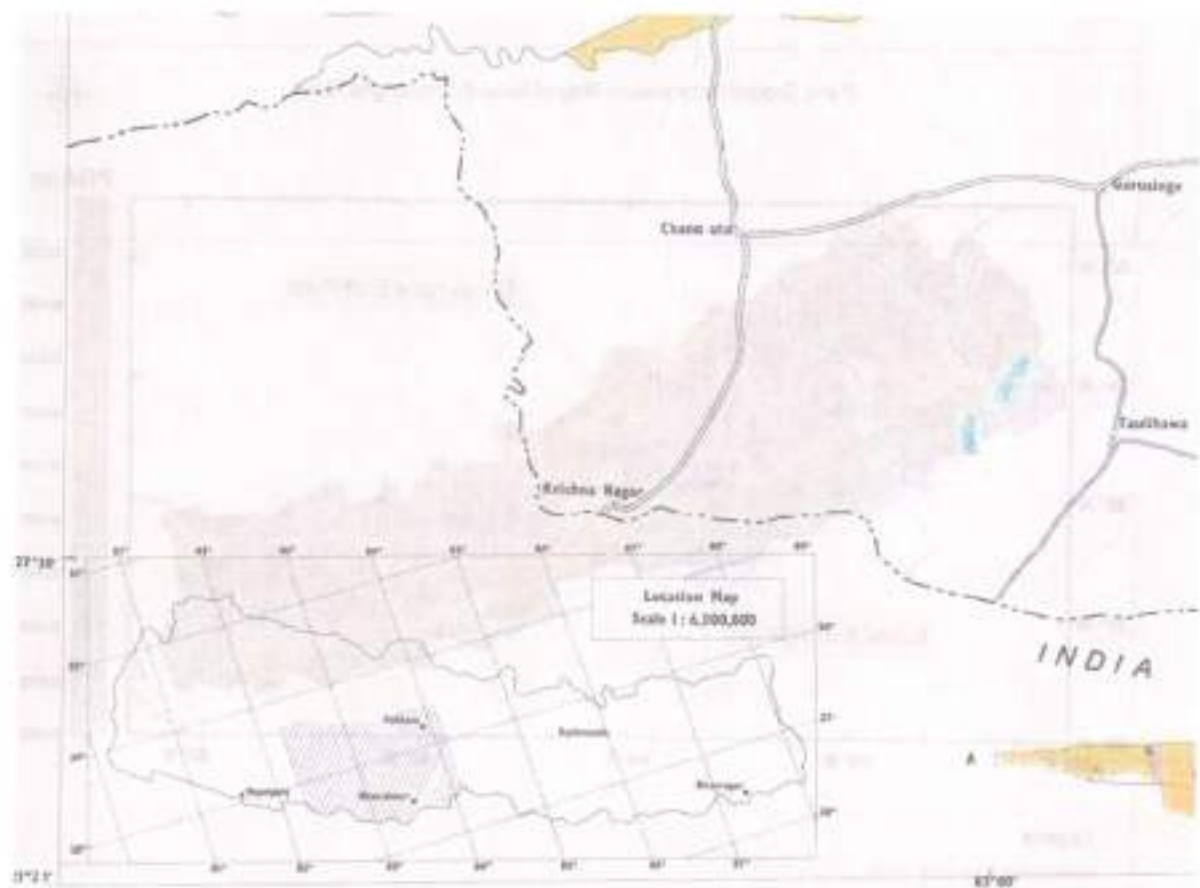


Figure 3-9: Recent Alluvial soil found in the project area

3. Seismicity

In Nepal, specific standards for constructing large infrastructures to withstand seismic tremors have not yet been developed. However, the national building code published by the Government of Nepal can be used as general guidelines. According to Bajracharya (1994), the Nepal Himalaya has been subdivided into five seismic zones (Zone 1, Zone 2, Zone 3, Zone 4, Zone 5) with relation to the seismic hazard (Low, Moderate and High). The road alignment falls in the seismic low to moderate hazard area (Seismic zone 3 to 4). The Peak Gravitational Acceleration (PGA) value in the project area ranges from 0.095 to 0.115g (Figure 3-10).

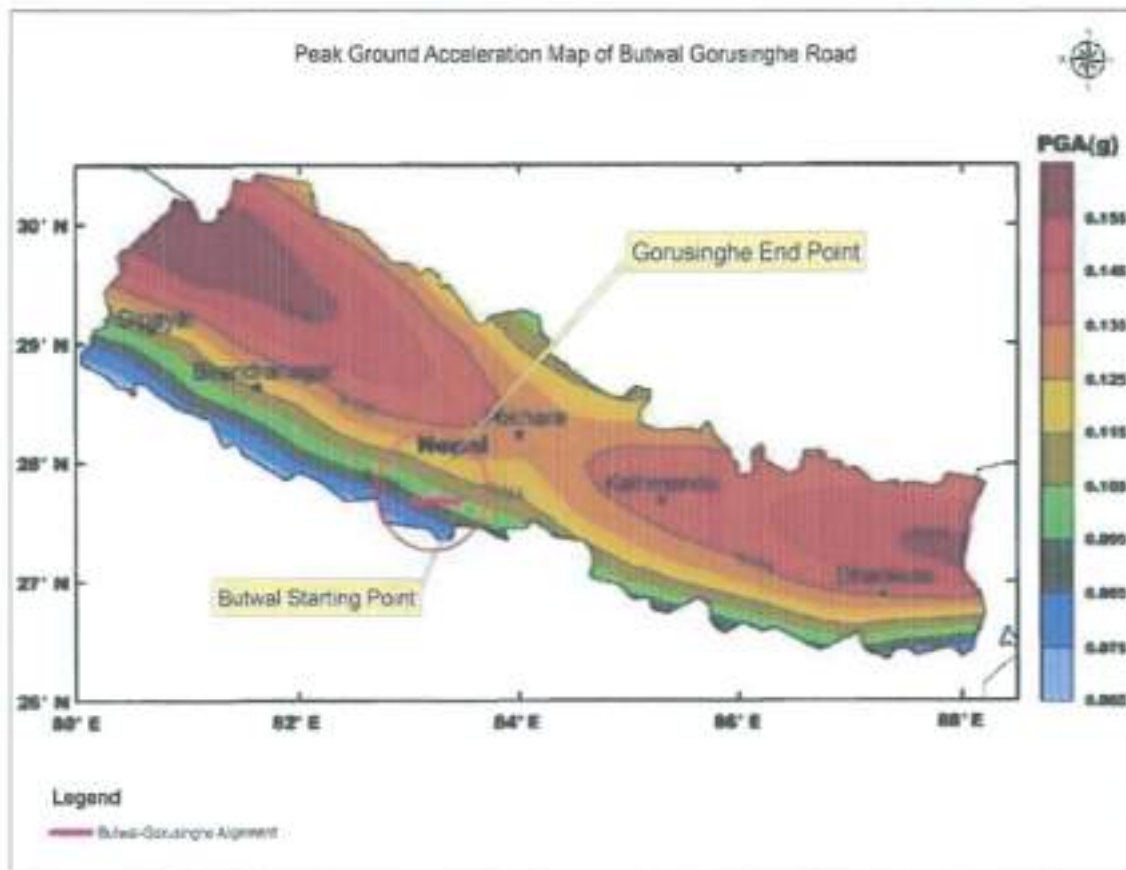


Figure 3-10: Peak ground acceleration map of Nepal indicating project area

4. Hydrology (flood prone area, stream, river, existing drain facilities)

There are three major bridges, eight minor bridges and 69 box culverts as well as 7 pipe culverts for draining water downstream i.e towards south. These rivers are of local origin i.e. are originated from Churiya hence have high discharge only during monsoon. Among them Bhargardawa river is the largest one and prone to splash flooding during intense rainfall. Apart from it, other bridges are sufficient to hold floods. Most of the section lies in high land area hence do not have water logging issues. Furthermore, Champapur and Chandrauta are low level areas and have reported waterlogging issues in some locations during monsoon. There should be special arrangement requirements to drain the discharge completely downstream of the road so that the road remains safe for the project. Catchments of the project area have been delineated by GIS and checked by overlapping them on Google Earth Professional. Figure 3-11 shows the catchment area of the river of the GC road.

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

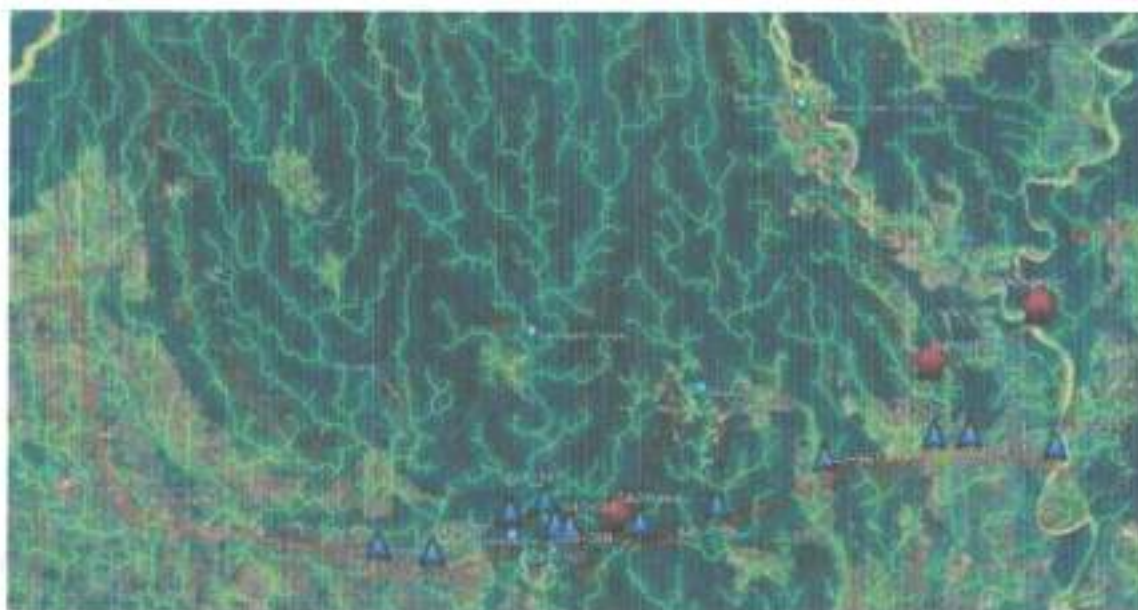


Figure 3-11: Catchment area of rivers of Goringhe-Chandrauta road

Table 3.19: River and rivulets across the road

S. N	CA Chainage	Existing Structure		Proposal	Proposed Structure			
		Span Arrangement	Skew Angle		Type	No of span	Clear span (m)	Width** (m)
1	640+262	3x21	0°	Retain + New 2-lane bridge	RCC Integral bridge with Pile foundation	3	21	11.75
2	641+637	1x6.8	29	Reconstruction	RCC Box	1	7	11.5 + 2 + 11.5
3	642+199	1x6.4	0°	Reconstruction	RCC Box	1	10	11.5 + 2 + 11.5
4	648+157	1x 12.6	0°	Retain + New 2-lane bridge	Box Bridge with Micro Pile foundation	1	12.6	11.75
5	648+561	3x21	0°	Retain + New 2-lane bridge	RCC Integral bridge with Pile foundation	3	21	11.75
6	649+257	1x17.1	0°	Retain + New 2-lane bridge	Box Bridge with Micro Pile foundation	2	7.7	11.75
7	650+768	1x6.8	18	Reconstruction	RCC Box	1	7	11.5 + 2 + 11.5
8	651+614	1x7.15	0°	Reconstruction	RCC Box	1	7.5	11.5 + 2 + 11.5

Source: Design Report of the Project, 2025

*The width provided is the total width of the deck at LHS & RHS along with median.

5. Land Use Pattern

The land use is predominantly agricultural, rural and forest section except few settlements. The whole land use pattern in the project area is shown in figure 3-10. The entire road section lies within the RoW of DOR and there is mixed land use pattern along the both side of the road. Several fuel stations exist in the entire project corridor. Along the project road, there is major parts of community managed forests. Several numbers of public utilities like electric poles, solar poles, cable, telephone and internet cable, water pipe line etc. either running parallel or crossing the project road at different locations. In addition, several crossings of electric cables including high-tension line are common in the road section. During reconnaissance, it has also observed that Optical Fiber Cable (OFC) lines of different telecom companies are running parallel on either left or right side of existing road.

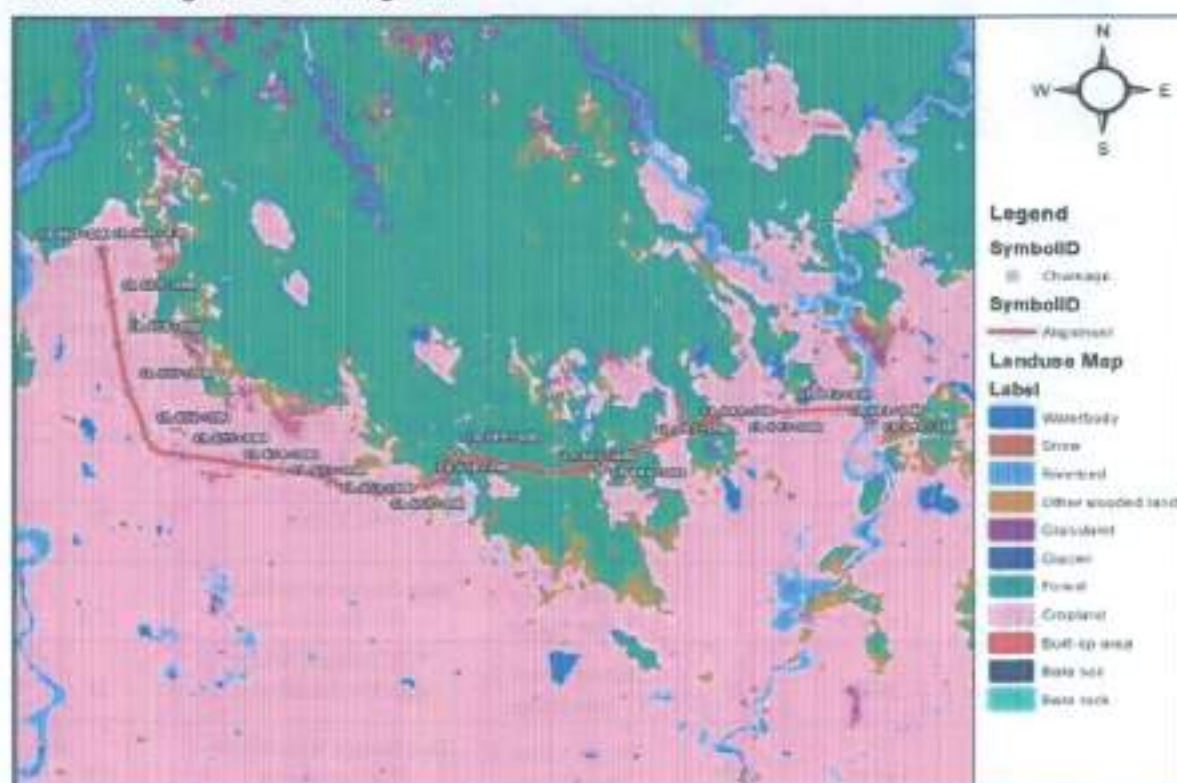


Figure 3-12: Land use pattern of project area

There will be no need to acquire new land for upgrading the road as it already has its 50 m RoW. The land use is predominantly agricultural and rural except at forest area. There is mixed land use pattern along the both side of road. Most of the land around the existing road is barren land. Proposed formation will extend to 24 m at rural and forest area similarly will occupy entire RoW especially at urban areas with dense settlements at Imiliya and Chandrauta section. The details of land use pattern in the project site are presented in *Table 3.20*



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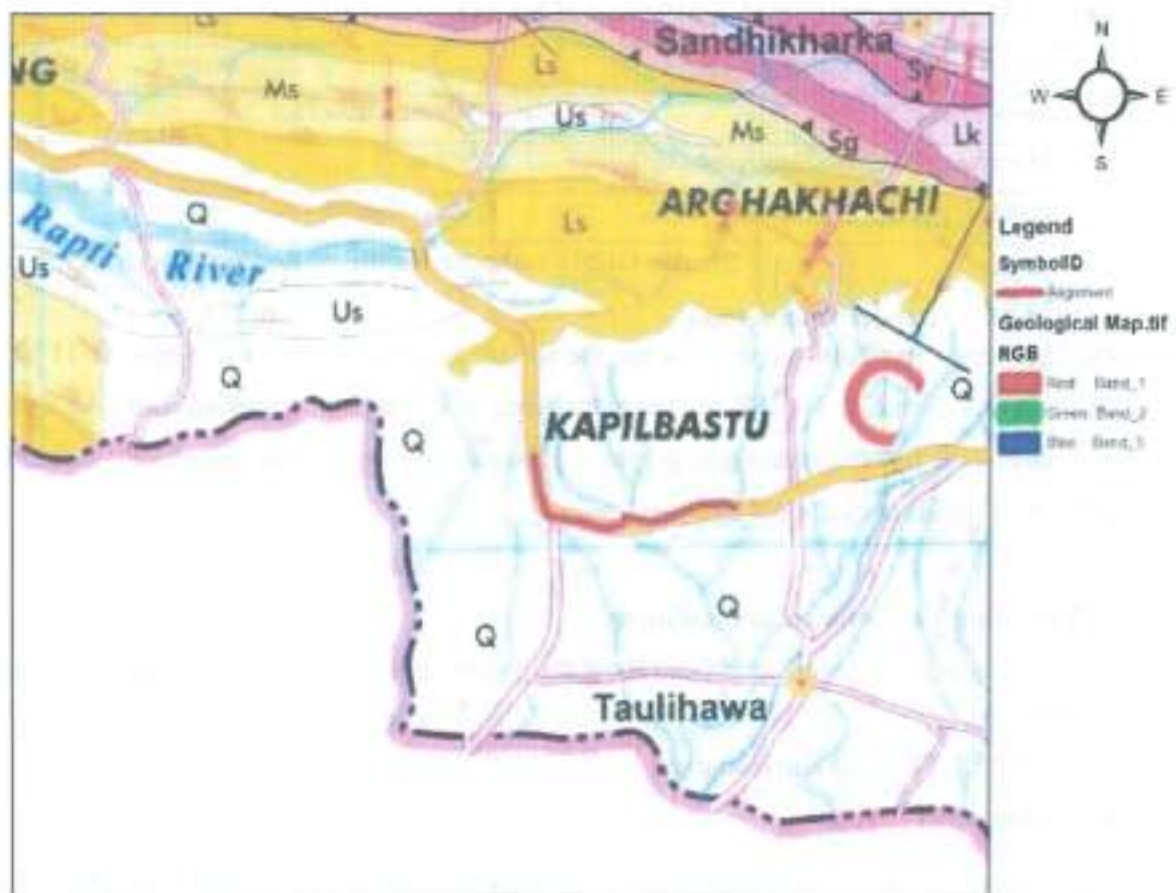


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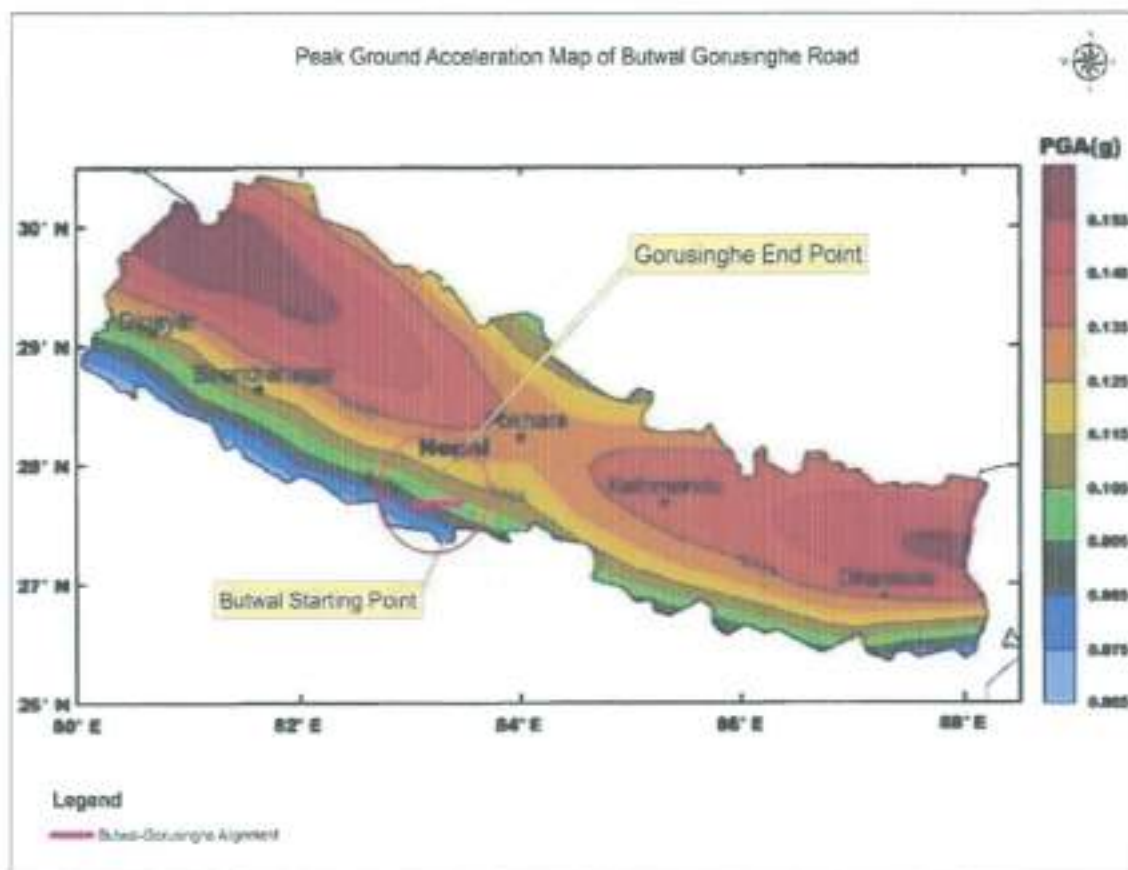


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Initial Environmental Examination (IEE) for Upgrading Goringhe-Chandrauta (19.2 Km) Road and Associated Bridges

