

SN	Name of Species		Conservation Status		
	Local Name	Botanical Name	GoN	IUCN	CITES
13	Bhogate	<i>Citrus maxima</i>		LC	
14	Bijaysal	<i>Pterocarpus marsupium</i>	Protected		
15	Bot dhairo	<i>lagerstroemia parviflora</i>			
16	Chiuri	<i>Aesandra butyracea</i>			
17	Dabdabe	<i>Garuga pinnata</i>			
18	Dhupi	<i>Cupressus sps</i>			
19	Emli	<i>Tamarindus indica</i>			
20	Gayo	<i>Bridelia retusa</i>			
21	Gulmohor	<i>Delonix regia</i>		LC	
22	Harro	<i>Terminalia chebula</i>			
23	Ipil Ipil	<i>Leucaena leucocephala</i>			
24	Jamun	<i>Syzygium cumini</i>		LC	
25	Kadam	<i>Anthocephalus chinensis</i>			
26	Kapur	<i>Cinnamomum camphora</i>			
27	Katahar	<i>Artocarpus heterophyllus</i>			
28	Khair	<i>Acacia catechu</i>		LC	
29	Khaltu	<i>Diospyros malabarica</i>			
30	Khaniyo	<i>Ficus cunia</i>			
31	Kimbu	<i>Morus alba</i>			
32	Kumbi	<i>Careya arborea</i>			
33	Kusum	<i>Schleichera oleosa</i>			
34	Lichi	<i>Litchi chinensis</i>			
35	Mango	<i>Mangifera indica</i>		LC	
36	Masala	<i>Eucalyptus sps</i>		NT	
37	Neem	<i>Azadirachta indica</i>		LC	
38	Okhar	<i>Juglans regia</i>			
39	Pipal	<i>Ficus religiosa</i>			
40	Rajbrikshya	<i>Cassia fistula</i>		LC	
41	Sitafal	<i>Annona reticulate</i>			
42	Sal	<i>Shorea robusta</i>	Protected by GoN	LC	
43	Sami	<i>Ficus benjamina</i>			
44	Shrikhanda	<i>Santalum album</i>			
45	Simal	<i>Bombax ceiba</i>			

SN	Name of Species		Conservation Status		
	Local Name	Botanical Name	GoN	IUCN	CITES
46	Sindure/Rohini	<i>Mallotus philippensis</i>			
47	Sisso	<i>Dalbergia sissoo</i>		LC	II
48	Sitalchini	<i>Moringa oleifera</i>			
49	Supari	<i>Areca catechu</i>			
50	Teak	<i>Tectona grandis</i>			
51	Tilka	<i>Wendlandia puberula</i>			
52	Tote	<i>Ficus hispida</i>			

Source: Field survey, 2022

Note: IUCN Red List Categories: Extinct (EX), Extinct In the Wild (EW), Critically Endangered (CE), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concerned (LC), Lower Risk (LR) GoN Categories: P =Protected by legislation, F =Felling, T=Transportation, E=Export CITES Categories: I - Appendix I (are species that are threatened with extinction and are or may be affected by trade), II - Appendix II (are species that are not necessarily threatened with extinction, but may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with the survival of the species in the wild), and III - Appendix III (are species that are listed after one member country has asked other CITES Parties for assistance in controlling trade in a species).

5.2.3. Protected Species

Sal (*Shorea robusta*) and Bijayasal (*Pterocarpus marsupium*) are protected species banned for felling, transportation and export as per GoN.

5.2.4. NTFPs

Notable species of medicinal and herbal species found during field study are Jamun (*Syzygium cumini*), Barro (*Terminalia bellirica*), Harro (*Terminalia chebula*), Bot Dhayaro (*Lagerstroemia parviflora*), etc. Others species available in these forests of the project area, with varying medicinal values are Khair (*Acacia catechu*), Karma (*Adina cordifolia*), Bel (*Aegle marmelos*), Amala (*Phyllanthus emblica*), and Asarey (*Murraya koenigii*).

Table 38: Medicinal herbal and NTFPs

Local Name	Scientific Name	Uses
Jamun	<i>Syzygium cumini</i>	Used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers. It is also a good blood purifier
Barro	<i>Terminalia bellirica</i>	to protect the liver and to treat respiratory conditions, including respiratory tract infections, cough, and sore throat. Terminalia chebula is used for dysentery
Harro	<i>Terminalia chebula</i>	To treat diseases that includes dementia, constipation, and diabetes.



Local Name	Scientific Name	Uses
Khair	<i>Acacia catechu</i>	Used for stomach problems such as diarrhea, swelling of the colon (colitis), and indigestion.
Bel	<i>Aegle marmelos</i>	Help to cure inflammation. Aegle Marmelos leaf juice with honey can prove useful for treating fever.
Amala	<i>Phyllanthus emblica</i>	Used in Ayurveda as a potent rasayana and in traditional medicine for the treatment of diarrhea, jaundice, and inflammation.
Bot dhaero	<i>Lagerstroemia parviflora</i>	Used for Weight loss, It can help in treating dysentery, constipation and diarrhea, Relieves morning sickness and nausea.
Neem	<i>Azadirachta indica</i>	Used for skin diseases, treat asthma, constipation, cough, diabetes, gastric ulcers, indigestion, periodontal disease, and urinary tract infection

Source: Forest Survey 2022

5.2.3. Wildlife in the Project Area

Mountain ridges and deep valleys in Nepal is habitat for a wide range of flora and fauna. Wetlands in project area are habitat for many threatened and endemic species of flora and fauna and are resting places for many migratory and globally threatened bird species. Fishes, amphibians and reptiles are no exception.

Linear infrastructures have been found largely passing through the biodiversity rich areas through the Forests and Farmland, grassland and wetlands, etc. polluting water, deforestation, habitat loss, etc. Such activities are accelerating in Nepal, in addition to population growth, climate change; land use changes have direct impact on the Nepalese ecology. The impact includes losses, degradation, and fragmentation of ecosystems, road kills, injuries and casualties of wildlife, wildlife – vehicle collisions, among others.

Proposed alignment traverses through three isolated patches of forests, i.e., Saljhandi-Pipara Forest covers a distance of 6.1 km (Ch 611+800 - Ch 617+900), Gorusinghe Forest 8.6 km (Ch 627+000 - Ch 635+600) and Badhare/Budhi Forest 1.3 km (Ch 637+700 - Ch 639+000). The Saljhandi – Pipra forest is a good Sal (*Shorea robusta*) forest (Sal Forest Type) and is found distributed between the districts of Rupandehi and Kapilvastu. Gorusinghe forest is mixed deciduous forest (type) with patchy small blocks of good sal forests and Badhare/Budhi Forest, compared to other two, is degraded, scanty, dry and small patch (mixed deciduous forest type). Further forest condition of Gorusinghe forest is degraded sal forest compared to Sljhandi-Pipra forest. The later 2 blocks are distributed in the Kapilbastu district.



Wildlife mobility was observed and was reported in Saljhandi-Pipar and Gorusinghe forests. These forest blocks are important for wildlife movement as they (Saljhandi-Pipar and Gorusinghe forests) extend southward from Churia/Siwalik Hill Range with movement of wildlife North to South and vice versa. Wildlife migrates down south and crosses the road to visit forest blocks south of the road. This connectivity is important as the mammals travel to the hills during summer and return to Terai as the monsoon rains begins. The mammals travel during the dry season mostly and other seasons as well. As the species preferences differ, some travel towards the road-side and of which most of them cross the EWH in search of food and seasonal travelling towards the Churia hills during the summer season to get away from the heat.

The BG road does not overlap with any protected areas, however passes through a wildlife movement corridor, *i.e.*, Kothi Khola Corridor in the Saljhandi-Pipra forest block. Including other mammals, this corridor was found used by Nilgai (*Boselaphus tragocamelus*) travelling from Churia hills to Lumbini area and vice versa.

The highway runs through most of the seasonal rivers except the Tinau, and Banganga and Kothi Rivers. Other rivers/streams/springs remaining dry most of the time of the year are Kanchan Khola, Kandra Khola, Kaila Khola and Harkur Khola, etc. Prime habitat for the fish species was found in Tinau River and Baanganga River. The riverine ecosystem in the project site is influenced by human activities; fishing, extraction of river deposits, laundering and bathing, direct sewage disposal, discarded trash deposits, riverbank encroachment and recreational gathering at the riverbanks (picnic spots).

a. Mammals

Field survey (indirect sign study, reviewing road kill records, reviewing research reports/literature), revealed that there were 24 mammal species inhabited in the proposed project area. Some of the species are Barking Deer (*Muntiacus vaginalis*), Fishing cat (*Prionailurus viverrinus*), Leopard (*Panthera pardus*), Large Indian Civet (*Viverra zibetha*), Golden Jackal (*Canis aureus*), Jungle Cat (*Felis chaus*), Rhesus Macaque (*Macaca mulata*), Small Asian Mongoose (*Herpestes javanicus*), Wild Boar (*Sus scrofa*), Nilgai (*Boselaphus tragocamelus*), Sambar (*Rusa unicolor*), and Indian Crested Procupine (*Hystrix indica*).

Fishing cat present in the project area is a globally threatened species, while other 9 species, *e.g.*, Indian Spotted Deer (*Axis axis*), Nilgai (*Boselaphus tragocamelus*), Barking Deer,



(*Muntiacus vaginalis*) Striped hyaena (*Hyaena hyaena*), Honey badger (*Mellivora capensis*), Fishing Cat (*Prionailurus viverrinus*), Crab-eating mongoose (*Herpesses urva*), Common Leopard (*Panthera pardus*), Bengal Fox (*Vulpes bengalensis*) are nationally threatened species. Striped Hyaena (*Hyaena hyaena*) is nationally protected mammal and Indian crested porcupine (*Hystrix indica*) is nationally Data Deficient species. Conservation status, together with species detail is enlisted in **Table 39**.

Table 39: Mammal species present in project area

S.N	Name of Species		Conservation Status		
	Common Name	Species Name	Global	GoN	CITES
1	Indian Spotted Deer	<i>Axis axis</i>	LC	VU	
2	Nilgai	<i>Boselaphus tragocamelus</i>	LC	VU	
3	Barking Deer	<i>Muntiacus muntjak</i>	LC	VU	
4	Sambar	<i>Rusa unicolor</i>			
5	Wild Boar	<i>Sus scrofa</i>	LC	LC	
6	Striped Hyaena	<i>Hyaena hyaena</i>	NT	EN; Protected	
7	Honey Badger	<i>Mellivora capensis</i>	LC	VU	III
8	Fishing Cat	<i>Prionailurus viverrinus</i>	EN	EN	II
9	Crab Eating Mongoose	<i>Urva urva</i>	LC	VU	
10	Leopard	<i>Panthera pardus</i>	NT	VU	I
11	Bengal Fox	<i>Vulpes bengalensis</i>	LC	VU	
12	Large Indian Civet	<i>Viverra zibetha</i>	NT	NT	
13	Golden Jackal	<i>Canis aureus</i>	LC	LC	
14	Jungle Cat	<i>Felis chaus</i>	LC	LC	II
15	Indian Grey Mongoose	<i>Herpestes edwardsi</i>	LC	LC	
16	Small Asian Mongoose	<i>Herpestes javanicus</i>	LC	LC	
17	Yellow-throated Marten	<i>Martes flavigula</i>	LC	LC	
18	Masked Palm Civet	<i>Paguma larvata</i>	LC	LC	
19	Small Indian Civet	<i>Viverricula indica</i>	LC	LC	
20	Rhesus Macaque	<i>Macaca mulatta</i>	LC	LC	
21	Terai Grey Langur	<i>Semnopithecus hector</i>	NT	LC	I
22	Five-striped Palm Squirrel	<i>Funambulus pennantii</i>	LC	LC	
23	Indian Hare	<i>Lepus nigricollis</i>	LC	LC	
24	Indian Crested Porcupine	<i>Hystrix indica</i>	LC	DD	

Source: Forest Survey 2022

Convention on International Trade on Endangered fauna and Flora (CITES) Conservation Status,

Appendix I: Species threatened with extinction



Appendix II: Not yet threatened but which could become endangered if trade is not controlled, Appendix III: species identified by any Party as being subject to regulation in that country and which require international co-operation control trade,

International Union for Conservation of Nature (IUCN) Conservation Status,

LC= Least concerned, LR= Low risk, NR= Nearly threatened, EN=Endangered, VU=Vulnerable, CR=Critically Rare, I= intermediate, Insufficiently Known, T= Threatened

Nature and need of wildlife crossing highway and road kill.

From wild mammal movement perspective Saljhandi-Pipara and Gorusinghe forests are vibrant area. The observed reasons of mammal approaching the highway are;

North-South Movement Corridor: Saljhandi-Pipara and Gorusinghe forests serve as wildlife corridor for wild mammal movement across north-south crossing the highway. These forest areas are dense and are good refuge to the wildlife. In Saljhandi-Pipara forest, wild mammals crossing the highway in Saljhandi-Pipara Forest is merely obtained. The barbed wire fence at the forest edge at the both side of highway alignment has been effective in controlling the wild mammal (exception to *Rhesus macaque*) movement approaching toward the highway. Unlike, forest edge at highway side in Gorusinghe forest block is without fence providing free movement of wild mammals crossing the highway. Moreover, the forest is comparatively dense. The road kills of small mammals; Jungle cat, Golden Jackal and Large Indian Civet was noted in Gorusinghe forest block (Figure 28).

b. Avifauna

The Butwal-Gorusinghe road is aligned through settlement, farmland and tropical forest which is richly inhabited by bird species (Grimmett et al., 2016). The survey reported 93 species of birds are found in and around the project area. Among the reported birds, 26 are full migrants, 8 altitudinal migrants, 2 nomadic and remaining 55 are residents. Parakeet species such as Plum-headed Parakeet (*Himalayapsitta cyanocephala*), Alexandrine Parakeet (*Palaeornis eupatoria*) and Slaty-headed Parakeet (*Himalayapsitta himalayana*) are the most frequently observed and abundant species across the study area. No nesting/roosting sites were found in the forests within the RoW. The detail of observed avifaunal species in the project area is listed in Table 40.



Table 40: Observed avifauna in the project area during the field Survey

S. N	Common Name	Scientific Name	Conservation Status		CITES	Movement Pattern
			Global	National		
1	Alexandrine Parakeet	<i>Palaeornis eupataria</i>	NT	NT	II	Nomadic
2	Ashy Prinia	<i>Prinia socialis</i>	LC			Not a Migrant
3	Asian Pied Starling	<i>Gracupica contra</i>	LC			
4	Besra	<i>Accipiter virgatus</i>	LC		II	Altitudinal Migrant
5	Black Bulbul	<i>Hypsipetes leucocephalus</i>	LC			Full Migrant
6	Black Drongo	<i>Dicrurus macrocercus</i>	LC			Full Migrant
7	Black Kite	<i>Milvus migrans</i>	LC		II	Full Migrant
8	Black Redstart	<i>Phoenicurus ochruros</i>	LC			Full Migrant
9	Black-hooded Oriole	<i>Oriolus xanthornus</i>	LC			Not a Migrant
10	Black-winged Cuckooshrike	<i>Lalage melascistos</i>	LC			Full Migrant
11	Black-winged Kite	<i>Elanus caeruleus</i>	LC		II	Not a Migrant
12	Blue Whistling Thrush	<i>Myophonus caeruleus</i>	LC			Altitudinal Migrant
13	Blue-throated Barbet	<i>Psilopogon asiaticus</i>	LC			Not a Migrant
14	Cattle Egret	<i>Bubulcus ibis</i>	LC			Full Migrant
15	Chestnut-shouldered Bush-sparrow	<i>Gymnoris xanthocollis</i>	LC			Not a Migrant
16	Chestnut-tailed Starling	<i>Sturnia malabarica</i>	LC			Not a Migrant
17	Great Tit	<i>Parus major</i>	LC			Not a Migrant
18	Common Hawk Cuckoo	<i>Hierococcys varius</i>	LC			Full Migrant
19	Common Iora	<i>Aegithina tiphia</i>	LC			Not a Migrant
20	Common Myna	<i>Acridotheres tristis</i>	LC			Not a Migrant
21	Rock Dove	<i>Columba livia</i>	LC			Not a Migrant
22	Common Stonechat	<i>Saxicola torquatus</i>	LC			Full Migrant
23	Common Tailorbird	<i>Orthotomus sutorius</i>	LC			Not a Migrant
24	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	LC			Not a Migrant
25	Crested Bunting	<i>Emberiza lathami</i>	LC			Altitudinal Migrant
26	Crested Serpent Eagle	<i>Spilornis cheela</i>	LC		II	Not a Migrant
27	Crimson Sunbird	<i>Aethpyga siparaja</i>	LC			Not a Migrant
28	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	LC			Not a Migrant
29	Eurasian Tree	<i>Passer montanus</i>	LC			Not a Migrant



S. N	Common Name	Scientific Name	Conservation Status		CITES	Movement Pattern
			Global	National		
	Sparrow					
30	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>	LC			Not a Migrant
31	Greater Coucal	<i>Centropus sinensis</i>	LC			Not a Migrant
32	Greater Racquet-tailed Drongo	<i>Dicrurus paradiseus</i>	LC			Not a Migrant
33	Asian Green Bee-eater	<i>Merops orientalis</i>	LC			Full Migrant
34	Green Sandpiper	<i>Tringa ochropus</i>	LC			Full Migrant
35	Greenish Warbler	<i>Phylloscopus trochiloides</i>	LC			Full Migrant
36	Grey-breasted Prinia	<i>Prinia hodgsonii</i>	LC			Altitudinal Migrant
37	Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i>	LC			Not a Migrant
38	Hair-crested Drongo	<i>Dicrurus hottentottus</i>	LC			Full Migrant
39	Himalayan Bulbul	<i>Pycnonotus leucogenys</i>	LC			Full Migrant
40	Himalayan Griffon	<i>Gyps himalayensis</i>	NT	VU	II	Full Migrant
41	House Sparrow	<i>Passer domesticus</i>	LC			Not a Migrant
42	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	LC			Not a Migrant
43	Indian Peafowl	<i>Pavo Cristatus</i>	LC	NT	III	Not a Migrant
44	Indian Pond Heron	<i>Ardeola grayii</i>	LC			Not a Migrant
45	Indian Roller	<i>Coracias benghalensis</i>	LC			Not a Migrant
46	Jungle Babbler	<i>Turdoides striata</i>	LC			Not a Migrant
47	Jungle Owlet	<i>Glaucidium radiatum</i>	LC		II	Not a Migrant
48	Indian Cuckooshrike	<i>Coracina macei</i>	LC			Not a Migrant
49	Large Woodshrike	<i>Tephrodornis variegatus</i>	LC			Altitudinal Migrant
50	Large-billed Crow	<i>Corvus macrorhynchos</i>	LC			Not a Migrant
51	Lesser Adjutant	<i>Leptoptilos javanicus</i>	VU	VU		Full Migrant
52	Black-rumped Flameback	<i>Dinopium benghalense</i>	LC			Not a Migrant
53	Little Cormorant	<i>Microcarbo niger</i>	LC			Not a Migrant
54	Little Egret	<i>Egretta garzetta</i>	LC			Full Migrant
55	Little Ringed Plover	<i>Charadrius dubius</i>	LC			Full Migrant
56	Long-tailed Shrike	<i>Lanius schach</i>	LC			Full Migrant
57	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	LC		II	Full Migrant
58	Oriental Magpie-robin	<i>copsychus saularis</i>	LC			Not a Migrant
59	Oriental Pied Hornbill	<i>Anthracoceros</i>	LC	NT	II	Not a Migrant

S. N	Common Name	Scientific Name	Conservation Status		CITES	Movement Pattern
			Global	National		
		<i>albirostris</i>				
60	Indian White-eye	<i>Zosterops palpebrosus</i>	LC			
61	Paddyfield Pipit	<i>Anthus rufulus</i>	LC			Not a Migrant
62	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	LC			Not a Migrant
63	Pied Bushchat	<i>Saxicola caprata</i>	LC			Full Migrant
64	Plain Prinia	<i>Prinia inornata</i>	LC			Altitudinal Migrant
65	Plum-headed Parakeet	<i>Himalayapsitta cyanocephala</i>	LC		II	Not a Migrant
66	Purple Sunbird	<i>Cinnyris asiaticus</i>	LC			Not a Migrant
67	Red Avadavat	<i>Amandava amandava</i>	LC			Not a Migrant
68	Red Junglefowl	<i>Gallus gallus</i>	LC			Not a Migrant
69	Red-billed Blue Magpie	<i>Urocissa erythrorhynchos</i>	LC			Altitudinal Migrant
70	Red-headed Vulture	<i>Sarcogyps calvus</i>	CR	EN	II	Not a Migrant
71	Red-naped Ibis	<i>Pseudibis papillosa</i>	LC			Not a Migrant
72	Red-rumped Swallow	<i>Cecropis daurica</i>	LC			Full Migrant
73	Red-vented Bulbul	<i>Pycnonotus cafer</i>	LC			Not a Migrant
74	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	LC			Not a Migrant
75	Rose-ringed Parakeet	<i>Alexandrinus krameri</i>	LC			Not a Migrant
76	Ruddy Shelduck	<i>Tadorna ferruginea</i>	LC	NT		Full Migrant
77	Rufous Treepie	<i>Dendrocitta vagabunda</i>	LC			Not a Migrant
78	Rufous Woodpecker	<i>Micropternus brachyurus</i>	LC			Not a Migrant
79	Rusty-cheeked Scimitar-babbler	<i>Erythrogonys erythrogonys</i>	LC			Not a Migrant
80	Scarlet Minivet	<i>Pericrocotus flammeus</i>	LC			Not a Migrant
81	Shikra	<i>Accipiter badius</i>	LC		II	Full Migrant
82	Slaty-headed Parakeet	<i>Himalayapsitta himalayana</i>	LC		II	Nomadic
83	Slender-billed Vulture	<i>Gyps tenuirostris</i>	CR	CR	II	Not a Migrant
84	Western Spotted Dove	<i>Spilopelia suratensis</i>	LC			Full Migrant
85	Steppe Eagle	<i>Aquila nipalensis</i>	EN	VU	II	Full Migrant
86	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	LC			Not a Migrant
87	Verditer Flycatcher	<i>Eumyias thalassinus</i>	LC			Full Migrant
88	White-bellied Drongo	<i>Dicrurus caeruleus</i>	LC			Not a Migrant
89	White-bellied Redstart	<i>Hodgsonius phaenicuroides</i>	LC			Altitudinal Migrant

S. N	Common Name	Scientific Name	Conservation Status		CITES	Movement Pattern
			Global	National		
90	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	LC			Not a Migrant
91	White-rumped Vulture	<i>Gyps bengalensis</i>	CR	CR	II	Not a Migrant
92	White-throated Kingfisher	<i>Halcyon gularis</i>	LC			Not a Migrant
93	Zitting Cisticola	<i>Cisticola juncidis</i>	LC			Not a Migrant

Source: Forest Survey 2022

Convention on International Trade on Endangered fauna and Flora (CITES) Conservation Status,

Appendix I: Species threatened with extinction,

Appendix II: Not yet threatened but which could become endangered if trade is not controlled, Appendix III: species identified by any Party as being subject to regulation in that country and which require international co-operation control trade,

International Union for Conservation of Nature (IUCN) Conservation Status,

LC= Least concerned, LR= Low risk, NR= Nearly threatened, EN=Endangered, VU=Vulnerable, CR=Critically Rare, I= intermediate, Insufficiently Known, T= Threatened

Of the total recorded species, 3 species are globally critically endangered, 1 endangered, 1 vulnerable species, 2 near threatened and rest 87 species are categorized as the least concerned species according to IUCN Red list. Similarly, 2 species are nationally critically endangered, 1 endangered and 3 vulnerable and 4 near threatened. A diversity and abundance of scavenging birds occurs as these are attracted to a vulture restaurant maintained by Bird Conservation Nepal, a local NGO.

c. Herpetofauna

Most of the herpetofauna such as frogs and toads, and lizards recorded were gathered through literature, and much lesser herpetofauna were observed during the field study. A total of 47 species of herpetofauna were recorded of which 9 were frogs and toads, 10 skinks, Geckos and lizards, 20 species of snakes and python and 8 species of turtle and tortoise (Table 41). However, mugur crocodile (*Crocodylus palustris*) was reported to have been observed in Kothi river during the consultation with division forest office and public. Likewise, most herpetofauna species listed may not necessarily be represented as the limited species were observed during the field survey. Additional field survey in the different seasons (spring/summer) before construction work would be beneficial as the field survey was limited to understand the better picture of herpetofauna status in the study area, i.e., Spring Summer

seasons. The field survey was conducted during the winter season, i.e., dormant period when the species undergo hibernation under the ground.