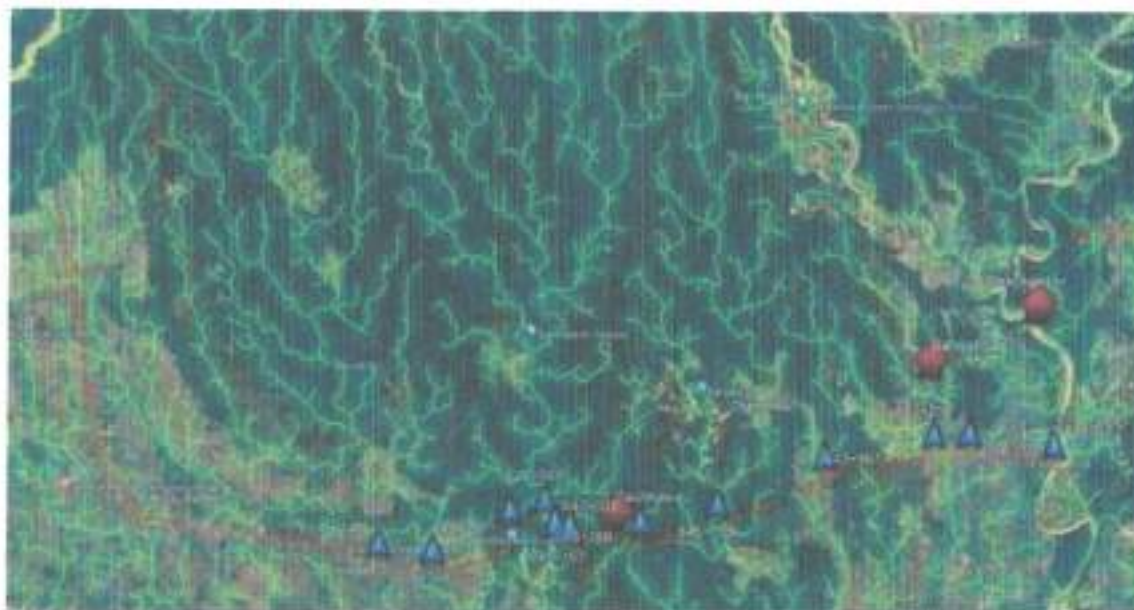


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Source: Design Report of the Project, 2025

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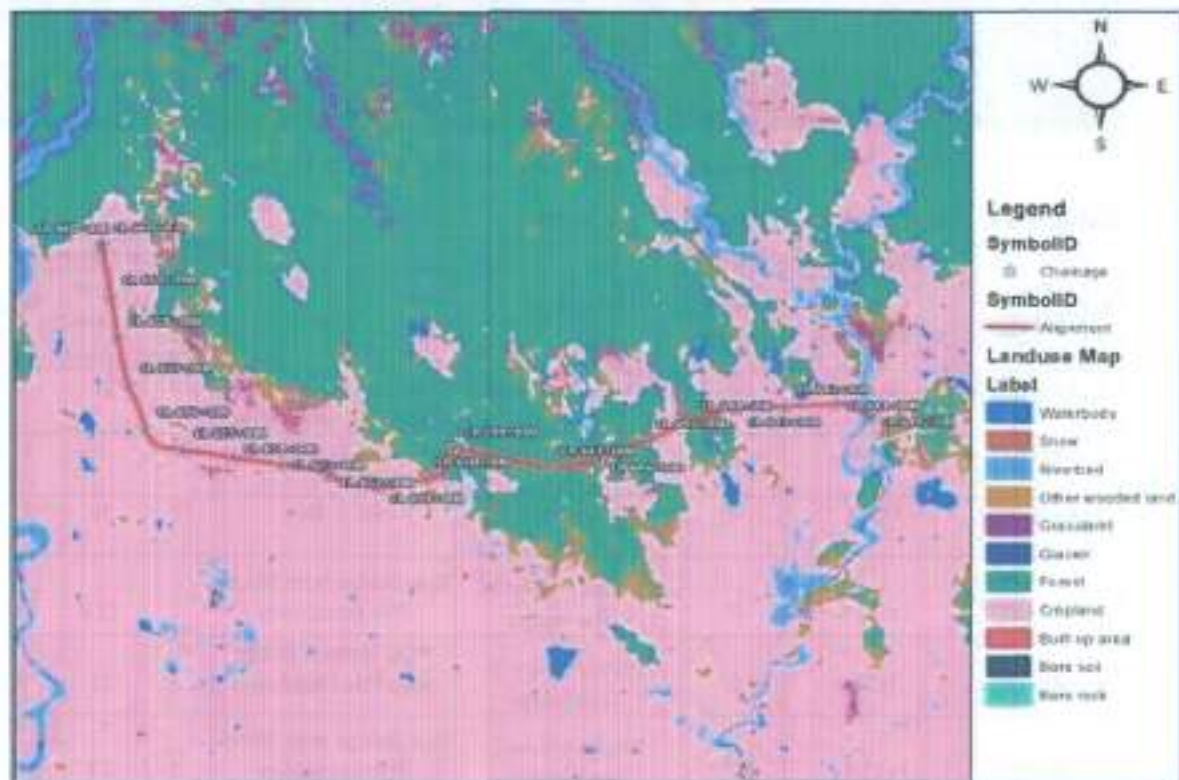


Figure 3-12: Land use pattern of project area

There will be no need to acquire new land for upgrading the road as it already has its 50 m RoW. The land use is predominantly agricultural and rural except at forest area. There is mixed land use pattern along the both side of road. Most of the land around the existing road is barren land. Proposed formation will extend to 24 m at rural and forest area similarly will occupy entire RoW especially at urban areas with dense settlements at Imiliya and Chandrauta section. The details of land use pattern in the project site are presented in *Table 3.20*



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

Table 3.20: Chainage length (m) land use pattern

LHS			Average Length (m)	RHS			Average Length
Chainage		Dominant Land Use		Chainage		Dominant Land Use	
From	To			From	To		
640+200	640+290	River	90	640+200	640+290	River	900
640+290	640+400	Barren land	110	640+290	640+440	Barren land	150
640+400	640+500	Settlement	100	640+440	640+500	Agricultural land	600
640+500	641+500	Barren land	1000	640+500	641+500	Barren land	1000
641+500	641+540	Agricultural land	40	641+500	642+000	Barren land	500
641+540	641+800	Barren land	260	642+000	642+200	Agricultural land	200
641+800	642+300	Agricultural land	500	642+200	642+930	Barren land	730
642+300	643+650	Barren land adjacent to forest	1350	642+930	643+200	Barren land djacent to forest	270
643+650	643+900	Forest Area	250	643+200	643+740	Forest Area	540
643+900	644+510	Agricultural land	610	643+740	644+300	Agricultural land	200
644+510	645+000	Forest Area	490	644+300	644+500	Barren land	200
645+000	645+210	Barren land adjacent to forest	210	644+500	644+700	Forest Area	200
645+210	645+400	Forest Area	190	644+700	645+400	Barren land adjacent to forest	900
645+400	645+660	Barren land adjacent to forest	260	645+400	645+860	Forest Area	460
645+660	645+800	Forest Area	140	645+860	648+520	Barren land adjacent to forest	2660
645+800	645+900	Barren land adjacent to forest	100	648+520	648+600	River	800
645+900	647+760	Forest Area	1860	648+600	649+080	Barren land adjacent to forest	480
647+760	648+050	Barren land adjacent to forest	290	649+080	649+260	Forest Area	180
648+050	648+520	Forest Area	470	649+260	649+330	Barren land	700
648+520	648+600	River	80	649+330	649+800	Forest Area	470
648+600	649+100	Forest Area	500	649+800	650+000	Barren land	200
649+100	650+000	Barrenland adjacent to forest	900	650+000	650+440	Vegetation	440
650+000	650+100	Barren land	100	650+440	651+100	Agricultural land	660
650+100	650+440	Vegetation	340	651+100	652+300	Barren land	120
650+440	651+100	Agricultural land	660	652+300	652+500	Agricultural land	200
651+100	651+600	Barren land	500	652+500	653+600	Barren land	1100
651+600	652+040	Agricultural land	440	653+600	654+800	Barren adjacent to settlement	1200
652+040	652+150	Vegetation	110	654+800	654+940	Vegetation	140
652+150	652+200	Barren land	50	654+940	658+000	Agricultural land	3060
652+200	652+330	Vegetation	130	658+000	659+300	Barren adjacen to settlement	1300
652+330	652+840	Barren land	510	659+300	659+570	Agricultural land	270
652+840	652+910	Agricultural land	70	659+570	660+000	Barren land	430



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

LHS			Average	RHS			Average
Chainage		Dominant Land Use	Length (m)	Chainage		Dominant Land Use	Length
From	To			From	To		
						Adjacent to settlement	
652+910	653+200	Barren land with sparse vegetation	290	660+000	660+038	Agricultural land	38
653+200	654+800	Barren land adjacent to settlement	160	Source: Field Survey, 2024 and Google Map, 2021			
654+800	654+940	Vegetation	140				
654+940	655+700	Barren land	760				
655+700	655+900	Vegetation	200				
655+900	655+970	Agricultural land	70				
655+970	656+160	Barren land	190				
656+160	656+240	Pond (Water Body)	80				
656+240	656+400	Agricultural land	160				
656+400	656+500	Settlement	100				
656+500	658+600	Agricultural land	210				
658+600	658+700	Settlement	100				
658+700	659+270	Agricultural land	570				
659+270	659+340	Barren land	70				
659+340	659+830	Agricultural land	490				
659+830	659+940	Settlement	110				
659+940	660+038	Agricultural land	98				

The dominant existing land use along the northern and southern sides of the Right of Way (RoW) of the highway has been summarized based on the linear distribution of land within the corridor. On average, the existing road and associated structures occupy approximately 15 meters (7.5 meters on each side) of the RoW. The remaining 35 meters, out of the total 50-meter RoW, have not been utilized to date and will be used for the proposed road upgrading. This expansion will require new land acquisition, which may place additional pressure particularly on forested and semi-urban areas, where land use changes have so far been minimal. The anticipated land use changes within the RoW for the road expansion are summarized below:

Table 3.21: Land cover of the RoW except existing use

Land use	Area in ha	% of land cover
Forest	27.10925	40.60
Agricultural land	16.03175	24.01
Barren land	15.20050	22.77
Settlement	7.46375	11.18
Water Body	0.96075	1.44
Total	66.76600	100

Source: Field Survey, 2024 and Google Map, 2021



6. Climate

The proposed project area lies in Terai region with tropical climate zone. Due to major difference in maximum and minimum temperature, summer is very hot whereas winter is foggy and colder. Based on the climatic data from World Weather Atlas, average daily temperature ranges from 11.8°C (53.2°F) to 39.8°C (103.6°F) with the lowest temperatures occurring in January and peak temperatures in May in Kapilvastu district. Similarly, humidity varies from 25% in April to 68% in July and August. Average daily rainfall ranges from a paltry 1 mm (0.04") in November to a considerable 248 mm (9.76") in July. In the similar manner, about 80% of the total rainfall occurs in rainy season having average annual rain fall of 1699.6 mm. January proves to be the driest month with just 2.8 days of rainfall, while July has the maximum hazard of rain with 23.8 days.

A. Temperature and Rainfall of Project Area

Temperature and rainfall data of Kapilbastu (Taulihawa Station) was collected from Department of Hydrology and Meteorology (DHM). Based on the available data, the average maximum and minimum temperature of the Taulihawa station was measured to be 30.93°C and 18.79°C, respectively. The average annual rainfall in Kapilvastu District is 1,622 mm (*Table 3.22*).

Table 3.22: Annual rainfall and temperature of the project area

Station Name	Station No.	Rainfalls (mm)		Temperature (°C)	
		Annual	Monsoon	Average Min Temperature (°C)	Average Max Temperature (°C)
Taulihawa	0716	1,622	1,411	18.79	30.93

Source: Department of Hydrology and Meteorology, 2024

7. Landslides and Slope InStability

The proposed road section lies in flat terrain from Imiliya to Chandrauta where no issue of slope stability exists. However, embankment erosion has been occurred due to flood in the river and streams. The Bargadawa river basin is the largest one in the project alignment where frequent flash floods occur as the catchment response to high intensity and short duration precipitation is swift, leading to flooding and water-logging downstream.

8. Air Quality

Baseline Air Quality of the project area is given in Table 3.23 and the Lab analysis report for air quality is given in Annex II. It is noticed that all the monitored parameters were within National Air Quality Standard (NAQS), Ministry of Forests and Environment, 2012.

Table 3.23: Baseline Air Quality (24-hour averaging time)

S.N.	Parameters	Unit	Observed Value			Tolerance Limit (National Air Quality Standard, Ministry of Forests and Environment, 2012) ($\mu\text{g}/\text{m}^3$)	Remarks
			M1	M2	M3		
1.	TSP	($\mu\text{g}/\text{m}^3$)	110	75	85	230	Exceeding the limit
2.	PM10	($\mu\text{g}/\text{m}^3$)	70	55	65	120	Exceeding the limit
3.	PM2.5	($\mu\text{g}/\text{m}^3$)	25	15	20	40	Exceeding the limit
4.	SO ₂	($\mu\text{g}/\text{m}^3$)	N.D.	N.D.	N.D.	70	Within the limit
5.	NO ₂	($\mu\text{g}/\text{m}^3$)	N.D.	N.D.	N.D.	80	Within the limit

Field survey: Laboratory report, 2024

Note: N.D.: Not Detected, Where: M1- Imiliya, M2- Jwai Khola, M3 – Chandrauta

Table 3-23 represents 24 hours air quality monitoring data. The main source of air pollution within project area is vehicular emissions, construction activities, industrial pollution, loading and unloading of sand from riverbeds. During construction phase, dust level is expected to be high due to construction activities, transportation of construction material, loading and unloading of construction material, excavation of soil and movement of vehicles & equipment.

9. Noise Quality

Noise Level of the project area as measured in three different locations viz Imaliya settlement, Jawai khola and Chandrauta settlement along the road and presented in **Table 3.24** below. It is noticed that both sound level as well as equivalent noise level at are higher at Chandrauta chowk than in other places. The maximum noise level is in Chandrauta and minimum is in Jaawai river. It is found that all the three different locations have not exceeded National Standard for Noise Level 2069 for urban residential area and was within the range of commercial area. Measured noise level in other places was within urban residential area. Some sensitive receptors like school, health center exists along the road similarly the road alignment passes close to three major settlements namely, Imaliya, Chandrauta here sound level is within national standard. Peak noise is recorded when vehicles (mainly trucks and buses) blow pressure horn and the impact is high at night when background noise is low.



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

Table 3.24: Noise Level within Project Area

SN	Name of area	Imiliya	Jawai River	Chandrauta
1.	GPS	N27°39.593' E082°59.607'	N27°38.900' E082°54.609'	N27°38.959' E082°51.859'
2.	Start time	2024-11-24; 10:30	2024-11-24; 10:30	2024-11-25; 10:30
3.	End time	2024-11-25; 10:30	2024-11-25; 10:30	2024-11-26; 10:30
Noise level dB(A)				
4.	Maximum	72	55	75
5.	Minimum	43	35	45
Equivalent Noise dB(A)				
6.	$L_{eq(day)}$	66	52	70
7.	$L_{eq(night)}$	53	40	55

Source: Field Measurement and Lab Analysis, 2024

Table 3.25: National Ambient Sound Quality Standard, 2012 and WB-EHS Standard 2007

S.N.	Area/Zone	NASQS limit (dBA)		WB-EHS limit (dBA)	
		Day	Night	Day	Night
1	Commercial	75	70	70	70
2	Residential	65	55	55	45

Movement of heavy vehicles and use of machineries/equipment and construction activities during construction phase will increase noise level in the project area.

10. Water Quality

Surface water quality of the three rivers where major bridge construction has to be done were monitored and result of surface water quality is presented in Table 3.27. The different parameters like pH, Temperature, TDS, Electrical conductivity, COD, DO, TSS were measured. All water quality parameters were compared with the national drinking water quality standard for industrial release and found that none of the parameters exceeded the permissible standard value of potable water. The Lab analysis result for water quality is presented in Annex II.

Table 3.26: Water Quality of surface water body along the Project Area

S. N.	Category	Parameters	Method	NWQS (MOE 2010)	Belgardawa river	Bel River	Jawai River
1.		pH	450 0 H.B	5.5-9.0	8.0	7.6	7.5



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

	Physical		APHA 23 rd edition				
2.		Temp. °C	Thermometric	-	300	21.7	21.6
3.		TDS (mg/L)	2540 C. APHA 23 rd edition		162	286	395
4.		Electrical Conductivity (µS/cm)	2540 C. APHA 23 rd edition		1.49	528	730
5.	Chemical	Total Suspended Solids, TSS (mg/L)	Filtration	50	0.041	25	18
6.		Chemical Oxygen Demand (mg/L)	Dichromate method	250	38.68	65	75
7.		Dissolved Oxygen (mg/L)	Iodometric method		107.52	7.88	7.82

Source: Field Measurement and Lab Analysis, 2024

11. Soil Quality

Baseline data on soil quality of the near from the bridges and agricultural lands is given in *Table 3.27* Lab analysis report of these soil samples is given in **Annex II**.

Table 3.27: Soil Quality within Project Area

S.N.	Soil Test	Method	Near Belgardawa	Near Bel	Near Jwai Khola
1.	pH	Electrometric	8.3	8.0	7.2
2.	EC (µs/cm)	Electrometric	89	300	118
3.	TDS (ppm)	Electrometric	49	162	64



Initial Environmental Examination (IEE) for widening Gorusinghe-Chandrauta (19.2 Km) Road and Associated Bridges

4.	SOM (%)	Walkly and Black	1.72	1.49	1.31
5.	Nitrogen (%)	Kjeldhal	0.073	0.041	0.035
6.	Phosphorus (Kg/Ha.)	Modified Olsen's	31.79	38.68	33.68
7.	Potassium (Kg/Ha.)	Ammonium Acetate	161.88	107.52	134.40

Source: Field Measurement and Lab Analysis, 2024

For the proposed project, different associated/ancillary facilities are required like contractor and labor camps, construction yards, stockpiling yards, quarry and borrow pit sites, crusher plant sites, hot mix plants, batching plants etc. Haphazard disposal of wastes (both solid and liquid), leakage of oil and grease from construction vehicles, machineries and equipment, inappropriate storage and handling of chemicals etc. can contaminate soil, surface water and ground water during construction phase.



12. Existing and Predicted Traffic Volume

As per Detailed Design Report 2025, traffic data was collected for regular seven days at two locations (via Imiliya and Chandrauta) along the road sections. The representative Average Daily Traffic (ADT), expressed as numbers of vehicles are given below **Table 3.28**:

Table 3.28: Traffic Count Result (ADT)

Vehicle Type	UP Direction		DN Direction	
	At Imiliya	At Chandrauta	At Imiliya	At Chandrauta
Car	1,628	629	1,646	630
Utility vehicle (Pickups, 4WD)	895	242	894	197
Minibus, Matatu	450	309	466	315
Medium bus or coaster	483	237	437	205
Large Bus, coach	606	230	546	304
Light Truck (Dynas, etc)	69	72	606	230
Heavy truck (Fuso 10- tyre, etc)	305	334	268	348
Multi Axle	259	585	271	617
Motor Cycles	7,983	2,541	8,140	2,782
Tractor-Trailer	145	122	128	154
Total	12822	5301	13403	5782

Source: Detailed Design Report, 2025

On the basis of this data, past trend, and seasonal variation factor the design has estimated Annual Average Daily Traffic (AADT) at two locations of road sections. Estimated AADT for base year (i.e. 2024) is given in **Table 3.29**.

Table 3.29: Traffic Estimation for Base Year

Vehicle Type	UP Direction		DN Direction	
	Imiliya	Chandrauta	Imiliya	Chandrauta
Car	1,514	585	1,531	586
Utility vehicle (Pickups, 4WD)	832	225	831	183
Minibus, Matatu	419	287	433	293
Medium bus or coaster	449	220	406	191
Large Bus, coach	564	214	508	283
Light Truck (Dynas, etc)	64	67	564	214
Heavy truck (Fuso 10-tyre, etc)	284	311	249	324
Multi Axle	241	544	252	574
Motor Cycles	7,424	2,363	7,570	2,587



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

Vehicle Type	UP Direction		DN Direction	
	Imiliya	Chandrauta	Imiliya	Chandrauta
Tractor-Trailer	135	113	119	143
Total	11925	4930	12464	5377

Source: Detailed Design Report, 2025

Traffic forecast for different section of the GC road was made focusing potential traffic congestion junction specially in Imiliya and Chandrauta chwok. Projection of catogerical traffic volume for next twenty year including consecutive five year starting with 2024 were made and presented in 3.30

Table 3.30: Traffic flow projection at Major junctions

At Imiliya					
Vehicle Type	2024	2029	2034	2039	2044
Car	1,514	5,308	8,070	11,791	16,443
Utility vehicle (Pickups, 4WD)	832	2,194	2,701	3,261	3,846
Minibus, matatu	419	1,185	1,538	1,944	2,386
Medium bus or coaster	449	1,271	1,650	2,085	2,559
Large Bus, coach	563	1,594	2,070	2,617	3,211
Light Truck (Dynos etc)	64	168	207	250	295
Medium Truck (Lorries, etc)	284	748	920	1,111	1,310
Heavy truck (Fuso 10-tyre, etc)	241	636	783	945	1,115
Truck Trailer and Semi Trailer	7,424	19,575	24,092	29,087	34,312
Motor Cycles	135	238	317	409	512
Bicycles	0	0	0	0	0
Total Vehicles	11925	32,917	42,347	44,437	46,641
Total PCUs	30,070	81,246	1,02,233	1,06,797	1,11,577
At Chandrauta					
Vehicle Type	2024	2029	2034	2039	2044
Car	585	2,075	3,154	4,609	6,428
Utility vehicle (Pickups, 4WD)	225	597	734	887	1,046
Minibus, matatu	287	819	1,063	1,344	1,649
Medium bus or coaster	220	628	815	1,031	1,265
Large Bus, coach	214	610	791	1,000	1,228
Light Truck (Dynos, etc)	67	178	219	264	311
Medium Truck (Lorries, etc)	311	824	1,014	1,224	1,444
Heavy truck (Fuso 10-tyre, etc)	544	1,443	1,775	2,143	2,528
Truck Trailer and Semi-Trailer	2,363	6,266	7,711	9,310	10,983
Motor Cycles	113	201	267	345	431
Bicycles	0	0	0	0	0
Total Vehicles	4,930	6,668	8,587	12,304	12,952
Total PCUs	12,555	16,933	21,735	31,040	32,545

Source: Detailed Design Report, 2025



13. Green House Gas (GHG) Emission Analysis for GC Road

Road construction contributes to greenhouse gas (GHG) emissions through various activities, including site clearing, subgrade preparation, material production, transportation, construction, supervision, and maintenance. Recognizing the impact of these emissions, particularly those embodied in key materials like asphalt, concrete, and steel, state transportation agencies are exploring strategies to reduce the life cycle GHG emissions of highway infrastructure. These efforts aim to address the significant upstream emissions associated with material production and mitigate the challenges posed by global climate change.