Table 41: Herpetofauna species observed and present in the project site

S. N	Common Name	Species Name	Conservation Status		CITES	National Protection Status	References
			Global	National			
Frog and Toads							
1	Black-spined Toad	<i>Duttaphrynus melanostictus</i>	LC				Shah and Tiwari, 2004
2	Marbled Toad	<i>Duttaphrynus stomaticus</i>	LC				Shah and Tiwari, 2004
3	Skittering frog	<i>Euphlyctis cynoplyctis</i>	LC				Observed
4	Indian bull frog	<i>Hoplobatrachus tigerinus</i>	LC		II		Observed
5	Bhamo frog	<i>Humerana humeralis</i>	LC				Shah and Tiwari, 2004
6	Teipeh frog	<i>Hylarana tytleri</i>	LC				Shah and Tiwari, 2004
7	Indian burrowing frog	<i>Sphaerotheca breviceps</i>	LC				Shah and Tiwari, 2004
8	Maskey's burrowing frog	<i>Sphaerotheca maskeyi</i>	LC				Shah and Tiwari, 2004
9	Common Indian tree frog	<i>Polypedates maculatus</i>	LC				Observed
Skinks, Geckos and Lizards							
10	Common garden lizard	<i>Calotes versicolor versicolor</i>					Observed
11	Himalayan rock lizard	<i>Laudakia tuberculata</i>					Observed
12	Nepalese Fan-throated lizard	<i>Sitana sivalensis</i>					Shah and Tiwari, 2004
13	Sikkim skink	<i>Scincella sikimmensis</i>					Shah and Tiwari, 2004
14	Brahminy skink	<i>Mabuya carinata</i>					Shah and Tiwari, 2004
15	Striped grass skink	<i>Mabuya dissimilis</i>					Shah and Tiwari, 2004
16	Bronze grass skink	<i>Mabuya macularia macularia</i>					Shah and Tiwari, 2004
17	Spotted litter skink	<i>Sphenomorphus maculatus</i>					Shah and Tiwari, 2004
18	Bengal monitor	<i>Varanus bengalensis</i>	LC		I		Shah and Tiwari, 2004
19	Golden monitor	<i>Varanus flavescens</i>	LC		I	Protected	Shah and Tiwari, 2004
Snakes and Python							
20	Common blind snake	<i>Rhampotyphlops braminus</i>					Shah and Tiwari, 2004
21	Burmese python	<i>Python molurus bivittatus</i>	VU		II		Shah and Tiwari, 2004
22	Common vine snake	<i>Ahaetulla nasuta</i>					Shah and Tiwari, 2004

S. N	Common Name	Species Name	Conservation Status		CITES	National Protection Status	References
			Global	National			
23	Buff-striped keelback	<i>Amphiesma stolatum</i>					Shah and Tiwari, 2004
24	Olive keelback water snake	<i>Atretium schistosum</i>	LC				Shah and Tiwari, 2004
25	Forsten's cat snake	<i>Boiga forsteni</i>	LC				Shah and Tiwari, 2004
26	Common cat snake	<i>Boiga trigonata trigonata</i>					Shah and Tiwari, 2004
27	Common bronze backed tree snake	<i>Dendrelaphis tristis</i>					Shah and Tiwari, 2004
28	Mock Viper	<i>Psammodynastes pulverulentus</i>					Shah and Tiwari, 2004
29	Common rat snake	<i>Ptyas mucosus</i>			II		Shah and Tiwari, 2004
30	Cantor's black-headed snake	<i>Sibynophis sagittaria</i>					Shah and Tiwari, 2004
31	Dark-bellied marsh snake	<i>Xenochrophis cerasogaster</i>					Shah and Tiwari, 2004
32	Yellow spotted keelback	<i>Xenochrophis fravipunctatus</i>					Shah and Tiwari, 2004
33	Chequered keelback	<i>Xenochrophis piscator</i>					Shah and Tiwari, 2004
34	Common Krait	<i>Bungarus caeruleus</i>					Shah and Tiwari, 2004
35	Banded krait	<i>Bungarus fasciatus</i>	LC				Shah and Tiwari, 2004
36	Monocellate cobra	<i>Naja kaouthia</i>	LC		II		Shah and Tiwari, 2004
37	Spectacled cobra	<i>Naja naja</i>	LC				Shah and Tiwari, 2004
38	King cobra	<i>Ophiophagus hannah</i>	VU		II		Shah and Tiwari, 2004
39	Russell's viper	<i>Daboia russelii russelii</i>	LC		III		Shah and Tiwari, 2004
Turtle and Tortoise							
40	Tricarinate hill turtle	<i>Melanochelys tricarinata</i>	EN	VU	I		Aryal et al., 2010
41	Black pond turtle	<i>Melanochelys trijuga indopeninsularis</i>	NT	Susceptible	II		Aryal et al., 2010
42	Indian eyed turtle	<i>Morenia petersi</i>	EN	Susceptible	II		Aryal et al., 2010
43	Indian tent turtle	<i>Pangshura tecta</i>	LC	Susceptible	I		Aryal et al., 2010
44	Elongated tortoise	<i>Indotestudo elongata</i>	CR	Susceptible	II		Aryal et al., 2010
45	Indian softshell turtle	<i>Aspideretes gangeticus</i>	EN	VU	I		Aryal et al., 2010
46	Indian peacock softshell turtle	<i>Aspideretes hurum</i>	VU	Susceptible	I		Aryal et al., 2010
47	Indian flapshell turtle	<i>Lissemys punctata andersoni</i>	LC	Susceptible	II		Aryal et al., 2010

Source: Forest Survey 2022

Convention on International Trade on Endangered fauna and Flora (CITES) Conservation Status,



Appendix I: Species threatened with extinction,

Appendix II: Not yet threatened but which could become endangered if trade is not controlled, Appendix III: species identified by any Party as being subject to regulation in that country and which require international co-operation control trade,

International Union for Conservation of Nature (IUCN) Conservation Status,

LC= Least concerned, LR= Low risk, NR= Nearly threatened, EN=Endangered, VU=Vulnerable, CR=Critically Rare, I= intermediate, Insufficiently Known, T= Threatened

Frogs and toad species reported were globally least concerned species. Among listed amphibians, Indian Bull frog (*Hoplobatrachus tigerinus*) is regulated in Appendix-II in CITES. Bengal Monitor (*Varanus Bengalensis*) and Golden monitor (*Varanus flavescens*) present in project district are regulated by CITES appendix-II. Golden monitor (*Varanus flavescens*) is protected by the National Park and Wildlife Conservation Act, 1973.

Among snake and python species, Burmese python (*Python molurus bivittatus*), and King cobra (*Ophiophagus hannah*) are globally vulnerable species and listed in CITES appendix-II. Common rat snake (*Ptyas mucosus*) and Monocellate cobra (*Naja kaouthia*) are also regulated by CITES appendix-II while Russell's Viper (*Daboia russelii*) is in CITES Appendix-III.

d. Fish

Butwal-Gorusinghe Road section passes through seasonal and perennial springs and seasonal culverts. The field study recorded seven fish species and the presence of additional seven fish species in the project site was reported through the publications; with total of 14 fish species in project site (Table 42). In addition, one Eel species reported present in Baanganga River based on public consultation.

All fish species recorded present in the water bodies of study are classified as Least Concerned. While Copper Mahseer (*Neolissocheilus hexagonalepis*) is nationally Vulnerable, others are common fish species. One Eel species reported present in Baanganga River could relate to Eel species (*Macrognathus aral*, *Macrognathus punctatus* and *mastacembelus armatus*) reported in Jagadishpur Reservoir which is located 12 kilometers downstream from the Baanganga river. Jagadishpur Reservoir is drained through canal from Baanganga River and the canal provides fish movement passage between the Baanganga River and the Jagadishpur Reservoir.



Table 42: Fish species of the project area

S.N	Common Name	Species Name	Conservation Status		CITES	Reference
			Global	National		
1	Reba carp	<i>Cirrhinus reba</i>	LC	Uncommon		Cited
2	Kalbasu	<i>Labeo calbasu</i>	LC	Common		Cited
3	Cooper mahseer	<i>Neolissocheilus hexagonalepis</i>	LC	Vulnerable		Observed
4	Tor mahseer	<i>Tor tor</i>	DD	Endangered		Cited
5	Silver razor belly minnow	<i>Salmostoma acinaces</i>	LC	Common		Cited
6	Barred baril	<i>Barilius barila</i>	LC	Common		Cited
7	Hamilton's baril	<i>Barilius bendelisis</i>	LC	Common		Cited
8	Annandale garra	<i>Garra annandalei</i>	LC	Uncommon		Cited
9	Gotyla	<i>Garra gotyla gotyla</i>	LC	Common		Observed
10	Asiatic snakehead	<i>Channa gachua</i>	LC	Common		Observed
11	Walking catfish	<i>Clarias batrachus</i>	LC	Common		Observed
12	Spotfin swamp barb	<i>Punctius sophore</i>	LC	Rare		Observed
13	Spotted snakehead	<i>Channa punctatus</i>	LC	Common		Observed
14	Stinging catfish	<i>Heteropneustes fossilis</i>	LC	Common		Observed

Source: Forest Survey 2022

5.2.4. Other important wildlife information

5.2.4.1 Wildlife Habitat and Movement Corridor

Saljhandi-Pipara forest block and Gorusinghe forest block are serving as wildlife corridor for mammal movement across north-south crossing the highway. Both of these forest areas dense enough to provide refuge to the wildlife.

In the Saljhandi-Pipara forest section, wildlife crossing the highway were merely observed mainly because of the presence of barbwire fence along the road (except for *Rhesus macaque*). The fence also kept the road kill and the roadside accident at the lowest level.

Kothe Khola bridge (Ch 615+264) which is more than 4.5 m tall and most used under bridge, hence was proposed for the construction of an underpass to suit the big animal such as Sambar deer, Nilgai, Indian Spotted Deer, Striped Hyaena and others. As most of the animals visited the stream for water and moved south afterward.

Additionally, the use of Kothi river, by the mammals, both small and large, as biological corridor to cross the highway from underneath the bridge. However, all the other culverts/drainage available in the forests were hardly used due to low light index.

Unlike, forest edge at highway side in Gorusinghe forest block is without fence providing free movement of wild mammals crossing the highway. Moreover, the forest is comparatively bushy and dense, despite the roadkill records were not maintained in the Sub-Division Forest Offices, three cases of road kill of small mammals *i.e.* Jungle cat, Golden Jackal and Large Indian Civet were recorded, in this forest block, during the filed survey (**Figure 28**).

Rhesus macaque was observed along the roadside of Saljhandi-Pipara forest block picking discarded/disposed food by commuters. The macaques were found approaching the roadside where buses stopped for sanitary break for commuters. During the break, the commuters disposed instant food packets and cereals, which attracted macaque. No roadkill was observed, however there is higher chances of roadkill of these species.

Consultations with forest officials and community forest users revealed that wildlife poaching and trapping at Argakhanchi district located about 8 kilometers north of the highway have been resulting in the wildlife congregation near the highway area since higher security, and forest management activities increased availability of grasses. The competition for the food source and foraging ground are also inducing the wildlife movement from the high mountain area in the north to the Terai region in the south, which could potentially increase the chances of collision with traffic and wildlife casualties.



Figure 28: Road Killed Jungle cat (left), Golden Jackal (middle) and Large Indian Civet (right) at Gorusinghe forest

5.2.4.2 Protected and Internationally Recognised area of high biodiversity Value

The project is not located within the proximity of any protected areas although there are protected areas in the greater vicinity, as described in **Table 43**.

Table 43: Protected areas near the BG road

Protected Area Name	Status	Distance from the project	Potential Impact
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Protected Area Name	Status	Distance from the project	Potential Impact
Legally Protected Areas			
Chitwan National Park	World Heritage Site, IUCN Category II	50 km East	None, separated by extensive settlement and cultivation.
Chitwan National Park, Buffer Zone	IUCN Category II		
Key Biodiversity Areas (KBA)			
Jagdishpur Reservoir	Ramsar wetland of International Importance	12 km South	None, located in different habitat
Gainda Tal (Gaidahawa lake)	Recognized by IUCN due to the presence of Indian Eyed Turtle (<i>Morenia petersi</i>)	11 km South West	Species is recognized as a critical habitat feature with mitigation developed. Refer to text below.
Farmlands in Lumbini area	Agricultural landscape recognized for White-rumped Vulture, Slender-billed Vulture, Pallas's Fish-eagle, Lesser Adjutant, White-throated Bushchat, Bristled Grassbird and Sarus Crane	10 km South	Large area of modified habitat that is not directly impacted. Priority species are assessed for critical habitat.
Nawalparasi forests	Habitat for White-rumped Vulture, Slender-billed Vulture and Lesser Adjutant	20 km East	Not impacted by BG road section, although species are assessed for critical habitat.
Dang Deukhuri foothill forests and west Rapti wetlands	Habitat for Bengal Tiger and Smoothcoated Otter	18 km West	Not impacted by BG road section, although species are assessed for critical habitat.

Gaidahawa lake (Gaida Tal), the nearest conservation site has been designated by IUCN due to the presence of the IUCN Endangered Indian Eyed Turtle (*Morenia petersi*). The lake is situated (Lat: 27.64 Lon: 82.96) at Gaidahawa Village. The lake was established on 2005, approximately 11km away from the highway over an area of 10,391 ha. The lake (an inland lake) is the biggest lake in the Rupandehi District. It is a manmade lake with devoid of inlet and outlet. Water in the lake is filled by the accumulation of monsoon water and aquifer from the forest in the proximity. The lake has been used for the fishery and provides habitat for wetland birds and seasonal stopover and congregation site for migratory birds. The field study reported 17 wetland birds and 3 raptors (Table 44). The Indian Eyed Turtle was not

recorded during the field study. However, this turtle was identified in the project area and is assessed for critical habitat status.

Table 44: Birds in Gaidahawa Lake, observed during the field visit

S.N	Common Name	Scientific Name	Conservation Status		CITES	Movement pattern
			Global	National		
Waterbirds						
1	Asian Openbill	<i>Anastomus oscitans</i>	LC	VU		Not a Migrant
2	Bar-headed Goose	<i>Anser indicus</i>	LC			Full Migrant
3	Black-crowned Nightheron	<i>Nycticorax nycticorax</i>	LC			Full Migrant
4	Cattle Egret	<i>Bubulcus ibis</i>	LC			Full Migrant
5	Common Sandpiper	<i>Actitacus hypoleucos</i>	LC			Full Migrant
6	Great Egret	<i>Ardea alba</i>	LC			Full Migrant
7	Great Cormorant	<i>Phalacrocorax carbo</i>	LC			Full Migrant
8	Green Sandpiper	<i>Tringa ochropus</i>	LC			Full Migrant
9	Indian Pond Heron	<i>Ardeola grayii</i>	LC			Not a Migrant
10	Little Egret	<i>Egretta garzetta</i>	LC			Full Migrant
11	Little Ringed Plover	<i>Charadrius dubius</i>	LC			Full Migrant
12	Red-wattled Lapwing	<i>Venellus indicus</i>	LC			Not a Migrant
13	River Lapwing	<i>Venellus duvaucelii</i>	LC			NT Not a Migrant
14	Ruddy Shelduck	<i>Tadorna ferruginea</i>	LC			NT Full Migrant
15	Small Pratincole	<i>Glareola lactea</i>	LC			NT Full Migrant
16	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	LC			Not a Migrant
17	White-throated Kingfisher	<i>Halcyon gularis</i>	LC			Not a Migrant
Raptors						
18	Cinereous vulture	<i>Aegypius monachus</i>	NT	EN	II	Full Migrant
19	Himalayan Griffon	<i>Gyps himalayensis</i>	NT	VU	II	Full Migrant
20	Osprey	<i>Pandion Haliaetus</i>	LC		II	Full Migrant

Source: Field survey, 2022

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5.3. Socio-Economic and Cultural Environment

5.3.1. Demography of Project Affected Municipality

The project area covers Rupandehi and Kapilbastu districts and passes through Butwal Sub-metropolitan, Sainamaina, Banganga, Buddhabhumi municipalities, and Kanchan rural municipality. Gorusinghe is a junction of Gulmi and Arghakhachi road network. Butwal is a centrally located city of the country that links Kathmandu and other cities. Bhairahawa, 25 km from Butwal is the bordering city with India and carries significance in terms of trade and business.

A total of 140,056 populations from 32,744 households are residing in project affected wards of sub-metropolitan city/municipalities/ rural municipalities. Out of this population, males and females are 66,129 and 73,927, respectively. The total population of the 5 municipalities is shown in the Table 45.

Table 45: Population composition of affected municipality

SN	Province	Municipality	Total HHs	Sex		Total Population	Remarks
				Male	Female		
1	Lumbini	Butwal Sub-Metropolitan City	5265	11618	12147	23765	National Data Profile 2011
2		Sainamaina Municipality	14230	26407	29283	55690	Source: Municipality Profile 2077
3		Kanchan Rural Municipality	1326	2699	3253	5952	National Data Profile 2011
4		Banganga Municipality	9157	19031	22179	41210	Source: Municipality Profile 2075
5		Buddhabhumi Municipality	2766	6374	7065	13439	Source: Municipality Profile 2075/76
		Total	32,744	66129	73927	140056	

Source: Municipality Profile, 2074

5.3.2. Project Affected Households

5.3.2.1. Demography of Project Affected Households

In total 120 HHs are affected by the BG road upgrading project (Table 46). The total population of project affected households is 660 and family size is 5.5, greater than national



figure of 4.8. Out of surveyed households, 52.58% are male and 47.42% are female. The female population of the affected HHs is less than the national figure of 51%.

Table 46: Demographic information of project affected households

SN	Variable	No of Affected HHs	Remarks
1	Total Affected HHs	120	
2	Total Population	660	
3	Interviewed Population	407	
4	Male	214	
5	Female	193	
6	Average HHs Size	5.5	

Source: Field survey, January 2022

5.3.2.2. Caste and Ethnicity of Project Affected Households

Out of total project affected households, 40.54% belongs to Brahmins, 14.86% Newar, and 13.51% Chhetri, 13.51% Magar, 10.81% Muslim, 4.05% and Dalits 2.7% Madhesi and others. The composition of population by caste and ethnicity is presented in Table 47.

Table 47: Caste and ethnicity of project affected households

Ethnicity	No of HHS	Percentage (%)
Brahmin	30	40.54
Newar	11	14.86
Magar	10	13.51
Chhetri	10	13.51
Muslim	8	10.81
Dalits	3	4.05
Madhesi and others	2	2.70
Total	74	100

Source: Field survey, January 2022

5.3.2.3. Literacy Rate

The literacy rate of affected surveyed population is found approximately 94% is literate. The details are presented in Table 48.



Table 48: Literacy rate of project affected families

Literacy Types		No of Population	Percentage
Literate	Male	197	52.53
	Female	156	41.60
Illiterate	Male	4	1.07
	Female	18	4.8

*Source: Field survey, January 2022***5.3.2.4. Occupational Status**

The survey of affected households reveals that most of the household's member are engaged in business (17.69%) followed by household's chores (16.46%). About 11.79% populations are found service holders and only 1.97% is engaged in agricultural. The details of occupation of the affected households are given in **Table 49**.

Table 49: Occupational Status of project affected surveyed population

Occupation	BG Road Section		Remarks
	No of population	Percentage (%)	
Business	72	17.69	
Service	48	11.79	
Labor	16	3.93	
Foreign Job	16	3.93	
Agriculture	8	1.97	
Households chores (House wife)	67	16.46	

*Source: Field survey, January 2022***5.3.2.5. Poverty Status**

Out of 74 interviewed households, 4 HHs (5.41%) fall below the poverty line (BPL) and 90.54% households are found above the poverty level. Considering the average HH size of 5.5 for the project roads, BPL households are those households whose per capita income is less than 35,738 per year. According to the Nepal Living Standard Survey (NLSS 2011), an individual is considered poor if his/her per capita total annual consumptions is below NRs.35,738 at 2020/2021 prices. On the basis of family size and minimum income to secure poverty level the minimum income is fixed 196,559. **Table 50** provides the breakdown of income levels of affected households as per the average annual income range.



Table 50: Poverty status of project affected households

Income Range	Project Affected HHs	
	HHs	%
50000-100000	1	1.35
101000-150000	1	1.35
151000-200000	7	9.46
201000-201000	13	17.57
201000-300000	14	18.92
301000 Above	38	51.35
Total	74	100

*Source: Field survey, January 2022***5.3.2.6. Family Head of Project Affected Households**

Of the project affected HHs surveyed, 81.08% of HHs are headed by males and remaining 18.92% are headed by females. The percentage of HHs headed by females amongst the project affected surveyed HHs along the BG road is less than the national average of 28.2% (CBS, 2011) indicating poor leadership and deprivation of women. The number of surveyed household head by gender is given in **Table 51**.

Table 51: Family head of project affected household of surveyed households

Road Section	Male		Female		Total
	No.	%	No.	%	
BG	60	81.08	14	18.92	74

*Source: Field survey, January 2022***5.3.5. Project Affected Private Structures and Public Utilities**

127 private structures are getting affected by the BG road upgrading the road. Among them, 122 private structures are belonging to 120 households and 5 structures are owned by institutions. 122 private structures include 50 residences, 15 small business structures, 45 residences/business, and 12 other structures (**Annex XIV-A**). The upgrading of this road will impact 206 community structures (**Annex XIV-B**). Out of them, 105 *chautara*/resting places, 65 passenger waiting sheds, 14 temples/shrines, 10 police check posts/entrance gates/traffic direction posts, 2 public figure statues (*Buddha stambha*) and 1 notice board, 4 are public water tanks/taps and 2 are public toilets along the road corridor. In addition, 1 snake-bite treatment centre, 2 higher secondary schools (*Ujirsingh* and *Jana Chetana*) are also affected.

Furthermore, 2,358 public utilities will be affected temporary due to the implementation of the proposed project (**Annex XIV-C**). Among them, 55 solar street light, 328 telephone pole, 67 transformers, 1809 electric pole (concrete and steel) and 53 LT line are within RoW.

While relocating these structures, there will be temporary disruption in the routine life of the affected communities who are using these utilities. Guideline for public utilities shifting is attached in **Annex XXI**.

5.3.6. Religious, Cultural resources Sites, Existing/Potential Area for Tourism

The project area does not pass through cultural heritage sites. However, the project districts have many religious sites. People in the project area have different cultural values amongst the different ethnic groups. Significant numbers of religious structures such as temples and resting place with religious trees (Bar/Pipal) occur along the existing highway within a RoW. All the cultural and religious sites are of public importance. Jhundula Mai Temple is located at 49+800 (Left), which is famous in the project area. Altogether, 13 temples are along the road alignment will be affected during improvement of Butwal-Gorusinghe road. The detail is given in the following **Table 52**.

Table 52: Religious and cultural sites affected by project

SN	Chainage	Distance from CL (Mtr)	Types of Structures	Municipality	Ward no	Settlement	L/R Side	Types of Structures
1	0+510	22	Temple	Butwal SMC	2	Phoolbari	R	Temple
2	0+710	23	Temple	Butwal SMC	2	Pakhapani	L	Temple
3	0+890	23	Temple	Butwal SMC	2	Pakhapani	R	Temple
4	0+890	10	Temple	Butwal SMC	2	Pakhapani	L	Manakamana Temple
5	0+890	10	Temple	Butwal SMC	2	Pakhapani	L	Manakamana Temple
6	1+020	10	Temple	Butwal SMC	2	Pakhapani	R	Temple
7	1+500	12	Temple	Butwal SMC	2	Pakhapani	R	Temple (Durga)
8	32+470	10	Temple	Banganga Municipality	1	Banganga Pul	R	Temple
9	27+960	22	Temple	Banganga Municipality	2	Pipra	L	Temple
10	28+920	15	Temple	Banganga Municipality	2	Pipra	R	Temple (Wall)



SN	Chainage	Distance from CL (Mtr)	Types of Structures	Municipality	Ward no	Settlement	L/R Side	Types of Structures
11	34+590	15	Temple	Banganga Municipality	7	Chappar gaun	L	Temple
12	45+160	22	Temple	Buddhabhumi Municipality	2	Gorsingay	L	Temple (Wall and Gate)
13	49+800	12	Temple	Buddhabhumi Municipality	4	Buddi Chowk	R	Temple (Jhadula Mai)

Source: Field survey, January 2022



Figure 29: Jhundula Mai Temple at Ch 49+800 (Left); Temple at Ch 28+920, Pipara (Right)

Following are the Existing/Potential Area for Tourism in the project area. Nevertheless, those are out of ZoI.