Research has suggested that the life-cycle GHG emissions associated with building roads can account for 10–20% of the emissions associated with the lifetime usage of the road by vehicles (Chester and Horvath, 2009, Noland and Hanson, 2015).

The GHG emission calculation from construction phase was 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. The emission factors used from "Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects: Additional guidance for transport projects". CO₂ quantities calculated refers to the embodied carbon in construction materials. The emission factors and quantities of Kg CO₂ equivalent obtained indicate that Cement and Steel have more carbon embodied among construction materials. This also indicates a greater number of structure occurrence in the proposed road project. The estimation of GHG due to construction material is given in *Table 3.31*.

Table 3.31: Estimation of GHG Emission by Construction Material Requirement

Material	Unit	Quantity required	Unit conversion	Kg CO ₂ equivalent	Emission factor
Soil	Cum	942,820.18	1,697,076,321.71	3,394,152.64	0.002 kg CO ₂ per kg
Steel	MT	3,181.79	3,181,794.22	4,645,419.56	1.460 kg CO ₂ per kg
Aggregate	Cum	548,477.77	1,426,042,196.71	5,704,168.79	0.004 kg CO ₂ per kg
Bitumen	Ton	5,445.93	5,445,926.18	359,431.13	0.066 kg CO ₂ per kg
Cement	Ton	40,063.26	40,063,261.76	30,528,205.46	0.762 kg CO ₂ per kg
Sand	Cum	34,163.04	61,493,479.24	122,986.96	0.002 kg CO ₂ per kg
Total				44,754,364.54 Or 44,754 Tons	

Source: Detailed Design Report, 2025 and Calculations from ADB Guidelines



As a whole, roadway construction only makes up a small part of the energy use of a roadway throughout its lifetime than roadway traffic in operation phase. 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. Estimation of the same for proposed GC road construction is given in 3.32:

Table 3. 32: Fuel Requirement for Construction Activities and related GHG Emission

S. No.	Description	Fuel Quantity (Liters- Diesel)	GHG Emission* (Tons CO ₂)
1	Site Clearance	278.67	0.835
2	Earthwork	19,247.02	48.776
3	Sub base Course & base Course	13,977.33	35.422
4	Bituminous Course	23,645.31	59.922
5	Culverts	7,017.01	17.782
6	Bridges & Underpasses	9,528.31	24.147
7	Drainage & protection Works	6,374.97	16.155
8	Reinforced Earth Wall & Retaining Wall	9,084.45	23.022
9	Traffic safety Items	29,454.99	74.645
10	Toll Plaza & Misc. Items	507.08	1.285
11	Rest Area	2,224.88	5.638
12	Extra for miscellaneous items	12,139.07	30.764
	Total	133,479.10	338.39

*Emission Factor for Diesel fuel considered as per below

Source: Detailed Design Report, 2025 and Calculations from ADB Guidelines

14. GHG Emission due to Tree Felling and Carbon saving due to Tree Plantation

A tree has the ability to provide an essential of life for all living things on our planet – oxygen, and the power to remove harmful gases like carbon dioxide making the air we breathe healthier. When you look at a tree, note that about five percent of the tree is comprised of its leaves, 15 percent its stems, 60 percent goes into its trunk and 20 percent is devoted to its roots.

Through the photosynthesis process, leaves pull in carbon dioxide and water and use the energy of the sun to convert this into chemical compounds such as sugars that feed the tree. But as a by-product of that chemical reaction oxygen is produced and released by the tree. It is proposed that one large tree can provide a day's supply of oxygen for up to four people. As per American Lung Association an adult human requires about 378 Liters of pure oxygen per day. Hence, a tree can provide up to 1514 liters of Oxygen per day. The mass of 1 liter of oxygen at standard conditions of temperature and pressure is 1.43 gram. So, a tree can produce about 2.16 Kg oxygen per day.



Trees also store carbon dioxide in their fibers helping to clean the air and reduce the negative effects that CO₂ could have had on our environment. According to the "Arbor Day Foundation", in one year a mature tree will absorb more than 48 pounds of carbon dioxide from the atmosphere depending on a lot of factors (i.e. the tree's size, species, and the amount of sunlight it receives etc.). Hence, one tree can absorb approximately 25 kg of CO₂ per year.

From the above studies and facts, following measurements were observed;

Total number of Trees and poles to be cut in the proposed project: 9808

- Decrease in CO₂ absorption due to loss of Trees: $9808 \times 25 = 2,45,200$ Tons/year
- Decrease in Oxygen production due to Tree loss: $9808 \times 2.16 \times 365 = 77,32,627.2$ Tons/year

In lieu of xxxx number of trees to be felled 1:10 (ten trees planted against one tree felled as per GON requirement) number of trees are proposed to be planted. The loss of trees from RoW will be compensated as per rules of Government of Nepal

- Total CO₂ absorption due to plantation of Trees: $9,808 \times 25 \times 10 = 24,52,000$ Tons/year
- Total Oxygen production due to plantation of Trees: $98080 \times 2.16 \times 365 = 77,326,272$ Tons/year

15. GHG Emissions in Operation Phase of GC road Project

Greenhouse gasses (GHG) are generated from different sources. GHG emissions can be attributed to several areas such as transportation, residential, industrial and commercial sectors. It is stated in the same source that Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and Fluorinated gases are the major GHG emissions through human activities. Among those, CO₂ is the most widespread GHG components, and among all factors, the transportation sector is the largest emitter of CO₂.

In the transportation sector, factors that may affect the amount of GHG emissions include, but are not limited to, vehicle type and size, ambient temperature, traffic flow, fuel type, frequent deceleration and acceleration and vehicle speed. Pavement characteristics in term of pavement type and roughness could affect some of these factors. According to some studies, roads with lower IRI values have relatively higher mean speeds, resulting in less CO₂ emissions. This relationship was



detected for speeds lower than 50 mph. it is interesting to note, however, that for speeds higher than 50 mph, emissions increase with higher speeds.

In this report, the GHG Emission estimation was conducted using different variables i.e. Traffic data forecasting, Vehicle type, fuel used & efficiency, vehicle speeds, Road condition etc. The Emission factor considered from "IPCC Guidelines for National Greenhouse Gas Inventories". The emission factors should 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 NMVOC or as particulate matter. The default CO₂ emission factor is given in 3.33.

Table 3.33: Road Transport Default CO₂ Emission Factors

Fuel Type	Default	Lower	Upper
Motor Gasoline (kg/TJ)	69300	67500	73000
Gas/ Diesel Oil (kg/TJ)	74100	72600	74800

Source: IPCC Guidelines

The GHG emission estimation was done on the basis of Emission factors and Road Condition- Fuel efficiency estimation forecasting on "with" and "without project" scenarios.

Under "without project" scenario, the Road condition - Fuel efficiency will deteriorate in coming years along with increasing traffic. There would be periodic maintenance work, which is also considered in estimation.

Under "with project" scenario, the Road Condition-Fuel efficiency will be very good after construction period. Which in result, will be aiding in saving of carbon emission significantly. The periodic maintenance work is considered in this estimation as well.

It has been clear from the emission estimation study below that if the project is proceeded it would result in significant carbon saving with the period of time against "without project".

16. Solid Waste Management Scenario

It is recorded that among surveyed household, 84.2% of households produce solid waste of less than 25 kg per year and 12.2% of households produce solid waste in between 25 to 50 kg. 2.1% of household recorded waste quantity greater than 50 kg.

It is recorded that 54.1% of the household burn wastes. As per national guidelines burning of waste is strictly prohibited. Similarly, 6.3% of household bury solid wastes and 39.6% households manage wastes by other means.



17. Waste Water Management

It is noticed that among surveyed household, 30.1% of households discharge waste water and sewage on septic tank/soak pit, 24.4% discharge waste water and sewage on barren land and 20.6% household discharge waste water and sewage on upland.

18. Sources of Air Pollution

It is noticed that 72.8% of the respondent have mentioned vehicle smoke as major source of air pollution within the locality. Similarly, 18.2 % have mentioned dust blowing due to the gravel road as major source of air pollution, 7.6% respondent have mentioned burning of household waste and 1.4% replied it is smoke from factories that has been emitting as major source of air pollution.

19. Major Sources of Surface Water Pollution

There are limited sources of water pollution along the road. Some crusher plants, vehicle workshops are economic activities that supports to release water pollutant in the area. Apart from its sewerage and defecation practices has also been supporting the water pollution.

3.12.2. Biological Environment

1. General Ecosystem and Biodiversity

The forests growing on both sides of the road along the alignment are primarily tropical, with *Shorea robusta* (Sal) forests being predominant, and patches of *Dalbergia* and *Senegalia* forests found along the riversides. Species such as *Terminalia alata*, *Lagerstroemia parviflora*, *Phyllanthus emblica*, *Pterocarpus marsupium* are the major associate species of the Sal Forest type. Major species in the *Dalbergia*/*Acacia* forests are *Dalbergia sissoo*, *Senegalia catechu* and *Bombax ceiba*. Both native and introduced tree species were found growing along both sides of the road. Native species were mainly found in natural forests where as local people have planted exotic species in their home-stead for different purposes.

2. Distribution and Ownership of Forests

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. It aims to manage large Terai forests for multiple benefits, enhance forest governance by involving distant households, and improve livelihoods through income-generating activities. There are very few trees in the farm land and rest of the privateland.

3. Flora (Trees, Shrubs and Herbs in the project area)

a. Trees

The Project area lies along the tropical region of western Terai. Sal is the dominant tree species in the project area with associated other tropical tree species. The detail of tree species found in the project site are listed in the table 3.34.

Table 3.34: List of Major Tree Species within Project Area

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Sal	<i>Shorea robusta</i>	LC	-	Non-Protected
2.	Asana/Saj	<i>Terminalia alata</i>	LC	-	Non-protected
3.	Simal	<i>Bombax ceiba</i>	LC	-	Non-protected
4.	Khayar	<i>Acacia catechu</i>	LC	-	Non-protected
5.	Sisoo	<i>Dalbergia Sisoo</i>	LC	-	Non-protected
6.	Sindure	<i>Mallotus philipensis</i>	LC	-	Non-protected
7.	Bot Dhayero	<i>Lagerstroemia parviflora</i>	LC	-	Non-protected
8.	Karma	<i>Haldina cordifolia</i>	LC	-	Non-protected
9.	Kusum	<i>Schleichera oleosa</i>	LC	-	Non-protected
10	Jamun	<i>Syzygium cumini</i>	LC	-	Non-protected
11	Mauwa	<i>Engelhardia spicata</i>	LC	-	Non-protected
12	Kutmero	<i>Litsea monopetala</i>	LC	-	Non-protected
13	Bhalayo	<i>Semecarpus anacardium</i>	LC	-	Non-protected
14	Peepal	<i>Ficus religiosa</i>	LC	-	Non-protected
15	Bar	<i>Ficus benghalensis</i>	LC	-	Non-protected

Note: LC – Least Concern, NT – Near Threat, EN – Endangered, VU – Vulnerable, DD – Data Deficit

Source: Field Survey/ Consultation, 2024

b Shrubs

Major shrub species found in the proposed project area are listed in the table 3.36 including their IUCN, CITES and GoN protection status.



Table 3.35: Shrub species found in the project site

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Dhairo	<i>Woodwardia fruticosa</i>	LC	-	Non-protected
2.	Kera	<i>Musa paradisiac</i>	LC	-	Non-protected
3.	Aasuro	<i>Adhatoda vasica</i>	LC	-	Non-protected
4.	Tite Pati	<i>Artemissia vulgaris</i>	LC	-	Non-protected
5.	Nagbeli	<i>Lycopodium clavatum</i>	LC	-	Non-protected
6.	Kurilo	<i>Asparagus racemosus</i>	LC	-	Non-protected
7.	Karbir	<i>Nerium oleander</i>	LC	-	Non-protected
8.	Jhadibanmara	<i>Lantana camara</i>	LC	-	Non-protected
9.	Jhingani	<i>Eurya acuminata</i>	LC	-	Non-protected
10.	Bansuli	<i>Dichroa febrifuga</i>	LC	-	Non-protected
11.	Rudhilo	<i>Pogostemon benghalensis</i>	LC	-	Non-protected

Note: LC – Least Concern, NT – Near Threat, EN – Endangered, VU – Vulnerable, DD – Data Deficit (Source: Field Survey/ Consultation, 2022)

a. Herb or Ground Vegetation

Major herb or ground vegetation in the proposed project area detailed in Table 3.36.

Table 3.36: Major herbs species found around the project vicinity

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Banmara	<i>Eupatorium adenophorum</i>	LC	-	Non-protected
2.	Bukiphool	<i>Osbeckia nepalensi</i>	LC	-	Non-protected
3.	Datiwan	<i>Achyranthes aspera</i>	LC	-	Non-protected
4.	Tulsi	<i>Ocimum sanctum (L.)</i>	LC	-	Non-protected
5.	Gandhe	<i>Ageratum conyzoides</i>	LC	-	Non-protected
6.	Kuro	<i>Bidens pilosa</i>	LC	-	Non-Protected
7.	Lajwar	<i>Mimosa pudica (L.)</i>			
8.	Gurjo	<i>Tinospora sinensis</i>			
9.	Cogongrass	<i>Imperata cylindrica</i>	LC	-	Non-protected
10.	Bermuda Grass	<i>Cynodon dactylon</i>	LC	-	Non-protected



Note: LC – Least Concern, NT – Near Threat, EN – Endangered, VU – Vulnerable, DD – Data Deficit
Source: Field Survey/ Consultation 2022

4. Quadrat Analysis of Vegetation Along the Road Alignment

Out of the trees found in adjacent to the RoW of the highway, Sal, shajh, botdhairo are the most dominant species. The importance value index of Sal is highest indicating most valued tree species in the area as presented in table 3.37.

Table 3.37: Species wise importance value index (IVI)

Local Name of Species	Scientific Name	Density (trees/ha)	R-Density (%)	Frequency	R. Frequency	Abundance	R- Abundance	IVI
Sal	<i>Shorea robusta</i>	196	39.35	70.59	10.62	11.08	23.17	73.14
Shajh	<i>Terminalia alata</i>	71	14.20	82.35	12.39	3.43	7.17	33.76
Botdhairo	<i>Lagerstroemia parviflora</i>	43	8.58	58.82	8.85	2.90	6.06	23.49
Pyari	<i>Ficus glaberrima</i>	25	5.03	52.94	7.96	1.89	3.95	16.94
Sindure	<i>Mallotus philippensis</i>	25	5.03	35.29	5.31	2.83	5.92	16.26
Jamuna	<i>Syzygium cumini</i>	18	3.55	35.29	5.31	2.00	4.18	13.04
Mauwa	<i>Madhuca longifolia</i>	18	3.55	35.29	5.31	2.00	4.18	13.04
Khayar	<i>Acaciacatechu</i>	16	3.25	23.53	3.54	2.75	5.75	12.54
Banjhi	<i>Anogeissus latifolia</i>	15	2.96	41.18	6.19	1.43	2.99	12.14
Genger	<i>Dillenia pentagyna</i>	15	2.96	41.18	6.19	1.43	2.99	12.14
Kusum	<i>Schleichera oleosa</i>	10	2.07	23.53	3.54	1.75	3.66	9.27
Karam	<i>Haldina cordifolia</i>	9	1.78	35.29	5.31	1.00	2.09	9.18
Bhalayo	<i>Semecarpus anacardium</i>	7	1.48	17.65	2.65	1.67	3.48	7.62
Sisoo	<i>Dalbergia sissoo</i>	7	1.48	17.65	2.65	1.67	3.48	7.62
Bel	<i>Aegle marmelos (L.)</i>	4	0.89	17.65	2.65	1.00	2.09	5.63
Chipple/Bakla pate	<i>Cinnamomum tamala</i>	3	0.59	11.76	1.77	1.00	2.09	4.45
Kutmiro	<i>Litsea monopetala</i>	3	0.59	11.76	1.77	1.00	2.09	4.45
Rajbrikshya	<i>Cassia fistula</i>	3	0.59	11.76	1.77	1.00	2.09	4.45
Sajan	<i>Moringa oleifera</i>	3	0.59	11.76	1.77	1.00	2.09	4.45
Amala	<i>Phyllanthus emblica</i>	1	0.30	5.88	0.88	1.00	2.09	3.27
Bar	<i>Ficus benghalensis</i>	1	0.30	5.88	0.88	1.00	2.09	3.27
Gindari	<i>Premna integrifolia</i>	1	0.30	5.88	0.88	1.00	2.09	3.27
Patpate	<i>Macaranga pustulata</i>	1	0.30	5.88	0.88	1.00	2.09	3.27
Pipal	<i>Ficus religiosa</i>	1	0.30	5.88	0.88	1.00	2.09	3.27

Source: Field survey, 2024



5. Fauna found in the Project Area

Further, as per field observation and consultations, major wildlife found within the project area are listed in Tables

a. Mammals

A total of 14 mammal species were recorded at the project site. The Common Leopard is classified as a Vulnerable species and Terai Grey Langur is Near Threatened species, while the remaining species fall under the Least Concern category in the IUCN Red List. The detailed list of mammal species observed in the project area is provided in Table 3.38.

Table 3.38: List of mammalian species in project area

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Common Leopard	<i>Panthera pardus</i>	Vulnerable	Appendix I	Non-protected
2.	Blue Bull	<i>Boselaphus tragocamelus</i>	Least Concern (LC)	-	Non-protected
3.	Spotted Deer	<i>Axis axis</i>	LC	-	Non-protected
4.	Golden Jackal	<i>Canis aureus</i>	LC	-	Non-protected
5.	Jungle Cat	<i>Felis chaus</i>	LC	-	Non-protected
6.	Wild Boar	<i>Sus scrofa</i>	LC	-	Non-protected
7.	Yellow-throated Marten	<i>Martes flavigula</i>	LC	-	Non-protected
8.	Rhesus Macaque	<i>Macaca mulatta</i>	LC	-	Non-protected
9.	Terai Grey Langur	<i>Semnopithecus hector</i>	Near Threatened	-	Non-protected
10.	Northern Pal Squirrel	<i>Funambulus pennantii</i>	LC	-	Non-protected
11.	Indian Crested Porcupine	<i>Hystrix indica</i>	LC	-	Non-protected
12.	Gray Mongoose	<i>Herpestes edwardsii</i>	LC	-	Non-protected
13.	Barking Deer	<i>Muntiacus muntjak</i>	LC	-	Non-protected
14.	Indian Flying Fox	<i>Pteropus giganteus</i>	LC	-	Non-protected

Source: Field survey, 2024



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

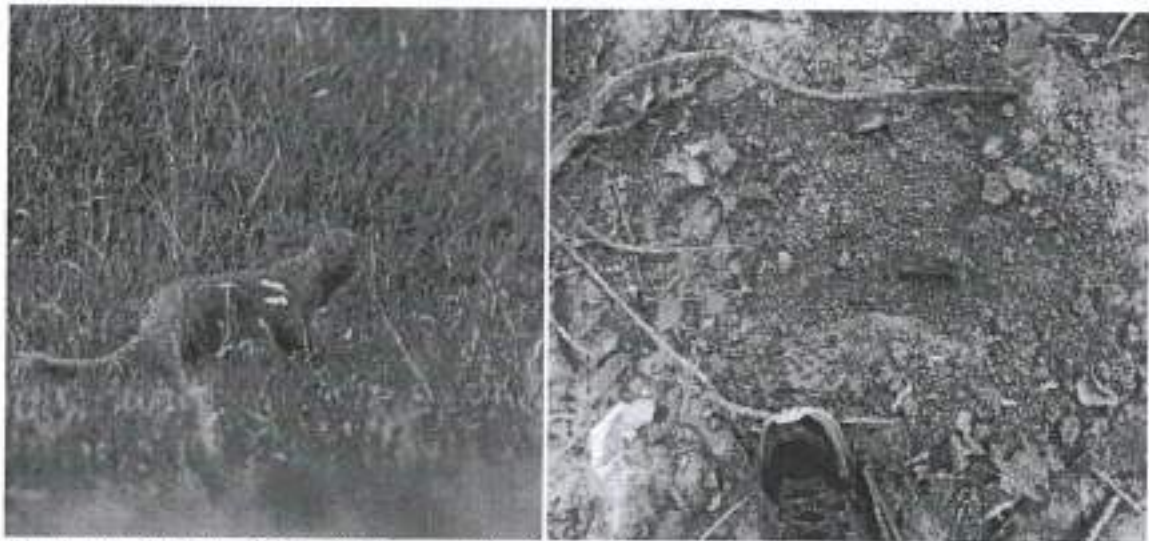


Figure 3-13: Photo during field survey First Gray Mongoose and second digging sign of wild boar

Avifauna

A total of 62 bird species were recorded within the project site. Among these, three globally threatened species-White-rumped Vulture, Slender-billed Vulture, and Egyptian Vulture were observed. Notably, nesting activity of the White-rumped Vulture was documented approximately 800 meters from the road's Right of Way. The majority of the recorded bird species are classified as Least Concern under the IUCN Red List. No nesting activity was observed in the roadside trees. A detailed list of the bird species identified in the project area is provided in *Table 3.39*.

Table 3.39: Bird species found in the project area

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	White-rumped Vulture	<i>Gyps benghalensis</i>	Critically Endangered	Appendix II	Non-protected
2.	Slender-billed Vulture	<i>Gyps tenuirostris</i>	Critically Endangered	Appendix II	Non-protected
3.	Egyptian Vulture	<i>Neophron percnopterus</i>	Endangered	Appendix II	Non-protected
4.	Indian Gray Hornbill	<i>Ocyrceros birostris</i>	Least Concern	-	Non-protected
5.	Lesser Adjutant	<i>Leptoptilos javanicus</i>	Near Threatened	-	Non-protected
6.	Asian Openbill	<i>Anastomus oscitans</i>	Least Concern	-	Non-protected
7.	Common Myna	<i>Acridothores tristis</i>	Least Concern	-	Non-protected
8.	Little Cormorant	<i>Microcarbo niger</i>	Least Concern	-	Non-protected
9.	Red-napped Ibis	<i>Pseudibis papillosa</i>	Least Concern	-	Non-protected
10.	Brahminy Starling	<i>Sturnia pagodarum</i>	Least Concern	-	Non-protected
11.	Large Cuckooshrike	<i>Coracina maculata</i>	Least Concern	-	Non-protected

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
12.	Asian Koel	<i>Eudynamys scolopaceus</i>	Least Concern	-	Non-protected
13.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	Least Concern	-	Non-protected
14.	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Least Concern	-	Non-protected
15.	Blue-throated Barbet	<i>Magalaima asiatica</i>	Least Concern	-	Non-protected
16.	House Crow	<i>Corvus splendens</i>	Least Concern	-	Non-protected
17.	Jungle Crow	<i>Corvus macrorhynchos</i>	Least Concern	-	Non-protected
18.	Rock Pigeon	<i>Columba livia</i>	Least Concern	-	Non-protected
19.	House Sparrow	<i>Passer domesticus</i>	Least Concern	-	Non-protected
20.	Black Kite	<i>Milvus migrans</i>	Least Concern	Appendix II	Non-protected
21.	Shikra	<i>Accipiter badius</i>	Least Concern	Appendix II	Non-protected
22.	Spotted Dove	<i>Spilopelia chinensis</i>	Least Concern	-	Non-protected
23.	Gray-hooded Warbler	<i>Seicercus anthoschistos</i>	Least Concern	-	Non-protected
24.	Red-vented Bulbul	<i>Phycnonotus cafer</i>	Least Concern	-	Non-protected
25.	Red-whiskered Bulbul	<i>Phycnonotus jocosus</i>	Least Concern	-	Non-protected
26.	Himalayan Bulbul	<i>Phycnonotus leucogenys</i>	Least Concern	-	Non-protected
27.	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Least Concern	-	Non-protected
28.	Oriental Magpie Robin	<i>Copsychus saularis</i>	Least Concern	-	Non-protected
29.	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Least Concern	-	Non-protected
30.	Long-tailed Shrike	<i>Lanius schach</i>	Least Concern	-	Non-protected
31.	Plumbious Water Redstart	<i>Rhyacornis fuliginosus</i>	Least Concern	-	Non-protected
32.	Black Drongo	<i>Dicrurus macrocercus</i>	Least Concern	-	Non-protected
33.	White-bellied Drongo	<i>Dicrurus caeruleus</i>	Least Concern	-	Non-protected
34.	Hair-crested Drongo	<i>Dicrurus hottentottus</i>	Least Concern	-	Non-protected
35.	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	Least Concern	-	Non-protected
36.	Cattle Egret	<i>Bubulcus ibis</i>	Least Concern	-	Non-protected
37.	Paddyfield Pipit	<i>Anthus rufulus</i>	Least Concern	-	Non-protected
38.	Chestnut-headed Bee-Eater	<i>Merops leschenaulti</i>	Least Concern	-	Non-protected
39.	Green Bee-eater	<i>Merops orientalis</i>	Least Concern	-	Non-protected
40.	Brown Rock Chat	<i>Oenanthe fusca</i>	Least Concern	-	Non-protected
41.	Indian Roller	<i>Coracias benghalensis</i>	Least Concern	-	Non-protected
42.	Gray-throated Martin	<i>Riparia chinensis</i>	Least Concern	-	Non-protected
43.	Greater Coucal	<i>Centropus sinensis</i>	Least Concern	-	Non-protected
44.	Jungle Babbler	<i>Argya striata</i>	Least Concern	-	Non-protected



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S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
45.	Cinereous Tit	<i>Parus cinereus</i>	Least Concern	-	Non-protected
46.	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Least Concern	-	Non-protected
47.	Indian Golden Oriole	<i>Oriolus oriolus</i>	Least Concern	-	Non-protected
48.	Barn Swallow	<i>Hirundo rustica</i>	Least Concern	-	Non-protected
49.	Red-wattled Lapwing	<i>Vanellus indicus</i>	Least Concern	-	Non-protected
50.	Crimson Sunbird	<i>Aethopyga siparaja</i>	Least Concern	-	Non-protected
51.	Common Tailorbird	<i>Orthotomus sutorius</i>	Least Concern	-	Non-protected
52.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Least Concern	-	Non-protected
53.	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	Least Concern	-	Non-protected
54.	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Least Concern	-	Non-protected
55.	White-rumped Munia	<i>Lonchura striata</i>	Least Concern	-	Non-protected
56.	Himalayan Flameback	<i>Dinopium shorii</i>	Least Concern	-	Non-protected
57.	Black Francolin	<i>Francolinus francolinus</i>	Least Concern	-	Non-protected
58.	Common Hoopoe	<i>Upupa epops</i>	Least Concern	-	Non-protected
59.	White-throated Fantail	<i>Rhipidura albicollis</i>	Least Concern	-	Non-protected
60.	Grey-brested Prinia	<i>Prinia hodgsonii</i>	Least Concern	-	Non-protected
61.	Oriental White-eye	<i>Zosterops palpebrosus</i>	Least Concern	-	Non-protected
62.	Chestnut-bellied Nuthatch	<i>Sitta cinnamoventris</i>	Least Concern	-	Non-protected

Source: Field survey, 2024



Figure 3-14: Photo of White-rumped Vulture feeding carcass in roadside and Asian Openbill roosting in the roadside trees.

Eventhough, there were vultures feeding on carcass no vultures nest was observed along the RoW of the hghway.



Herpetofauna

Altogether, 12 species of herpetofauna recorded from the project area. Both species Burmese Python and Indian flapshell turtle are listed in the Vulnerable category in the IUCN Red List. Other species found in the project site are least concern according in the IUCN conservation status and not protected according to GoN. Detail of herpetofauna found in project site is summarized in table 3.40

Table 3.40: Herpetofauna found in the project site

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Common Rat Snake	<i>Ptyas mucosus</i>	Least Concern (LC)	-	Non-protected
2.	Buff-striped Keelback	<i>Amphiesma stolatum</i>	LC	-	Non-protected
3.	White Lipped Pit Viper	<i>Trimeresurus albolabris</i>	LC	-	Non-protected
1.	Burmese Python	<i>Python bivittatus</i>	Vulnerable	CITES Appendix II	Non-protected
2.	Banded Krait	<i>Bungarus fasciatus</i>	LC	-	Non-protected
6.	Bengal Monitor Lizard	<i>Varanus bengalensis</i>	LC	CITES Appendix I	Non-protected
7.	Common Garden Lizard	<i>Calotes versicolor</i>	LC	-	Non-protected
8.	House Gecko	<i>Hemidactylus spp</i>	-	-	Non-protected
9.	Asian Toad	<i>Hoplobatrachus rugulosus</i>	LC	-	Non-protected
10..	Jerdon's Bullfrog	<i>Hoplobatrachus crassus</i>	LC	-	Non-protected
1.	Skittering Frog	<i>Euphlyctis cyanophlyctis</i>	LC	-	Non-protected
12.	Indian flapshell Turtle	<i>Lissemys punctata</i>	Vulnerable	CITES Appendix I	Non-protected

Source: Field survey, 2024



Figure 3-15: Photo of Burmese Python and Jerdon's Bullfrog

Fish Species

All fish species recorded present in the water bodies of study are classified as least concern. Major fish species found in the project area are listed in the Table 3-40 including their IUCN, CITES and GON protection status.

Table 3.41: Fish species found in the project site

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Gotyla	<i>Garra gotyla</i>	Least Concern	-	Non-protected
2.	Asiatic Snakehead	<i>Channa gachua</i>	Least Concern	-	Non-protected
3.	Stinging Catfish	<i>Heteropneustes fossilis</i>	Least Concern	-	Non-protected
4.	Walking Catfish	<i>Clarias batrachus</i>	Least Concern	-	Non-protected
5.	Spotfin Swamp barb	<i>Puntius sophore</i>	Least Concern	-	Non-protected
6.	Barred Baril	<i>Barilius barila</i>	Least Concern	-	Non-protected
7.	One-stripe spiny Eel	<i>Macrogynathus aral</i>	Least Concern	-	Non-protected
8.	Swamp Barb	<i>Puntius chola</i>	Least Concern	-	Non-protected
9.	Chana Sps.				Non-protected

Source: Field survey, 2024

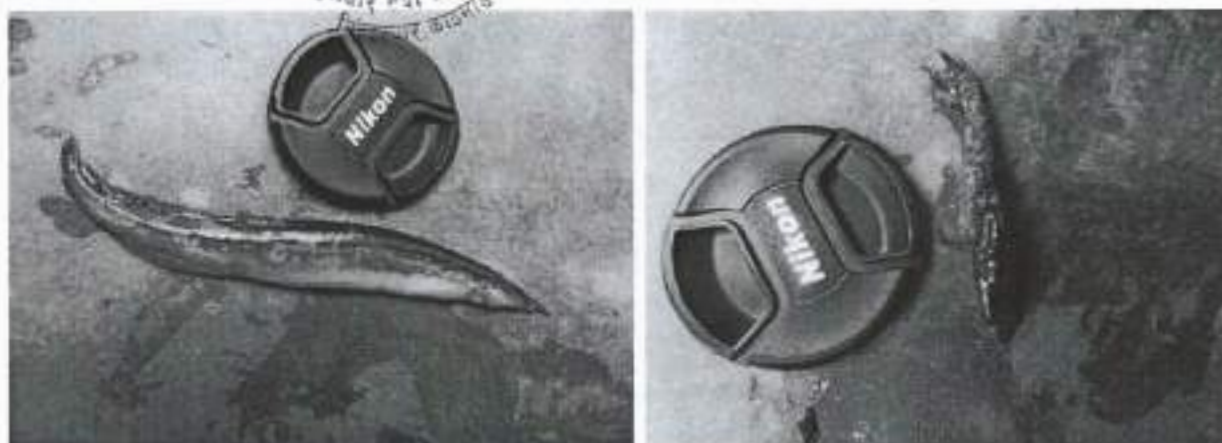


Figure 3-15a: Photo of One-stripe spiny eel and Chana Sps

6. Other Important Wildlife information

In 2021, a study identified a male and a female tiger in the Churia forest range spanning Kapilbastu, Rupandehi, and Palpa. The male was located in northern Kapilbastu, while the female was photographed at multiple sites in Rupandehi and along the Rupandehi-Palpa border. In February 2024, WWF Nepal reported three tigers captured on camera during an ecological survey in the central Terai Arc Landscape (TAL) in Kapilbastu. These tigers were recorded more than 10 kilometers away from the project area within the Churia range. The Fishing Cat and Four-horned Antelope, both listed as Vulnerable on the IUCN Red List, have been recorded in Kapilbastu district. However, they have not been observed within the project site, and the area is not suitable for either species.

Integrated Biodiversity Assessment Tool (IBAT) report was used to assess the proximity of the threatened wildlife within the 50 km radius of the project site. That confirms the presence of Near Threatened Striped Hyacna (*Hyaena hyaena*), Critically Endangered Red-headed Vulture (*Sarcogyps calvus*) and Slender-billed Vulture (*Gyps tenuirostris*), Endangered Steppe Eagle (*Aquila nipalensis*) and Vulnerable Great Slaty Woodpecker (*Mulleripicus pulverulentus*). Among reptiles Critically Endangered Elongated Tortoise (*Indotestudo longate*), Endangered Tricarinate Hill Turtle (*Melanochelys tricarinata*), Indian Eyed Turtle (*Morenia petersi*), Indian Peacock Softshell Turtle (*Nilssononia hurum*) and Yellow Monitor (*Varanus flavescens*) are recorded within the buffer zone.



7. Wildlife Habitat and Movement Corridor

The road stretches approximately 7 kilometers through forest patches that extend into the Churia region but do not continue significantly to the south. The longest forest patch, about 4 kilometers, extends southward from the road but gradually transitions into farm land and settlements further south. As a result, there is likely to be north-south wildlife movement across the road for feeding or breeding purposes. The existing bridge will be modified for wildlife crossing for medium sized animals at Bel Nadi (648+561) and Jwai khola (649+257) and also Minor Bridge-Dry Nala (648+157) and box culverts (645+ 789), (646+233) and (647+791) will be modified for wildlife crossings. Canopy bridge for the crossing of Terai Gray Langur has been proposed in the chainage 649+085. As per the Wildlife Friendly Infrastructure Construction Directives 2022, culverts or bridge underpasses should have a minimum width of 8 meters and a height of 3 meters can be used as animal crossing for medium sized animals.



Figure 3-16: Photo showing Belnadi bridge



8. Protected and Internationally Recognized area of high biodiversity Value

The Goringhe-Chandrauta road section does not pass through any protected areas but traverses diverse habitats, including settlements, farmlands, rivers, and forests. The project area falls within the Terai Arc Landscape (TAL), with its eastern half located in the globally significant Kapilvastu Important Bird and Biodiversity Area (IBA). This IBA was designated due to its importance as a breeding habitat for the critically endangered White-rumped Vulture, other threatened bird species, and its role as a biodiversity hotspot (BCN, DNPWC and DoFSC, 2024). Additionally, the project site serves as an important groundwater reservoir, featuring several small wetlands and connected forests that facilitate wildlife dispersal.

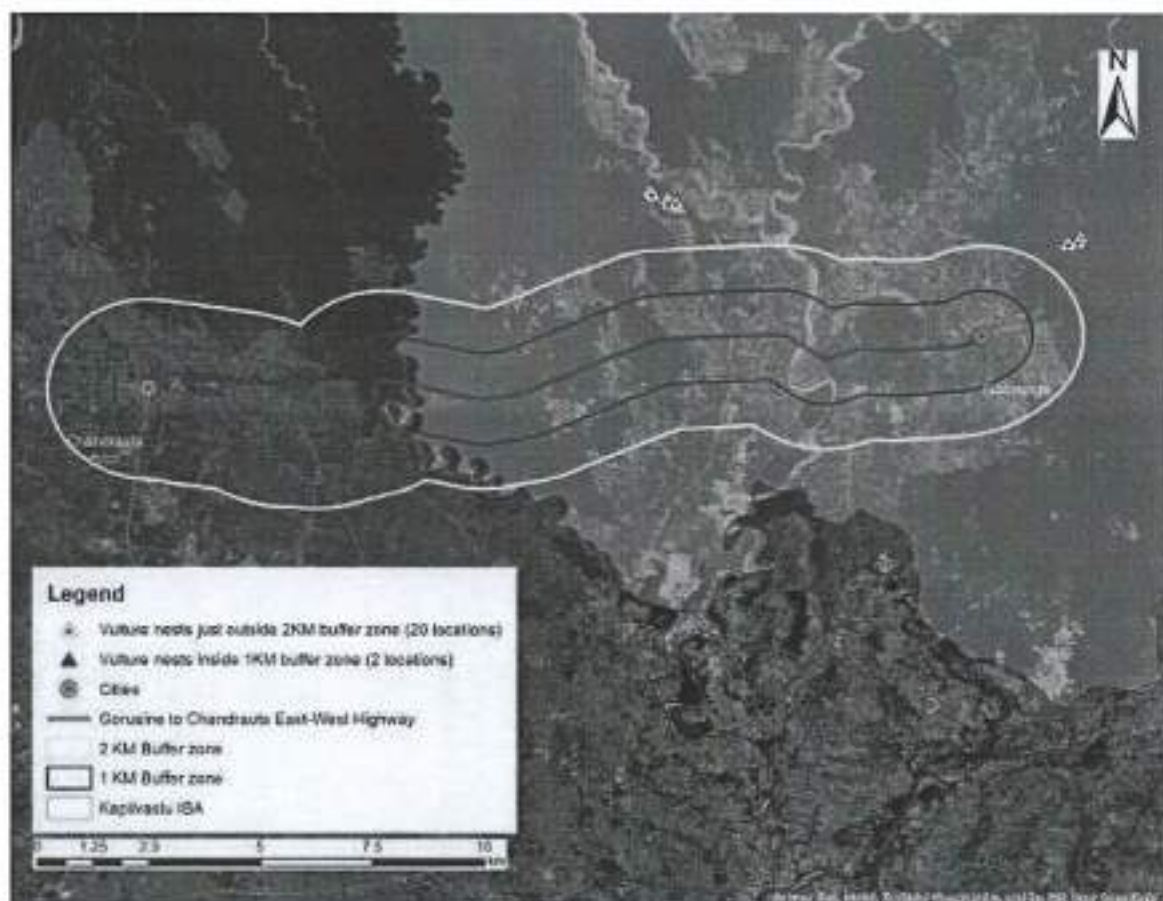


Figure 3-17: Map showing area of Kapilbastu IBA and nesting location of White-rumped Vulture

Movement of satellite tagged vultures in the project site

The satellite telemetry data on White-rumped Vulture movements were extracted from Bird Conservation Nepal, which indicates frequent vulture activity within the project site (Figure 3-6).



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

Disposing of dead cattle near the road could attract vultures, increasing the risk of vehicle collisions.

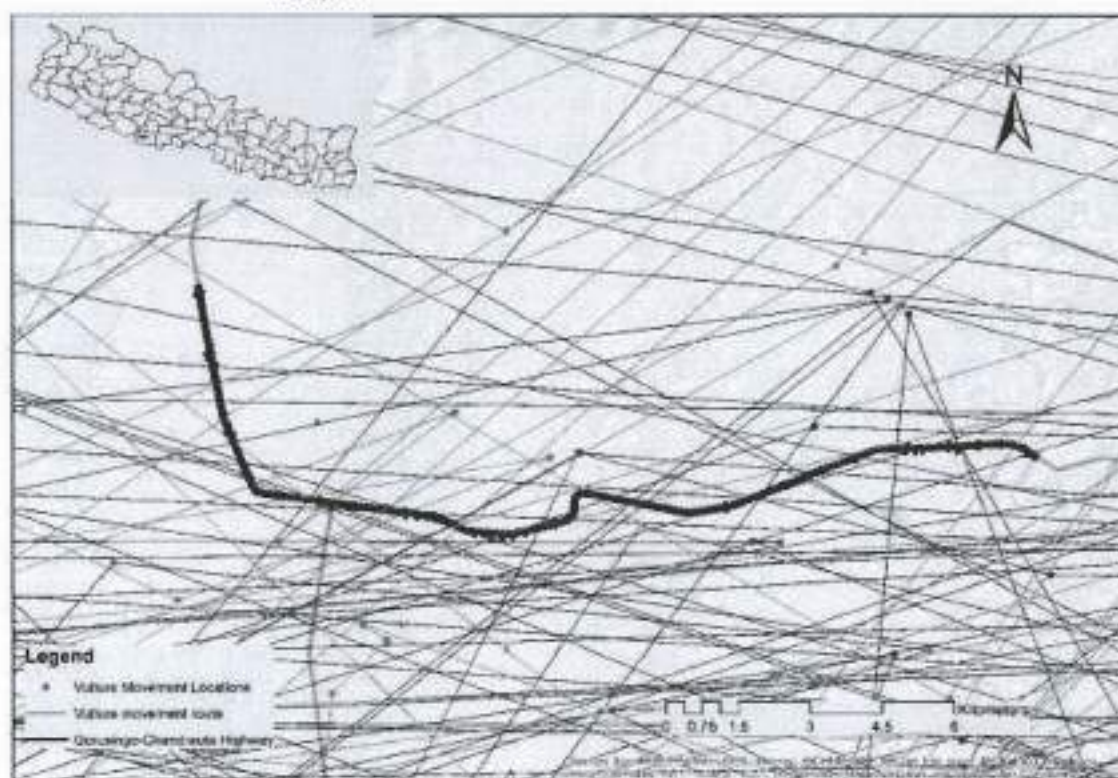


Figure 3-18: Movement of satellite tagged vultures in the project site

IBAT Analysis

The Integrated Biodiversity Assessment Tool (IBAT; <https://www.ibat-alliance.org/>) was used to assess biodiversity risks within or close to a project area. The IBAT proximity analysis with 1, 10, and 50 km buffers identified Key Biodiversity Area (KBA) that includes five Important Bird and Biodiversity Area (IBA) and a single Jagdishpur Ramsar site and one Gaidahawa Lake wetland but not include any protected area (Figure 3-19).



Figure 3-13: Photo during field survey First Gray Mongoose and second digging sign of wild boar

Avifauna

A total of 62 bird species were recorded within the project site. Among these, three globally threatened species-White-rumped Vulture, Slender-billed Vulture, and Egyptian Vulture were observed. Notably, nesting activity of the White-rumped Vulture was documented approximately 800 meters from the road's Right of Way. The majority of the recorded bird species are classified as Least Concern under the IUCN Red List. No nesting activity was observed in the roadside trees. A detailed list of the bird species identified in the project area is provided in *Table 3.39*.