Lumbini (Birth place of Gautam Buddha)

Lumbini is the birthplace of Lord Buddha on whose Buddhism was founded. It is granted World Heritage status by UNESCO in 1997. Thousands of Buddhist monks, pilgrims and tourists visit Lumbini annually. The ongoing up-gradation of Gautam Buddha Airport into international airport is expected to increase the number of visitors. There are many access road ways to Lumbini from the Butwal –Gorusinghe road section.

Siddha Baba Temple

This is a temple dedicated to Lord Shiva situated in border between Palpa and Rupandehi. There is a belief that Lord Shiva grants the wishes of the devotees who visit the temple. Interestingly, there are two Siddha Baba Mandir adjacent to each other. One lies within Rupandehi and another in Palpa. Nonetheless, both temples are regarded as pilgrimage of equal importance.



Manimukunda Sen Park

Once a winter palace of King Manimukunda Sen, Manimukunda Sen Park is another major attraction in Rupandehi. The palace is not in shape but the ruins and antiquities of the majestic palace can still be found. It is situated in Butwal City and is popular for the picnic spots, zoo and the gardens inside the park. The greenery and the view of Rupandehi, Palpa and Kapilvastu districts is also another attraction in the park.

Parroha Bol Bam Dham

It is the oldest Bol Bam Dham (pilgrimage and festival) in Nepal. The pilgrimage is dedicated to Lord Shiva located in Sainamaina Municipality. Thousands of Lord Shiva's devotees from various parts of the country and from neighboring States of India visit to worship the Shivalinga inside the Bol Bam Dham. The major inflow of pilgrims occurs during the Bol Bam. Bol Bam is an annual pilgrimage glorifying the Lord made in Shraavana in which devotees' travel barefooted wearing saffron robes in routes to the dham.

5.4. Issues Raised during Public Hearing

The proponent has conducted public hearing in all affected sub metropolitan city/municipalities/rural municipalities. Suggestion, views and concern of stakeholders towards projects were collected during public hearing. Detail of participation is given in Table 53 and feedback from the public hearing is summarized in Table 54.

Table 53: Summary of Participation during public hearing

SN	Location	Date	Participants		
			Male	Female	Total
1	Budhabhumi Municipality	2079-03-12	27	1	28
2	Butwal Sub-metropolitan City	2079-03-13	30	10	40
3	Banganga Municipality	2079-03-13	46	12	58
4	Kanchan Rural Municipality	2079-03-14	25	7	32
5	Sainamaina Municipality	2079-03-16	55	7	62

Source: Public hearing, 2022

Table 54: Feedbacks from public hearing

SN	Issues/Concern/Demands	Response/Action
1	Collaboration with local government in extraction of construction materials from rivers	For extraction of construction materials, approval will be taken from concern authorities/municipalities
2	All the project affected community forest should	All affected roadside CF is included in the



SN	Issues/Concern/Demands	Response/Action
	be included in the IEE	report (Table 36)
3	Improvement of Junctions of the road	Major Junction in the settlement will be improved, 12 major junctions and many minor junctions are included in the design.
4	Maintain connectivity with local roads	All access road will be maintain in certain length (15m)
5	Different types of wastes generated during the construction phase should manage	Waste will be segregate in the camp. Only disposable will be managed in designated location or in municipalities waste disposal location. (Refer mitigation measures on waste management)
6	Refreshment center should be included in design	It will construct with consultation of municipalities cost is included in provision sum.
7	Coordination and collaboration with local government in management of physical structure with in RoW	Coordination will be done with local authorities
8	Management of irrigation cannel adjacent to road	Project will reinstate all public utilities including irrigation canal cost is included in provision sum
9	Construction to be carried out by dividing the entire road section into small parts which would help in reducing the air pollution.	The new design has made sufficient provisions to address these issues, 3 construction packages has been made. Pavement will be scarified after complection of all roadside structures.
10	For the management of other public utilities like drinking water pipeline, electricity and telephone wire, drain, optical fiber etc., the project has to include in the design	All relocation /reinstate cost is included in the project cost
11	Project's construction works should begin after the completion of compensation process	Project construction will be carried out after removal of all RoW's structures which will not hamper the construction work
12	The project has to made necessary collaboration with Daanaw-Tinau project, ring road project and Jhumsa drinking water project	Project will coordinate during pre-construction phase with concern stakeholder
13	Design should be done properly in the landslide area near the Butwal.	Special design has been done at landslide area, service lane is reduced at left side due to considering the landslide prone area.
14	Project has to enforce contractor to complete project within prescribed time.	Project will facilitate for timely completion of work

SN	Issues/Concern/Demands	Response/Action
15	Need of electric charging station and public toilet	Electric charging station is out of scope of work, Project has allocated budget for construction of public toilet at Gorusinghe junction way to Sandhikharka but land and management will be arranged by local government/municipalities
16	Project should design and construct under pass and overpass for the safety of wildlife.	Under pass is included in the road design at forest area
17	The provision of monitoring by the technical people of the local government during the construction phase should be made.	Project will coordinate with local authorities/municipalities during construction phase
18	Necessary precaution and preventive measures should be adopted to reduce the impact of air pollution during construction	Water sprinkle is provisioned in the project cost; pavement will be scarified after completion of all roadside structures.
19	Project should discuss and collaborate with local community during relocation and construction of affected physical infrastructure	Project will consult with local authorities and community during relocation of public structures
20	Conservation related programs should be conducted	Awareness program will be conducted
21	Enforce project for attractive gate and park at fire line-Lumbini chowk	Project will considered during construction
22	Prior to construction of main roads, it would be better to construct after completion of roadside physical infrastructure	Construction procedure will done accordingly
23	Under pass and over pass is necessary in main market area for pedesrain crossing	There is provision of under pass and overpass for pedestrian in main bazaar/settlement area
24	For the proper drainage management, side drain adjacent to road should be included in design	Side drain is included in the design
25	Approved initial environmental examination report should be make concerned available at local government.	A copy of approved IEE will be make available in all municipalities

Source: Public hearing, 2022



6. REVIEW OF POLICIES, LAWS, RULES AND MANUALS WHILE PREPARING THE REPORT

The proposed Butwal-Gorusinghe road project attracts the following policies, laws, guidelines, manuals and standards of Government of Nepal (GoN). Apart from the GoN policies, laws, guidelines and standards, the project will also attract the international convention treaties to which Nepal is a signatory.

LAWS	DESCRIPTION
Constitution	
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	
Fifteen Plan (Fiscal Year (2076/77-2080/81 BS) 2019/20-2023/24 AD)	Fifteenth 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 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



LAWS	DESCRIPTION
	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 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

LAWS	DESCRIPTION
	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 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, 2077 BS (2020 AD)	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, pont 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 fro 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.
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

LAWS	DESCRIPTION
	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
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



LAWS	DESCRIPTION
	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 Reduction and Management Act, 2074 BS (2017 AD)	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 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.
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 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.



LAWS	DESCRIPTION
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.
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 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 Labor (abolition and regulation) Act, 2056 (2001) are the major acts related to child labor in Nepal. The Child Labor (Abolition and Regulation) Act, 2056 (2001), Article 3, Clause 1 prohibited for labor employment any child below the age of 14 years. Clause 2 prohibit child below 16 years to work in risk-prone sectors such as public transportation and construction related works.
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.
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 minerals development centre to launch a minerals promotion programme.
Soil and Watershed Conservation Act, 2039 BS (1982 AD)	Soil and Watershed Conservation Act makes provision to control floods 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.
Public Road Act,	The Public Road Act, 1974 has been enacted to ensure the construction and operation

LAWS	DESCRIPTION
2031 BS (1974 AD)	of the road Projects smoothly. Section 3 of the Act empowers GoN to prohibit the construction of permanent structures (buildings) in the prescribed distance from the road, i.e., the Department of Roads (DoR) has the authority over everything within the boundaries of the road. The DoR may acquire temporarily the land and other property adopting compensatory measures during the construction, rehabilitation and maintenance of the public road (Sections 14 and 15). The Act obliges the DoR to plant trees on both sides of the road and handover it to the local bodies (Municipality) for their management (Section 16). The Act also empowers the DoR to operate quarries and borrow pits and other facilities during the road construction (Section 17). In sum, the Act facilitates the construction of this road by even acquiring land and property including for the execution of construction materials and development of other facilities during road construction through compensation as negotiated and as well as to maintain greenery along the roadside.
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.
Lands Act, 2021 BS (1964 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 and Regulations	
Forest Rules, 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.



LAWS	DESCRIPTION
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 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 Labor 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.
Child Labor (Prohibition and Regulation) Rules, 2062 BS (2006 AD)	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 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.
Guidelines and Manuals	
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.

LAWS	DESCRIPTION
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 Standards, 2076 BS (2019 AD)	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 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.
Conventions	
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 2017	Convention on International Trade of Endangered Species of Wild Fauna and Flora, CITES Act, 2073 has been enacted by Government of Nepal for the 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

LAWS	DESCRIPTION
AD	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 body for extraction, collection and sale of river and minebased products. They may award a contract to registered companies or organisations 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 kilometres from dense settlement and forest. No local level shall carry out such work in river area within areas 500metres from the highway and one kilometre 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.



LAWS	DESCRIPTION
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.
Nepal Bridge Standard, 2067 BS (2011 AD)	Department of Roads (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).

LAWS	DESCRIPTION
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 • Convention on Indigenous and Tribal Peoples, 1991 • 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	



7. IMPACTS ON IMPLEMENTATION OF PROPOSAL ON THE ENVIRONMENT

The upgrading of road and bridges will have potential impacts (both beneficial and adverse) on physical, biological and socio-economic, and cultural environment. The potential impacts have been predicted in terms of their nature (i.e., direct and indirect, reversible and irreversible), magnitude (High, Medium and Low), extent (i.e. local, regional, national and trans-boundary) and duration (Long term, Medium term and Short term). This chapter presents key environmental impacts (beneficial and adverse) associated with various aspects of the proposed road upgrading.

7.1. Beneficial Impacts

1. Generation of Employment Opportunities

One of the major direct beneficial impacts of the road during the construction stage is the creation of employment opportunity to the local community. The constructions of road and bridge works create a wide range of works for about 900,000 person-days of unskilled 110,000 person-days of skilled labour. Various employment opportunities will be generated during construction which tends to benefit directly to the people living in the directly affected area. The project required about 500 workers (both skilled and unskilled) throughout the construction of road and bridges. Priority for employment will be given to local people. It is expected more than 200 labours will be from local people. The project will provide skill training (such as Doll & cushion Making, Small hotel and lodge assistant, Light Vehicle Driver, Beauty Parlor, Mobile phone repairer technician) to people of affected households. *The potential beneficial impacts resulting in generation of employment opportunities is assessed to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is highly significance.*

2. Increase in Income of Local People

Besides the opportunity of labour work, the project activities open opportunities for additional business such as the establishment of tea stalls and small eateries and shops. Local resident can take advantage of these opportunities and expand their business. The consumption of local products such as vegetables, dairy products and meat products will be significantly increase which directly create the opportunities for new income generation activities. As a result, a significant amount of cash from the project works will be channeled into the local economy. *The potential beneficial impacts resulting in increase in income of*

3. Technical Skill and Capacity Enhancement of Local People

4. Improvement of Trade

5. Women Empowerment

More than 100 women's groups have been formed in the country since the start of the year.

resulting in women empowerment is assessed to be indirect, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.

6. Reduce Travel Time, Travel Cost and Road Accident

During operation, 4 lanes asphalt concrete road will provide easy, comfortable, safe and quick access, eliminating existing traffic congestion and reduce road accidents. Consequently, the transportation of goods and services from India to the project region and to other parts of the country will be easier, faster, and cheaper.

The most significant benefit of improved road infrastructure includes increased width of the road from 2 lanes into 4 lanes, cross drainages, side drain, pedestrian walks, bus stops, traffic signs, street light, pedestrian crossing, overpass, crash barrier median fencing, footpath railing, junction improvement etc. A more efficient and safe road transport system will reduce travel times, road accidents, vehicle operating and maintenance costs and transportation costs for goods. The upgraded road also will provide better linkage to other districts such as Arghakhachi, Palpa.

Road safety includes provision of signs, delineators, barriers and pavement markings, minor realignment at identified black spots including pedestrian foot paths in market areas etc. The project has proposed for installation of following road safety features.

Table 55: Summary of the road furniture and ancillary works

S. No.	Type of Safety Measures	Quantity	Unit
1	W Beam	10478	m
2	Thrie Beam	11630	m
3	RCC End Block	120	Nos
4	Hazard Plates	60	Nos
5	Emergency Boards	9	Nos
6	Edge Rumble Strip	33354	m
7	Transverse Rumble Strip	737	Sqm
8	Delinator	465	Nos
9	Road Studs	702	Nos
10	Foothpath With Cycle Lane and Tactile Tiles	29060	m
11	Footpath Railing	4370	m
12	Zebra Crossing	44	Locations
13	Overhead Pedestrian Crossing	2	Locations

Source: Detail Design report of Butwal-Gorusinghe road, 2022



Table 56: Location of the different types of intersections improvement

S. No.	Type of Intersection	Total Number	Location/Chainage
1	Major Junction	11	Signalized Four Way: 625+720-Bangai Chowk Signalized Three Way: 590+510-Butwal Municipality Road Channelized Four Way: 592+820-Shanti Chowk 639+000-Buddhi Chowk Channelized Three Way: 602+210-Jhabaria Chowk 605+710-Kalauni, Saina Maina 607+570-Bansgadhi, Saina Maina 611+250- Bansgadhi Bridge 613+950-Fire-Line, way to Lumbini 634+540-Taulihawa Chowk, Gorusinghe 634+940-Arghakhanchi Chowk
2	U-Turn Facilities		The space between two U-Turn not closer than 500 m in Urban Area whereas 3 km in Rural area. Typical design of U-Turn is attached in Annex IV .
3	Over passes for facilitation of U-Turn and pedestrian facility in urban area	6	592+302-Jitgadhi Chowk 594+540-Nayagaun Chowk 597+100-Tamnagar Chowk 602+895-Murgya Bazaar 604+235-Buddhanagar Chowk 620+362- Charnumber Chowk
4	Accelerating, Deaccelerating Lane (Speed Change Lane)	8	616+610~616+800- Accelerating 616+803~617+173- Deaccelerating 634+320~634+510- Accelerating 634+520~634+890- Deaccelerating 634+800~634+905- Deaccelerating 634+915~635+105- Accelerating 628+800~638+900- Accelerating 639+000~639+090- Deaccelerating

Source: Detail Design report of Butwal-Gorusinghe road, 2022

The detail proposed road safety features are given in Table 11. *The potential beneficial impacts resulting in reduction of travel time, cost and road accident is assessed to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is highly significance.*



7. Reduce Green House Gas Emission

The improved road surface will reduce the wear and tear on vehicles parts thus reducing the general costs for spare parts; increase the fuel efficiency and reduce vehicular emissions. *The potential beneficial impacts resulting in reduction in GHG emission is assessed to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

8. Enhancement of Public facilities

The project will enhance market centre at Ch 618+000 Pipara Bazaar with facilities of permanent shade, drainage and sanitation facilities. Public toilet at Gorusinghe Chowk, way to Sandhikharka (Ch 634+950) will be upgraded into a gender responsive/universal access facility. The passengers and public will get benefit from the public toilet. The project will support for construction of public toilet and its management will be done by Buddha Bhumi Municipality. *The potential beneficial impacts resulting in enhancement of public facilities is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

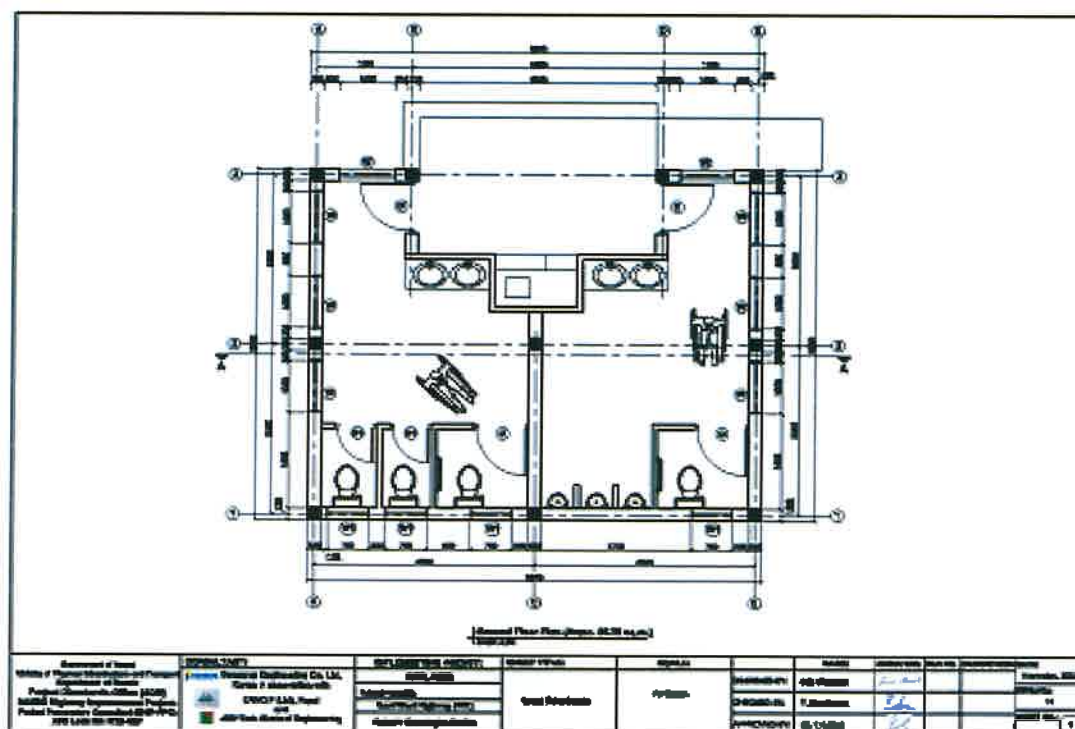


Figure 30: Design of disable friendly public toilet at Sindakharkha chowk (Ch 634+940)

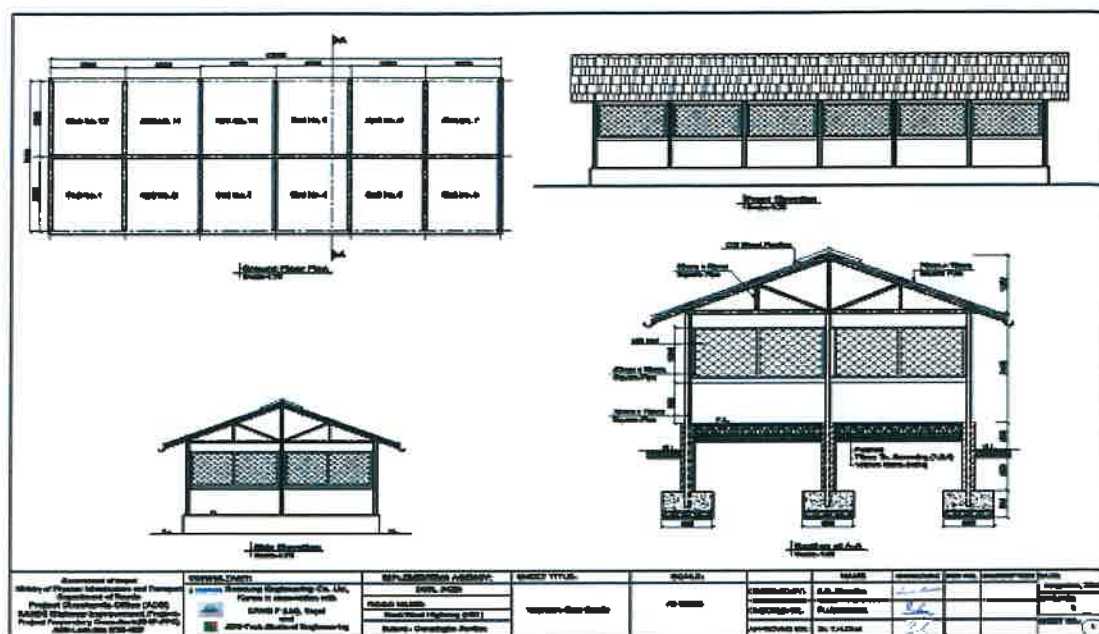


Figure 31: Design of market center at Pipra bazar (Ch 618+000)

9. Tourism Development

The improved road will enhance tourism due to better and smooth road to well-known tourist destination places such as Lumbini, Siddha Baba Temple, Manimukunda Sen Park, Parroha Bol Bam Dham, Jhandula Mai etc. The construction of road adds aesthetic beauty to the project area and attracts local tourist in the project area which will support to enhance local tourism development in this area. After upgrading of highway there will be increased the flow of local tourism due to good road. *The potential beneficial impacts resulting in tourism development is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

7.2. Adverse Impacts

7.2.1. Physical Environment

A. Issues during Pre-Construction Phase

1. Permission for installation and operation of crusher plant, batching plant, asphalt plant, camp sites and stock piling sites and quarry and borrow operations

Temporary use of land will be required for the installation and operation of crusher plant, asphalt plant, camp sites and stockpiling area and quarry and borrow operation. Public land, open spaces will be used for this purpose as much as possible. In case of unavailability of the public land, private land/agriculture land will be acquired. The likely impact in temporary

acquiring private land will have adverse impact on loss of crops, HHs requiring compensation of the land and the crops. For crusher plant, asphalt plant, and quarry and borrow operation need to take permission from concern stakeholders before operation.

2. Vegetation Clearance

In total 7,114 trees and poles fall within the RoW of the road and will be felled down during construction (**Annex XIII-A**). The project has to obtain permission for clearance of road side trees prior construction.

3. Temporary Land Acquisition

RoW of the road is almost clear so no further land beyond RoW will be acquired permanently. However, 6.6 ha of the land will be acquired temporarily. Construction of materials processing plants, storage yards, vehicle parks, labour camps for temporary use will require additional lands within project affected areas. The impact due to temporary land acquisition will be change in the quality of land in terms of fertility.

4. Private Structures Acquisition

During the pre-construction stage, all acquisition activity for the land and properties required will be completed. BG road improvement project will not require any private land beyond the RoW. The project will affect a total of 127 private structures (**Annex XIV-A**). Out of the 127 private affected structures, only 35 are fully affected (**Table 57**).

Table 57: Details of affected assets

Affected Assets	Partially Affected	Fully Affected	Total Structures Numbers	HHs	Remarks
Residential Structures	34	16	50	50	
Small Business Structure	9	6	15	15	
Residential/Business structure	42	3	45	44	
Other structures	3	9	12	11	(Bathroom, store, kitchen etc)
Subtotal without institution	88	34	122	120	
Institutions ¹	4	1	5		
Total including institution.	92	35	127	120	

Source: Field Survey, January 2022



5. Impact on Public Structures and Utilities

The proposed widening works will impact on existing public structures and utilities such as drinking water supply pipelines, electrical poles, power lines and telephone lines, resting places, tube wells and access roads etc. Public utilities will be relocating prior to construction works to avoid significant impacts on public services to the local communities. The construction of road and bridges will affect 206 community structure (**Annex XIV-B**) and 2,358 public utilities during the construction (**Annex XIV-C**).

6. Temporary Traffic Diversion

The road and cross drainage construction will provoke accident risks if the road safety and safe diversion is not managed for smooth flow of traffic. During construction will minimise road safety hazards and inconvenience to other road users by taking appropriate measures such as proper diversions, signages, speed limit etc. Contractor will take all reasonable measures to minimise interference with traffic flow at bridge locations and to provide safe transit at diversions. The contractor will maintain two-way traffic at diversions and will inform the local traffic police about the traffic diversion.