Table 3.39: Bird species found in the project area

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	White-rumped Vulture	<i>Gyps benghalensis</i>	Critically Endangered	Appendix II	Non-protected
2.	Slender-billed Vulture	<i>Gyps tenuirostris</i>	Critically Endangered	Appendix II	Non-protected
3.	Egyptian Vulture	<i>Neophron percnopterus</i>	Endangered	Appendix II	Non-protected
4.	Indian Gray Hornbill	<i>Ocyrceros birostris</i>	Least Concern	-	Non-protected
5.	Lesser Adjutant	<i>Leptoptilos javanicus</i>	Near Threatened	-	Non-protected
6.	Asian Openbill	<i>Anastomus oscitans</i>	Least Concern	-	Non-protected
7.	Common Myna	<i>Acridotheres tristis</i>	Least Concern	-	Non-protected
8.	Little Cormorant	<i>Microcarbo niger</i>	Least Concern	-	Non-protected
9.	Red-napped Ibis	<i>Pseudibis papillosa</i>	Least Concern	-	Non-protected
10.	Brahminy Starling	<i>Sturnia pagodarum</i>	Least Concern	-	Non-protected
11.	Large Cuckooshrike	<i>Coracina macul</i>	Least Concern	-	Non-protected



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

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
12.	Asian Koel	<i>Eudynamis scolopaceus</i>	Least Concern	-	Non-protected
13.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	Least Concern	-	Non-protected
14.	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Least Concern	-	Non-protected
15.	Blue-throated Barbet	<i>Magalaima asiatica</i>	Least Concern	-	Non-protected
16.	House Crow	<i>Corvus splendens</i>	Least Concern	-	Non-protected
17.	Jungle Crow	<i>Corvus macrorhynchos</i>	Least Concern	-	Non-protected
18.	Rock Pigeon	<i>Columba livia</i>	Least Concern	-	Non-protected
19.	House Sparrow	<i>Passer domesticus</i>	Least Concern	-	Non-protected
20.	Black Kite	<i>Milvus migrans</i>	Least Concern	Appendix II	Non-protected
21.	Shikra	<i>Accipiter badius</i>	Least Concern	Appendix II	Non-protected
22.	Spotted Dove	<i>Spilopelia chinensis</i>	Least Concern	-	Non-protected
23.	Gray-hooded Warbler	<i>Seicercus anthoschistos</i>	Least Concern	-	Non-protected
24.	Red-vented Bulbul	<i>Phycnonotus cafer</i>	Least Concern	-	Non-protected
25.	Red-whiskered Bulbul	<i>Phycnonotus jocosus</i>	Least Concern	-	Non-protected
26.	Himalayan Bulbul	<i>Phycnonotus leucogenys</i>	Least Concern	-	Non-protected
27.	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Least Concern	-	Non-protected
28.	Oriental Magpie Robin	<i>Copsychus saularis</i>	Least Concern	-	Non-protected
29.	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Least Concern	-	Non-protected
30.	Long-tailed Shrike	<i>Lanius schach</i>	Least Concern	-	Non-protected
31.	Plumbious Water Redstart	<i>Rhyacornis fuliginosus</i>	Least Concern	-	Non-protected
32.	Black Drongo	<i>Dicrurus macrocercus</i>	Least Concern	-	Non-protected
33.	White-bellied Drongo	<i>Dicrurus caeruleus</i>	Least Concern	-	Non-protected
34.	Hair-crested Drongo	<i>Dicrurus hottentottus</i>	Least Concern	-	Non-protected
35.	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	Least Concern	-	Non-protected
36.	Cattle Egret	<i>Bubulcus ibis</i>	Least Concern	-	Non-protected
37.	Paddyfield Pipit	<i>Anthus rufulus</i>	Least Concern	-	Non-protected
38.	Chestnut-headed Bee-Eater	<i>Merops leschenaulti</i>	Least Concern	-	Non-protected
39.	Green Bee-eater	<i>Merops orientalis</i>	Least Concern	-	Non-protected
40.	Brown Rock Chat	<i>Oenanthe fusca</i>	Least Concern	-	Non-protected
41.	Indian Roller	<i>Coracias benghalensis</i>	Least Concern	-	Non-protected
42.	Gray-throated Martin	<i>Riparia chinensis</i>	Least Concern	-	Non-protected
43.	Greater Coucal	<i>Centropus sinensis</i>	Least Concern	-	Non-protected
44.	Jungle Babbler	<i>Argya striata</i>	Least Concern	-	Non-protected



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S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
45.	Cinereous Tit	<i>Parus cinereus</i>	Least Concern	-	Non-protected
46.	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Least Concern	-	Non-protected
47.	Indian Golden Oriole	<i>Oriolus oriolus</i>	Least Concern	-	Non-protected
48.	Barn Swallow	<i>Hirundo rustica</i>	Least Concern	-	Non-protected
49.	Red-wattled Lapwing	<i>Vanellus indicus</i>	Least Concern	-	Non-protected
50.	Crimson Sunbird	<i>Aethopyga siparaja</i>	Least Concern	-	Non-protected
51.	Common Tailorbird	<i>Orthotomus sutorius</i>	Least Concern	-	Non-protected
52.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Least Concern	-	Non-protected
53.	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	Least Concern	-	Non-protected
54.	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Least Concern	-	Non-protected
55.	White-rumped Munia	<i>Lonchura striata</i>	Least Concern	-	Non-protected
56.	Himalayan Flameback	<i>Dinopium shorii</i>	Least Concern	-	Non-protected
57.	Black Francolin	<i>Francolinus francolinus</i>	Least Concern	-	Non-protected
58.	Common Hoopoe	<i>Upupa epops</i>	Least Concern	-	Non-protected
59.	White-throated Fantail	<i>Rhipidura albicollis</i>	Least Concern	-	Non-protected
60.	Grey-breasted Prinia	<i>Prinia hodgsonii</i>	Least Concern	-	Non-protected
61.	Oriental White-eye	<i>Zosterops palpebrosus</i>	Least Concern	-	Non-protected
62.	Chestnut-bellied Nuthatch	<i>Sitta cinnamoventris</i>	Least Concern	-	Non-protected

Source: Field survey, 2024



Figure 3-14: Photo of White-rumped Vulture feeding carcass in roadside and Asian Openbill roosting in the roadside trees.

Eventhough, there were vultures feeding on carcass no vultures nest was observed along the RoW of the hghway.



Herpetofauna

Altogether, 12 species of herpetofauna recorded from the project area. Both species Burmese Python and Indian flapshell turtle are listed in the Vulnerable category in the IUCN Red List. Other species found in the project site are least concern according in the IUCN conservation status and not protected according to GoN. Detail of herpetofauna found in project site is summarized in table 3.40

Table 3.40: Herpetofauna found in the project site

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Common Rat Snake	<i>Ptyas mucosus</i>	Least Concern (LC)	-	Non-protected
2.	Buff-striped Keelback	<i>Amphiesma stolatum</i>	LC	-	Non-protected
3.	White Lipped Pit Viper	<i>Trimeresurus albolabris</i>	LC	-	Non-protected
1.	Burmese Python	<i>Python bivittatus</i>	Vulnerable	CITES Appendix II	Non-protected
2.	Banded Krait	<i>Bungarus fasciatus</i>	LC	-	Non-protected
6.	Bengal Monitor Lizard	<i>Varanus bengalensis</i>	LC	CITES Appendix I	Non-protected
7.	Common Garden Lizard	<i>Calotes versicolor</i>	LC	-	Non-protected
8.	House Gecko	<i>Hemidactylus spp</i>	-	-	Non-protected
9.	Asian Toad	<i>Hoplobatrachus rugulosus</i>	LC	-	Non-protected
10.	Jerdon's Bullfrog	<i>Hoplobatrachus crassus</i>	LC	-	Non-protected
1.	Skittering Frog	<i>Euphyctis cyanophlyctis</i>	LC	-	Non-protected
12.	Indian flapshell Turtle	<i>Lissemys punctata</i>	Vulnerable	CITES Appendix I	Non-protected

Source: Field survey, 2024



Figure 3-15: Photo of Burmese Python and Jerdon's Bullfrog

Fish Species

All fish species recorded present in the water bodies of study are classified as least concern. Major fish species found in the project area are listed in the Table 3-40 including their IUCN, CITES and GON protection status.

Table 3.41: Fish species found in the project site

S. N	Common Name	Scientific Name	IUCN Status	CITES	GoN Protection status
1.	Gotyla	<i>Garra gotyla</i>	Least Concern	-	Non-protected
2.	Asiatic Snakehead	<i>Channa gachua</i>	Least Concern	-	Non-protected
3.	Stinging Catfish	<i>Heteropneustes fossilis</i>	Least Concern	-	Non-protected
4.	Walking Catfish	<i>Clarias batrachus</i>	Least Concern	-	Non-protected
5.	Spotfin Swamp barb	<i>Puntius sophore</i>	Least Concern	-	Non-protected
6.	Barred Baril	<i>Barilius barila</i>	Least Concern	-	Non-protected
7.	One-stripe spiny Eel	<i>Macrogynathus aral</i>	Least Concern	-	Non-protected
8.	Swamp Barb	<i>Puntius chola</i>	Least Concern	-	Non-protected
9.	Chana Sps.				Non-protected

Source: Field survey, 2024



Figure 3-15a: Photo of One-stripe spiny eel and Chana Sps

6. Other Important Wildlife information

In 2021, a study identified a male and a female tiger in the Churia forest range spanning Kapilbastu, Rupandehi, and Palpa. The male was located in northern Kapilbastu, while the female was photographed at multiple sites in Rupandehi and along the Rupandehi-Palpa border. In February 2024, WWF Nepal reported three tigers captured on camera during an ecological survey in the central Terai Arc Landscape (TAL) in Kapilbastu. These tigers were recorded more than 10 kilometers away from the project area within the Churia range. The Fishing Cat and Four-horned Antelope, both listed as Vulnerable on the IUCN Red List, have been recorded in Kapilbastu district. However, they have not been observed within the project site, and the area is not suitable for either species.

Integrated Biodiversity Assessment Tool (IBAT) report was used to assess the proximity of the threatened wildlife within the 50 km radius of the project site. That confirms the presence of Near Threatened Striped Hyena (*Hyaena hyaena*), Critically Endangered Red-headed Vulture (*Sarcogyps calvus*) and Slender-billed Vulture (*Gyps tenuirostris*), Endangered Steppe Eagle (*Aquila nipalensis*) and Vulnerable Great Slaty Woodpecker (*Mulleripicus pulverulentus*). Among reptiles Critically Endangered Elongated Tortoise (*Indotestudo longate*), Endangered Tricarinate Hill Turtle (*Melanochelys tricarinata*), Indian Eyed Turtle (*Morenia petersi*), Indian Peacock Softshell Turtle (*Nilssononia hurum*) and Yellow Monitor (*Varanus flavescens*) are recorded within the buffer zone.



7. Wildlife Habitat and Movement Corridor

The road stretches approximately 7 kilometers through forest patches that extend into the Churia region but do not continue significantly to the south. The longest forest patch, about 4 kilometers, extends southward from the road but gradually transitions into farm land and settlements further south. As a result, there is likely to be north-south wildlife movement across the road for feeding or breeding purposes. The existing bridge will be modified for wildlife crossing for medium sized animals at Bel Nadi (648+561) and Jwai khola (649+257) and also Minor Bridge-Dry Nala (648+157) and box culverts (645+ 789), (646+233) and (647+791) will be modified for wildlife crossings. Canopy bride for the corssing of Terai Gray Langur has been proposed in the chainage 649+085. As per the Wildlife Friendly Infrastructure Construction Directives 2022, culverts or bridge underpasses should have a minimum width of 8 meters and a height of 3 meters can be used as animal crossing for medium sized animals.



Figure 3-16: Photo showing Belnadi bridge



8. Protected and Internationally Recognized area of high biodiversity Value

The Goringhe-Chandrauta road section does not pass through any protected areas but traverses diverse habitats, including settlements, farmlands, rivers, and forests. The project area falls within the Terai Arc Landscape (TAL), with its eastern half located in the globally significant Kapilvastu Important Bird and Biodiversity Area (IBA). This IBA was designated due to its importance as a breeding habitat for the critically endangered White-rumped Vulture, other threatened bird species, and its role as a biodiversity hotspot (BCN, DNPWC and DoFSC, 2024). Additionally, the project site serves as an important groundwater reservoir, featuring several small wetlands and connected forests that facilitate wildlife dispersal.

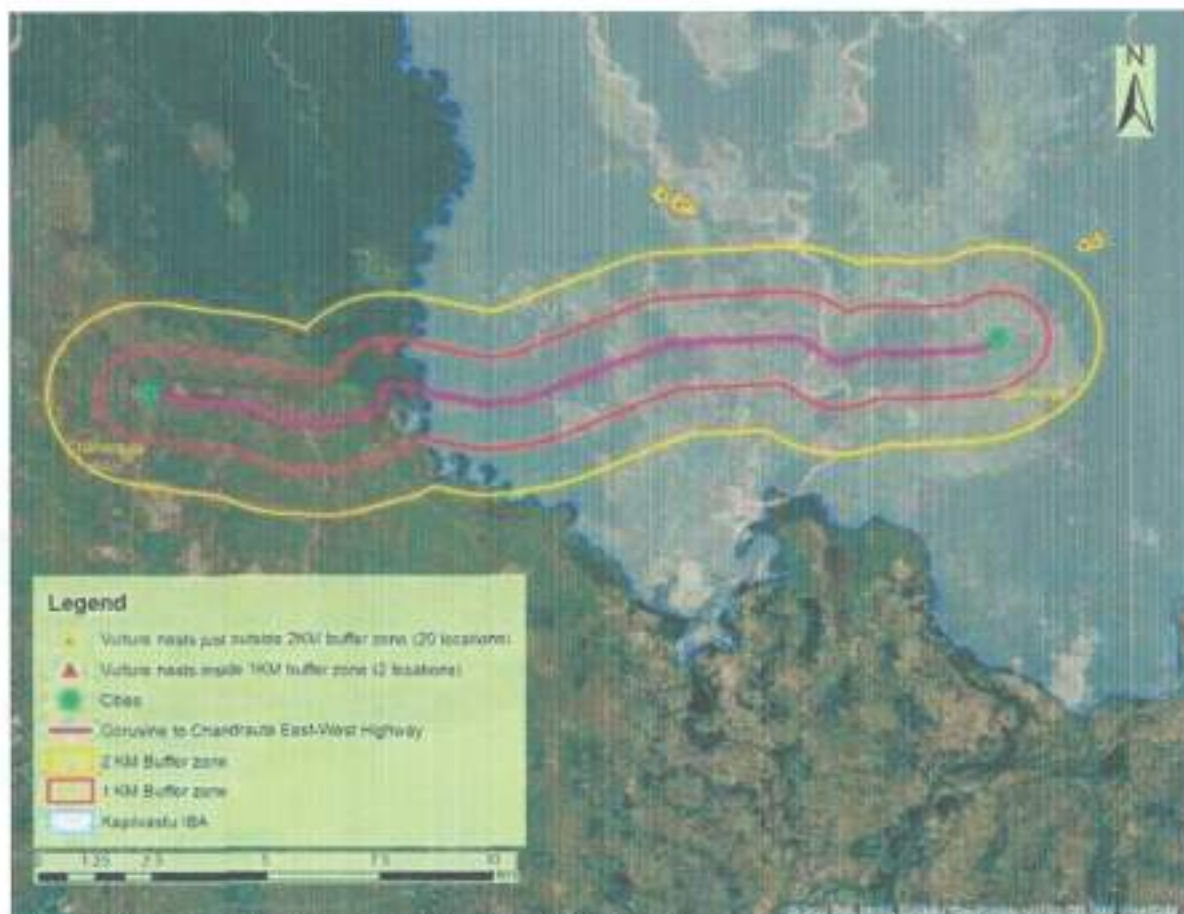


Figure 3-17: Map showing area of Kapilbastu IBA and nesting location of White-rumped Vulture

Movement of satellite tagged vultures in the project site

The satellite telemetry data on White-rumped Vulture movements were extracted from Bird Conservation Nepal, which indicates frequent vulture activity within the project site (Figure 3-6).



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Disposing of dead cattle near the road could attract vultures, increasing the risk of vehicle collisions.



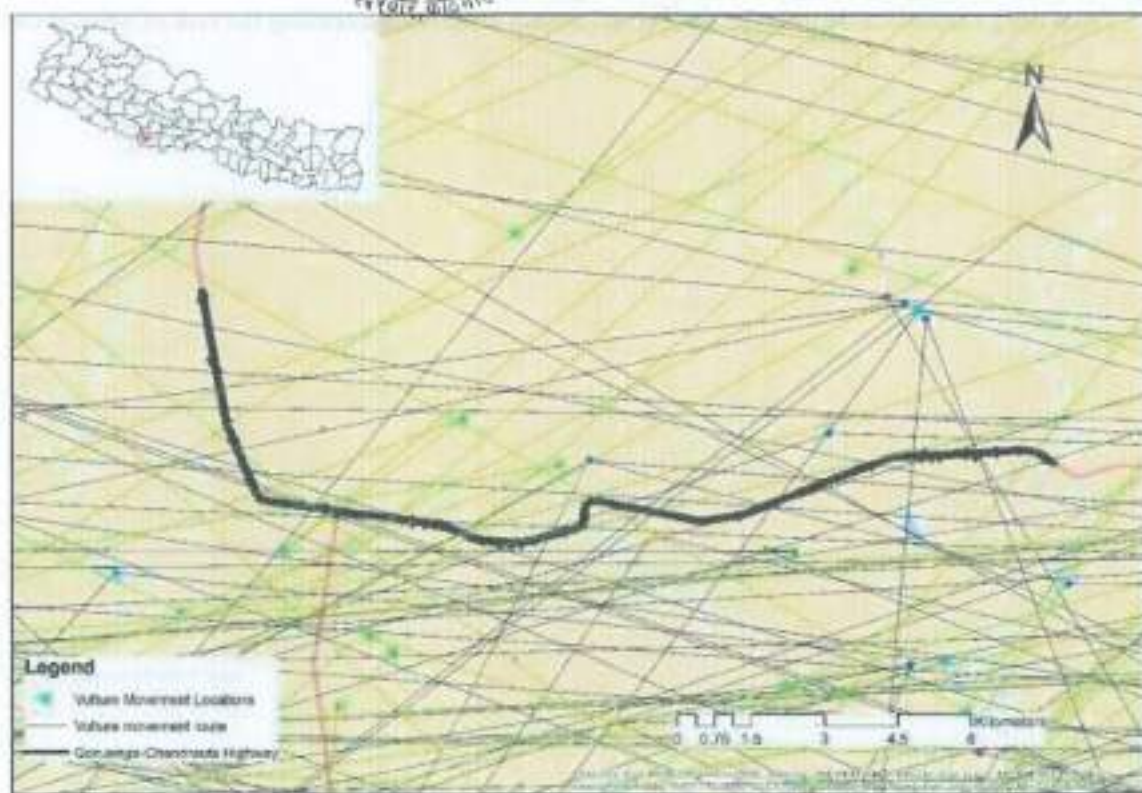


Figure 3-18: Movement of satellite tagged vultures in the project site

IBAT Analysis

The Integrated Biodiversity Assessment Tool (IBAT; <https://www.ibat-alliance.org/>) was used to assess biodiversity risks within or close to a project area. The IBAT proximity analysis with 1, 10, and 50 km buffers identified Key Biodiversity Area (KBA) that includes five Important Bird and Biodiversity Area (IBA) and a single Jagdishpur Ramsar site and one Gaidahawa Lake wetland but not include any protected area (Figure 3-19).

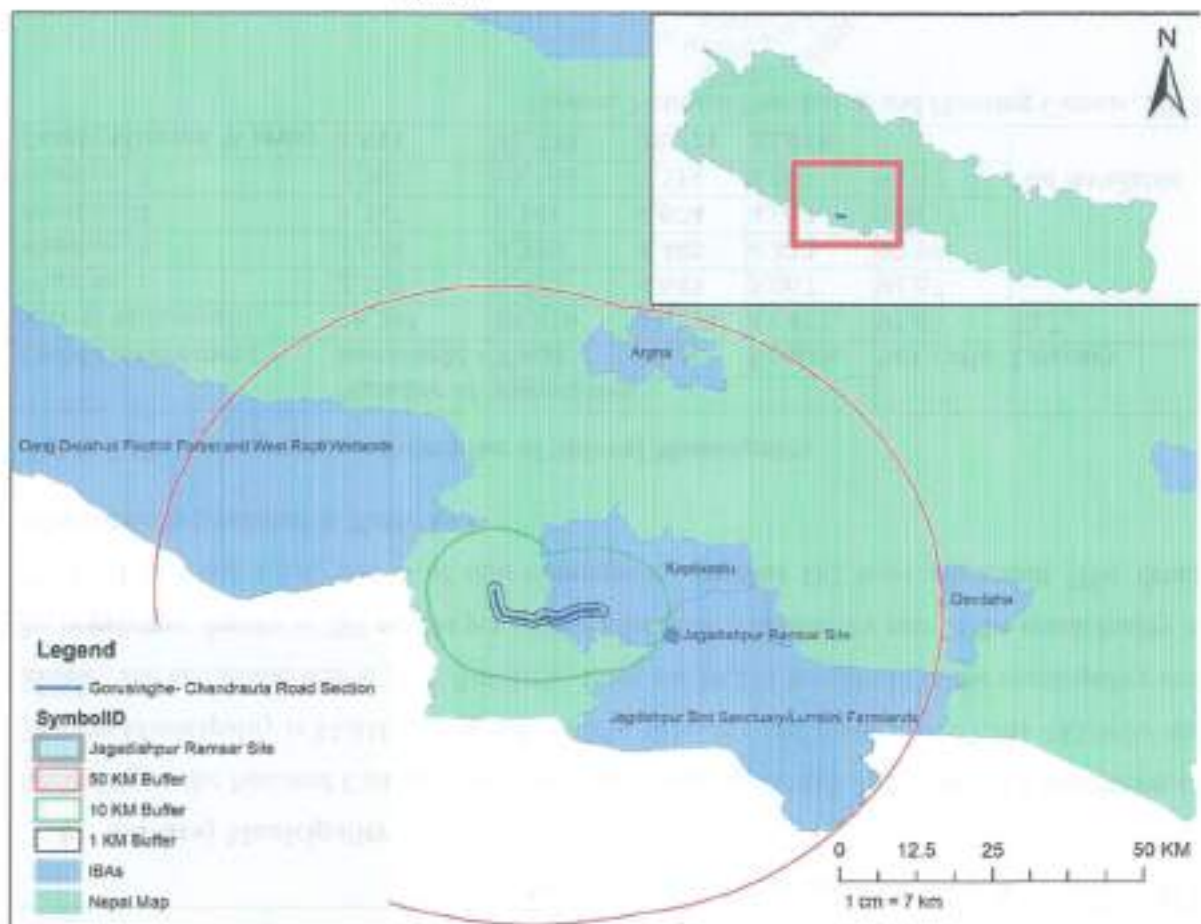


Figure 3-19: Map of the project route and KBA provided by IBAT showing 1 km, 10 km and 50 km buffers

3.12.3. Socio-Economic and Cultural Environment

The proposed Road under ACCESS project will upgrade 19.2 km road Section from Goringhe to Chandrauta in Kapilbastu district. The road passes through four major settlements i.e. Imiliya, Dumara, Barkalpur, Kharendrapur, Bankatti, Chandrauta and ends at Umari Chowk (Shivapur chowk). Similarly, the proposed road covers two municipalities (Buddhabhumi and Shivraj).