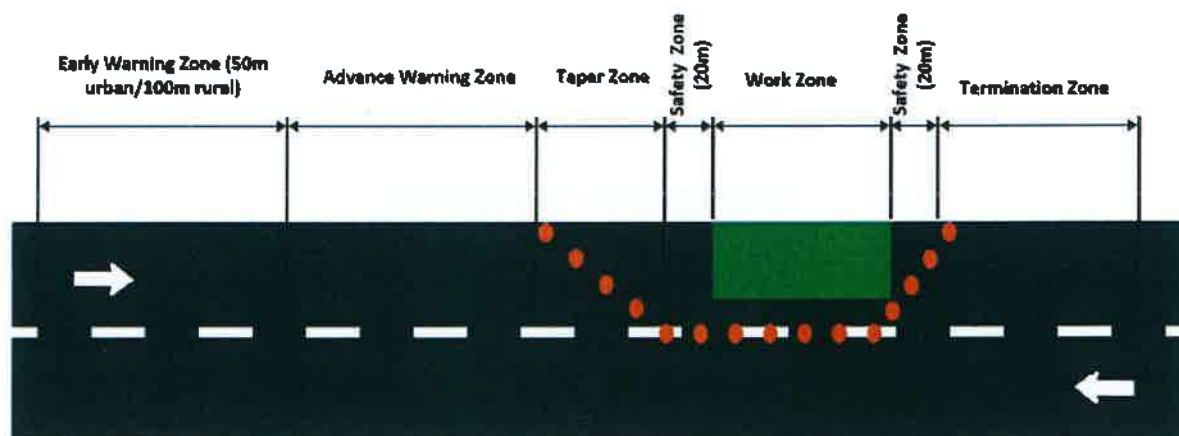


Figure 32: Temporary traffic management plan for road safety

B. Impacts during Construction Phase

1. Change in Land Use Pattern

The design of road width at rural area and forest area is 24m, semi urban area is 37.4m and urban area is 50m. The ownership of RoW's land has already been transferred to MoPIT/GoN. However, the 50 m RoW (25m on both sides from centre line) of road is almost clear and the existing formation width of the road is 8 to 12m. During the upgrading, 196.45 ha RoW's land will be changed into asphalt road and bridges. *The potential project impacts*

resulting in change in land use pattern during construction phase is assessed to be direct, medium in magnitude, site specific in extent, long term in duration and thus overall impact is moderately significance.

2. Loss of Top Soil

Construction activities such as excavation, site clearances cause loss of top soil. Approximately 37,500 cum top soil will be generated by widening the road. Conversion of forest area and agricultural land within RoW to allow the proposed road widening and soil borrowing for embankment formation will lead to loss in productive top soil during the construction. *The potential project impacts resulting in loss of top soil during construction phase is assessed to be direct, medium in magnitude, site specific in extent, long term in duration and thus overall impact is moderately significance.*

3. Slope Instability

Soil erosion, during the construction phase, mainly occurs due to excavation, cutting and removal of vegetation cover. There have been numerous locations where heavy rainfall in the downstream areas has led to water logging. Landslide, gully erosion and old slide scar can be seen from Ch 590+000 to Ch 591+000. Mainly Ch 590+550 - Ch 590+600, Ch 590+700, Ch 590+800, Ch 591+000 is found active landslides and gully erosion. At some bridge sites, embankment erosion was noticed due to high embankment. There is also observed bank cutting, high embankment at Ch 596+364, Ch 604+975, Ch 611+000, Ch 611+400, Ch 627+100, Ch 639+700. Excavation for the foundation of the bridge will cause landscape disturbance river bank cutting, disturbance in natural water flow and soil erosion may occur along the river banks. Slope instability at river banks will be occurred due to new bridges construction. *The potential project impacts resulting in slope stability during construction phase is assessed to be direct, medium to high in magnitude, local in extent, short to long term in duration and thus overall impact is highly significance.*

4. Quarry and Burrow Pits Operations

Construction materials such as boulders, sand and aggregates materials are obtained from quarry sites. These materials are required in large amount for the construction of gabion wall, retaining wall and other structures. About 284,400 cum of aggregates, 61,160 cum sand, 402,500 cum sub base and 259,500 cum base materials will be required for construction activities. 11 potential locations are identified for construction materials (Table 17). Improper extraction of these construction materials will have significant impacts on the

physical environment. Extraction activity will disrupt natural water course, land contours resulting disturbance in natural drainage patterns, and siltation, water pollution, air pollution and water logging will increase. *The potential project impacts resulting from quarry and burrow pit operation during construction phase is assessed to be indirect, medium in magnitude, local in extent, short to long term in duration and thus overall impact is moderately significance.*

5. Establishment of Workforce Camps Sites and Stockpiling Area

The contractor will establish workforce camps for the outsider labors. Workforce camps will be properly planned in terms of disposal of solid and liquid waste, drainage, drinking water and sanitation, entertainment and emergency health facility. The presence of camps, site offices and works yards/compounds within a rural community can cause an adverse impact through the increased disturbance, noise and waste generated by camps and work sites, especially if the sites are located close to settlement areas and houses. The outsider laborer might roam around the settlement area during the non-working time, may create sense of insecurity to the local people. The construction materials if not properly stored or stockpiled will lead to dust pollution, siltation and pollution of surface water. This in turn will disturb adjoining community, private property. 4 possible locations for camp and 5 possible locations for stockpile are identified (Table 16 and 18). *The potential project impacts resulting from establishment of workforce camp sites and stockpiling area during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

6. Operation of Crusher Plant, Batching Plant and Asphalt Plant

The operation of crusher plant release dust particles, produce persistent loud noise and leakage of lubricants can cause air pollution, noise pollution and soil pollution locally. If the crusher plant is established near the water sources, it can cause water pollution too. Lack of using PPE will direct affect the health of labours. *The potential project impacts resulting from crusher plant, batching plant and asphalt plant during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

7. Generation of Spoils

Excavations works for road widening, bridge and drainage structures and removal of road material from the damaged sections of existing roads will generate about 272,883 cubic

meters of cut material. Most of the cut material can be used as fill material for embankment as backfilling for retaining structures and road material can be used as the base or sub base. Disposal of spoils is not anticipated due to potential reuse of all cut material. *The potential project impacts resulting from generation of spoils during construction phase is assessed to be direct, low in magnitude, local in extent, short term in duration and thus overall impact is insignificant.*

8. Generation of Waste (Hazardous, Non-Hazardous and Liquid Waste)

During road and bridge construction, non-hazardous waste will be generated mainly from the camps and offices which include food waste, paper and plastic, etc. 300 workers live in the construction camp and the average solid waste generation per worker is 0.251 kg per day. Thus, the total quantity of waste generated from the camps will be 75.3 kg per day. Most of these wastes will be food waste. Open dumping of the such waste can lead to ground water contamination by the generating leachate. In addition, surface water may be contaminated by the run off from the waste dump especially in the rainy seasons.

Furthermore, small quantities of hazardous waste and liquid waste will also be generated from the camps, vehicle maintenance activities such as batteries, glass, bottle, lubricants, hydraulic oils; machine/engine filter cartridges; oily rags, spent filters, etc.). Due to the spillage, soil and water will contaminate. It is imperative that such waste is responsibly disposed to avoid adverse environmental and human health impacts. *The potential project impacts resulting from generation of waste during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significant.*

9. Construction of Bridge/Drainage Structures

The project requires the construction of bridges, culverts, side drain, retaining structures and other protection works. 30 major and minor bridges, and 6 are more than 50m. 121 culverts and 32,620 m side drain will be constructed. Major bridge over Banganga river which is approximately 300m long. Obstruction of natural drainage pattern may modify the course of natural flow of surface runoff. There will be chance of temporary inundation and flooding during monsoon. The river diversion works will be done for the construction of the bridge pier foundation. The increase in the sedimentation and change morphology of the river is likely with the river diversion. The direct disposal of construction material into water bodies may also lead to further adverse impacts by increasing the sedimentation of the water and

aquatic life. *The potential project impacts resulting from construction of bridge and drainage structures during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

10. Air, Noise Pollution and Vibration

Air Pollution: Excavation, quarry operation, operation of crusher plants and asphalt plant are the possible sources of air pollution in the proposed road alignment during construction. These activities mostly generate dust particles and smoke which degrade the air quality. The major sources of energy required viz diesel, petrol and kerosene will be required 2,400,000 litre, 480,000 litre and 850,000 litre respectively. Burning of such fuels would results in environmental pollution due to emission of Sulphur oxides (SO_x), Nitrogen oxides (NO_x), Carbon dioxide (CO₂). Total 24,472.5-ton carbon will be emitted during construction. Asphalt plants would also create problems of ash disposal and thermal pollution. Furthermore, vehicular movement and machinery operation emits smoke and fine particles. Air pollution will cause inconvenience to local people residing close to the construction sites. *The potential project impacts resulting in air quality during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

Noise Pollution: The noise impacts will significantly increase during the construction phase due to increase of vehicular movement, operation of machinery and crushing plants and transportation of materials. Persistent exposure to the higher noise level affect wildlife, health of labours and nearby community. Noise emission from construction machineries and quarrying operations can cause nuisance to local residents and workers. *The potential project impacts resulting in noise quality during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

Vibration: Large machinery and equipment including construction vehicles, generators, compressor and pumps will be used during construction. Such equipment generate vibration, will be experience by the nearby settlement. Any vibration would result in nuisance effects, and will be localized and temporary and will unlikely result in structural damage such as buildings or walls of the adjacent to the road. *The potential project impacts resulting in*

vibration during construction phase is assessed to be direct, low in magnitude, local in extent, short term in duration and thus overall impact is insignificant.

11. Deterioration on Water Quality

The road crosses 30 rivers and rivulets. During the construction of road and bridges petrol, diesel, kerosene will be used; Siltation from construction spoils and water contamination from oil spills may occur during road and bridge construction, which will impair the use of the receiving water use. Water bodies near construction sites are at risk of contamination from the disposal of sewage, solid waste, and construction material spills. The spills will affect on aquatic life, and wildlife feeding on these water bodies. The wastewater discharges from the crusher plant and batching plants contain high sediments. These discharges will pollute the soil and surface water quality and aquatic environment if they are discharged into rivers and streams without any prior treatment. Other wastewater discharges from the construction sites include sanitary effluents from workers' camp, and vehicle and machinery washing facilities. *The potential project impacts resulting in deterioration on water quality during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

C. Impacts during Operation Phase

1. Landslides and Slope Failure

During the operation phase, from Ch 590+000 to Ch 591+000, the area is vulnerable and landslides and gully erosion may occur during monsoon. High embankment slope will be destabilized due to monsoon rain. This will cause damage to the road. *The potential project impacts resulting in landslides and slope failure during operation phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

2. Air and Noise Pollution

The improved road surface is expected less dust and noise pollution due to traffic plying on the asphalt paved road. However, the increased number of vehicles plying in the highway and the increased commercial and industrial activities will increase air and noise pollution.



Table 58: Projected Traffic growth rate (unit: %)

vehicle type		Truck			Bus			Car		2-3wheel		utility vehicle	others	
		multi-axle	heavy	light	Big	mini	micro	car	four wheels	MC	three wheels	utility vehicle	tractor	power tiler
2019	7.1	7.0	7.0	7.0	8.8	8.8	8.8	14.4	14.4	9.6	8.8	7.0	7.0	7.0
2020	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2021	2.5	2.5	2.5	2.5	3.1	3.1	3.1	5.1	5.1	3.4	3.1	2.5	2.5	2.5
2022	6.0	5.9	5.9	5.9	7.4	7.4	7.4	12.2	12.2	8.1	7.4	5.9	5.9	5.9
2023	5.2	5.1	5.1	5.1	6.4	6.4	6.4	10.6	10.6	7.0	6.4	5.1	5.1	5.1
2024~	5.0	4.9	4.9	4.9	6.2	6.2	6.2	10.2	10.2	6.8	6.2	4.9	4.9	4.9
2026~	5.0	4.4	4.4	4.4	5.6	5.6	5.6	9.1	9.1	6.1	5.6	4.4	4.4	4.4
2031~	5.0	4.0	4.0	4.0	5.0	5.0	5.0	8.2	8.2	5.5	5.0	4.0	4.0	4.0
2036~	5.0	3.6	3.6	3.6	4.5	4.5	4.5	7.4	7.4	4.9	4.5	3.6	3.6	3.6
2041~	4.6	3.0	3.0	3.0	3.7	3.7	3.7	6.1	6.1	4.1	3.7	3.0	3.0	3.0
2046~	4.6	2.7	2.7	2.7	3.4	3.4	3.4	5.5	5.5	3.7	3.4	2.7	2.7	2.7

Source: Detail design report of BG road, 2022

Projected Traffic growth rate (Table 58) shows that increased traffic due to the improved road will generate more air pollution due to vehicle exhaust and noise. *The potential project impacts resulting in air quality and noise level during operation phase is assessed to be direct, low in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

3. Water Pollution

The road passes through many rivers and water sources. With the completion of project, there will be increase settlements, hotels and lodges and other business activities, workshop in the project area near the road alignment and which also increase the volume of waste material, garage (workshops) and wash center may also possibility to dispose waste in nearby river. *The potential project impacts resulting in water quality during operation phase is assessed to be direct, low in magnitude, site specific in extent, long term in duration and thus overall impact is insignificant.*

4. Impacts on Drainage System

Drainage problems will be occurred such as water blockage, chocking of natural drainage due to erosion, slides, sediments deposition and disposal of debris by the public. It will create

overflow of surface water, change paths causing soil erosion, bank cutting inundation and flooding. Sometimes it might cause complete failure of drainage structure. The inundation and floods cause severe bank erosion, threatening the destruction of settlements and agricultural land. *The potential project impacts resulting in drainage system during operation phase is assessed to be direct, low in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

7.2.2. Chemical Environment

A. Impacts During Construction Phase

1. Impacts due to Accidental Leakage of Fuels and Chemicals

Large number of vehicles, crusher/asphalt/batching plants and heavy equipment will operate during construction of road and bridges. There is possibility of accidental leakage of fossil fuel, lubricants, and oils from such operations, if all these are not maintained properly. Exposure to acids and chemicals might bring carcinogenic effect to the laborers and land. Directly mixing of chemicals and lubricants in the water sources can disrupt aquatic species. *The potential project impacts resulting from leakage of fuels and chemical during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

2. Use of Bitumen

Bitumen is used for black topping the road surface. 1,125 metric ton bitumen will be required during asphalt works. Spillage of bitumen could damage soil productivity and pollution. Furthermore, during operation of bitumen, it also causes adverse impact to human health including skin burning. *The potential project impacts resulting from use of bitumen during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

7.2.3. Biological Environment

A. Impacts during Construction Phase

1. Loss of Forest Land and Vegetation

Proposed width of the 4-lane highway to be widened to is 24 m. Width of BG road in operation (with carriage-way) is 9 m and additional 25 m of forests (12.5 m on ether sides) will be cleared. For construction purpose, other activities will also require to be carried, hence a total width of 34 m of forest opening will be made. All the activities will be carried

within the Right of Way, which falls into the jurisdiction of the DoR. During widening of the road, 7,114 trees within RoW will be cleared. The summary of district wise tree loss is given in **Table 59** and detail number and types of tree species that will be lost from RoW are presented in **Annex XIII-A**.

Table 59: Summary of district wise tree loss

District	No of Tree loss
Rupandehi	4,242
Kapilvastu	2,872
Total	7,114

Source: Field survey, 2022

*Note: Tree Census Survey (TCS) was carried between December 2021 to January 2022, which is more than a year ago. It can be expected that during the construction phase, there remains a probability of new recruitments in the tree segment, as the Lathra and othe small trees will grow and there will be increase in DBH and height of trees. Based on the approved ToR of IEE dated on 2078-08-23 of BG road (**Annex II**), DBH is taken more than 10cm. Approximately 2,199 nos was recorded as sapling (DBH less than 10cm). Further Tree cutting numbers will be verified by DOF/DFO before implementation of the project.*

Biomass and carbon loss of each of the trees to be felled during the construction were calculated and details is given in **Annex XIII-A**. District wise summary of biomass and carbon loss from RoW's trees is given in **Table 60**.

Table 60: District wise estimated volume, biomass and carbon loss from RoW's trees

District	Volume (m ³)	Biomass (ton)	Carbon (ton)
Rupandhi	16218.63	15751.77	7403.224
Kapilbstu	16841.1	16019.36	7529.144
Total	33059.7	31771.1	14932.4

Source: Field survey, 2022

The potential project impacts resulting in forest land and vegetation during construction phase is assessed to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is highly significance.

2. Use of Forest Products by Construction Workers

The construction workers living in the camps are likely to use fuel wood for cooking from forest. Construction workers may involve in unauthorized collection NTFPs from adjoining forest area during their leisure time. NTFPs such as Barro (*Terminalia bellirica*), Harro (*Terminalia chebula*) have been important for the income generation. The excessive

harvesting and collection of NTFPs might hinder the growth and scarce of NTFPs. This further leads to conflict with local community. However, the labors will be staying for limited period. *The potential project impacts resulting from the use of forest products by construction workers during construction phase is assessed to be direct, low in magnitude, site specific in extent, short term in duration and thus overall impact is insignificant.*

3. Loss of Protected Species

Sal (*Shorea robusta*) and Bijayasal (*Pterocarpus marsupium*) are a protected species found in project area which are banned for felling, transportation and export as per GoN. Sal forest is found both side of the road in the forest area and approximately 871 Sal trees will be affected by the project. *The potential project impacts resulting in loss of protected species during construction phase is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

4. Impact on Wildlife and Disturbance on Wildlife Movement

The tree clearance within RoW in the forest blocks would degrade wildlife habitat. In addition to the forests, the species also use the stream, culverst, trees/climbers and other potential means of movement. Dismantalling these during the construction phase may impact the wildlife movement. For long time structures like fences have regulated the movement of wildlife, removal and distruction of which (from Saljhandi-Pipara forest (Ch 611+800 - Ch 617+900) and Gorusinghe forest blocks (Ch 627+000 - Ch 635+600) may increase the wildlife movement towards the highway and hence roadkill and/or human-wildlife conflict (HWC). During the construction phase, road kills could be increased. Three cases of road kills of small mammals (Jungle Cat, Golden Jackal and Large Indian Civet) were recorded in Gorusinghe forest block. At Buddhi Forest (Ch 637+700 - Ch 639+000) snake and turtle kills were recorded. Construction of roads bring changes in the landscape and could as well alter the patterns of wildlife movement due to addition and changes in the existing structures, such as high embankment, construction of retaining walls etc. These structures may even act as a barrier, and impact on the movement of the wildlife for water, food and other biological requirements. Hence utmost care will be taken during the construction phase to avoid impacts on wildlife as stated and maximum care on retaining the movement corridors used by these species. *The potential project impacts resulting in impact on wildlife and disturbance on wildlife movement during construction phase is assessed to be direct, medium in magnitude, site specific in extent, short term in duration and thus overall impact is moderately significant.*

5. Impact on Avifauna

Construction phase will have certain impacts on the avifauna. Cutting down of trees, such as Simal and other light crowned species together with old trees growing along the road side will reduce bird habitat, foraging and roosting trees. Increased people mobility and noise during construction might disturbed the bird species and affect their behaviors. *The potential project impacts resulting in impact on avifauna during construction phase is assessed to be direct, low in magnitude, local in extent, short term in duration and thus overall impact is insignificant.*

6. Impact on Aquatic Species

There will be impact for free movement of aquatic species due to bridge construction and due to extraction of sand and gravel from river. The road alignment cross 30 rivers and rivulets (Table 27). Spoil disposal, accidental spill of materials, chemicals, and oils will deteriorate quality of streams/river water which may affect the aquatic species. *The potential project impacts resulting in impacts on aquatic species during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

7. Forest Fire

About 7,114 trees and poles will be removed during the construction stage (Annex XIII-A). The piling of cutting trees, branches and leaf are likely to catch fire in the dry season, if due attention is not given. The construction activities of worker are likely to induce fire due to smoking habits of workers as well. *The potential project impacts resulting in forest fire during construction phase is assessed to be indirect, low in magnitude, local in extent, short term in duration and thus overall impact is insignificant.*

8. Illegal Trade and Poaching of Wildlife

Hunting and poaching will be one of the likely impacts on the wildlife such as deer and wild boar due to the presence of construction workers. The poacher among the workforce might be attracted to hunt birds and other wild animals. The possibilities of poaching and trapping by workers during construction period will have some adverse impact on local wild fauna. *The potential project impacts resulting in illegal trade and poaching of wildlife during construction phase is assessed to be direct, low in magnitude, site specific in extent, short term in duration and thus overall impact is insignificant.*

B. Impacts during Operation Phase

1. Impact on Flora and Fauna

The compensatory plantations and tree plantation along the median and road side may die due to not adequate aftercare and maintenance, which losses the number of planted trees. The fences established in the forest areas and proposed underpass structures for wildlife, reptile movement will be maintained regularly to ensure their proposer use. The high vehicle speeds due to improved road conditions may increase road kills. *The potential project impacts resulting in impact on flora and fauna during operation phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

2. Forest Encroachment

During operation phase, forest area might be encroached by the street shops and temporary structures. Human activities increases with the forest encroachment lead to loss of biodiversity and increases human wildlife conflict. Encroachment of forest area further causes the excessive harvesting of NTFPs. The incident of illegal trade of forest products and poaching of wildlife may increase. *The potential project impacts resulting in forest encroachment during operation phase is assessed to be indirect, low in magnitude, local in extent, long term in duration and thus overall impact is insignificant.*

3. Disturbance to Wildlife Movement

Fast vehicular movement (especially during night), excessive use of horn in forest area will disturb wildlife. The lighting of vehicles during night time restricts the movement of wildlife and also possibility of collision with vehicles. *The potential project impacts resulting in disturbance to wildlife movement during operation phase is assessed to be indirect, low in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

7.2.4. Socio-Economic and Cultural Environment

A. Impacts during Construction Phase

1. Private Structure Acquisition

The project will affect a total of 127 private structures. Out of the 127 private affected structures, only 35 are fully affected. The details are given in Annex XIV-A. *The potential project impacts resulting in private structure acquisition during construction phase is*

assessed to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is highly significance.

2. Disruption of Community Structure and Public Utilities

The proposed widening works will impact on existing public structures and utilities such as drinking water supply pipelines, electrical poles, power lines and telephone lines, resting places, tube wells and access roads etc. Public utilities will be relocating prior to construction works to avoid significant impacts on public services to the local communities. The construction of road and bridges will affect 206 community structures and 2,358 public utilities during the construction. The details are given in the **Annex XIV-B. *The potential project impacts resulting in disruption of community structure and public utilities during construction phase is assessed to be direct, high in magnitude, local in extent, long term in duration and thus overall impact is highly significance.***

3. Impacts from Labour Influx

The average labour requirement per day will be 500 (approx.) for the proposed project activities. Unskilled and semi-skilled labours will be hired locally. About 300 skilled workers will be brought in the project area. Labor influx may impact on the host community. The potential risks associated with labor influx are social tension arise between the local community and the construction workers, increase the rate of crimes and/or a perception of insecurity and influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), COVID-19 etc. The presence of workers in local communities can also result in intimate relations as well as sexual exploitation and harassment. *The potential project impacts resulting in impacts from labour influx during construction phase is assessed to be indirect, medium in magnitude, site specific in extent, short term in duration and thus overall impact is insignificant.*

4. Occupational Health and Safety

Occupational Health and Safety risks which are likely to arise during the construction phase include: exposure to physical hazards from use of heavy equipment; working at height and electrical equipment; working on water, trip and fall hazards; exposure to dust, noise and vibrations; falling objects; exposure to hazardous materials; and exposure to electrical hazards from the use of tools and machinery. Potential health issues on workers are associated with the use of temporary accommodation sites include those relating to sanitation, disease, sleeping space, quality and quantity of food, personal safety and security etc.

Workers may be encountered with health hazard during earthworkcutting, handling of hazardous materials, machinery movement, bitumen works, bridge construction and slope stabilization etc., if the personnel protective equipment (PPE) (helmet, gloves, boots, google, ear guard with sponge muffler etc.) will not used, workers may suffer from accident, respiration issues and eye irritation due to exposure to dust and emissions. Health risk are also associated with poor labour camp conditions, unsafe drinking water and unhygienic conditions (poor latrines conditions and washing facilities) which could cause endemic diseases such as dysentery, diarrhea and cholera. Mental stress may increase to the migrant workers due to harassment from the local communities and unfavorable working environment. ***The potential project impacts resulting in occupational health and safety during construction phase is assessed to be direct, high in magnitude, local in extent, short term in duration and thus overall impact is highly significance.***

5. Community Health and Safety

The construction workers coming from different locations might be infected with different communicable disease. Exposure to nearby community raise the changes of transmission of diseases and creating health hazard. Furthermore, dust and particulate matters emitted during excavation and other construction activities and the noise levels of the construction machinery can affect the health of local community. The road widening activities will affect the normal traffic on the highway and local traffic, and could lead to traffic congestion. Due to increased use of trucks and other vehicles on the existing roads in the project area, pedestrians, particularly elderly people and children will be more exposed to dangerous situations, which may lead to traffic accidents. ***The potential project impacts resulting in community health and safety during construction phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.***

6. Risk of Gender Based Violence

The project construction may disturb the local people from the non-local workers. Cases of girls and women trafficking may raise during the construction phase, and especially on the women workers, may lead to Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). There will be also chances of discrimination in the daily wages to women workers by the contractor or sub-contractor. The women workers, may lead to SEA and SH. ***The potential project impacts resulting in risk of gender based violence during construction***

phase is assessed to be direct, low in magnitude, local in extent, short term in duration and thus overall impact is insignificant.

7. Impacts on Religious Sites

During widening of the road, 13 temples falls within RoW of the proposed road and will be affected during the construction phase. Out of 13 temples, 4 temples (of Ch 0+510, Ch 0+710, Ch 28+920 and Ch 45+160) are partially affected whereas remaining will be fully impacted (Table 52). *The potential project impacts resulting in impacts on religious sites during construction phase is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

8. Loss of agriculture land/standing crops

The improvement/upgrading works will not require additional land beyond RoW. Based on the inventory of affected assets, there will be no impact of loss of agriculture land and standing crops. The land within 50 m RoW is almost barren and no standing crops were seen during census survey. However, for the construction of materials processing plants, storage yards, vehicle parks, labour camps etc. will require additional lands for temporary use within project affected areas. The impact due to temporary land acquisition will be change in the quality of land in terms of fertility. *The potential project impacts in loss of agriculture land and standing crops will be direct, low in magnitude, local in extent, short term in duration and thus overall impact is low significance.*

B. Impacts during Operation Phase

1. Encroachment of RoW

After the construction, the RoW can be possible to encroach by local people for different purposes such as vegetables and fruit sales stalls etc. The encroachers will construct permanent or temporary structures within the RoW. Encroachment of RoW will increase of accidents, undesired landscape aesthetics and reduces overall road capacity. *The potential project impacts resulting in encroachment of RoW during operation phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*

2. Road Safety

The proposed road passes through market areas, settlements, school areas and forest areas. The improvement and widening of road will increase the vehicular speed. This will increase

the risk of frequent road accidents. *The potential project impacts resulting in road safety during operation phase is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

3. Community Health and Safety

For community safety there is provision of traffic signs, pedestrian crossings, overpass, under passes, crash barrier, median fencing, footpath, footpath railing, junction improvement etc. However, during operation the potential risks to the pedestrians and bicyclists are at risk of serious injury, collisions due to high speed of moving vehicles on the road. Children are generally the most vulnerable due to lack of experience and knowledge of traffic related hazards. *The potential project impacts resulting in community health and safety during operation phase is assessed to be direct, medium in magnitude, local in extent, long term in duration and thus overall impact is moderately significance.*

4. Workers Health and Safety

The potential risks associated with the operation and maintenance stage mainly result from the routine maintenance works include exposure to high traffic cause accident, and exposure to high noise levels from the traffic. *The potential project impacts resulting in worker's health and safety during operation phase is assessed to be direct, medium in magnitude, local in extent, short term in duration and thus overall impact is moderately significance.*



Table 61: Summary of impacts

Beneficial Impacts

Environmental Impacts	Nature	Magnitude	Extent	Duration	Total Sum	Significance (More than 75-high, 45-75 medium, <45 Low)
Beneficial Impacts						
Generation of Employment Opportunities	D	H (60)	L(20)	LT (20)	100	High significance
Increase in Income of Local People	D	M (20)	L(20)	MT (10)	50	Medium significance
Technical Skill and Capacity Enhancement of Local People	ID	M(20)	L(20)	LT(20)	60	Medium significance
Improvement of Trade	ID	H(60)	R(60)	LT(20)	140	High significance
Women Empowerment	ID	M(20)	L(20)	LT(20)	60	Medium significance
Reduce Travel Time, Travel Cost and Road Accident	D	H(60)	L(20)	LT(20)	100	High significance
Improved road infrastructure and Reduce Green House Gas Emission	D	M (20)	L (20)	LT (20)	60	Medium significance
Enhancement of Public facilities	D	M (20)	L (20)	LT (20)	60	Medium significance
Tourism Development	D	M (20)	L (20)	LT (20)	60	Medium significance

Adverse Impacts

Environmental Impacts	Nature	Magnitude	Extent	Duration	Total Sum	Significance (More than 75-high, 45-75 medium, <45 Low)
Physical Environment						
Construction Phase						
Change in Land Use Pattern	D	M(20)	SS(10)	LT(20)	50	Medium significance
Loss of Top Soil	D	M(20)	SS(10)	LT(20)	50	Medium significance
Slope Instability	D	H(60)	L (20)	ST (5)	95	High significance
Quarrying Materials and Burrow Pits Operations	ID	M(20)	L (20)	ST (5)	45	Medium significance
Establishment of Workforce Camps and Stockpiling Sites	D	M(20)	L (20)	ST (5)	45	Medium significance
Operation of Crusher Plant, Asphalt plant	D	M (20)	L (20)	ST (5)	45	Medium significance
Generation of spoils	D	Lo(10)	L(20)	ST (5)	35	Low/Insignificance
Generation of waste (Hazardous, non-hazardous and liquid waste)	D	M (20)	L (20)	ST (5)	45	Medium significance
Construction of Bridge/drainage structures	D	M (20)	L (20)	ST (5)	45	Medium significance
Air Pollution	D	M (20)	L (20)	ST (5)	45	Medium significance
Noise Pollution	D	M (20)	L (20)	ST (5)	45	Medium significance
Generation of Vibration	D	Lo(10)	L (20)	ST (5)	35	Low/Insignificance
Water and Soil Pollution/Deterioration on Water Quality	D	M(20)	L (20)	ST (5)	95	Medium significance
Operation Phase						



Environmental Impacts	Nature	Magnitude	Extent	Duration	Total Sum	Significance (More than 75-high, 45-75 medium, <45 Low)
Landslides and Slope Failure	D	M (20)	L (20)	ST (5)	45	Medium significance
Air and Noise Pollution	D	Lo (10)	L (20)	LT (20)	50	Medium significance
Water Pollution	D	Lo (10)	SS (10)	LT (20)	40	Low/Insignificance
Impacts on Drainage System	D	Lo (10)	L (20)	LT (20)	50	Medium significance
Chemical Environment						
Impacts due to Accidental Leakage of Fuels and Chemicals	D	M (20)	L (20)	ST (5)	45	Medium significance
Use of Bitumen	D	M (20)	L (20)	ST (5)	45	Medium significance
Biological Environment						
During Construction Phase						
Loss of Forest Land and Vegetation	D	H(60)	L (20)	LT (20)	100	High significance
Use of Forest Products by construction workers	D	Lo (10)	SS (10)	ST (5)	25	Low/Insignificance
Loss of Protected Species	D	M(20)	L(20)	LT(20)	60	Medium significance
Impact on wildlife and Disturbance on Wildlife Movement	D	M(20)	L(20)	ST(5)	35	Medium significance
Impact on Avifauna	D	Lo (10)	L (20)	ST(5)	35	Low significance
Impact on Aquatic Life	D	M (20)	L (20)	ST (5)	45	Medium significance
Forest Fire	ID	Lo (10)	L (20)	ST (5)	35	Low/Insignificance
Illegal Trade and Poaching of Wildlife	D	Lo (10)	SS (10)	ST (5)	25	Low/Insignificance
Operation Phase						
Impact on Flora and Fauna	D	M (20)	L (20)	LT (20)	60	Medium significance
Forest Encroachment	ID	Lo (10)	SS (10)	LT (20)	40	Insignificance



Environmental Impacts	Nature	Magnitude	Extent	Duration	Total Sum	Significance (More than 75-high, 45-75 medium, <45 Low)
Disturbance to Wildlife Movement	ID	Lo (10)	L (20)	LT (20)	50	Medium significance
Socio-economic and Cultural Environment						
During Construction Phase						
Private structure Acquisition	D	H (60)	L (20)	LT (20)	100	High significance
Disruption of Community Structure and Public Utilities	D	H(60)	L(20)	LT(20)	100	High significance
Impacts from Labour Influx	ID	M (20)	SS (10)	ST (5)	35	Low/Insignificance
Occupational Health and Safety	D	H (60)	L (20)	ST (5)	85	High significance
Community Health and Safety	D	M (20)	L (20)	ST (5)	45	Medium significance
Risk of Gender-Based Violence	D	Lo (10)	L (20)	ST (5)	35	Low/Insignificance
Impacts on Religious Sites	D	M (20)	L (20)	LT (20)	60	Medium significance
Loss of Agricultural Land/Standing Crops	D	Lo (10)	L (20)	ST (5)	35	Low/Insignificance
Operation Phase						
Encroachment of RoW	D	M (20)	L (20)	LT (20)	60	Medium significance
Road Safety	D	M (20)	L (20)	LT (20)	60	Medium significance
Community Health and Safety	D	M (20)	L (20)	LT (20)	60	Medium significance
Workers Health and Safety	D	M (20)	L (20)	ST (5)	45	Medium significance

Note: D=Direct, ID= Indirect, SS= Site Specific, L= Local, R= Regional, ST= Short Term, MT= Medium Term, LT= Long Term, Lo= Low, M= Medium, H= High



8. ALTERNATIVE ANALYSIS

The proposed upgrading of the existing Butwal -Gorusinghe road section of the East- West Highway explored design alternatives during the feasibility stage, detail design including maintaining the status quo. This section summarizes the alternative assessment undertaken.

8.1. Technologies

Due to time taken Mechanized technology will be used for road and bridge construction rather than conventional method. Conventional method will take long time to construct 50km road. The proposed road and bridges construction will be conventional mechanized methods with partially labour based.

Machines and excavators will be used throughout the length for the formation of road width and site clearance. The equipment like Truck, Grader, Pump, Vibrator roller, Roller, Water Bowser, Loader, Boiler, Sprayer, Air compressor, Hand sprayer, Aggregate spreader, Pneumatic Tyre, Mixer, vibrator/Compactor, Generator, Bitumen distributor, Tractor and Crane will be used during construction period. The proposed road and bridges construction will be mechanized methods with partially labour based. Crusher plants and borrow pits will be established in proposed locations to obtain sand, soil and aggregates. Required safety and personal protection equipment such as helmets, visibility vests, gumboots, masks, gloves and other equipment will be provided to all workers during the time of construction. Prevention of erosion along the alignment will be carried out with the adoption civil structures and bio-engineering application.

8.2. Design

The “Upgrading of the Road Section Alternative” assumes that the road will be improved as 4 lanes. The upgrading of the road is corrected the geometric defects and comply with the Asian Highway standard, improve riding quality, increase road capacity, and enhance the road safety.

During the detail design stage several design options were investigated to determine the most feasible options needed upgrading for the road will be based on projected traffic.

In the forest area upgrading options for the project also include opening of new road in either the northern or the southern sides of the existing road. This will cause significance loss of natural forest and habitat fragmentation than existing road. Existing forest of RoW was

degraded compared to if additional road for upgrading will construct either the northern or the southern sides of the existing road. The existing road alignment is the better option rather than the proposal to construct a new additional 2 lanes road. So further new 2 lanes road either the northern or the southern sides has not studied.

Alternative mainly focus on design parameters like at grade vs. elevated intersections, pavement materials, lane width and numbers, shoulder materials, maintenance or improvement of drainage and bridges type were assessed. Reduce traffic congestion, reducing idling time and speeding up the traffic, such as through measures like traffic signal optimization or encouraging drivers to turn off their engines while waiting in traffic can help to reduce localize pollution. to come up with the project design that meets environmental, financial, economic, and technical requirements. 2 alternative design options were studied and the first option (I) was selected for the project mainly due to environment, technical and financial reasons. These parameters are presented in the **Table 62**.

Table 62: Design options assessed in the details design

Design Alternative	Design Description	Significance Impact
Option-I	This option comprised of • Intersections improvement, in existing major Bazaar Areas crossings with adequate traffic safety signage • Service lane, Cycle Lane, Footpath i.e., in about 16.3 km urban area, • Road width 24 m in forest area/rural area, 37.4m in semi urban and 50m in urban area • AC pavement in all length • Paved Shoulder in jungle section, • 4 Lane • Most of the bridges are RCC • Two lane additional new concrete bridges • Replacement of pipe culvert and construction of 153 box culvert • Service lane and drain • Pedestrian crossing of foot over bridge, underpass	• Reduce traffic congestion • IF road width will be 24m instead of 50m, it will reduce vegetation loss from forest section reducing the width in forest section has significantly decrease the tree losses. • Most of the construction materials are available in Locally. • Consider Occupation health and safety of local people including different measures such as cycle lane, foot over bridge, underpass, zebra crossing, different traffic safety and community safety measures • Different traffic safety and community safety measures are proposed • Provision of wildlife underpasses • Construction of road will be done in section wise starting from first 10 km, Pavement will be scarified after complection of necessary structures in bothdise of road, and this will support to reduce dust pollution during

Design Alternative	Design Description	Significance Impact
	- Wildlife underpasses - Installation of traffic safety and community safety measures	- vehicle plying on the road. - Vegetative plantation will be done in the median and roadside in the sensitive area
Option-II	This option comprised of - Intersections improvement, Underpass for major intersection and remaining, - Service lane i.e., existing major Bazaar Areas, 50 m road width in all section including Jungle area - Concrete pavement in all length - Paved Shoulder in Jungle Section, - All additional Steel bridges - Pipe culvert - Service lane and drain, - Utility crossing HPC on Bazaar - Foot over bridge - Installation of traffic safety and community safety measures	- Reduce traffic congestion - High tree numbers loss, if construct the road entire width of RoW. - Huge quantity Steel materials need to import - Different traffic safety and community safety measures are proposed - Construction of road will be done in section wise starting from first 10 km, Pavement will be scarified after completion of necessary structures in bothdise of road, and this will support to reduce dust pollution during vehicle plying on the road

Source: Detail design report 2022

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

Mitigation measures of all such impacts are carefully implemented. The most moderate significant adverse impacts of the project pertain to loss of vegetation and risk of further destruction of wildlife crossing at forest section. Option I- reducing the width has significantly decreased the tree losses; Consider Occupation health and safety of local people including different measures such as cycle lane, foot over bridge, underpass, zebra crossing, different traffic safety and community safety measures.etc. Widening the existing 2 lanes into 4 lanes, the linear barrier for wildlife to cross the road and with the projected increase in speed of traffic will be significantly increase the impacts of wildlife-vehicular crashes unless mitigation measures are not implemented. Option-I is considered by reducing the road width



in the forest area by 24m which also reduce forest loss and tree loss. For wildlife crossing underpass are proposed at different locations. Construction of road will be done in section wise starting from first 10 km, Pavement will be scarified after completion of necessary structures in bothdise of road, and this will support to reduce dust pollution during vehicle plying on the road. In Option-I local construction materials are used which reduce financial cost of the project rather than option II.

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

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

8.3. Implementation Procedures

Construction activities will be carried out in piecemeal approach for the improvement of existing road. Construction contractor will not be allowed to stop or complete halt of existing traffic movement along the highway during the time of construction. For traffic management construction contractors for each package will prepare traffic management plans and will seek approval from the construction supervision consultant prior to implementation.

The construction of bridge works will be halted during monsoon season (June to August). The energy required for the construction of the approach roads and Bridges will be generated from electricity supply around the project area. Likewise, diesel generators will also be used during the load shedding period. About 500 workers, both skilled and unskilled, will be required throughout the construction period. Out of which, about 300 will be outside workers (outside the project area), and 200 laborers are expected local, mostly un-skilled or semi-skilled labour.

8.4. Time Schedule

The project is planned to be constructed within 36 months after the contract award and 12 months Defect Liability Period (DLP). During the rainy season, the construction/upgradation work cannot continue due to risk of flood and problem of access. The construction work is generally limited to construction of side drains and other structural works and the majority of the excavation works will be stopped. Similarly, construction work will not be performed during night time at settlement and forest areas. The upgrading of BG road will be implemented over 3 years.

8.5. Raw Materials to be used

Construction materials such as stone, coarse aggregates, sand, sub base, base course, and surface dressing/asphalt concrete chips will be used from proposed quarry sites. Manufactured materials such as cement, steel and bitumen will be mostly sourced from local suppliers. The proposed upgrading will emphasize on the use of local materials as far as possible. Alternatives to the selected materials will not be considered.

8.6. Less Forest Option

Avoidance of forest areas due to location of the project structures is not possible. Forests have been avoided for the location of camps and other facilities. In the forest area upgrading options for the project also include opening of new road in either the northern or the southern sides of the existing road. This will cause significance loss of natural forest and habitat fragmentation than existing road. Existing forest of RoW was degraded compared to if additional road for upgrading will construct either the northern or the southern sides of the existing road. The existing road alignment is the better option rather than the proposal to construct a new road. This is site specific best alternative option in forest area. Widening of the existing 2 lanes to 4 lanes, all impacts will be mitigated by following measures.

- Clearing of vegetation/trees in forest area road width will be confined 24m.
- Compensatory tree plantation will be carryout 1:10 ratio. Details of activities to be implemented under this will be worked out during the project implementation by the E&S staff of project in consultation with the Department of forest/Divisional Forest Office.
- The project will develop tree plantation in the median of road. About 10,000 native tree species will be planted all along the median (distance between each tree is 3m). The tree plantation will be carried out by the contractor and will be later maintained by DoR.
- Impact on movement corridors may be reduced through establishment of improved and coordinated cross-road structures, ensuring movement wild animals. Identify the location and type of wildlife crossing structure along the road alignment, there is proposed wildlife crossing facilities. Under pass with modified existing cross drainage structures are proposed. Incorporate the recommended wildlife crossing structure and location into the detailed road design.
- Warning sign, speed limit, display board of wildlife will be erected in the crossing areas.



- Awareness on wildlife co-existence and regulation of Illegal wildlife hunting to the community residing in the area is recommended which would help lessen poaching triggered wildlife movement in the periphery of highway.

8.7. No Project Option

The “No Action” alternative assumes that there will be no alteration of the existing road. This would imply that the road section would be left in their present state with the following geometric defects:

- Presence of road hazards such as “S” curves with poor visibility;
- Localized flooding and overtopping due to narrow cross-sections without proper drainage channels;
- Water logging on the carriageway due to lack of and shallow side drains;
- Lack of crash barriers particularly along embankment in built-up areas;
- No provision for wildlife crossing increasing the risk of collision with vehicles particularly at night;
- Inadequate road signs to warn motorists of impending hazards; and
- Lack of pedestrian crossings in the settlements;

The impacts of these defects against the backdrop of increase in traffic in the future are: i) increase risk of injuries and mortalities from road crashes due to inadequate road safety measures; ii) accelerated deterioration of the road condition due to inadequate drainage works will increase road maintenance cost; iii) increase in road congestion due to lack of road capacity will lead to increase in operating cost, and travel time resulting to economic loss; iv) congestion and accelerated deterioration of road leads due to non-optimal travel speed will increase fuel consumption leading to higher emissions, deterioration of air quality, and increase impacts on human health. Increase in traffic particularly at night will increase the risk of vehicle-wildlife crashes endangering the population of wildlife.

However, one positive note of not improving the road is the preservation of trees along the road right-of-way and avoid further disturbance to wildlife habitat in the project area. Without the project there will be no impact related to construction like camp site management, occupational and community health and safety, shifting of utilities, dust, noise, vibration from construction equipment etc.

9. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) comprises a set of measures to be taken in different stages to eliminate, offset or reduce adverse environmental impacts to acceptable levels. The implementation of the mitigation measures will be the responsibility of the project/Proponent. The Environmental Management Plan (EMP) presents the set of mitigation and management measures to be taken its location, timeframe, cost for implementation and institutional arrangement to ensure that no significant adverse impacts will be occurred from the project intervention. Detailed of Environmental management plan for road is presented in **Table 63** and Environmental Management plan for Bridges is attached in **Table 64**. Environmental enhancement and mitigation cost is given in **Table 65**.



Table 63: Environmental management plan

A. Beneficial impacts enhancement measures

Activities	Impacts	Enhancement Measures	Location	Implementation Time	Budget (NRs)	Institution Responsible	
						Implementation	Supervision
Road and Bridge construction	Generation of employment opportunities. The construction works create 900,000 person-days of unskilled 110,000 person-days of skilled labour	Priority for employment will be given to local people. The Project will encourage local people to participate in construction works. The project will give priority to local people for jobs. The contractors will be requested to employ local labors to work in the construction of road.	Along the road	During construction	NA	Contractor	MOPIT/DOR, DCID/PMU/SC
Employment	Increase in Income of Local People	Construction activities will not only increase the income sources of the local people, but will open opportunities for additional businesses such as the establishment of additional food and tea shops, groceries for serving large numbers of people. Also the established tea stalls and shops will foster their business with the influx of construction workers in the project area.	DIZ/IIIZ/ Zol	During construction	NA	Contractor	MOPIT/DOR, DCID/PMU/SC
Road and bridge construction	Enhancement of technical skill and capacity of local people	The project will provide different type of skill training (such as Doll & cushion Making, Small hotel and lodge assistant, Light Vehicle Driver, Beauty Parlor, Mobile phone repairer technician) to people of affected households. For skill training, project will conduct the need assessment during the construction period and as per demand of need assessment, will be provided related training to the project affected peoples. Considerable number of employed work forces will convert themselves into fully skilled laborers in works such as masonry, gabion wires weaving, construction of dry and foundation walls, bar binding for bridge, embankment filling and slope stabilization work such as bio-engineering works etc.	DIZ	During construction	Covered by BoQ item 8.4 Cost is provision in RAP	Contractor	MOPIT/DOR, DCID/PMU/SC

Activities	Impacts	Enhancement Measures	Location	Implementation Time	Budget (NRs)	Institution Responsible	
						Implementation	Supervision
Operation of Road	Improvement of trade	The proposed road upgrading will improve the connectivity on the East-West Highway and the trade with the neighboring countries. The road has connecting other country via India. The road is located close to border crossing points (Belhiva and Krishnanagar) with India. After 4 lanes, the transportation of goods and services from India to the project region and to other parts of the country will be cheaper, easier and faster. The project will provide different type of skill training (such as Doll & cushion Making, Small hotel and lodge assistant, Light Vehicle Driver, Beauty Parlor, Mobile phone repairer technician) to people of affected households, women. Road transportation will strengthen women in particular while providing jobs, training. Women will also have better access to women development training institutes, offices and various administrative line agencies	Project area	During operation	NA	DOR	MOPIT/DOR, DCID/PMU/SC
Construction and Operation of Road	Women Empowerment	4 lanes asphalt concrete road will provide easy, comfortable, safe and quick access, eliminating existing traffic congestion and reduce road accidents. Consequently, the transportation of goods and services from India to the project region and to other parts of the country will be easier, faster, and cheaper. The most significant benefit of improved road infrastructure includes increased width of the road from 2 lanes into 4 lanes, eliminate black spot, cross drainages, side drain, bus stops, traffic signs, street light, pedestrian crossing, overpass, crash barrier median fencing, junction improvement etc. will make more efficient and safe road transport system. Improve road will reduce travel times (approximately 30 minutes), road accidents, vehicle operating and maintenance costs and transportation costs of goods. 11 overpass has been proposed at Belbas (Ch 592+980), Bamaha Bazzar (Ch 598+500), Rani Bangai Chowk (Ch	Project area	During construction	Cost is provision in RAP	Contractor	MOPIT/DOR, DCID/PMU/SC
Operation of Road	Reduce Travel Time, Travel Cost and Road Accident		Along the road	During construction and Operation	Project cost/ Maintenance cost is included in PBM of project cost	Contractor	MOPIT/DOR, DCID/PMU/SC