The study team has explored basic information about the socio-economic and cultural environment of project area which includes demographic and economic features, along with, likely impacts on private and public structures and public utilities, public transport, social services facilities available in the project area. Basic information on religious sites and cultural aspects.

A. Basic Demographic Information of Influence Area**a. Buddhahumli Municipality:**

According to the National Census 2021, the total population of Buddhahumli Municipality is 76,507, of which 48.3% (36,951) are male and 51.7% (39,556) are female and household size is 5.22. Similarly, there are 15,379 household in the municipality and the population density is 209 persons per square kilometer. The literacy rate of the municipality is 71.5%. The ward-9 is touches the GC road alignment. The detail information is presented in table 3.42.

Table 3.42: Demographic information of Buddhahumli Municipality

Local Government	Number of HH	Population			Sex ratio	Literacy
		Total	Male	Female		
Buddhabhumli Municipality	15,379	76,507	36,951	39,556	95.05	71.5
Ward no. 9	2441	11043	5222	5821	89.80	Not available

Source: National Population and Housing Census, 2021

b. Shivraj Municipality

According to the National Census Population and Housing Census 2021, the total population of Shivraj Municipality is 84,810, of which 48.7% (41,328) are male and 51.3% (43,482) are female and household size is 5.22. Similarly, there are 16,241 household in the municipality and the population density is 299 people per square kilometer. The literacy rate of the municipality is 72.7%. The ward 1,3,4, and 5 of this municipality touches GC road alignment. The detail information is presented in Table 3.43

Table 3.43: Demographic information of Shivraj Municipality

Local Government		Number of Population			Sex ratio	Literacy
		household s	Total	Male	Female	
Shivraj Municipality	16,241	84,810	41,328	43,482	95.05	72.7
Ward no. 1	2,183	9,712	4,645	5,067	91.67	
Ward no. 3	1,914	9,320	4,488	4,832	92.88	
Ward no. 4	1,347	8,141	4,074	4,067	100.17	
Ward no. 5	3,367	15,566	7,514	8,052	93.32	Not Available
Total (Affected Wards)	8,811	42,739	20,721	22,018		

Source: National Population and Housing Census, 2021





B. Demography of the Indirect Impact Zone (IIZ) of Surveyed Households

The adjacent area within 300 meter either side of the road alignment (600 m corridor) is considered as the Indirect Impact Area (IIA). In this area, physical and biological environment will experience impacts during the time of construction.

Besides, indirect impacts, there will be cumulative impacts during operation stage due as a result of better access to the area such as increased poaching, fodder collection, deforestation, unplanned human encroachment along the road and other similar activities in the region.

Public consultations within settlements, Focused Group Discussions (FGDs), etc. have been done in the project area for establishing the socio-economic and cultural baseline. Within forest area, general observation of vegetation and observation of wildlife movement and their habitat through direct and indirect methods has been done. The total surveyed households are 312 (20% of universe 1562 HHs) sample survey within Direct Impact Area, 300 m. either side) where surveyed population is 1643 and household size is 5.3. This sub-chapter includes social demography: mother tongue/language spoken, religion, caste/ethnicity, indigenous people, literacy and education along with economic status of the surveyed households.

1. Surveyed Population by Municipality and Ward

Buddhabhumi Ward 9 has the total population is 560 with gender disaggregated (Male: 48.9%, Female: 51.1%). In the similar manner, ward 1, 3, 4 & 5 of Shivraj Municipality has 1083. with gender disaggregated (Male: 52%, Female: 48%). which is almost similar to national level. Details of the population with HHs size and gender distribution is presented in table 3.44.

Table 3.44: Population by Municipality and Ward

Municipality	Ward No	HHs	Population					Sex Ratio
			Male	%	Female	%	Total	
Buddhabhumi	9	105	274	48.9	286	51.1	560	95.8
Shivraj	1	23	55	51.9	51	48.1	106	107.8
	3	36	107	58.2	77	41.8	184	139.0
	4	36	99	51.3	94	48.7	193	105.3
	5	112	312	52.0	288	48.0	600	108.3
Total		312	847	51.6	796	48.4	1643	

Source: Household Survey, 2024



2. Mother Tongue/ Language

The below table represents the distribution of households (HHs) based on their mother tongue across affected municipalities, as well as the combined total for both areas. The analysis highlights language diversity and relative population sizes among different language-speaking communities. Nepali is the most widely spoken mother tongue in both areas is about (60%).

Table 3.45: Mother Tongue/ Language of Surveyed HHs.

Mother Tongue	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Nepali	61	58%	126	61%	187	60%
Tharu	17	16%	27	13%	44	14%
Maithili	9	9%	11	5%	20	6%
Newar	4	4%	5	2%	9	3%
Magar	3	3%	9	4%	12	4%
Hindi	7	7%	23	11%	30	10%
Bhojpuri	4	4%	6	3%	10	3%
Total	105	100%	207	100%	312	100%

Source: Household Survey, 2024

3. Religion

Hinduism dominates in both municipalities (68.9%) approaching the national average i.e 81.2 % followed by buddhist (18.3%) and Christian (6.7 %) as expressed in *Table 3.46:*

Table 3.46: Religion

Religion	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Hindu	77	73.3	138	66.7	215	68.9
Buddhist	19	18.1	38	18.4	57	18.3
Christian	7	6.7	14	6.8	21	6.7
Muslim	0	0.0	13	6.3	13	4.2
Other	2	1.9	4	1.9	6	1.9
Total	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024



4. Caste/ Ethnicity

The project area has multi-ethnic/caste groups which include Brahman, Chhetri, Janjati, Dalit, Tarai Caste and Muslim. Among the surveyed households, Brahmins and Chhetri are dominant covering 51.42 percent, where Janajati (26.92%). In comparison to the Buddhabhumi, Shivraj municipality has some proportions of Muslim (5.8%). Whereas population of Janajati (36.18 %) is higher in Buddhabhumi municipality than Shivraj. Newar, Tharu, and Magar are found in the project area. Details of the population has presented in table 3.47.

Table 3.47: Caste and Ethnicity in the area

Caste/Ethnicity	Buddhabhumi		Shivraj		Total	
	HHs	%	HHs	%	HHs	%
Brahmin and Chhetri	54	51.42	110	52.4	164	52.56
Dalit	4	3.8	20	9.7	24	7.62
Muslim	0	0.0	12	5.8	12	3.9
Janjati	38	36.18	46	22.8	84	26.92
Tarai Caste	5	4.8	18	8.7	23	7.4
Other	4	3.8	1	0.5	5	1.6
Total	105	100	207	100.0	312	100

Source: Household Survey, 2024

5. Indigenous People (Indigenous Nationalities)

Nepal is a multi-ethnic, multilingual, and multicultural country. Stretching from the Himalayas to the Terai, the people residing here exhibit diverse languages and cultures. According to the *Aadiwaasi/Janajaati Uthhan Rastriya Partisthan Act, 2058 (2002 AD)*, a total of 60 ethnic groups are officially recognized as *Adivasi/Janajati* (Indigenous Nationalities). Furthermore, the Nepal Federation of Indigenous Nationalities (NEFIN) classifies these listed indigenous groups into five categories: advance, disadvantage, marginalized, highly marginalized, and endangered. In the baseline survey 2024, total 312 households were studied (sampled), among which 76 households belonged to Indigenous Nationalities (Newar-lies in advanced, Magar-disadvantage, Tharu, and Tamang are marginalized), was recorded with a total population (195 male and 188 female) of 383. The population distribution by indigenous group is presented in the table below.

Table 3.48: Presence of Indigenous People (Aadiwaasi/Janajaati) in Study area

Indigenous Nationalities	Household		Total HH	Male Population		Female Population		Total population
	Buddha...	Shivra...		Buddha...	Shivra...	Buddha...	Shivra...	
Newar	2	2	4	3	7	5	9	24
Magar	8	22	30	15	57	10	45	127
Tamang	1	0	1	4	0	3	0	7
Tharu	26	15	41	69	40	77	39	225



Total	37	39	76	91	104	95	93	383
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Source: Household Survey, 2024

6. Educational Status of Surveyed Household

Based on baseline surveyed households, a total 4.8 percent population are illiterate among them male is 1.7 and female are 3.8 percent. The population of graduate and above is 2.8 percent. The majority of the population in both Buddhabhumi and Shivraj municipalities is educated, with most individuals having completed at least read and write or higher secondary education. However, there are notable differences in educational attainment between males and females. Educational status of school going age and above of surveyed population is given in Table 3.49

Table 3.49: Educational Status of Study Area (5 Years and Above Population)

Educational Status	Male		Female		Total populations	Percentage
	Buddhabhumi	Shivraj	Buddhabhumi	Shivraj		
Illiterate	0.4	1.3	1.0	2.1	75	4.8
Read and write	5.4	12.3	7.2	13.6	600	38.5
Higher Secondary	9.4	17.3	6.9	12.4	719	46.1
Bachelor's Degree	1.0	3.0	1.4	2.4	121	7.8
Master's Degree	0.5	0.5	0.2	0.3	23	1.5
Above Master's Degree	0.3	0.3	0.3	0.4	21	1.3
Total	17.1	34.6	17.1	31.2	1559	100.0

Source: Household Survey, 2024

7. Migration Status

a. In-Migration

In-Migration is a common phenomenon in terai region as they tend to migrate from hilly areas to terai over the period for seeking different facilities. Around 60% interviewed HH migrated from different places outside the district to ensure their better livelihood, education, health and other facilities. Buddhabhumi has a large proportion of originally settled households compared to Shivraj, including that Buddhabhumi is relatively more stable in retaining its native population. On the other hand, Shivraj has a higher proportion of households from outside the district, suggesting it might be a more attractive destination for migrants. Details have been presented in Table 3.50.

Table 3.50: Status of Migration in affected Municipality

Origin	Buddhabhumi		Shivraj		Total	
	HHs	%	HHs	%	HHs	%
Own rural Municipality	5	4.8	11	5.3	16	5.1



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Own District	4	3.8	15	7.3	19	6.1
Outside of District	54	51.4	134	64.7	188	60.4
Originally Settle	42	40	47	22.7	89	28.4
Total	105	100	207	100	312	100

Source: Household Survey, 2024

b. Purpose of In-Migration

The table highlights the purpose of in migration in two areas, Buddhabhumi and Shivaraj Municipality, with percentages calculated for each category relative to the total number of households in each area. People has been migrating to project affected municipalities mainly for employment, education and business holding 33.3, 25.0 and 24.4 percentage of the migrants as presented in table 3.51 below:

Table 3.51: Purpose of In-migration

Purpose of Migration	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Employment	30	28.6	74	35.7	104	33.3
Business/Trade	21	20.0	55	26.6	76	24.4
Education	24	22.9	54	26.1	78	25.0
Facilities	13	12.4	17	8.2	30	9.6
Others (multiple answers other than mentioned)	17	16.2	7	3.4	24	7.7
	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024

c. Out-Migration Status

Among surveyed households (312 HHs) 78.5% HHs have at least one member out of the country for work, education and family visits. The economy of the project area is gradually shifting from rural agricultural economy to business, service and foreign employment. About 32.4% of the surveyed HHs have atleast one person migrated for foreign employment.

8. Household Economy and Modes of Livelihood

Since the economy of the area is gradually shifting from rural agricultural economy to business and service based, the major sources of income for majority of the households are nonfarm activities. However, the overall livelihood strategy of the surveyed households is characterized by a mixture of farm and nonfarm activities. Farm activities are carried out for food supply, whereas other requirements of the household are fulfilled through nonfarm activities. The surveyed households are largely relying on more than one source of income for the fulfillment of their livelihood needs.



Non-agriculture activities like business and services are the main contributors for household economy.

9. Occupational status of surveyed household

The project area is characterized as plain Terai area and most of the people of the area are engaged in agriculture based economic activities. The main occupation of the study area is agriculture followed by foreign job, service and business. Among the total population, 46.1 percent is involved in agriculture. Similarly, 24.4 percent people are engaged in foreign job which is the main source of rentence. Likewise, 17.5 and 12.1 percent population are involved in business and Service. There are notable gender differences, with males dominating foreign jobs and business, while females are more involved in agriculture. The following table provides information on occupational status of the project area.

Table 3.52: Occupational Status of Study Area

Occupation	Buddhabhumi		Shivraj		Total economically active population	Total
	Male	Female	Male	Female		
Agriculture	5.9	14.4	7.5	18.3	375	46.1
Service	3.0	1.7	4.9	2.5	98	12.1
Foreign job	7.0	0.7	15.3	1.4	198	24.4
Business	2.8	1.2	10.3	3.1	142	17.5
Total	18.7	18.1	38.0	25.2	813	100.0

Source: Household Survey, 2024

10. Skill Training Status

Most of the residents remains unskilled around 60% in project area. Municipality has provided different trainings to the residents in the project area about 39.1% of the HHs are trained. Beautician, light vehicle driving, tailoring, security guard, basic computer and automobile repairing etc. are the most demanded in the project area. Among such demanded trainings some of the trainings has already been provided by the municipalities. Though sex disaggregated data on skill training status has not been recorded but it has been noted from group discussion that mostly women are benefited from mix group training. Details of the training demanded in the project area are shown in the Table 3.53



Table 3.53: Skill Training Status of HHs

S. N.	Trainings	Households (%)		Total
		Buddhabhumi	Shivaraj	
1	Beautician	9.5	15.5	13.5
2	Light Vehicle Driving	17.1	12.1	13.8
3	Tailoring	14.3	16.9	16.0
4	Security Guard	1.9	0.0	0.6
5	Basic Computer	9.5	7.2	8.0
6	Automobile Repairing	2.9	6.8	5.4
7	Others	4.8	2.9	3.5
8	Trained HHs	40.0	38.6	39.1
	Total	100.0	100.0	100.0

Source: Household Survey, 2024

11. Land holding size of surveyed household

The table presents the distribution of land ownership in Buddhabhumi and Shivaraj municipalities from a **gender perspective**, including categories for Male, Female, and both (representing joint ownership or other gender identities). The data reveals a clear gender disparity in land holding, with men controlling nearly two-thirds of land in both municipalities. Women own less than one-third. The table below summarizes the land holding pattern by gender in the project area.

Table 3.54 : Land holding status by male and female in study Area

Municipality	Male	Percent	Female	Percent	Both	Percent	Total
Buddhabhumi	64	20.5	34	10.9	8	2.6	106
Shivaraj	130	41.7	66	21.2	10	3.2	206
Total	194	62.2	100	32.1	18	5.8	312

Source: Household Survey, 2024

12. Agriculture Practice

It is found that about 50.96 percent of the surveyed households have no agriculture land holdings. Only 6.09% of the HHs has agriculture land above 0.6 ha as shown in table below.

Table 3.55: Status of Agricultural Land Holding

Agricultural Land Holding Status	Buddhabhumi		Shivaraj		Total	%
	HHs	%	HHs	%	HHs	
No Agriculture	36	34.29	123	59.42	159	50.96
Less than 0.015 ha	3	2.86	4	1.93	7	2.24
0.015-0.03 ha	4	3.81	14	6.76	18	5.77
0.03- 0.3 ha	44	41.90	51	24.64	95	30.45
0.3 – 0.6 ha	8	7.62	6	2.90	14	4.49
> 0.6 ha	10	9.52	9	4.35	19	6.09



Agricultural Land Holding Status	Buddhabhumi		Shivaraj		Total	%
	HHs	%	HHs	%	HHs	
Total	105	100.00	207	100	312	100.00

Source: Household Survey, 2024

13. Agriculture and Livestock Activities

a. Agricultural

Agricultural practice in the project area is mostly traditional and agriculture production system is conventional. Farmers are producing mainly rice, wheat and maize as cereals crops, and mustard, wheat, as cash crops at subsistence level. Irrigation and fertilizer are the main problem of farmers in the project area. Other agricultural problems prevailing in the project area are uncertain rainfall, flooding and river bank cutting.

Table 3.56: Cropping Pattern in Municipality

Crops	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Garlic	0	0.0	1	0.5	1	0.3
Lentils	12	11.4	5	2.4	17	5.4
Maize	8	7.6	4	1.9	12	3.8
Mustard	5	4.8	8	3.9	13	4.2
Onions	0	0.0	1	0.5	1	0.3
Paddy	23	21.9	26	12.6	49	15.7
Rice	6	5.7	6	2.9	12	3.8
Vegetable	8	7.6	5	2.4	13	4.2
Wheat	17	16.2	23	11.1	40	12.8

Source: Household Survey, 2024

b. Livestock Facilities

It is found that among 312 surveyed household, 260 households are involved in livestock rearing and rest donot have any livestock. Most of the households (126) are rearing goat followed by buffalo (65 households), cow/ox (52 households), poultry (12 households) and pig (5 households). It is found that there are 4 animals per HHs on an average. Average number of poultries per household is 11. Average number of goats and pig per HHs is 4 each whereas average number of cow/oxen and buffalo per HHs is only 2.



14. Food Sufficiency Status

Among the surveyed HHs, 13.78% HHs of households have food sufficiency throughout the year from their own production. 43.91 % of the households do not have their food production hence depending absolutely on other sources for food. Details of the status of food sufficiency from their own production has presented as shown in Table 3.57.

Table 3.57: Food sufficiency in the project area your own production

Food Sufficiency from own production	Buddhabhumi	Shivaraj	Total HHs	%
	HHs	HHs		
Less than 3 months	17	42	59	18.91
3-6 months	16	20	36	11.53
6-9 months	12	25	37	11.87
9-12 months	20	23	43	13.78
Other sources	40	97	137	43.91
Total	105	207	312	100

Source: Household Survey, 2024

15. Irrigation Facilities

In regards to irrigation facilities, around 90% people do not have irrigation facilities rather they depend on monsoon for cultivation. On the contrary only 9.6% have irrigation facilities.

Table 3.58: Status of Irrigation Facilities

Irrigation Status	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Yes	9	8.6	21	10.1	30	9.6
No	96	91.4	186	89.9	282	90.4
Total	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024

16. House Structure and Household Assets

a. House Structure

It is found that all the surveyed households have shelter for living. Modern housing is the most common across both Municipalities, accounting for 91%. Semi modern and traditional housing together represent only 9.0% of the total as shown in the table. Modern housing structure unit is made by reinforced cement concrete with pillars foundation, cement bonded bricks/stone outer wall and reinforced cement concrete roof. Semi-modern housing structure unit is made by cement bonded bricks/stone foundation, cement or mud bonded bricks/stone outer wall and galvanized sheet or tile or Unplasticized Polyvinyl Chloride (UPVC) roof. Traditional housing structure unit



is made by mud bonded bricks/stone foundation, mud bonded bricks/stone or wood/planks or mud bonded bamboo outer wall and galvanized sheet or tile or UPVC or thatched/straw roof. Temporary sheds/Jhupra is made by metal pole or wooden pillars foundation, stick or bamboo or galvanized sheet outer wall and galvanized sheet or thatched/straw roof. Definition of housing unit is adopted from Nepal Population and Housing Census (NPHC), 2021.

Table 3.59: Types of House Structure

Type of House	Buddhabhumi		Shivraj		Total	
	HHs	%	HHs	%	HHs	%
Traditional (stone/and mud wall with straw roof)	3	2.9	3	1.4	6	1.9
Semi-modern (stone/block/brick and cement wall with Jasta/slate roof)	8	7.6	14	6.8	22	7.1
Modern (stone/brick/block and cement wall with RCC roof)	94	89.5	190	91.8	284	91.0
Total	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024

b. Household Asset Ownership

The household assets/ utilities owned by the surveyed households include television, table/ chair, sewing machine, motor cycle, bicycle, iron press, radio, rice cooker, refrigerator, AC, 4-wheeler vehicle and cell phone. Out of 312 surveyed households, 77 HHs (9%) have no assets mentioned above. Five households have only one asset. Among them, 3 HHs have bicycle and 3 HHs have cell phone. Sixteen households have two assets. Among them, 1HHs have television, 4HHs have Fan, 1 HH have motorcycle, 1 HHs have bicycle, 1 HH has Radio and 3HH has Mobile phone. It is found that only 3 HHs have all assets mentioned above. Detail information about the HHs having assets is presented in **Annex IV**.

17. Household Income Source

The major source of household income is remittance (48.10%) followed by small business (31.32%), service (24.05%), pension (24.68%) and Wage Labour (14.55%) as shown in the **Table 3.60**.

Average Annual Income per Household is Nrs 572,086 in the project area which is significantly higher than the average of national poverty line demarcated as per the national census 2021 (i.e average annual income per household Rs 72,908). Details of the average annual income for both the affected municipalities including different income sources are presented in the **Table 3.60** below.



Table 3.60: Annual average income

Income Category	Buddhabhumi		Shivaraj		Total	
	HHs	Amount	HHs	Amount	HHs	Amount
Cereal Crop sale	8	472,000	11	1,115,000	19	1,587,000
Vegetables sale	1	120,000	2	40,000	3	160,000
Cash Crop sale	2	220,000	3	700,000	5	920,000
Livestock	11	591,000	14	1,087,000	25	1,678,000
Wage Labour	26	4,952,000	20	4,029,200	46	8,981,200
Service	23	9,196,230	53	17,686,000	76	26,882,230
Trade/Business	29	11,045,000	70	28,998,000	99	40,043,000
Remittance	49	29,794,000	103	55,458,000	152	85,252,000
Pension/rent/interest/ Social Allowance	28	4,110,000	50	8,877,500	78	12,987,500
Total	105	60,500,230	207	117,990,700	312	178,490,930
Annual Average Income Per Household		576,193		570,003		572,086
Annual Per Capita Income		108,036		108,948		108,637

Source: Household Survey, 2024

18. Household Expenditure

When asked about the annual household expenses, it depicts the annual expenditure of the interviewed HHs. Majority of the HHs 104 spent on ritual/festivals followed by food and clothing 105 HHs each. Total expenditure amount of the interviewed HHs is NPR 91,287,850. The survey reveals that people have tendency to celebrate festival and rituals more often and spent more money as compared to basic necessities.