Activities	Impacts	Enhancement Measures	Location	Implementation Time	Budget (NRs)	Institution Responsible	
						Implementation	Supervision
Operation of Road	Improved road infrastructure and Reduce Green House Gas Emission	599+920), Murgya Bazzar area (Ch 606+410), Pahila area (Ch 610+060), Saljandi (Ch 611+220), Piparaha (Ch 618+050), Buddhanagar Chowk (Ch 618+780), Charnumber Chowk (Ch 626+660), Resting Place (Ch 627+860), Gorusinghe (Ch 636+020) (Table 10).	Along the road				
		The improved road surface will reduce the wear and tear on vehicles parts thus reducing the general costs for spare parts; increase the fuel efficiency and reduce vehicular emissions		During operation	Maintenance cost is included in PBM of project cost	Contractor	MOPI/DOR, DCID/PMU/SC
	Enhancement of Public facilities	The project will enhance market centre at Ch 618+000 Pipara Bazzar with facilities of permanenebt shade, drainage and sanitation facilities. Public toilet at Gorusinghe Chowk way to Sandhikharka (Ch 634+950) will be upgraded into a gender responsive/universal access facility. The passengers and public will get benefit from public toilet. The project will support for construction and management will be done by Buddhabhumi Municipality	Ch 618+000 Pipara Bazzar, Gorusinghe /Arghakh anchi Chowk (Ch 634+950)	During construction and operation	Included in Project cost	Contractor	MOPI/DOR, DCID/PMU/SC Municipalities
	Tourism Development	The improved road will enhance tourism due to better and smooth road to well-known tourist destination places such as Lumbini, Siddha Baba Temple, Manimukunda Sen Park, Parroha Bol Bam Dham, Jhandula Mai etc. The construction of road adds aesthetic beauty to the project area and attracts local tourist in the project area which will support to enhance local tourism development in this area. After upgrading of highway there will be increased the flow of local tourism due to good road.	Lumbini, Siddha Baba Temple, Manimu kunda Sen Park, Parroha Bol Bam Dham, Jhandula Mai	During operation	Project cost	Contractor	MOPI/DOR, PD-ADB/PIU/SC



B. Adverse impacts mitigation measures

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Pre-construction phase							
Preparatory works	Permission for installation and operation of quarry and borrow pits, crusher plant, batching plant, asphalt plant, camp sites and stock piling sites	The contractor will have proposed potential sites and get approval from supervision consultant and from concerned stakeholders. Compensation will be provided to private land and the crops, for public land approval will take from concerned district, municipalities and local community, and will be reinstated with original condition. Restoration plan will be prepared by the contractor.	Along the Road and bridges	Before the start of construction work	Contractor	Contract or DCID/P MU	MOPIT/DOR, DCID/PMU/SC
Preparatory works	Vegetation clearing 7,114 trees and poles fall within the RoW of the road and will be felled down during construction	Prior approval from Department of Forest/Divisional Forest Office for donot disturbed the civil works. The loss of vegetation from forests will be compensated through compensatory plantation. According to forest act, 2076 and forest regulations, 2079, a compensatory plantation will be done at a ratio of 1:10. Approximately 44.46 ha land will be required for compensatory plantation. Details of the compensatory afforestation program will be more elaborated and confirmed in consultation with the local forestry officials. Guideline for compensatory plantation is given in Annex XVII.	Along the Road and bridges	Before the start of construction work	45,030,534 Included in Project cost	Contract or, DCID/P MU	MOPIT/DOR, DCID/PMU/SC, DFO
	Private Structures acquisition and compensation, Total of 127 private structures will be affected by the project	BG road section of the Highway improvement project will not require any private land beyond the RoW. The affected households will receive cash compensation against loss of structures and will provide additional cost of assistance for relocation and livelihood restoration. Sufficient advance notice and requested to vacate premises and dismantle affected structures prior to project implementation.	Along the Road and bridges	Before the start of construction work	Provided in RAP/ provisional sum	Contract or	MOPIT/DOR, DCID/PMU/SC, Municipality

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Preparatory works	Relocation of 206 Community Structures and 2,358 public utilities, The construction of road and new bridges will affect 2,564 numbers of community structures and public utilities during the construction	Prior inform to public before shifting of the respective structures, utility. Take advanced actions and process necessary clearance, transfer of funds etc. to the respective utility service provider so that not cause any disturbance for uses by local community; and delays to the road construction schedule. Community structures- Rebuilt/shift with consultation of the local community, local authorities, and the cost is allocated in project cost. These community properties will be relocated during the implementation phase in close coordination and collaboration with municipalities and local community. Compensation will be provided to private land and the crops, for public land approval will take from concern district, Municipalities and local community. Three months' prior notice will be given to owner or share cropper to avoid the losses of standing crops. Compensation for crops loss for one harvest at market value will be provided as provisioned. After completion it will be reinstated with original condition. Restoration plan will be prepared and approved by the contractor. .	Along the Road and bridges	Before start the construction work	Provided in RAP/provisional sum	Contract or/ DCID/PMU, Concern authorities	MOPIT/DOR, DCID/PMU/SC, Concern authorities
Preparatory works	Temporary Land Acquisition 6.6. ha of the land will be acquired	Compensation will be provided to private land and the crops, for public land approval will take from concern district, Municipalities and local community. Three months' prior notice will be given to owner or share cropper to avoid the losses of standing crops. Compensation for crops loss for one harvest at market value will be provided as provisioned. After completion it will be reinstated with original condition. Restoration plan will be prepared and approved by the contractor. .	Along the Road and bridges	Before start the construction work	Contractor responsibility	Contract or	MOPIT/DOR, DCID/PMU/SC, Municipality
Physical Environment							
Construction Phase							
Widening of road and bridge	Change in Land Use Pattern	The ownership of RoW's land is already transferred to the MoPIT/GoN (Annex XX). In forest area and rural area road width will be 24 m and semi urban area 37.4m. This will reduce land use pattern change by 45% of forest area and 2.5% agriculture land.	Throughout the road alignment	During construction	Rehabilitation cost is included in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Site clearance/	Loss of top soil Approximately 37,500	Topsoil will be stockpile in designated location. Top soil will be used for plantation work. Top soil (0-25 cm) from the	Along the road	During construction	Included in	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
excavation	cum top soil will be generated by widening the road	productive land will be collected and stored for reuse as final dressing of embankment for bio-engineering works. 40,000 Sqm for road embankment protections and 3,240 Sqm bridge and river side slope protection will be done by applying bio-engineering technique (Grass plantation, Brush layering, and Tree/Shrub plantation) with combination of civil structures. Further, it will be reused in medians plantation, and site restoration (camps, quarry and borrow pit).		n	project cost		DCID/PMU/SC
Excavation, of road and bridge widening of road	Slope instability Landslide, embankment erosion, river bank instability due to earthwork excavation of road and bridge	Landslide area prone area from Ch 590+550 to 591+000, slope will not disturb and additional lane at right side will not construct. Slope protection will be done along the road with necessary civil structures specifically RCC wall, gabion wall, checkdam, catchdrain at Ch 590+550-590+600, Ch 590+700, Ch 590+800, Ch 591+000 further bioengineering such as grass plantation, brush layering and shrub plantation is proposed. For the protection of high embankment (Ch 596+364, Ch 604+975, Ch 611+000, Ch 611+400, Ch 627+100, Ch 639+700) civil engineering structures (retaining wall) with bio-engineering techniques (grass plantation, brush layering, shrub and tree plantation) will be applied. During road improvement, only required vegetation will be cleared. Bank protection works will be done near the proposed bridge sites. 40,000 Sqm for road embankment protections and 3,240 Sqm bridge and river side slope protection will be done by applying bio-engineering technique (Grass plantation, Brush layering, and Tree/Shrub plantation) with combination of civil structures. 42,825 cum gabion masonry (gabion 12,112 cum, gabion for river training 24,458 cum, stone masonry 6,255 cum) is proposed.	Chainage 590+550, 590+700, 591+000, 596+364, 604+975, 610+100, 611+000, 611+400, 627+100, 639+700,	During construction	NRS 60,597,917 Included in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Quarry and borrow pits operation	Extraction activity will disrupt natural water course, land contours resulting disturbance in natural drainage patterns, and siltation, water pollution, air pollution and water logging. About 284,400 cubic meters of aggregates 61,160 cubic meter sand, and 1,176,517 cubic meters of fill (borrow) material 402,500 cum subbase, 259,500 cum base materials will be required.	Contractor will prepare borrow pits and quarry sites operation and restoration plan and submit for approval from Engineer before beginning the quarry activity. Operate the quarry sites only approval locations. Obtain approval from concern authorities/local government. 11 potential locations for construction materials are identified (Table 17). Before extraction permissible bench mark will be fixed and extracted within permissible level. Will not disturb river water course during the operation of quarry. Material will be covered with tarpaulin during transportation to prevent dust emission. The contractor will be responsible for maintenance of any damage to haul roads to their original state. Maintain a buffer zone of 5 to 10m between the low flow channel and the mining operations to minimize the downstream impacts and limit the excavation activities to the low flow season (non-monsoon). Restore the site as per restoration plan maintaining natural contours and revegetation after use.	Proposed quarry and borrow pits locations (11 potential locations of construction materials)	During construction	Reinstate cost is allocated in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC/Local authorities
Establishment of workforce camps sites and Stockpiling of construction materials	Disturbance, noise to local community and waste generated by camps and work sites, especially if the sites are located close to settlement areas and houses. The construction materials will lead to dust pollution, siltation and pollution of surface water, will disturb adjoining community, private property.	The contractor will have proposed potential sites and get approval from supervision consultant and from concern stakeholders. The Contractor will prepare detailed plan for construction camp including location (distance from settlements, drainage facility, outdoor facilities, and surrounding areas), housing facilities (site roads, drainage, waste management and other facilities) and need to get approval from the Supervision Consultant. Basic facilities such as fire precaution, lavatories and showers, potable water supply, clean eating area, lighting, safe access, air supply, LPG /kerosene, and others will be provided. Appropriate facilities for women will be provided in the	Potential Camp sites Ch 600+200, Ch 610+100, Ch 636+600, Ch 639+900) Potential Construction materials stockpiling	During construction	Reinstate cost is allocated in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC/Local authorities



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		construction campsites. First aid facilities will be made available at camp sites. For emergency cases will be collaborated with municipalities level health/sub-health posts for major injury cases. Restore the site after use.	sites (Chaingae 589+400, 610+100, 627+900, 636+600, 639+900); however, the contractor will have proposed potential sites during construction				
Establishment and operation of crusher plant, batching plant and asphalt plant	The establishment and operation of crusher plant release dust particles, produce persistent loud noise and leakage of lubricants can cause air pollution, noise pollution and soil pollution locally. If the crusher plant is established near the water sources, it can cause water pollution too. Lack of using or improper use of PPE could direct affect the health of labours	The contractor will have proposed potential sites and get approval from supervision consultant and from concern stakeholders. Obtain permission from local stakeholders, Municipality. Locate, stake out and seek approval from Design Supervision Consultant. Stone crushing equipment / cement batching will be fitted with dust control devices and operated as per Manufacturer's Specification. Possible locations for Crusher Plant, Hot mix plant, Batching Plant and asphalt plant at Ch 622+100 (LHS), Ch 639+900 (LHS). Location of plant site is away from population centers, drinking water sources, cultivated lands and water bodies.	Potential 622+100 (LHS), 639+900 (LHS), however, the contractor will have proposed potential sites during construction	During construction	Restoration cost and siltation pond establishment is included in project cost	Contractor	MOPIT/DOR, DCID/PMU/SC/Local authorities

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		Water sprinkle to crusher running materials during operation to minimize dust Make siltation pond to manage waste water The plant will be operated during day time only. Restore the site after use.					
Excavation works	Spoil generation Spoil disposal may often cause damage to farmlands, water pollution and erosion, Impact on property at downhill through direct deposition (Approximately 272.883 Cum of spoil will be generated)	Most of the cut material will be reused as fill material for embankment construction backfilling for retaining structures and road material will be used as the base or subbase. Disposal of spoils is not anticipated due to potential reuse of all cut material. Existing borrow sites will be also used as spoil disposal sites. Further potential spoil disposal sites will be Ch 598+400, Ch 633+200; however, the contractor will have proposed potential sites and get approval from supervision consultant during construction. The spoil sites will be revisited and provided retaining structures as needed.	Spoil management sites (Chainage 598+400), 633+200 however, the contractor will have proposed potential sites during construction	During construction	Included in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Camp, Road and bridge construction	Generation of waste (Hazardous, non-hazardous and liquid waste) Generation of solid waste from campsites and offices (about 0.251 kg per day). 500 workers per day, approximately 126kg	Before commencing the construction activities, the contractor will be required to prepare a Waste Management Plan including hazardous waste management and submit it to the Project office/Supervision consultant for their review and approval. The plan will cover - manage hazardous material use, storage, transport and disposal. The project will place containers of separately and adequate size and numbers for the collection of various types of wastes such as non-hazardous, hazardous and liquid from the worksites, and transport these wastes regularly to a	Construction site, Equipment yard, Camps	During construction	Included in project cost covered by BoQ item 8.2	Contract or	MOPIT/DOR, DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
	waste will be generated	centralized facility. Impervious concrete base and a sump will be constructed at all the fuel, waste oil and bitumen, emission and chemical storage yards. A berm will also be constructed along the periphery of the concrete platforms. Provision of suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities for workers. Collection and segregation of solid waste into kitchen waste (organics), paper and plastic (recyclable) and garbage (non-recyclable). Three kinds of waste bins (with different colors) with adequate numbers and capacities will be placed at the campsite (kitchen, offices, and rooms) for the segregation of the waste at source.					
Bridge, culvert drain construction	Construction of cross drainage structures might block the river channel and obstruction of natural drainage pattern may modify the course of natural flow of surface runoff, it will affect aquatic life. There will be chance of temporary inundation and flooding during monsoon.	The size of the drainage structures is designed to accommodate increasing volumes of water. 30 major and minor bridges, 121 culverts and 32,620 m side drain will be constructed. Existing natural drainage system will not be disturbed by providing temporary measures (such as humepipe). The excess spoil will be stockpile in designated location. Bridge and cross drainage works at river/streams will not be undertaken during the peak monsoon season. All pipe culverts will be replaced by box culvert to minimize flooding, inundation, and maintain natural flow. Silt deposition will be removed from water course.	30 Bridge, 121 Cross drainage and side drainage location	During construction	Included in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC

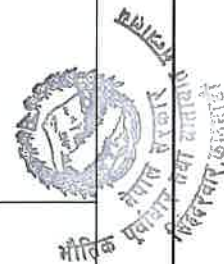


Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Road and bridge construction, operation of asphalt plant, crusher plant, quarry and borrow pit etc.	Air, Noise Pollution and Vibration The major sources of energy required viz diesel, petrol and kerosene will be required 2,400,000 litre, 480,000 litre and 850,000 litre respectively. Total 24,472.5-ton carbon will be emission during construction. Asphalt plants would also create problems of ash disposal and thermal pollution. Higher noise level affects wildlife, health of labours and nearby community. Noise emission from construction machineries and quarrying operations can cause nuisance to local residents and workers.	Construction of road will be done in section wise as far as possible (starting from first 10 km), Pavement will be scarified after completion of necessary structures in bothside of road, and this will support to reduce dust pollution during vehicle plying on the road. Regular maintenance of road/pothole repair will be done. Frequent sprinkling of water on the local roads and work sites to control dust emissions. The Contractor has to mobilize adequate water sprinkling trucks. Spray water before loading and transportation of soil and sand particularly during windy conditions, Personal protective equipment will be provided to the construction workers. Vegetative plantation will be done in the median and roadside in the sensitive area (about 10000 roadside tree plantations will be done) which act as air and noise absorbers. Every 3 months regular air quality monitoring will be carried out (Construction camp, asphalt plant, hot mix plant, crusher plant, settlements, School, Hospital, Forest area) to ensure compliance with national ambient air quality Standards and WHO Air Quality Guidelines. Covering and fencing of the construction sites located in the urban and semi-urban area will also help in reducing dust pollution and noise level. Crusher plants, asphalt and hot-mix plants are required to be located at least 1 km away	Regular Air and noise monitoring at sensitive locations, Construction camp, asphalt plant, hot mix plant, crusher plant, active construction sites, urban areas, settlements, forest area	During construction	Provided in provisional sum/ NRs Air and Noise monitoring 5,400,000, Water sprinkle and others measures covered by BoQ item 8.2	Contract or	MOPIIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		from the nearest sensitive receptor (e.g. school, hospital) and forest habitat and at least 100m from a water body or groundwater well. All approval from concerned agencies will be obtained prior to the construction. Construction activities will be carried out only day time at forest area to avoid disturbance to the wildlife. Periodic air and noise quality monitoring will be carried out in the project area to ensure compliance with national air and noise quality. The workers will be provided Personal Protective Equipment (PPE) such as anti-vibration gloves, avoid continuous exposure by taking rest periods. Contractor will aware the operator for careful handling of machines and equipment. Low vibration equipment will be used. During construction period before start the work old houses which will be risk due to vibration will be documentaed.					
Road and bridge construction, operation of Camp, crusher plant, quarry and borrow pit etc	Deterioration on Water Quality Deterioration on Water Quality of rivers and other sources due to construction, spillage of oil, waste water	Existing natural drainage system will not be disturbed by providing temporary measures (such as humepipe), and construction near/inside rivers, Prohibited to dispose excavated spoils and wastes into streams water. All chemicals and oil will be stored away from water and will be stored at concreted platform with catchments pits for spills collection. Silt fencing and/or brush barrier will be installed for collecting sediments before letting them into the water body. Silt/sediment will be collected and stockpiled for possible reuse as surfacing of slopes for re-vegetation.	Nearby rivers, water bodies streams, rivulets (30 major and minor rivers and rivulets), Camp,		Provided in provisional sum/2,400,000	Contract or	MOPIT/DOR, DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		All wastes arising from the construction sites will be disposed in a designated location. The wastes will be collected, stored and transported at approved disposal sites. Bridge and cross drainage works at river/streams will not be undertaken during the peak monsoon season. Regular monitoring of surface and ground water quality.	crusher plant, quarry and borrow pit				
Operation and Maintenance							
Maintenance work	Landsides and slope failure	Landslide and mass wasting will be immediately cleared, and slope will be restored by using civil structures and bioengineering measures. Pantation will be promoted in the right of way and embankment slopes.	Throughout road alignment but mainly Chainage 590+550, 590+700, 591+000, 610+100, 611+000, 611+000, 640+200	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Road traffic	Air and noise pollution due to increase traffic	Maintenance of plants, approximately 10,000 trees at median will be planted which act as air and noise absorbers. For addressing the impacts of air and noise pollution, regular maintenance of the road surface. Additional at sensitive areas (e.g., school, hospital) will install noise barriers as tree plantation. Implementation of No Blowing of Horn Zones particularly in settlement areas, sensitive areas. Promote planting of trees along the RoW as far as possible. Enforce Nepal vehicle mass emission standard, 1999 and will stipulate vehicle owners/drivers to engage in proper and regular vehicle maintenance.		During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Maintenance works, road traffic	Water pollution	Soil, sludge, and other wastes will generate from maintenance of road, drain and cross drainage and directly disposal into water bodies will be avoided. designated sopol disposal locations will be used; Prohibition of activities likes washings - near water bodies.	30 rivers and rivulets	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Road operation	Blockage of Cross Drainage cause Inundation; Drain and culvert may block due to sediments, improper disposal of debris or disposing garbage into side drain by the public; Blockage of Cross Drainage cause Inundation.	Regular monitoring of the road condition and maintenance will be necessary especially before and after rainy season. DoR has established a system of employing road maintenance staff that is responsible for routine and recurrent maintenance of roads like cleaning of cross drainage, drains and additional slope protection structures will be constructed. This practice will be continued with allocation of adequate budget and numbers of staff to the project road for maintenance	Along the road	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Chemical Environment							
Construction of road and bridge	Accidental leakage of fuels and chemicals	PPEs such as boot, coverall, mask, globes, will be provided to all labours. Paved storage area with chamber will be constructed to collect or recover any oil spills. Oil and grease spill and oil soaked materials will be collected and stored in labeled containers..	Construction camp,	During construction	Provided in provisional sum/ NRs Air and Noise monitoring ₹ 5,400,000	Contract or	MOPIT/DOR, DCID/PMU/SC
Asphalt work	Use of Bitumen Bitumen is used for black topping the road surface. 1,125 metric ton bitumen will be required during asphalt works. Spillage of	Automated asphalt plants will be used, Bitumen drums will be stored in a secure place within the construction and camp site and at least 500m from any water bodies. Bitumen mixing plant will have in-built mechanisms for the absorption of gases. No bleeding of bitumen into the soil and nearby water bodies will be allowed. All fuel, lubricants and	Asphalt plant (Chainage 622+100 and 639+900),	During construction	Provided in provisional sum/ NRs Air and Noise		 मन्त्रालय, काठमाडौं

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		wildlife. Compensatory Plantation will be carried in land allotted by DFO. The plantation will be taken care for five years and handover to DFO. Another option will be that the project will sign a Memorandum of Understanding (MoU) with the DoFSC/DFO and all compensatory plantation program will do by DoFSC/DFO. Tree cutting will be verified by DoF/DFO before implementation of the project. Project will request the Divisional Forest Office to start locating the land for plantations during the early stages of project construction. The seedling production, afforestation site identification, and afforestation works are expected to progress in parallel, and continue over three years. The detail guideline for compensatory plantation plan is given in Annex- XVII. Contractor will supply LPG for cooking. No temporary construction facilities will be established in the forest areas. Awareness-raising to the workers on the protection of flora and fauna will be provided.					
Use of Forest Products by workers	Loss of Forest Products, NTFPs	No worker's camps and construction facilities will be constructed in the forest areas. Construction workers will follow the code of conduct during works in forest area. Worker's camps and construction facilities will not be constructed in the forest areas.	Throughout the road alignment especially at forest areas	During construction		Contractor	MOPIT/DOR, DCID/PMU/SC
Widening of road	Loss of Protected Species	Compensatory plantation will be given priority as per conservation (Such as Sal and other indigenous species).	Throughout the road alignment especially at forest areas	During construction	Provided in provisional summary	Contractor	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
			areas		plantation		
Constructi of road in forest section	Forest Fire	Aware the workers during work in the forest area, prohibited smoking in the forest area, Use of forest wood will be prohibited for meeting the fuel needs. Contractor will provide kerosene or LPG for cooking, kerosene will be used for bitumen heating	Saljhandi- Pipara Forest block Gorusinghe Forest block and Badhare Forest block	During constructio n	Awarenes s cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Widening of road	Impacts on wildlife and Disturbance to habitat and Movement Impacts on Wildlife due to road widening wildlife movement across the road could result into accidents/kills	No worker's camps and construction facilities will be constructed in the forest areas. Rehabilitation of existing barbwire fence in Saljhandi-Pipara forest considering wildlife protection. Installation of a fence in Gorusinghe forest block considering wildlife conservation and effectiveness. Modified wildlife crossing facilities especially underpass will be constructed in the forest blocks for wildlife movement as per guideline of GoN (GoN, 2022. Wildlife-friendly Infrastructure Construction Directives). There are 3 dedicated wildlife crossing and others are climate resilience and wildlife friendly structure are proposed at Ch 612+600, Ch 613+709, Ch 615+258 (Kothi bridge for big wildlife), Ch 616+825, Ch 628+389, Ch 629+476, Ch 629+679, Ch 629+853, Ch 630+993, Ch 631+141, Ch 632+108, Ch 632+377, Ch 634+679, Ch 635+326, Ch 638+004, 638+426 (for reptiles), Ch 639+021, Ch 639+397, Ch 639+561 (for reptiles). Detail is given in Annex XII-V and typical design is given in Annex-IV.	Saljhandi- Pipara Forest block (611+800- 617+900), Gorusinghe Forest block (627+000- 635+600) and Badhare Forest block (637+700- 639+000)	During constructio n	NRs. 48,435,5 91, and Covered by BoQ item 8.2,8.5, 8.6	Contract or	DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		fodder trees and scrubs for enrichment at habitat corridors will be done. A 3 m wide flat RCC animal passes is to be constructed, both sides of the riverbanks beneath the bridge. A gentle slope is constructed, keeping in mind the antelopes like spotted deer. As flow during the dry season is low, hence the slope floor flowing gently so that an antelope did not fall down. The slope is naturalized so that the animals foot grip balanced the wild animals. Underneath the Banganga river bridge, an underpass is recommended with necessary protection measures keeping the anthropogenic activities regulated in favour of the animal movement. Transform all the prevailing "pipe culverts" to "Box Culverts" to maintain a better flow of water during the monsoon and other seasons, within Saljhandi-Pipra, Gorusinghe and Buddhi forest. Dimension of the box culverts being built are recommended as per Directives for wildlife friendly infrastructure development, 2022 of GoN. The box culverts, increased in dimension will enhance used by wildlife. It is also recommended that the box culvert will have an opening (3 m x 3 m) in the median to increase light index and enhance usability by wildlife/mammals Ensure if the burrows existed are active, tortoises, snakes and lesser fauna/animals found are removed and released to appropriate safe locations No construction activities during the night time					

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		Regular visual inspection of wildlife will be conducted by ecologist appointed in the contractors Warning sign, speed limit, display board of wildlife will be erected in the crossing areas. Informatory signboards on the presence of wildlife and importance will be installed along the forested road sections. At forest area most of the cross drainage structures (box culvert) are proposed medium and small wildlife crossing standard of Nepal considering the standard openness index followed by Government of Nepal. These structures will support/enhance for the crossing medium to small wildlife and herpetofauna if it is existing around this area. Existing pipe culvert are replaced by box culverts raising height and width, which could be used by wildlife. Awareness-raising workshops with the forest user groups at the forest blocks regarding wildlife behaviors, road kills, wildlife poaching, human-wildlife conflict and traffic regulations. Training provision to workers on the potential impacts from their behavior including wildlife poaching and habitat degradation/pollution. Regular inspection of wildlife will be conducted. Erract funneling fences in all the blocks of forests to reduce the roadkill prevailing and guide as appropriately for safe movement of rare and endangered mammal species. The fence will constitute a 1.5 m (0.5 m below ground) high brick wall, above which will be a meter-tall mess wire fence erected. The fence is predator and reptile proof (keeps animals off the road).					
Bridge construction	Impact on aquatic life and Herpetofauna Construction activities in	Construction of 2 herpeto fauna underpasses (for snakes specially) at Ch 638+426 (83.009863°E, 27.657455°N) and Ch 639+561 (83.003008°E, 27.656003°N) in Badhare forest	30 rivers and rivulets	During construction	Provided in provisiona	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
	the river, for bridges and bank protection works have the potential to adversely affect aquatic life by sediment, spoil, accidental spillage of fuels. Quarrying activities from rivers also generate high sediment load impacting the water quality. Leakages of fuels and chemicals, also impact on aquatic species.	block is strongly recommended. During excavation, canalize river and do not disturb river regime as far as possible, sand and gravel extraction will be done only approved location without affecting river regime, reinstate all affected locations immediately. Water flow will be maintaining providing hume pipes during bridge construction. Prohibited destructive fishing by the construction workers. All chemicals, bitumen, oil and fuel will be stored on impervious floor with drainage facility, so that no leakage or spillage will reach in the water bodies. Construction activities will not be carried out near the water bodies during monsoon period. Avoid quarrying of the rivers to avoid impact on fish, other aquatic species and river habitat Construction of wastewater treatment facilities at the campsites (e.g., septic tank and soak pit) and at the worksites (sedimentation tanks) Monitoring of wastewater quality to ensure good health of aquatic life. Ensure low turbidity during bridge construction at Kothi river, Banganga River, Dano River, Kanchan River and others' Machinery leaking fuel, lubricants, hydraulic fluids, or solvents shall not work within the river. Availability of spill kits and trained personnel for immediate cleanup of any oil spills.		n	l sum		
Widening of road	Impact on Avifauna	In forest area road width has been minimize as 24m in forest area/rural area and 37.4m in semi urban area to avoid/reduce	Along the road, Forest	During construction	Provided in provisiona	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		impact on tree and bird habitat. Avoid clearing forest trees with light crown and old trees as far as possible. Plant with large size saplings of tree species bearing seed/fruit and open/light canopy form like Simal (Bombax ceiba), etc along the road side. Plantation is recommended to be carried out soon as the construction work is completed, to increase bird habitat, foraging and roosting trees outside forest area, specially in semi urban and rural area. Special measures (such as speed reduction, warning sign, display board) will be taken at forest section. discourage anthropogenic activities involving large group/s of people in the forest area to avoid disturbing the bird species affecting their behaviors Discourage dumping of wastes/chemicals and accidental spillage in springs, rivers and wetlands as it directly affects the bird habitat. Discourage vehicle high speed as it could collide with birds when flying at low level Roadside plantations and plantations of affected area will carry out as soon as the construction work is completed. Unnecessary sounds produced during the construction work will be regulated through regular awareness and placing the sign board such as no-horn zones. Code of conduct for workers and employee's protection of fauna and a ban on hunting. Any violation of code of conduct leads to strict punishment, including termination of employment/contract	section	n	l sum		

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Construction workers	Illegal trade and poaching of wildlife	No worker's camps and construction facilities should be allowed to be constructed in or adjacent to the forest areas. Code of conduct for workers and employee's protection of fauna and a ban on hunting Project proponent will monitor the activities of the construction workers. The contractor will be responsible if any workers are found involved in trapping or harassing the wild animals and birds. Awareness among the worker for conservation of the wildlife will be provided. No construction activities during the night time	Forest area	During construction	Awareness cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Operation Phase							
Operation of road	Impact on Flora and Fauna	35 km fences will be reinstated/established in the forest areas and proposed underpass structures for wildlife. Regular maintenance will be done at roadside tree, and compensatory tree plantation, replacement of dead plants. During the post construction phase, a regular monitoring system be developed and placed to keep a record of, understand the risks to wildlife and identify key locations of roadkill risk. Record the use of bridge, box-culvert by wildlife species, especially carnivores, snakes and other reptiles. Regular inspection and maintenance of fencing installed. Any loss of wildlife or lesser fauna as a result of the fences will be recorded and reported to division forest offices for improvement Regular cleaning and maintenance will be done at all culverts/ wildlife crossing structures to reduce the chances of blocking. Workshops for awareness-raising will be done on forest fire, wildlife protection such as prevention of waste dumping	Forest area	During Operation	Included in project cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Operation of road, high traffic in the road	Disturbance to wildlife movement, roadkills		Forest area	During Operation	Included in awareness cost	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		from vehicles, speed limit, and potential collision with animals. Regular inspection and maintenance of water sources/pond fencing installed in the forest areas. Improve movement corridors, maintain light index in the underpass. Installation of wildlife crossing information/display board at 1km span and traffic calming measures in the forests, especially Kothi River Banganga River and others Assessment of need of additional culvert/wildlife crossing structures along the road based on the monitoring result. For additional/new wildlife crossings, locations and design will be based on study data. Introduce no-horn zone in the forest blocks, discourage unnecessary noise generating activities in the forests during operation phase.					
Socio-economic and cultural environment							
Construction phase							
Widening of the road and bridge	Private Structures Acquisition 127 private structures will be affected by the project	The affected households will receive cash compensation against loss of structures and will provide additional cost of assistance for relocation and livelihood restoration. Skill training (such as Doll & cushion making, Small hotel and lodge assistant, Light vehicle driver, Beauty parlor, Mobile phone repairer technician) will be provided to people of affected households. A Resettlement Action Plan (RAP) has been prepared to address on the affected households.	Along the road	During construction	Included in RAP	Contract or	MOPIT/DOR, DCID/PMU/SC
Widening of the road and bridge	Disruption of Community Structures and Public	Prior inform to public before shifting of the respective structures, utility. Take advanced actions and process	Along the road	During construction	Included in	Contract	MOPIT/DOR,

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
road and bridge	Utilities 206 Community Structures (105 chautara, 65 passenger waiting shed, 14 temples, 2 public toilets, 4 water tank, 3 statue, 2 small shed of school, 1 snake bite treatment center, 10 police check post, entrance gate, traffic direction post) and 2,358 public utilities (55 solar street light, 328 telephone pole, 67 transformers, 1809 electric poles and 53 LT lines, 46 water taps) within RoW will be affected.	necessary clearance, transfer of funds etc. to the respective utility service provider so that not cause any disturbance for uses by local community; and delays to the road construction schedule. Community structures- Rebuilt/shift with consultation of the local community, local authorities, and the cost is allocated in project cost. Irrigation canal and water supply lines – contractor will relocate/reinstate the irrigation canal, water pipelines – provision in the engineering costs Electric poles and power lines – coordination with Nepal Electricity Authority for relocation Telephone lines – Communication Department Public toilet– Coordination with local government for relocation/reinstate Access roads – reinstate Tube wells - new tube well will be constructed before demolishing the existing on. Separate utility duct will be installed with consultation of concern stakeholders.mainly in bridges and settlement area. Guideline for public utilities shifting is attached in Annex XXI .	road	n	Provisional sum/RAP	or	DCID/PMU/SC
Road and bridge construction	Impacts from Labour Influx The average labour requirement per day will be 500 (approx.) for the proposed project activities.	Awareness campaign implemented at the beginning of the construction phase. Raising awareness and implementing a Code of Conduct for the workers. The awareness campaign with local people and the construction workforce, including the spreading of sexually transmitted diseases such as HIV/AIDS. Construction camps will be built in the designated areas, located away from the local settlements.	Camps,	During construction	Included in training of Workers on Code of Conduct		

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		COVID-19 protocol measures will be adopted. The contractor will prepare a labour management plan prior to construction works.					
Road and bridge construction	Occupational health and safety	The contractor will prepare, obtain approval and implement an Occupational Health and Safety (OHS) Plan, OHS Plan will contain general guidance for all identified hazards under each work activities, and site-specific OHS hazard and risks and preventive measures during construction. Regular training program for workers on occupational health safety (daily/weekly toolbox talks). Special attention will be focused on safety training for workers to prevent and restrict accidents and on the knowledge of how to deal with emergencies, In order to protect all project personnel and visitors, the Contractor will provide personal protective equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, body harness, protective clothing, goggles, fully face eye shields and ear protection, Availability of firefighting, ambulance, medical and rescue facilities at the site for implementation of an emergency response plan. First aid facilities will be made available at the worksites and in the camps. The contractors will engage qualified first aider(s). The construction camp will be built with all adequate facilities (safe drinking water and sanitation, kitchen, rest areas, etc.) including entertainment facilities so that there will be minimal interaction between them and local communities. The Contractor will establish a mechanism (maintaining grievance register) to collect the complaints from the workers and address those complaints.	Construction sites	During construction	Included in training of Workers on Code of Conduct	Contract or	MOPIT/DOR, DCID/PMU/SC
Road and bridge construction	Community health and safety	Community awareness programs on construction-related hazards, including awareness programs in schools. The contractor will develop and implement a comprehensive Traffic Management Plan with adequate measures such as	Construction sites along the road	During construction	Included in awareness cost	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		proposing traffic diversion measures, alternate routes for local traffic, avoiding school hours, following speed limits, hiring licensed drivers, etc. The plan will be implemented with the aim of preventing unsafe situations, especially near schools, housing areas, construction areas; The road will not be stopped for existing traffic. Road signage will be fixed at appropriate locations to reduce safety hazards associated with project-related vehicular traffic. Project drivers will be trained in defensive driving. Ensure that all construction vehicles observe speed limits on the construction sites and on public roads. Provide adequate signage, barriers, and flag persons for traffic control. Targeted employment of women, poor and the excluded Gender specific facilities for labour workers. Ensure equal wages for women and men. Specialized training to women for skilled employment opportunities (e.g. mason, heavy machine operator training, driving to women). Training for risk mitigation will be provided (e.g. on HIV AIDS, trafficking, child labour) by the project.					
Involvement of women workers	Risk of Gender-Based Violence	Awareness to explain suspicious situations and the signs of SEA/SH. Awareness to communities, particularly women, and male and female children to understand risks of SEA and SH and the roles and responsibilities of parties involved in project implementation on SEA and SH prevention, reporting incidents of project-related SEA/SH. Provide same wages for men and women for same nature of works. Posting of Code of Conduct at contractor's work camps and living areas, and public places of adjoining/neighborhood communities in Nepali language. Will be provided same wages for men and women for same nature of works.	Construction sites	During construction	Included in training of Workers on Code of Conduct	Contract or	MOPT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
Road and bridge construction	Impacts on religious sites 13 temples fall within RoW of the proposed road and will be affected during the construction phase. Out of 13 temples, only 4 temples of chainage 0+510, 0+710, 28+920 and 45+160 are partially affected whereas remaining are fully impacted	Prior inform to public before shifting of the respective structures. Plan shifting activities. Community structures/religious sites will be rebuilt with consultation of the local community, local authorities, the cost is allocated in project cost. In the event encounters any findings of archaeological value during the works, the Contractor will follow the Chance Find Protocol instructions. Chance find protocol/procedures which will be used are as follows: Stop the construction activities in the area of the chance find; Delineate the discovered site or area; Notify the supervisory Engineer and relevant Department of Archaeology immediately	Along the road	During construction	Included in Provisional sum/RAP	Contractor	MOPIT/DOR, DCID/PMU/SC
Temporary use of Land	Loss of agriculture land/standing crops	The improvement/upgrading works will not require additional land beyond RoW. The contractor shall provide compensation covering for land and any crops to be removed. The agreement shall be maintained by the contractor before temporary land acquisition. Once the project is completed and the temporary land will no longer required, undertake land reclamation activities to restore the acquired land.	Project area	During construction	Contractor's responsibility	Contractor	MOPIT/DOR, DCID/PMU/SC
Operation Phase							
Operation of the road	Encroachment of RoW	Project/DoR will conduct awareness to local about ROW encroachment. With coordination of local government, enforcement of law discourages such settlements adjacent to the road, plantation of trees. Combined efforts of various governmental agencies and substantial public information and awareness activities. Enforcement mechanisms need to be in placed that can carefully tackle the problem of	Throughout the road alignment, major settlements and market areas	During Operation	Awareness by DOR	Contractor	MOPIT/DOR, DCID/PMU/SC



Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		removing encroachers while taking into full account Project/DoR will conduct awareness to local about ROW encroachment. With coordination of local government, enforcement of law discourages such settlements adjacent to the road, plantation of trees. Combined efforts of various governmental agencies and substantial public information and awareness activities. Enforcement mechanisms need to be in place that can carefully tackle the problem of removing encroachers while taking into full account.					
Operation of the road	Road safety	Installation and maintenance of safety furniture, pedestrian crossing (preferably over or under, zebra crossing the roadway); Crossing locations will take into account community preferences, including those related to convenience or personal safety. Additional installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities; Speed control and regulations (especially in populated areas, near schools and other public places). Establishment of traffic signals, CC cameras for monitoring in the highway. Road safety awareness trainings will be provided to drivers and locals.	Major settlements and market areas	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC
Operation of the road	Community health and safety	There is provision of cycle lane and footpath in both side of the road; disabled friendly. Installation of barriers (e.g. fencing, plantings) to deter pedestrian access to the roadway except at designated crossing points;	Along the road Saljhundi, Pragati community forest and	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC

Activity	Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation	Supervision
		Road crossing infrastructures incorporating principal of universal access. Implementation of No Blowing of Horn Zones particularly in settlement, sensitive areas. Zebra crossing will be added in the forest areas, considering the potential crossing of community residents for community forest (at Saljhundi, Pragati community forest and Tilaarakot collaborative forest have both side of the Highway)	Tilaarakot collaborative forest				
Maintenance of works	Workers Health and Safety The potential OHS risks associated with the O&M stage mainly result from the routine maintenance works and they include (i) exposure to higher levels of live traffic because of working in proximity to live traffic, and (ii) exposure to high noise levels from the traffic.	Establishment of work zones to separate workers from traffic, Closure of lanes and diversion of traffic to the remaining lanes if the road is wide enough (e.g.re-routing of all traffic to one side of a multi-lane highway), Where worker exposure to traffic cannot be completely eliminated, use of protective barriers to shield worker from traffic vehicles, or installation of channeling devices(e.g. traffic cones and barrels) to delineate the work zone, Regulation of traffic flow by warning lights, use of flaggers if possible, Reduction of maximum vehicle speeds in work zones, Training of workers in safety issues related to their activities, safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space.	Maintenance section of the road	During operation	Provision in Project maintenance cost	Contract or	MOPIT/DOR, DCID/PMU/SC



Table 64: Environmental management plan of bridges

A. Beneficial impacts augmentation measures

Environment Impacts	Enhancement Measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation Agency	Supervision Agency
Generation of employment opportunities (100 skilled 100 unskilled)	The Project will encourage local people to participate in construction works. The contractors will be requested to employ local labors to work in the construction of road. The project will provide skill training to people of affected households.	All bridges	During construction	NA	Contractor	MOPIT/DOR, DCID/PMU/SC, Local Authorities
Technical Skill and Capacity Enhancement of Local People	The project will provide different type of skill training to people of affected households. Project has proposed the maximum use of local people for construction works which enables the transfer of skills and technical knowledge in construction and related technical sectors such as bar binding for bridge, river training, embankment filling and slope stabilization work such as bio-engineering works etc	DIZ	During construction	Cost is provision in RAP	Contractor	MOPIT/DOR, DCID/PMU/SC, Local Authorities

B. Adverse impacts mitigation measures of bridges

Environment Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation Agency	Supervision Agency
Physical Environment						
Embankment Erosion, River bank instability Due to Earthwork Excavation of bridge	Prohibited to dispose excavated spoils and wastes into streams water. Silt/sediment shall be collected and stockpiled for possible reuse as surfacing of slopes for re-vegetation. Soil erosion shall be stabilized by applying engineering as well as bio-engineering techniques. 3,240 Sqm bridge and river side slope protection will be done by applying bio-engineering technique (Grass plantation, Brush layering, and Tree/Shrub plantation) with combination of civil structures. 12,112 cum, gabion for river training 24,458 cum, stone masonry 6,255 cum) is proposed.	Mainly Satgadi, -1, Satgadi-2, Meghawa, Kanchan, Kaila, Ghamaha khola, Inguria, Banganga	During Construction	Included in project cost	Contractor	MOPIT/DOR, DCID/PMU/SC, Local Authorities
Deterioration on Water Quality of rivers due to	Prohibited to dispose excavated spoils and wastes into streams water. All chemicals and oil shall be stored away from water and	All perennial rivers	Water quality	Water Quality monitoring NRs.	Contractor	MOPIT/DOR, DCID/PMU/SC

Environment Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRS.)	Implementation Agency	Supervision Agency
excavation	shall be stored at concreted platform with catchments pits for spills collection. Silt fencing shall be installed for collecting sediments before letting them into the water body. Silt/sediment shall be collected and stockpiled for possible reuse as surfacing of slopes for re-vegetation. No vehicles or equipment shall be washed, parked or refueled near streams water, to avoid contamination of streams water from fuel and lubricants.		sampling- Site observation	2,400,000		C
Quarry/borrow sites Extraction activity could disrupt natural water course, land contours resulting disturbance in natural drainage patterns, and siltation, water pollution, Impact on bridge foundation	Prohibited quarry and borrow pit operation within 1 km upstream and downstream of the bridge. Contractor will prepare borrow pits and quarry sites restoration and submit for approval from Engineer before beginning the quarry activity. Operate the quarry/borrow sites only approval locations. Obtain approval from authorities of government and private land owners, Suitable size of borrow pits and quarry sites shall be operated as per required volume of materials. Restore the site as per restoration plan maintaining natural contours and revegetation after use. Maintain a buffer zone of 5 to 10m between the low flow channel and the mining operations to minimize the downstream impacts and limit the excavation activities to the low flow season (non-monsoon).	Proposed quarry and borrow pits locations (11 potential locations of construction materials)	During construction	Reinstate cost is allocated in project cost	Contractor	MOPIT/DOR, DCID/PMU/S C, Local Authorities
Wastewater Discharges from Construction Sites and pollute the surface water and ground water	Construction of wastewater treatment facilities at the campsite (e.g., septic tank and soak pit and site drainage). The contractor will be required to take appropriate measures to avoid and contain any spillage and pollution of the water. Sedimentation ponds of adequate size and capacity will be built for the treatment of discharges from the batching plants and the crushing plants to allow the sediments to settle. Final discharges from the sedimentation ponds shall comply with the National standards for wastewater standards. Quarterly monitoring of wastewater quality to ensure compliance with the standards.	Satgadi no 1, Ghamaha khola, Inguria, Kanchan, Banganga and Kaila bridge	During construction Water quality parameter levels	Water quality monitoring cost is included in project cost	Contractor	MOPIT/DOR, DCID/PMU/S C
Damage to services running parallel or across	Immediately reinstate all affected services such as electric pole, transformer, telephone pole, public toilet, resting place, access	All bridges	During construction,	Provision in Project cost	Contractor	MOPIT/DOR, DCID/PMU/S

Environment Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation Agency	Supervision Agency
the Bridges, interruption in supply	road, foot trail, irrigation, canal, water supply pipe etc. Separate utility duct will be installed with consultation of concern stakeholders in new bridges.		record, observation			C
Generation of Construction and Hazardous Waste	Before commencing the construction activities, the contractor will be required to prepare a Waste Management Plan for hazardous and non hazardous waste management plan. The contractor will place containers of adequate size and numbers in place for the collection of various types of wastes (metal, rubbers, used fuels, batteries, etc.) from the worksites, and transport these wastes regularly to a centralized facility. Storage of chemicals 100 meters away from any water sources.	Camp sites	During construction	Contractor responsibility	Contractor	MOPIT/DOR, DCID/PMU/S C
Generation of Solid Waste from camps, offices	Before commencing the construction activities, the contractor will be required to prepare a Waste Management Plan, Collection and segregation of solid waste into kitchen waste (organics), paper and plastic (recyclable) and garbage (non-recyclable). Proper availability of water and sanitation facilities at workers' camp. Contractor will install temporary toilets with septic tank/soak pits. Local municipal waste disposal sites will be used for the disposal of garbage.	Camp sites	During construction	Contractor responsibility	Contractor	MOPIT/DOR, DCID/PMU/S C
Air pollution from Hot Mix Plant, concrete batching plant, construction yard and due to movement and operation of construction vehicles and machinery	Construction camps will be located in open areas and away from residential areas. Monitoring of air pollution and timely action to reduce the pollutant concentration by appropriate measures will be taken up. Trucks carrying construction material will be covered with tarpaulin sheet to avoid spilling. Water sprinkling will be carried out in mornings and evenings on haul roads and compact surface. Vehicles and construction machinery will be maintained to conform emission standards specified by GoN. Construction debris shall be disposed only at designated sites.	All bridges including Satgadi no 1, Ghamaha khola, Inguria, Kanchan, Banganga and Kaila bridge	During construction Observation: Air Quality Sampling	NRs. 5,400,000	Contractor	MOPIT/DOR, DCID/PMU/S C
Traffic Hazard and Road Safety	Contractor will take all reasonable measures to minimise interference with traffic flow at bridge locations and to provide safe transit at diversions. The contractor will maintain two way traffic at diversions and will	All bridges	During construction	Contractor's responsibility	Contractor	MOPIT/DOR, DCID/PMU/S C

Environment Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRS.)	Implementation Agency	Supervision Agency
	inform the local traffic police about the traffic diversion					
Noise Pollution	Construction sites will be barricaded. Construction work will be prohibited between 10.0 PM – 6.00 A.M. near residential areas.	All bridges	During construction Noise level sampling	Included in Project cost	Contractor	MOPIT/DOR, DCID/PMU/S
Biological Environment						
Impact on Flora due to Cutting of 7,114 Tree and removal of vegetation 63 tree species	The loss of vegetation will be compensated through replantation of trees. According to Forest act, 2076, a replacement plantation at a ratio of 1:10 ratio (as compensatory plantation) will be done. About 44.48 ha land will be required for the compensatory plantation. Removal of trees only within the corridor of impact (Col) after joint verification with Division of Forest Office,	All bridges including Satgadi no 1, Ghamaha khola, Inguria, Kanchan, Banganga and Kaila bridge	During construction	Covered by BoQ item 8.3	CSC/Contractor	MOPIT/DOR, DCID/PMU/S, MoFE/DFO
Impact on aquatic species	Canalize river and do not disturb river regime as far as possible during excavation, sand and gravel extraction will be done only approved location without affecting river regime, reinstate all affected locations immediately. Water flow will be maintained providing hume pipes during bridge construction. Prohibited fishing by the construction workers. All chemicals, bitumen, oil and fuel shall be stored on impervious floor with drainage facility, so that no leakage or spillage will reach water bodies. Construction activities will not be carried out near the lake during monsoon period.	Perennial rivers like Kothi, Banganga, Kaila, Kanchan, Gamaha	Interview with local people and observation	Covered by BoQ item 8.2	Contractor	MOPIT/DOR, DCID/PMU/S
Socio economic and Cultural Environment						
Loss of Public properties/Infrastructures access road, foot trail, Electric pole, telephone pole water supply pipe, irrigation canal	Prior inform to local people before shifting of the respective structures, utility. Take advanced actions and process necessary clearance, transfer of funds etc. to the respective utility service provider so as not cause any delays to the road construction schedule. Plan shifting activities. Community structures- Rebuilt with consultation of the local	All bridges including Satgadi no 1, Ghamaha khola, Inguria, Kanchan, Banganga and	Observation and site inspection	Included in Provisional sum/RAP	contractor	MOPIT/DOR, DCID/PMU/S, Local authorities

Environment Impacts	Avoidance/Mitigation and Compensation measures	Location	Implementation Time	Mitigation Cost (NRs.)	Implementation Agency	Supervision Agency
	community, local authorities, the cost is allocated in project cost. Separate utility duct will be installed with consultation of concern stakeholders mainly in bridges and settlement area.	Kaila bridge				
Community health and safety	Additional installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, Establishment of traffic signals, crash barrier etc. Provision of footpath for pedestrians.	All bridges including Satgadi no 1, Ghamaha khola, Inguria, Kanchan, Banganga and Kaila bridge	Observation and site inspection	Included in awareness cost	Contractor	MOPIT/DOR, DCID/PMU/S C
Risk of Gender-Based Violence	Awareness to explain suspicious situations and the signs of SEA/SH. Awareness to communities, particularly women, and male and female children to understand risks of SEA and SH and the roles and responsibilities of parties involved in project implementation on SEA and SH prevention, reporting incidents of project-related SEA/SH. Provide same wages for men and women for same nature of works. Posting of Code of Conduct at contractor's work camps and living areas, and public places of adjoining/neighborhood communities in Nepali language.	Along the bridge sites	Observation and site inspection	Included in training of Workers on Code of Conduct	Contractor	MOPIT/DOR, DCID/PMU/S C
Impacts from Labour Influx The average labour requirement per day will be 200 (approx.) for the proposed project activities.	Awareness campaign implemented at the beginning of the construction phase. Raising awareness and implementing a Code of Conduct for the workers. The awareness campaign with local people and the construction workforce, including the spreading of sexually transmitted diseases such as HIV/AIDS. Construction camps will be built in the designated areas, located away from the local settlements. COVID-19 protocol measures will be adopted. The contractor will prepare a labour management plan prior to construction works.	Camp sites	Observation record,	Included in training of Workers on Code of Conduct	Contractor	MOPIT/DOR, DCID/PMU/S C
Impacts on Religious Sites, way to river	Prior inform to public before shifting of the affected structures. Community temple will be rebuilt with consultation of the local community, local authorities, the cost is allocated in project cost. Damage footsteps, access road way to river.	Gamaha river, Tulbuliya, Kanchan, Badganga, access road				MOPIT/DOR, DCID/PMU/S C. Local authorities



9.1. Environmental Budget

Cost estimation for the proposed mitigation measures and enhancement measures on physical, biological and socio-economic and cultural environment of Butwal-Gorusinghe road and bridge is given in the **Table 65**.