Table 3.61: Annual expenditure by expenses category

Expenses Category	Buddhabhumi		Shivaraj		Total	
	HHs	Amount	HHs	Amount	HHs	Amount
Foods	105	11,297,000	207	23,893,000	312	35,190,000
Clothing	105	3,574,000	207	6,181,000	312	9,755,000
Education	85	4,971,000	157	9,176,000	242	14,147,000
Health	100	3,707,600	206	6,260,200	306	9,967,800
Facilities	102	2,482,200	205	4,579,600	307	7,061,800
Accessories	5	535,000	13	643,000	18	1,178,000

Expenses Category	Buddhabhumi		Shivaraj		Total	
	HHs	Amount	HHs	Amount	HHs	Amount
Agricultural tools, fertilizers	59	597,500	72	1,538,600	131	2,136,100
Transportation and Communication	101	1,693,200	201	2,883,700	302	4,576,900
Festivals/rituals	104	2,049,000	204	3,306,250	308	5,355,250
Alcohol, tobacco	14	696,000	16	351,000	30	1,047,000
Others	5	103,000	6	770,000	11	873,000

Source: Household Survey, 2024

19. Sanitation and Water Supply

This sub-chapter includes the findings about the availability of sanitation and water facilities available within the surveyed households, which includes toilets and water source for domestic use, which have direct relation with the community and their accessibility for good health over the time.

a. Toilet Facility

Most of the surveyed households (93.6%) have toilet facilities at their home compound whereas about only 0.3 percent HHs have no toilet facility and go to nearby forest or field for toilet as reported by the respondents. Nepal Government has declared an “Open Defecation Free (ODF) Nation” in 2019; however, 0.3 percent HHs still do not have toilet facility in the project area. About 6.0 per cent households have pit toilet as shown in the table.

Table 3.62: Toilet Facilities in the Surveyed Households

Sanitation Facilities	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Permanent Structure with pan/commode	101	96.2	191	92.3	292	93.6
Temporary pit	4	3.8	15	7.2	19	6.1
No toilet, go open sp	0	0.0	1	0.5	1	0.3
Total	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024

b. Sources of Water for Domestic Use

Among the surveyed households, majority of the HHs are using Piped/tap water (71.2%) followed by hand pump water (22.4%), and Deep tube well with (6.4%) as sources of water for domestic



use. The detail information about the sources of water used by surveyed households in the project area is shown in Table 3.63.

Table 3.63: Sources of Water Use

Water Source	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Piped Tap	71	69.60	126	68.1	197	63.14
Natural (Well/Spring/Spout)	1	0.98	0	0.0	1	0.32
Ground (Deep tube Well)	6	5.88	12	5.8	18	5.78
Jar	1	0.98	9	4.3	10	3.21
Tanker	8	7.86	6	2.9	14	4.48
Hand pump	17	13.72	46	27.1	63	20.19
Others	1	0.98	8	3.9	9	2.88
	105	100	207		312	100

Source: Household Survey, 2024

20. Energy Sources

Electricity is the main source of lighting energy within the surveyed household. Out of 312 surveyed HHs, 310 HHs (99.4%) are using electricity for lighting purpose. The households using Kerosene for the lighting purpose is 0.3 percent and using kerosene is 0.3 percent only, which shows the decreasing use of kerosene and other sources of energy and increasing use of electricity for lighting as shown in *Table 3.64*.

Table 3.64: Sources of Lightning Energy

Lighting Sources	Buddhabhumi		Shivaraj		Total	
	HHs	%	HHs	%	HHs	%
Electricity	103	98.1	207	100.0	310	99.4
Kerosene	1	1.0	0	0.0	1	0.3
Others	1	1.0	0	0.0	1	0.3
Total	105	100.0	207	100.0	312	100.0

Source: Household Survey, 2024

a. Cooking Sources

Major sources of energy for cooking used by the surveyed households are Liquefied Petroleum Gas (LPG), which is 87.8 percent followed by firewood (42.9%), bio-gas (0.3%), and cow dung/straw (1.3%) as shown in Table 3.-65. Decreasing use of cow dung/straw within the surveyed households is noticed, which is good for human health and local environment.



Table 3.65: Sources of Energy for Cooking

Source of Cooking Energy	Buddhabhumi		Shivraj		Total	
	HHs	%	HHs	%	HHs	%
Fire wood	6	5.71	20	9.68	26	8.33
LPG Gas	93	88.59	180	86.95	273	87.5
Bio-gas plant	0	0.0	1	0.48	1	0.32
Dung cake	3	2.85	1	0.48	4	1.28
Electricity	3	2.85	5	2.41	8	2.57
Total	105	100	207	100	312	100

Source: Household Survey, 2024

21. Public Service Facilities

Public services available in the project area include market centers, industries, municipality offices, ward offices, and police stations, transportation and infrastructure development and ongoing and future projects, which are presented in following sub- chapters. Major public and private sector services are presented in Table 3- 67. Similarly, major market centers within the project area are Gorusinghe, Imaliya, Kharendrapur, Chamdrauta and Shivapur. These market centers have availability of small shops, hotels, lodges, restaurants and so on are involved and has been facilitating the adjoining villages. Weekly Hat bazars in all above-mentioned major settlements play the vital role in transaction of goods and product such as clothing, home appliances, agriculture products (grain, meat, fish, fruits and vegetables), food and beverages etc. There is frequent mobility of public for business as well as public services in these areas.

S.N.	Occupation	HH visit frequency in a month	No. of Service center
1	Health post	2	4
2	Hospital	2	3
3	School (primary/secondary), college	26	13
4	Major Market	10	4
5	Hatbazar	4	2
6	Veterinary center	2	1



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

7	Maternal facility	1	4
8	Electricity office	1	1
9	Public transport (Bus, Microbus, Safari, Tempo)	30	3

Source: Detail Design Report of the Project, 2025

22. Industries with in the project area

As per FGD participants, there were different types of industries were reported within the project area, which include carpet, grill, crusher, rice mill, oil mill, vehicle repair, furniture, garment, bakery, soap, cement and brick block, dalmoth, spice, incense stick and candle, hume pipe, oxygen gas, bag, dairy, poultry, banana product, toothpick, water processing etc.

23. Transportation Facilities

Municipality offices and Police Stations for the people of GC corridor are easily accessible. Among 2 project affected municipalities (within the survey area), 2 municipality offices are near outside to the GC road, alignment. Similarly, among 3 ward offices (within the survey area), a 1 ward office is within 1 km, and another is far from GC road.

24. Infrastructure Development Status, Ongoing and Future Projects

Physical infrastructure facilities like electricity, drinking water, school buildings, linking roads are good in condition. Regular maintenance for rural roads connected with the highway is essential. There are some on-going and future projects/programs being implemented/to be implemented in and around project area, which may bring cumulative impact to the GC road and bridges upgrading sub-project.

C. Demography of Project Affected Families

All the peoples who lose their property specially structure has considered as PAFs and census was carried out for preparation of the Resettlement plan of the project. Based on the census survey following status were observed in the project area.

1. Households and Population

A total 50 households were sampled for the survey comprising 316 populations. Among them, 161 are male and 155 are female, with an average household size of 6.3.

Table 3.66: Household and Population of Project Affected Households

S. N	Settlement	No. of HHs	Population	Male	Female	Average Family size
1	Imaliya	7	52	27	25	7.4
2	Kharendrapur	13	71	33	38	5.4
3	Bankatti	10	73	36	37	7.3
4	Chanuta	20	120	65	55	6.0
Total		50	316	161	155	6.3

Source: Household Survey, 2024

2. Status of household head

According to the baseline survey, 50.9 percent of the populations are male and 49.1 percent are female population covering four settlements in along the road.

Table 3.67 Head of Household by Gender

S. N	Settlement	No. of HHs	HHs Head		Population	Male	Percent	Female	Percent
1	Imaliya	7	Male	Female	52	27	51.9	25	48.0
2	Kharendrapur	13	45	5	71	33	46.4	38	53.5
3	Bankatti	10			73	36	49.3	37	50.6
4	Chanuta	20			120	65	54.1	55	45.8
Total		50	45	5	316	161	50.9	155	49.0

Source: HH Survey, 2024

3. Case /Ethnicity

Baseline survey shows that 39 individuals (78.0%) are Brahmin/Chhettri, 1 individual (2.0%) is Janajati, 1 individual (2.0%) is Dalit, and 9 individuals (18.0%) belong to the "Others" category, which includes Muslim and Madhesi groups (*Table 3. 68*).

Table 3.68: Distribution of Project Affected households by Caste and Ethnicity

S. N	Settlement	Caste/Ethnicity	HH	Percent
1	Gorusinghe - Chandrauta Road	Brahmin /Chhettri	39	78.0
2		Janajati	1	2.0
3		Dalit	1	2.0
4		Others (Muslim/Madhesi)	9	18.0
Total			50	100.0

Source: HH Survey, 2024



4. Family Structure

Two types of family structures were reported among the project affected households; nuclear and joint family. A nuclear family is a family that consists only of parents and their unmarried children sharing a common kitchen. Whereas, joint family consists of grandparents, parents and their children who share a common kitchen. The finding of the household census survey reveals that majority of the households (78.0 %) have a joint family structure and 22.0 percent households have a nuclear family structure (Table 3.69).

Table 3.69: Project Affected households by types of family structure

Family Type	Number of Households	Percent (%)
Nuclear family	11	22.0
Joint family	39	78.0
Total	50	100.00

Source: HH Survey, 2024

5. Literacy and Education

Out of total project affected household, majority of the family member of households (48.7%) reported that they have literate/elementary literacy followed by 29.4% have completed secondary level of education. Likewise, 15.8% have encompassed higher education and mere 6% are illiterate.

Table 3.70: Educational Status of the family member

Educational Status	No. of HH Head	Percent
Illiterate	19	6.0
Literate / Elementary	154	48.7
Secondary school level	93	29.4
Higher Education	50	15.8
Total	316	100.00

Source: HH Survey, 2024

6. Household Economy and Modes of Livelihood

Since the economy of the area is gradually shifting from rural agricultural economy to business and service based, the major sources of income for majority of the households are nonfarm activities. However, the overall livelihood strategy of the project affected households is characterized by a mixture of farm and nonfarm activities. Farm activities are carried out for food supply, whereas other requirements of the household are fulfilled through nonfarm activities. The project affected households are largely relying on more than one source of income for the fulfillment of their livelihood needs. Non-agriculture activities like business and services are the main contributors for household economy. The main source of income for majority of project affected households (60



%) is business followed by the remittance from foreign employment is the secondary source of income (26%) whereas 8 percent HH were involved in agriculture and only 4 and 2 percent HH are engaged in service and small industry respectively (Table 3.71).

Table 3.71: Main sources of income of the project affected households

S.N.	Occupation	No. of HH	Percent
1	Agriculture	4	8.0
2	Business	30	60.0
3	Service	2	4.0
4	Wage Labor	0	0.0
5	Remittance	13	26.0
6	Entrepreneur/small industry	1	2
Total		50	100.00

Source: HH Survey, 2024

7. Income and Expenditure

It is indeed a difficult task to calculate the income and expenditure patterns of the project affected households because generally income and expenditure data might not be very reliable as most of the PAFs either grossly underestimate their income or overestimate their expenditure patterns. The average annual household income of the 50 surveyed household is estimated as NRs 2,71,700. The average annual household expenditure of the surveyed households is estimated as NRs. 2,42,800. The major proportion is spent on education, food, clothing, fuel/energy, transport, communication, farming and health and medicine.

Table 3.72: Average Annual household income and expenditure

S.N.	Settlements	No. of HHs	Average Annual Income	Average Annual Expenditure
1	Imaliya	7	1750000	1400000
2	Kharendrapur	13	3835000	3250000
3	Bankatti	10	2000000	1825000
4	Chandauta	20	6000000	5665000
	Total /Average	50	271700	242800

Source: HH Survey, 2024

8. Availability of basic service center and visits by the household (monthly)

The table below shows that higher frequency of visit to public transport followed by school. Among the service center, school is in high number in the surveyed area.



Table 3.73: Basic service center and frequency of visits by HH

S.N.	Occupation	HH visit frequency	No. of Service center
1	Health post	15	4
2	Hospital	5	3
3	School (primary/secondary)	26	10
4	Market center	10	4
5	Vetnary center	5	1
6	Maternal facility	1	4
7	Electricity office	1	1
8	Public transport	30	3
Total		93	30

Source: HH Survey, 2024

9. Marital Status

Table 42 described the marital status of project affected household. Majority of the HH head are married 45 (90%) while unmarried HH head did not find during the survey. 3 HH are widowed and single HH head resulting from divorced is female and male each.

Table 3.74: Marital status of HH Head

S.N.	Occupation	No. of HH Head	Percent
1	Married	45	90.0
2	Unmarried	0	0.0
3	Single	0	0.0
4	Widowed	3	6.0
5	Divorced	2	4.0
Total		50	100.00

Source: HH Survey, 2024

3.11. Review of Policies, Laws, Rules and Manuals While Preparing the Report

While implementing the project, it is the responsibility of the proponent to follow the standards specified in the existing policies, laws, regulations, standards and guidelines related to environmental protection. During the study of this project, IEE is guided by the requirements and provisions of the following laws, acts, rules and guidelines, standards as applicable.

INSTRUMENT	DESCRIPTION
Constitution of Nepal	Article 30 (1) of the constitution has granted 'every person will have the right to live in a clean and healthy environment' as a fundamental right for the people. The victim will have the right to obtain compensation, in accordance with the law, for any injury caused by environmental pollution or degradation. Article 51 of the constitution mentions pursuing policies to develop balanced, environment friendly, quality and sustainable physical infrastructures, while according priority to the regions lagging behind from development perspective. The article also mentions about sustainable development.
Policies and Plans	
Sixteenth Plan (Fiscal Year (2081/82- 2086/87 BS) 2019/20- 2023/24 AD)	Sixteen Plan (2019/20-2023/24) has focused its objectives to extend the road network keeping the net transportation cost at a minimal level, and continue upgrading as well as maintenance work to ensure regular road connectivity. This plan has established multiple working area. It has also ensured to award contracts only after completion of all designs based on five major strategies. It has planned to ensure balanced development by considering provincial level balanced infrastructure development while establishing express highways, tunnels, and other modern infrastructure based on master. It has also ensured the contract only after completion of all designed reports as well as the declaration of RoW of the road.
National Environment Policy, 2076 BS (2019 AD)	The policy has created a new version for the management of pollution, and waste along with maintenance of greenery to ensure people's right to live in a healthy and hygienic environment. Similarly, the policy has the objective of mainstreaming the environmental concerns in development activities. It has emphasized promoting the reuse and recycling of waste. To prevent, control and

INSTRUMENT	DESCRIPTION
	minimize pollution have proposed following policies and strategies; Efficient structures will be formed to prevent, control and minimize pollution; Promotion of environment-friendly vehicles; Waste segregation as well as promotion of reuse and recycle techniques;
National Climate Change Policy, 2076 BS (2019 AD)	The Government has followed a theme-based approach in formulating Climate Change Policy, 2076 (BS). The strength of the policy, 2019 is the inclusion of guiding principles which are related to common but differentiated responsibilities and capabilities, need for internalization of climate change aspects in relevant policies, plans and programs, sustainable development, equity, public participation, coordination and cooperation, science-based decision-making, and balance between national priorities and international relations (with priority on climate change adaptation).
National Forest Policy, 2075 BS (2018 AD)	This policy focuses on sustainable management of forest in Nepal. It emphasizes for green economy, employment generation, tourism development, carbon sequestration, biodiversity, conservation and watershed management, to contribute for country's prosperity as national goal. This policy is related to overall management of forest for development of user's group, cooperatives, forest entrepreneurs, medicinal plants and NTFPs entrepreneurs. As country is newly structured in three federal system with three types of government. This policy also defines roles and responsibilities and resource mobilization of forest by three types of governments.
Land Use Policy, 2072 BS (2016 AD)	Land use Policy is a policy document relating to limits and protection of Land and Land Resources, optimum use and effective management thereto. The National need of this policy is to ascertain of environment-friendly construction-works by making optimum use of Lands and Land Resources in keeping with a balance between the environment and development, to develop a hygienic, beautiful, well-facilitated and safe human settlement; to enhance a planned and sustainable urbanization of the country, and to achieve sustainable and inclusive economic boost up through devising and executing of all regional development plans of the country under a level-wise Land Use Plans. The vision of this Policy is to make optimum use of available Lands and Land Resources



INSTRUMENT	DESCRIPTION
	in pursuit of sustainable social, economic and ecological developments and prosperity of the country as well.
Land Acquisition, Resettlement and Rehabilitation Policy, 2015 AD	The policy emphasizes scientific standards for land valuation and extension of compensation equivalent to the minimum market value of the land. A provision in the policy allows the government to take action against those who try to disrupt the land acquisition process or create hurdles for the project. In this regard, the policy has stressed the need to first assess of socio- economic impacts of a project. All expenses related to land acquisition, compensation and implementation of resettlement and rehabilitation plans should be considered as a project cost. It has four approaches for land acquisition: Voluntary donation; Direct negotiation; Land development program; and Expropriation.
ADB Safeguard Policy Statement, 2009 AD	The Asian Development Bank has defined its environmental safeguard requirements under its "Safeguard Policy Statement, 2009" (SPS 2009). The SPS 2009 key requirements include screening for significant impacts and categorization, consultation, and disclosure. Proposed projects are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts. Here, Projects are classified into four categories in terms of significance of impact to the environment.
National Wetland Policy, 2059 BS (2003 AD)	National Wetland Policy, 2059 mentions the need for conservation, restoration and effective management of wetlands. In addition to this, its objectives emphasize wise utilization of wetland resources and support for community dependent on such wetlands. It also makes clear that development activities should not lead to reduced quality and area of wetland. The policy has classified wetlands based on ownership, vulnerability, management and Importance.
National Transport Policy, 2058 BS (2002 AD)	This policy states, among others, that the entire process of land acquisition and transferring of land ownership to the project will be established prior to the commencement of road project implementation. Equally, a basis for livelihood will be established for the fully displaced families by way of rehabilitation or

INSTRUMENT	DESCRIPTION
	by any other means.
Acts	
Statistics Act, 2079 BS (2022 AD)	This act aims to generation, processing, storage, publication, distribution in a reliable and timely manner for the policy formulation, implementation, resources management and effective service delivery in federal, provincial and local level.
Federation, Province and Local Level Coordination and Inter-relation) Act,	This Act aims to manage the inter-relations between the Federation, Province and Local level that exercise the state powers under the Constitution of Nepal on the basis of cooperation, co-existence, coordination and mutual cooperation. Chapter 5 of this act explains the resolution of disputes, if arises among federation, province and local level.
Land Use Act, 2076 BS (2019 AD)	This Act is classified land into 10 categories; agricultural; residential; commercial; industrial; mining and mineral; forests; river, stream, pond and wetland; public use; cultural and archaeological; and others. The land classification is based on the composition and use of the land. The classification has not clearly pinpointed Guthi land, which is religious land in the name of temples or shrines, from the revenue of which the religious ceremonies or festivals associated with the temples or shrines are celebrated and the repairs and maintenance of the temples or shrines are carried out. The act is introduced based on the condition of land, population growth, requirements of land for various purposes, such as food and habitation and the need for economic development and infrastructure building among others. The main aim of the act is to ensure that land is properly used and managed and that land set aside for one purpose is not used for another. The provincial and local governments are also required to formulate their own land use laws based on the act.



INSTRUMENT	DESCRIPTION
Environment Protection Act, 2076 BS (2019 AD)	➤ Environment Protection Act, 2076 is the principal regulatory framework to make the development programs and projects environment-friendly which are now enforced through appropriate regulatory measures. The act: ➤ contains several provisions to internalize an environmental assessment system and to maintain a clean and healthy environment by minimizing the adverse impacts on human beings and other life forms and physical objects; ➤ highlights that any development project, before its implementation has to pass through an environmental assessment, which will be either Brief Environmental Study (BES), Initial Environmental Examination (IEE), ➤ Environmental Impact Assessment (ESIA), or Strategic Environmental Analysis (SEA) depending upon the location, type and size of the projects; empowers the Ministry of Forests and Environment (MoFE) to approve the EIA report, whereas National Investment Board (NIB) to approve the EIA report of national priority development road projects; and empowers MoFE to prohibit the use of any matter, fuel, equipment, or plant, which has adverse effects on the environment. ➤ The act has provisioned to establish an Environmental Protection Fund to be used for environmental protection, pollution control and heritage conservation, and gives the government the authority to declare specific areas as an environmentally protected area. ➤ Brief Environmental Study (BES), Initial Environmental Examination (IEE) of Federal projects are submitted to Federal respective ministries for approval, whereas the EIA and IEE of federal level projects are approved by Federal Government as per province environmental law, The EIA of local level are approved as per provincial law and IEE and BES is approved as per local level laws.



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INSTRUMENT	DESCRIPTION
Forest Act, 2076 BS (2019 AD)	Section 12, article 42 deals with the use of the forest for the provision of development projects. Article 42 (1) mentions government can grant permission to use a section of the national forest area for any development projects especially the national priority projects, projects granted to develop by the National Investment Board, and projects of national pride. Strategic Road Network lies under this category. Article 42 (2) compensatory plantation scheme (3) for provincial and local governments in case no alternative is left without using forest area while developing any project including road, they can request the government of Nepal for so. Section 10 article 37 and 38 of the forest act 2019 have stated the provision of plantation along the roadside as Article 37 (3) the trees planted in the road, canal and path side and trees providing shelter on the road and trees planted in the source of a ditch, religious site or similar other sensitive places may be cut or removed upon fulfilling the procedures as prescribed. Similarly, Article 38. Development and management of urban forest: (1) The local level may, on its own or in partnership with anybody, organization, or the private sector, develop and manage the forest in places such as public roads and parks in the urban area and settlement within its area
Child Related Act, 2075 BS (2018 AD)	As mentioned in chapter 2 of this act, Children below fourteen years of age shall not be deployed in any risky work or used as a house-servant or house- maid and the Government of Nepal, Provincial Government and Local Level may follow the necessary measures and make and implement the standards for the protection of the children.
Disaster Risks	The Act aims to protect human lives and properties of the public, private and individual, to preserve natural and cultural heritage, and to keep physical infrastructures safe from natural and non-natural disasters by effectively coordinating and managing all activities on reduction of disaster risk and

INSTRUMENT	DESCRIPTION
Reduction and Management Act, 2074 BS (2017 AD)	management. Section 3 of the Act mentions about the establishment of a National Council for Disaster Risk Reduction and Management, headed by the Prime Minister, to operate disaster related functions effectively. Further the Act also envisages the establishment of a National Disaster Risk Reduction and Management Authority under the Ministry of Home Affairs to effectively carryout and manage disaster management activities (Section 10).
National Civil Code and Criminal Code (<i>Muluki Debani Samhita</i>), 2074 BS (2017 AD)	This Act refers to land acquisition/utilization of land, restriction on illegal encroachment of land, non-obstruction in public places like road, river, or any other public places, and protection of governmental and public properties. Chapter 5 elaborates provisions relating to government, public and community properties. Chapter 14 explains provisions relating to wages, labor and employment.
The Act Relating to Rights of Persons with Disabilities, 2074 (2017)	The act aims to eliminate discrimination and ensure that people with disabilities can live independently and with dignity. This involves empowering them and including them in decision-making processes related to policy and development. The act also entails that (a) An enterprise shall make provision that workers or employees with disabilities can work in an easy manner. (b) No one shall deprive any person of an opportunity of promotion or deny to make promotion solely on the basis of disability.
Local Government Operation Act, 2074 BS (2017 AD)	The Section 3(j) of Local Governance Operation Act, 2017 explains about the role of newly formed local bodies such as Rural Municipalities and Municipalities in Environmental conservation and biodiversity protection through the formulation of local level rules, plans and policies, its implementation and monitoring. Similarly, the section 3(p) depicts the relevant rules, law and criteria for the project implementation with the wildlife, birds, water use and environment conservation. Thus, it empowers the local bodies for the conservation of natural resources and implementation of environmental conservation activities. The Rural Municipality, Municipalities and District Coordination Committees (DCCs) are mandated to take up responsibilities for the formulation and implementation of a program relating to the protection of the environment and biodiversity, and to give adequate priority for the



INSTRUMENT	DESCRIPTION
	protection of the environment during the formulation of local level plans and program.
Labor Act, 2074 BS (2017 AD)	According to the Labor Act 2017, section 4 on employment of workers and employees, and subsection 3 on workers or employees engaged in any contract work of a permanent nature in any enterprise will also be made permanent under subsection (2). Under section 5, no child will be employed. Except in prescribed circumstances, minors and women may ordinarily be employed for the period from 6 a.m. to 6 p.m. Women may be employed like men after making appropriate arrangements on the basis of mutual agreements between the general manager and the employees or workers in question. All laborers should be provided with safety equipment such as helmets, gloves etc. during works. The Labor Act will be followed in all the works carried out under the Project.
The National Civil (Code) Act, 2074 BS (2017 AD)	The National Civil (Code) Act, 2017 is expedient to make timely the civil provisions contained in the Country Code and other laws, by also amending and consolidating such provisions, in order to maintain morality, decency, etiquette and convenience as well as economic interest of the public by maintaining law and order in the country and maintain harmonious relationship between various castes, races and communities, by making just provisions in the economic, social and cultural fields; Now, therefore, the Legislature Parliament under clause (1) of Article 296 of the Constitution of Nepal has enacted this Act.
An Act to Regulate and Control International Trade in Endangered Wild Fauna and Flora, 2073 BS	The act aims to fulfill the requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) from 1973. The purpose is to regulate and control international trade to help conserve endangered species. Furthermore, the act states that no person shall purchase, sell, possess, use, plant, rear, captive breed, transport or import or export or cause to be done so a threatened or vulnerable wild fauna or flora or a specimen.
Solid Waste Management Act, 2068 BS (2011 AD)	The objectives of the act include maintaining a clean and healthy environment by minimizing the adverse effects of solid waste on public health and the environment. The act mandates local bodies to take the necessary steps to promote reduce, reuse, and recycle (3R), including segregation of MSW at



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INSTRUMENT	DESCRIPTION
	source. It also authorizes the local bodies to formulate rules, by-laws, and guidelines.
Plant Protection Act, 2064 BS (2007 AD)	This act aims to prevent or control harmful epidemic insect or disease spread in plant or plant products while importing or exporting. By notification in the Nepal Gazette the GoN may impose restrictions or conditions for the import of plant or plant products.
Child Labor (Prohibition and Regularization) Act, 2056 BS (2000 AD)	Child related Act, 2048 (1993) and Child Labour (abolition and regulation) Act, 2056 (2001) are the major acts related to child labour in Nepal. The Child Labour (Abolition and Regulation) Act, 2056 (2001), Article 3, Clause 1 prohibited for labour employment any child below the age of 14 years. Clause 2 prohibit child below 16 years to work in risk-prone sectors such as public transportation and construction related works.
Motor Vehicles and Transport Management Act, 2049 BS (1993 AD)	The Act defines and prescribes necessary standards for vehicles emission and mechanical condition for vehicle registration by the Transport Management Office (TMO) and the TMO can deny a permit based on environmental factor. Standards are set for petrol and diesel engine under the Nepal Vehicle Mass Emission Standard 1999.
Water Resource Act, 2049 BS (1992 AD)	It is expedient to make arrangements for the rational utilization, conservation, management and development of the water resources that are available in the Nepal in the form of surface water, underground water or in whatsoever form. It is expedient to make timely legal arrangements for determining beneficial uses of water resources, preventing environmental and other hazardous effects thereof and also for keeping water resources free from pollution.
Mines and Minerals Act, 2042 BS (1985 AD)	This act provides for the development of mines and mineral deposits existing in the country. The act classifies minerals based on their nature and importance as specified in section 3A. The Government of Nepal shall have the exclusive power to carry out mining operations. The act further provides for: restrictions on the export of minerals; royalties; inspection and investigations; establishment of a mineral's development center to launch a minerals promotion programme.
Soil and	Soil and Watershed Conservation Act makes provision to control floods



INSTRUMENT	DESCRIPTION
Watershed Conservation Act, 2039 BS (1982 AD)	landslides (Watershed Conservation Rules, 1985). The Watershed Conservation Office is the authority and District Watershed Conservation Committee must implement watershed conservation practices and promote public participation for soil and land protection. This act also attracts as and when slide or erosion within road is surfaced up significantly.
National Nature Conservation Act 2039 BS	This act has been implemented because the conservation and management of nature and natural resources is important. The is responsible for making necessary arrangements for the development of national parks and reserves.
Public Road Act, 2031 BS (1974 AD)	The Public Road Act, 1974 has been enacted to ensure the construction and operation of the road Projects smoothly. Section 3 of the Act empowers GoN to prohibit the construction of permanent structures (buildings) in the prescribed distance from the road, i.e., the Department of Road (DoR) has the authority over everything within the boundaries of the road. The DoR may acquire temporarily the land and other property adopting compensatory measures during the construction, rehabilitation and maintenance of the public road (Sections 14 and 15). The Act obliges the DoR to plant trees on both sides of the road and handover it to the local bodies (Municipality) for their management (Section 16). The Act also empowers the DoR to operate quarries and borrow pits and other facilities during the road construction (Section 17). In sum, the Act facilitates the construction of this road by even acquiring land and property including for the execution of construction materials and development of other facilities during road construction through compensation as negotiated and as well as to maintain greenery along the roadside.
National Park and Wildlife Conservation Act, 2029 BS (1973 AD) and amendment 2049 BS (1992 AD)	The Act includes provisions to restrict damage to forest products and to block or divert any river or stream flowing through a national park or reserve or any other source of water. It also states that, without permission, no one shall cut, fell, remove or overshadow any tree, plant, or any forest product, or do anything by which the forest produce may die, burn or get damage. This act is applicable to the national highway improvement project because the project will involve some clearing of forest and trees.

INSTRUMENT	DESCRIPTION
Land Acquisition Act, 2034 BS (1977 AD)	This act provides guidance on land and/or asset acquisition, land ceiling, rights of tenant, exemption from upper ceiling, land use, control of land fragmentation, and plotting.
Infectious Disease Act, 2020 BS (1964 AD) with amendments 2075 BS (2019 AD)	This act expedient to make provisions for the root out or prevention of any infectious disease which spreads or is likely to spread throughout the Nepal or any part so that such disease cannot reach to its climax.
Aquatic Animal Protection Act, 2017 BS (1960 AD)	The Aquatic Animal Protection Act, 1960 provides the legislative protection of the aquatic habitats. The section three (3) of the Act renders punishment to any party introducing poisonous, noxious or explosive materials into the water source or destroying any dam, bridge or water system with the intent of catching or killing aquatic life. The section four (4) empowers the government to prohibit catching, killing and harming certain kinds of aquatic animals through notification in the Nepal Gazette.
Rules/Regulations	
Forest Regulation, 2079 BS (2022 AD)	According to Rule 65 (1) of Forest Rules, "if there is loss of anything of local people during implementation of the national prioritized plan, the plan implementer has to pay compensation." Rule 65 (2) states that, "the proponent has to pay all the costs incurred in clearing and managing trees and bushes. According to Rule 87 (3) If Forest areas are to be used for development projects in accordance with this rule, coordination with the concerned Division Forest Office is required while formulating such projects, conducting feasibility studies and conducting environmental studies.
Environment Protection Rules, 2077 BS (2020 AD)	The Environment Protection Rules, 2020 contains the elaborative provisions on the process to be followed during the preparation and approval of projects requiring BES, IEE and EIA including scoping documents, terms of reference, information dissemination, public consultation and hearing, and environmental monitoring and auditing. EPR calls for public consultation before the preparation of scoping document and Terms of Reference and a public hearing



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INSTRUMENT	DESCRIPTION
	before the approval of the EIA Report. It stipulates requirements and procedures for the approval process of the Environmental Assessment. Sections 2 and 6 of the EPA, 2019 and Rule-3 to 13 of the EPR, 2020 contain such provisions, Rule 4, 5 and 6 of the EPR, mention the condition of scoping, ToR and public hearings. Similarly, 7, 8 and 9 on the preparation, submission and approval procedure of Environmental Reports.
Labor Rules, 2075 BS (2018 AD)	Rule 7 is concern with occupational safety and health policy. Employers are required to maintain an occupational health and safety policy including provisions related to arrangements Employee's safety and security, Employee's health, probable accident in workplace, precautions to be taken while operating devices and machines in workplace and precautions to be taken while using chemical substances. The Labour Rules has provided the detail safety measures to be followed by Employer.
Solid Waste Management Rules, 2070 BS (2013 AD)	Rule 3 mentions about segregation and management of solid waste, rule 4 about discharge of solid waste and rule 5 about discharge and management of harmful and chemical waste.
Plant Protection Rules, 2066	This rule has been formulated for the following reasons (a)Where deemed necessary, based on scientific evidence, to declare pest outbreak endangered area, pest free area, pest free production site/zone or area of low pest prevalence, (b) To prescribe standards required to be observed in carrying test, treatment of plants or plant products, establishing post entry quarantine facilities, area of low pest prevalence and establishing laboratories or treatment rooms to be established by the private sector, (c) To make recommendation to the Government of Nepal for the validation/accreditation of laboratories which are established by the private sector to carry out test, treatment or research of plants or plant products and meet the standards as referred to in Clause (b), (d) To carry out regular study, research and surveillance of regulated pests, and update information thereon and provide such information



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INSTRUMENT	DESCRIPTION
	to the concerned bodies or organizations.
Child Labor (Prohibition and Regulation)	This Rule was framed in exercise of powers conferred by section 27 of the Child Labor (Prohibition and Regulation) Act, 2056. Before, employing a child as a Labor an application will be filed in the Labor office to examine his /her health in relation to his/her ability and inability to do the work, mentioning about the nature of the work and the age of the child. A child
Rules, 2062 BS (2006 AD)	working in an Enterprise will get the monthly remuneration and allowance not less than prescribed by the Government of Nepal by publishing a notice in Nepal Gazette from time to time. A child working in an Enterprise will get at least Thirteen days public holiday with full salary each year. A child who goes to school will get Ten days educational leave during the annual examination in a year.
Water Resource Rules 2050 BS (1193 AD)	The rules mandate that environmental impact analysis (measures to be taken to minimize the adverse affect due to project on environment, measures to be taken for the conservation of aquatic animals and water-environment, social and economic effect of project on the concerned area and utilization of local labour, source and materials, benefits to be taken by the local people after the completion of the project, training to be provided for local people in relation to construction and maintenance and operation facilities to be required for construction-site, safety arrangements and possible side effects on concerned landowners due to operation of the project, details of the people to be evacuated and necessary plan for their rehabilitation also should clearly be shown),
Ancient Monuments Preservation Rules 2046	This rule is the basic legal instruments of the government for conservation and restoration of historical monuments and heritage sites. The rule states that upon deciding the design and standards of houses owned and occupied buildings or other constructions constructed in private land, within the Protected Monument Zone, it shall be the duty of the Technical Committee to give advise to the Department of Archaeology. It is also essential to carry out other necessary functions as prescribed by Government of Nepal in relation to the survey and classification of the ancient monuments.
National Trust for Nature	In order to fulfill the work and duties of the fund mentioned in Section 9 of the Act, the fund may coordinate with the relevant agencies of the Government of Nepal or non-governmental associations, organizations or

INSTRUMENT	DESCRIPTION
Conservation	
Regulation 2041, BS	individuals and obtain their approval and support as necessary and may arrange for the following work to be done in the governmental or non- governmental sector: - (a) planting trees, (b) doing work related to land and water resources conservation, (c) Advising technical and other opinions on national parks and wildlife conservation work, (d) To create public awareness and increase public participation in the work of protecting nature and natural resources.
Manuals/Guidelines/Directives	
Directive for Wildlife Friendly Infrastructure Development, 2078 BS (2022 AD)	The minimum size of the underpass for different type of wildlife will be as prescribed in Directives for Wildlife Friendly Infrastructure Development, 2078. This Directive classified the underpass size as per classification of very large, large, medium and small Wildlife. The size of underpass structure is given as per road width.
Guideline on Hydrologic and Hydraulic Analysis and River Training Works for Bridge Design, 2022 AD	This guideline is based on the latest IRC codes with added methodologies and explanations wherever necessary. It aims to address the hydrological dilemmas in the bridge design with proper explanations and calculations. This guideline has covered the topics of determination of design discharge, high flood level, scour estimation and river training works. This guideline describes the design discharge shall be increased by 10% in case the river reach is subject to enormous quantity of sediment transport. Most of the climate change models project increase in rainfall during monsoon in Nepal. The design discharge shall be increased by 10% to consider the impact of climate change in flood.
Procedures for National Priority Project to Acquire National Forest Land with	This procedure has been formulated as per Section 72 (Ka) of Forest Act 2049. According to Sub-section 1 of Section 4, if any proposed project lies in National Forest, the concerned party should conduct BES, IEE or EIA according to the prevailing EPA and EPR. According to Section 17 of this procedure, the project proponent itself will be responsible to remove the trees on its own cost and hand



INSTRUMENT	DESCRIPTION
Standards, 2076 BS (2019 AD)	over the forest resources to the concerned forest office. They should plant the saplings as per forestry norms if the project is subjected to remove the trees. They will be responsible to take care and protect the planted tree for five years with the co-ordination with concerned forest office.
MoPIT's GESI: Gender Equality and Social Inclusion Guideline, 2074 BS (2017 AD)	An institutional arrangement has been established for GESI implementation from Ministry Level to Regional, Division/Sub-divisional offices. At the departmental level, Geo-environment and social unit (GESU) has been responsible for the implementation and overseeing of GESI-related activities. This unit has comprised a sociologist designated as the GESI focal point with GESI responsibilities.
ADB Environmental Assessment Guidelines, 2003 AD	These Guidelines describe how to fulfil the requirements outlined in ADB's Environment Policy and the Operations Manual on Environmental considerations in ADB Operations. Information on ADB's policies and procedures for conducting and reporting on the environmental assessment is also provided for all types of Projects. Strategic tools such as country environmental analysis and strategic environmental assessment are also included.
Environmental Management Guidelines, (Road), 2056 BS (1999 AD)	This guideline assists to integrate environmental consideration in each phase of project cycle. The guideline consists of environmental mitigation measures to be incorporated into Road projects, procedures for public participation, and socio-economic consideration.
National Environmental Impact Assessment Guidelines, 1993	Chapter III of the guidelines explains that the project screening criteria and the methods to be applied in the IEE process. Project screening is done in order to determine if EIA is necessary based on indicators such as prescribed parameters, sensitive areas and so on as listed in this chapter. In case if it is not certain whether EIA is required or not, IEE shall be conducted to determine whether the project may cause significant impact on the environment and if that impact can be minimized or removed by applying appropriate measures.
Conventions	
Convention on International Trade	Convention on International Trade of Endangered Species of Wild Fauna and Flora, CITES Act, 2073 has been enacted by Government of Nepal for the



INSTRUMENT	DESCRIPTION
in Endangered Species of Wild Fauna and Flora (CITES), 2017 AD	implementation of CITES, 1973. This act requires the state to protect of endangered flora and fauna listed in CITES. This act was formulated on the basis of Sub-Article 1 of Article 296 of the Constitution of Nepal for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 2030. The main objective of this act is to protect the endangered flora and faunal species and monitor and control the international trade of those species. According to this Act, the species enlisted in Appendix I of CITES is stated as Rare Flora and Fauna, Appendix II is stated as Threatened Flora and Fauna and Appendix III is stated as Protected Flora and Fauna species.
ILO Convention on Indigenous and Tribal Peoples, 1989 AD	ILO Convention No.169 highlights the need to recognize indigenous and tribal people's specific knowledge, skills and technologies as the basis for their traditional economies and self-determined development process. Article-1 of the convention provides definition of the tribal and indigenous people. In Article 15, the rights of the peoples concerned to the natural resources pertaining to their lands will be specifically safeguarded. The uses of the term lands include the concept of territories, which covers the total environments of the areas that the peoples concerned occupy or otherwise use. The peoples concerned will wherever possible participate in the benefits of such activities and will receive fair compensation for any damages which they may sustain as a result of such activities. Article 16 (2) clearly mention that where the relocation of these peoples is considered necessary as an exceptional measure such relocation will take place only with their free and informed consent.
Environmental Standards	
Standard on Extraction, Sale and Management of Stone, Gravel and Sand, 2077 BS (2020 AD)	The standard aims to determine practical procedures to be adopted by rural municipalities and municipalities in exercising the power to sell stones, pebbles, sand and soil. As per the standard, local levels shall extract and collect river and mine-based products from the areas as specified in the approved environmental study report. The standard stipulates a provision for designating certain areas to operate mine and crusher industries. "A local unit shall prepare an environmental study report and get it approved by the concerned village or municipal executive



INSTRUMENT	DESCRIPTION
	body for extraction, collection and sale of river and mine based products. They may award a contract to registered companies or organizations to carry out these tasks at the rate approved by the executive body. The standard prohibits extraction and collection of river and mine-based products in an area two kilometers from dense settlement and forest. No local level shall carry out such work in river area within areas 500metres from the highway and one kilometer from motorable bridge and suspension bridge. The standard prohibits extraction and collection of stones, pebbles and sand from the Chure region. However, stones, pebbles and sand deposited within the Chure region due to flood may be collected as per the decision of the concerned district disaster management committee.
Nepal Road Standard, 2070 BS (2014 AD)	Nepal Road Standards- 2014, applies to all Strategic Roads in rural areas being constructed within Nepal. Based on this standard, standard designs for roads and bridges including typical drawings were prepared.
National Ambient Air Quality Standard, 2069 BS (2012 AD)	The new National Ambient Air Quality Standard (NAAQS) 2012 that came into effect requires effective monitoring and collection of eight-hour and 24- hour samples of air pollutants like Total Suspended Particulates (TSP), Particulate Matter (PM10 and PM2.5), carbon monoxide, lead and ozone levels for at least 347 days out of a 365-day year. The NAAQS further states that no particular place should fail to monitor air samples for two consecutive days. TSP consist of solid and liquid particles in the air that are harmful to health while PM10 is an air particle with a volume less than 10 micron that can easily enter into the end of the respiratory tract and cause serious health impacts. Both TSP and PM10 are considered major air pollutants.
National Ambient Sound Quality Standard, 2069 BS (2012 AD)	The National Noise Standard 2012 that came into effect as per the rule 15 of Nepal Government Environmental Protection Regulation that requires effective monitoring and collection of Day-time and Night-time noise level permitted limits.
Nepal Vehicle Mass Emission Standard, 2069 BS (2012 AD)	As per the EPR 2054 Rule 15, Government of Nepal has prescribed different National standards for emissions from vehicles. There are limit values for emission of harmful gases from vehicles as mentioned in the standards.

INSTRUMENT	DESCRIPTION
Nepal Bridge Standard, 2067 BS (2011 AD)	Department of Road (DoR) has formulated these standards with a view to establish a common procedure for design and construction of road bridges in Nepal. All permanent bridges will be designed for a design life of minimum 50 years. Traffic projections will be made for a period of 30 years and designed for a design discharge of 100 years return period.
National Drinking Water Quality Standards, 2066 BS (2006 AD)	Major tasks during monitoring to be performed by water supplier are cited as follows: Controlling regularly the quality to ascertain that the water supplied complies with the NDWQS; Periodic monitoring of all the components of the water supply system from the perspective of sanitation and risk to health; Proper supervision, inspection and maintenance as part of operation of the water supply systems; Development of necessary infrastructure like water quality testing laboratory and quality control. Following factors should be considered while monitoring Type and quality of water sources i.e. surface water, springs, dug-wells, willow wells, deep wells; Type and size of the water supply system (pipe system, treatment facilities); Local environmental settings (physical infrastructure, geography, etc.); Sanitation and hygienic condition surrounding the water supply system; Socio-economic environment at the local level; Site specific conditions for complying with the standards; User's opinion and suggestions regarding water quality; Health and Hygiene Information (information on water related diseases).
International Conventions and Treaties	
Nepal is a signatory to many international agreements, conventions etc. related to environmental conservation: • United Nations Declaration on the Rights of Indigenous Peoples, 2007 AD • UN Framework Convention on Climate Change, 1992 • The Convention on International Trade in Endangered Species of Wild Fauna and Flora, (CITES), 1973 • The Convention for Protection of the World Cultural and Natural Heritage, 1972	