Table 65: Environment mitigation and enhancement costs

SN	Mitigation and enhancement activities	Estimated cost (NRs)	Remarks
A	Capacity building Training (Tool Box talk sessions /labour force leaders, affected person/local stakeholders)	1,600,000	Covered by BoQ item 8.1
B	Budget for environmental-related civil works that included in the project cost		
	Cost for tree cutting		Covered by BoQ item 2.1.2
	Bio engineering works	60,597,917	Covered by BoQ item 5
	River training and protection works		Covered by BoQ item 3.5
	Community safety structure (such as footsteps, approach to property, boundry wall, culvert etc)		Covered by BoQ item 2.9
	Wild animal crossing		Covered by item 2.4, 3.3.4 in BoQ
	Public utilities reline/shifting	253,071,447	Covered by item 8. 9 in BoQ
	Enhancement of Vegetable market at Pipara and Public Toile at Gorusinghe	19,342,619	Covered by item 8.5 in BoQ
	Drainage management work		Covered by item 2.4, 2.5 in BoQ
	Installation of road safety signs/ Road Furniture and Traffic Safety Measures		Covered by item 2.8 in BoQ
	Pedestrian overhead crossing		Covered by item 3 in BoQ
C	Budget for the environmental mitigation and monitoring to be included as BOQ items in the contract		
	Air and noise quality monitoring	5,400,000	9*4*3=108*50000, Covered by BoQ item 8.1
	Water quality monitoring	2,400,000	10*4*2=120*20000, Covered by BoQ item 8.1
	Fencing in forest area	42,672,940	Covered by BoQ item 8.5

SN	Mitigation and enhancement activities	Estimated cost (NRs)	Remarks
	Funnel fencing	48,435,591	Covered by BoQ item 8.6
	Implementation of EMP	11,500,000	Covered by BoQ item 8.2
	Compensatory tree plantation	45,030,534	Covered by BoQ item 8.3
	Compensation of damaged public and private structure, loss of standing crops	38,294,436	Covered by BoQ item 8.4
	Public utilities reline/shifting		Covered by item 8. 9 in BoQ
	Total Cost	528,345,484	

Note: Most of the environmental and social mitigation cost is included in part of civil works. So the budget seems huge.



10. ENVIRONMENTAL MONITORING

Environmental Monitoring is an integral part of the Environmental Management Plan. As per EPR, 2077, The project proponent will be responsible for monitoring. In order to implement the effectiveness of mitigation measures, it is essential to conduct three types of environmental monitoring for Upgrading of Butwal-Gorusinghe Road Project which is as follows:

10.1. Baseline Monitoring

Baseline Monitoring is required to compile and maintain the database on environmental domains prior to the implementation of the project. The primary concern during this phase will be to implement field data collection to obtain the environmental baseline conditions needed to finalize the design and cost of the mitigation measures. This is especially important if the project is delayed due to unforeseen circumstances. Such data recorded before the project implementation will facilitate the comparison of information obtained in monitoring activities conducted during project construction. The detail is given in **Table 67-A**.

10.2. Compliance Monitoring

Compliance Monitoring employs a continuous recording of specific environmental quality indicators or pollution levels in order to ensure project compliance with recommended government environmental protection standards. Compliance covers the work to be done by the proponent and contractor. Basically, compliance monitoring would be carried out at site. The detail is given in **Table 67-B**.

10.3. Impact Monitoring

Impact Monitoring measures the physical, biological and socio-economic and cultural parameters within the project area during the construction and operation phases in order to detect environmental changes that occur as a result of project implementation. It involves actual measurement of the impacts of construction activities on the environment, such as water quality samples being taken at regular intervals to assess pollution concentrations in the river from construction work camps, after mitigation steps are taken. Impact monitoring is scientific data collection, analysis interpretation and follow-up of mitigation works. It is designed to assess actual impact vs. predicted impact and the effectiveness of the mitigation measures. The detail is given in **Table 67-C**.



Table 66: Environmental monitoring cost

Description	Quantity	Rate (per month) NRs	Amount (NRs)
Environmental Specialist	36 (Months)		Included in Supervision consultant cost
Sociologist	36 (Months)		Included in Supervision consultant cost
Safety Inspector	36 (Months)		Included in Supervision consultant cost
Field sampling and Lab Tests monitoring			
Air and Noise quality monitoring	108 (nos)	50,000	5,400,000
Water quality monitoring	120 (nos)	20,000	2,400,000
Wildlife movement monitoring	3 (nos)	1,000,000	3,000,000
Sub-Total Costs for Environmental Monitoring Works			10,800,000
Monitoring Costs by			
Geo-Environment and Social Unit, DoR/MoPIT	LS		500,000
Sub-Total Costs for Monitoring Agencies			500,000
Total Estimate			11,300,000



Table 67: Environmental monitoring

SN	Monitoring Parameters	Indicators	Methods	Schedule	Location	Monitoring Agency	Monitoring cost (NRs.)
A. Baseline Monitoring							
1	Air quality	PM _{2.5} , PM ₁₀ , NO _x , SO _x , CO _x , Lead, Benzene	Ambient air quality sampling and analysis at selected sites/sensitive spots using through High Volume Sampler 24-hour	Before construction	9 locations (refer Annex XII-F)	Contractor, SC/PIU/DOR	5,400,000
2	Noise level	1 hr Leq dB(A)	Points source measurements in dB(A) at settlement sites/sensitive spots for noise level at 2.5 and 15 m from roads	Before construction	9 locations (refer Annex XII-F)	Contractor, SC/PIU/DOR	
3	Water quality	pH, Electric conductivity, Turbidity, Total Hardness, Total Alkalinity, Chloride, Ammonia, Nitrate, Calcium, Magnesium, Iron and <i>E. Coli</i>	Collect and analyze sample from source	Before construction	10 locations (refer Annex XII-J)	Contractor, SC/PIU/DOR	2,400,000
4	Borrow Areas, Quarry Sites, Crusher Plant/Hot mix Plant/Batching plants	Landuse, drainage condition, surface water pollution, erosion	Site observation, discussion with local people	Before construction	Proposed sites	Contractor, SC/DCID/PMU	Contractor's responsibility
5	Wildlife movement, monitoring	Road kills/collision	Monitoring record, Site observation and consultation with DFO, local people			SC/DCID/PMU	3,000,000
6	Community structures, Public utilities	Existing condition/ disrupted/damage	Direct Observation, observation and consultation with local authorities, local people	Before construction	Within RoW locations	SC/DCID/PMU	
7	Private structures	Removal compensation	Direct observation and consultation with local authorities, local people	Before construction	Within RoW locations	SC/DCID/PMU	Included in RAP
B. Compliance monitoring							
Pre-construction Phase							
1	Removal of tree from ROW	Get approval from DoF/DFO	Felling of tree from RoW before construction work start	Before construction	Along the road	SC/DCID/PMU /DFO	Included in Project cost
2	Resettlement, assistance and compensation	Legal provisions by GoN Compensation paid	Check compliance to legal procedures, photos	Before construction	Along the road	SC/DCID/PMU / Concern stakeholders	Included in RAP
3	Relocation of	Coordination with concern	Relocation of public structures before	Before construction	Along the road	SC/PIU/DOR/	Included in

SN	Monitoring Parameters	Indicators	Methods	Schedule	Location	Monitoring Agency	Monitoring cost (NRs.)
	Public structures/utilities	stakeholders	construction work starts			Concern stakeholders	RAP
4	Establishment of camp, stockpile, Crusher Plant/Hot mix Plant/Batching plants	Get approval from Engineer, Local authorities'	Contractor's arrangements regarding labor camps materials storage and construction activities	Before construction	Proposed sites	SC/ DCID/PMU / Concern stakeholders	Contractor's responsibility
Construction Phase							
Physical Environment							
1	Slope protection	Civil structures with Bioengineering methods used at recommended sites	Observation, Walk through survey	During construction before monsoon, after monsoon	Ch 590+550- Ch 590+600, Ch 590+700, Ch 590+800, Ch 591+000, Ch 610+100, Ch 611+000, Ch 621+420, Ch 640+200	SC/ DCID/PMU	Included in supervision consultant cost
2	Extraction of material from recommended quarry sites and borrow pits	No cases of material extraction reported from unauthorized sites	Walk through survey, interaction with local peoples	During construction phase		SC/ DCID/PMU	Contractor's responsibility
3	Control of dust emission	Dust level at construction site, water sprinkling practice observed	Observation, Use of sprinkler tank, interview local about dust problem	Regular	Along the road,		4950000
4	Spoil disposal in safe tipping sites	Erosion protection measures used (grassing), bunds constructed, adequate drainage provided	Interaction with project manager, and local people, Walkthrough survey along road alignment	During construction phase	Proposed soil disposal locations	SC/ DCID/PMU	
5	Road Safety/Community safety	Dust level and noise level at work sites, major settlements and sensitive spots like health centers and schools	Air and Noise testing, Observation of good upgrading practices and discussion with residents and workers	Once in a 3 month during construction		SC/PIU/DOR	
6	Water quality	pH, Electric conductivity,	Observation, Collect and analyze	Once in a 3 month	Rivers	SC/ DCID/PMU	2,200,000

SN	Monitoring Parameters	Indicators	Methods	Schedule	Location	Monitoring Agency	Monitoring cost (NRs.)
7	Road Accidents	Turbidity, Total Hardness, Total Alkalinity, Chloride, Ammonia, Nitrate, Calcium, Magnesium, Iron and <i>E Coli</i> Record of accident in the road	sample from source Record keeping/ interview local	during construction During construction and operation phase	Along the road	SC/ DCID/PMU	NA
Biological Environment							
1	Spoil disposal in forest and water bodies	Spoil dumped in forest, and sensitive areas	Observation	During construction period	Forest Section	SC/ DCID/PMU	
2	Compensatory plantation done	Number of trees planted	Visit to plantation area	Before issuing of construction completion certificate	Proposed Compensatory plantation locations	SC/ DCID/PMU	
3	Use of firewood	Use of firewood by labor, and bitumen heating	Inspection, interaction with community forestry and labors	During construction phase	Camp sites, Bitumen plant sites	SC/ DCID/PMU	
4	Disturbing, illegal killing, poaching of wildlife	Cases of disturbances, illegal and hunting and poaching	Interaction with CPUG, locals, inspection of labor camp area	During construction phase	Forest area	SC/ DCID/PMU	
5	Human Wildlife conflict	Road kills, Damage Agriculture production	Record, observation Interview with concern stakeholders	During construction phase	Forest area,	SC/ DCID/PMU	
6	Disturbance to Aquatic Life	Babitat loss/ change the migratory route	Record, Interview with concern stakeholders	During construction phase	Bridge construction at all Perennel river	SC/ DCID/PMU	Contractor's responsibility
Socio-economic and cultural Environment							
1	Involvement of local labors in construction activities	Number of local labors employed in project	Inspection at construction site, interaction with labour, local people	Periodically during construction phase	Road and Bridge Construction sites	SC/ DCID/PMU	
2	Worker's sanitation, Occupational health and safety	Incidence of communicable/non-communicable diseases in labor camp, safety gears usage by labor, medical	Site inspection, interaction with labors	Periodically during construction phase		SC/ DCID/PMU	



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SN	Monitoring Parameters	Indicators	Methods	Schedule	Location	Monitoring Agency	Monitoring cost (NRs.)
		checkup camps, shelter, drinking water and toilet facility					
3	Social Conflict	Number of days lost due to conflict, bandhs at project level etc.	Interview with contractor, site consultant, locals	Periodically during construction phase		SC/ DCID/PMU	
4	Employment to Project affected people	Number of project affected people employed	Interaction with project affected people, recording	Periodically during construction phase		SC/ DCID/PMU	
5	Restoration, rehabilitation of infrastructures damaged by the subproject activities	Continued services by the facilities and functional public life	Site observation; records; Public Consultation Meetings; Photos	Once in a month during construction phase		SC/ DCID/PMU	
6	Compensation of Private structures	Compensation cost provided to APs	Site observation; records; Public Consultation Meetings; Photos	During construction phase	Along the road	SC/ DCID/PMU	Included in RAP
7	Community safety	Provision of safety measures,	Site observation; records; Public Consultation Meetings; Photos	During construction phase	Along the road	SC/ DCID/PMU	Included in Project cost
8	Religious Sites	Number of affected religious sites, temple	Site observation; records; Public Consultation Meetings; Photos	During construction phase	Along the road	SC/ DCID/PMU	Included in Project cost
C. Impact Monitoring							
1	Slope protection	Success/failure of bio-engineering solutions, drainage management	Site observation, photos, discussion with people and technicians	During construction and Operation phase	Slope protection/embankment slope,	SC/ DCID/PMU /GESU/ MoPIT	
2	Air quality	Dust level at construction site, water sprinkling practice observed, PM _{2.5} , PM ₁₀ , NOx, SOx, COx, Lead, Benzene	Ambient air quality sampling and analysis at selected sites/sensitive spots using through High Volume Sampler 24-hour	During construction phase	9 locations (refer Annex XII-F)	SC/ DCID/PMU /GESU/ MoPIT	
3	Noise level	1 hr Leq dB(A))	Points source measurements in dB(A) at settlement sites/sensitive spots for noise level at 2.5 and 15 m from roads	During construction phase	9 locations (refer Annex XII-F)	PIU/SC/GESU/ MoPIT	
4	Water quality	pH, Electric conductivity, Turbidity, Total Hardness, Total Alkalinity, Chloride, Ammonia, Nitrate, Calcium,	Collect and analyze sample from source	During construction	Water bodies of importance	SC/ DCID/PMU /GESU/ MoPIT	



SN	Monitoring Parameters	Indicators	Methods	Schedule	Location	Monitoring Agency	Monitoring cost (NRs.)
		Magnesium, Iron and <i>E Coli</i>					
5	Disruption of Drainage System	Status of rehabilitation Service status of irrigation channels and water supply system	Observation and interviews, photos, fisheries data, wildlife records	Bridge, culvert, irrigation canal	During construction	SC/ DCID/PMU /GESU/ MoPIT	
6	Forest and Vegetation	Numbers of trees, presence of ground vegetation, signs of illicit logging and extraction of NTFPs	Observations, DFO records, photos, stake- holder interviews	In and around the upgrading sites	During construction and operation	SC/ DCID/PMU /GESU/ MoPIT	
7	Worker's health and safety	Types of diseases in the labor camp	Discussion with labors, health workers,	Project Area	Monthly during construction phase	SC/ DCID/PMU /GESU/ MoPIT	
8	Occupational Health and Safety	Type and number of accident occurred during upgrading, Adequacy of occupational safety measured provided in case of fatal accidents or invalidity	Observations, photos, spot checks, Contractors' and health centre records interview with labourer	Project Area	During upgrading	SC/ DCID/PMU /GESU/ MoPIT	
9	Drainage blockage	Water overflow the road, damage to the drainage structure	Observation	Project area	During operation	SC/ DCID/PMU /GESU/ MoPIT	
10	Tree Plantation	Maintenance of planted saplings during construction, survival rate of trees, growth and development of saplings	Direct Observation and Discussion with local people			SC/ DCID/PMU /GESU/ MoPIT	
11	Wildlife movement	Road kills/collision	Monitoring record, Site observation and consultation with DFO, local people			SC/ DCID/PMU /GESU/ MoPIT	
12	Human Wildlife conflict	Road kills, Damage Agriculture production	Record, observation Interview with concern stakeholders	During construction and operation	Forest area,	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
13	Religious sites, Cremation yard	Number of affected religious sites, temple	Site observation; records; Public Consultation Meetings; Photos	During construction and operation	Along the road	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
14	Reinstate of	Number of affected sites	Site observation; records; Public	During construction	Along the road	SC/ DCID/PMU	Included in

SN	Monitoring Parameters	Indicators	Methods	Schedule and operation	Location	Monitoring Agency	Monitoring cost (NRs.)
	footrail, Access road, Irrigation Canal		Consultation Meetings; Photos			/GESU/ MoPIT	Project cost
15	Road Accident/road safety/Community safety	Record of accident in the road, Dust level and noise level at work sites, major settlements and sensitive spots like health centers and schools	Record keeping/ Observation, Air and Noise testing, Observation of good upgrading practices and discussion with residents and workers	During construction and operation	Along the road	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
16	Relocation of public utilities	Continued services by the facilities and functional public life	Site observation; records; Public Consultation Meetings; Photos	During construction and operation	Along the road	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
17	Reinstate Quarry borrow sites	Verification of Restoration plan followed, used quarry and borrow sites are level, revegetation	Observation, record	During operation	Proposed Quarry borrow sites	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
18	Reinstate Asphalt plant, Batching plant, Crusher plants	Verification of Restoration plan followed, no any material left in the sites	Observation, record	During operation	Proposed Asphalt plant, Batching plant, Crusher plants sites	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost
19	Reinstate of Camp, Stockpile	Verification of Restoration plan followed, no any material left in the sites	Observation, record	During operation	Proposed Camp, Stockpile sites	SC/ DCID/PMU /GESU/ MoPIT	Included in Project cost



10.4. Organization Setup for Monitoring

DoR under MoPIT is the key implementing agency for development and implementation of strategic road projects. DoR's Geo-Environment and Social Unit (GESU) is the focal point for the environment and social risk management and monitoring unit at DoR. Details of institutional arrangement for implementation and monitoring of the EMP are given in this chapter.

A. Ministry of Physical Infrastructure and Transport (MoPIT)

MoPIT is the mother agency of the DoR and is mandated by the Environmental Protection Act to review and approve BES, IEEs for projects in public works and transport sector. It also reviews and endorses EIA reports for review and forward to MoFE for approval process. The Ministry will also be the one to authorize the Project Implementation Unit (PIU) to initiate preliminary action for land acquisition. This function is handled by the Environment and Social section under the Planning, Monitoring and Evaluation Division of MoPIT. MoPIT also responsible agency for supervision of the project and conduct can the periodically.

B. Department of Roads

DoR is thus directly responsible for managing the E&S risks of individual projects during implementation. DoR has five (5) deputy directorships /branches that develop and implement projects. These are: (1) the Planning and Design Branch, which develops and implements all GoN-funded roads; (2) the Bridges Branch, which is in charge of the development of bridges; (3) the Maintenance Branch, which is in charge of the repair and rehabilitation of roads and bridges; (4) the Development Cooperation Implementation Division, which handles donor-funded projects; and, (5) the ADB Directorate, which handles all roads and bridges projects funded by ADB.

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

C. DCID/Project Management Unit (PMU)

Development Cooperation Implementation Division (DCID)/PMU handles for donor- funded projects. The DCID/PMU will organized EMP implementation according to agree with the donor, usually prepare their own EA, RAPs and other E&S Risk Management Plans by hiring their own consultants. DCID is directly responsible for managing the environmental issues of the projects. Ensure EMP is integrated in the bidding documents and civil work contracts,



Establish and maintain procedures to monitor implementation progress, Monitoring EMP implementation through monthly reports, established Grievance and Redress Mechanism, verify compliance as stated in monitoring reports. DCID has dedicated Environmental Expert and Social Expert, GESI Expert and supporting consultants.

D. Geo-Environment and Social Unit (GESU)

The focal point for the E&S risk management of DoR is GESU. GESU also undertakes compliance monitoring of projects, and as result also interacts with Project Implementation Unit (PIU). The role of the GESU is very important not only in environmental and social analyses is and ensuring stakeholders' participation in the planning and implementation process, but also for improved efficiency, effectiveness and sustainability of the projects. GESU has dedicated Environmental Inspector and Social Officer, Engineers and supporting consultants.

E. Supervision Consultant (SC)

Supervision Consultant will be responsible for supervision of environmental and social mitigation measures as per EMP and compliance monitoring of the construction contractor's activities, and prepare periodic monitoring reports for submission to DOR/DCID/PMU and WB. Prepared monthly monitoring report, identify needed corrective actions and follow-up actions, conduct regular site inspection to validate monitoring reports and identify unanticipated environmental impacts, compel contractors to take corrective actions within specified timeframe to address non-compliances, organize stakeholder consultations workshops. The SC's team includes one Environmental Safeguard Expert and one Social Safeguards Expert and one Occupational health and Safety Officer who will directly assist the PMU with its duties.

F. Contractor

The Contractor will be primarily responsible for the implementation and internal monitoring of all environmental and social management measures associated with Project design and construction, develop a Contractor's Environmental and Social Management Plan (CESMP) based on EMP of the project, which addresses all applicable construction phase, and revise it as needed in order to obtain approval from SC/PMU. The Contractor will have the sole responsibility for all activities on sites under its control for the duration of construction. This includes the activities of all subcontractors, whether employed or contracted directly or indirectly by the Contractor. Accordingly, it will be the Contractor's responsibility to ensure

that all activities are compliant with Project plans, permit and approval conditions, and any other statutory requirements. Employ qualified Environmental Social Health and Safety (ESHS) Officers (one Environmental Officer, one Social Officer and one OHS Officer) to oversee the Project's ESHS performance and ensure that staffing and resources are adequate, commensurate with the magnitude and timing of work and potential ESHS risks. Submit monthly report to SC/PMU on the status of EMP implementation; implement corrective actions as instructed by SC/PMU.

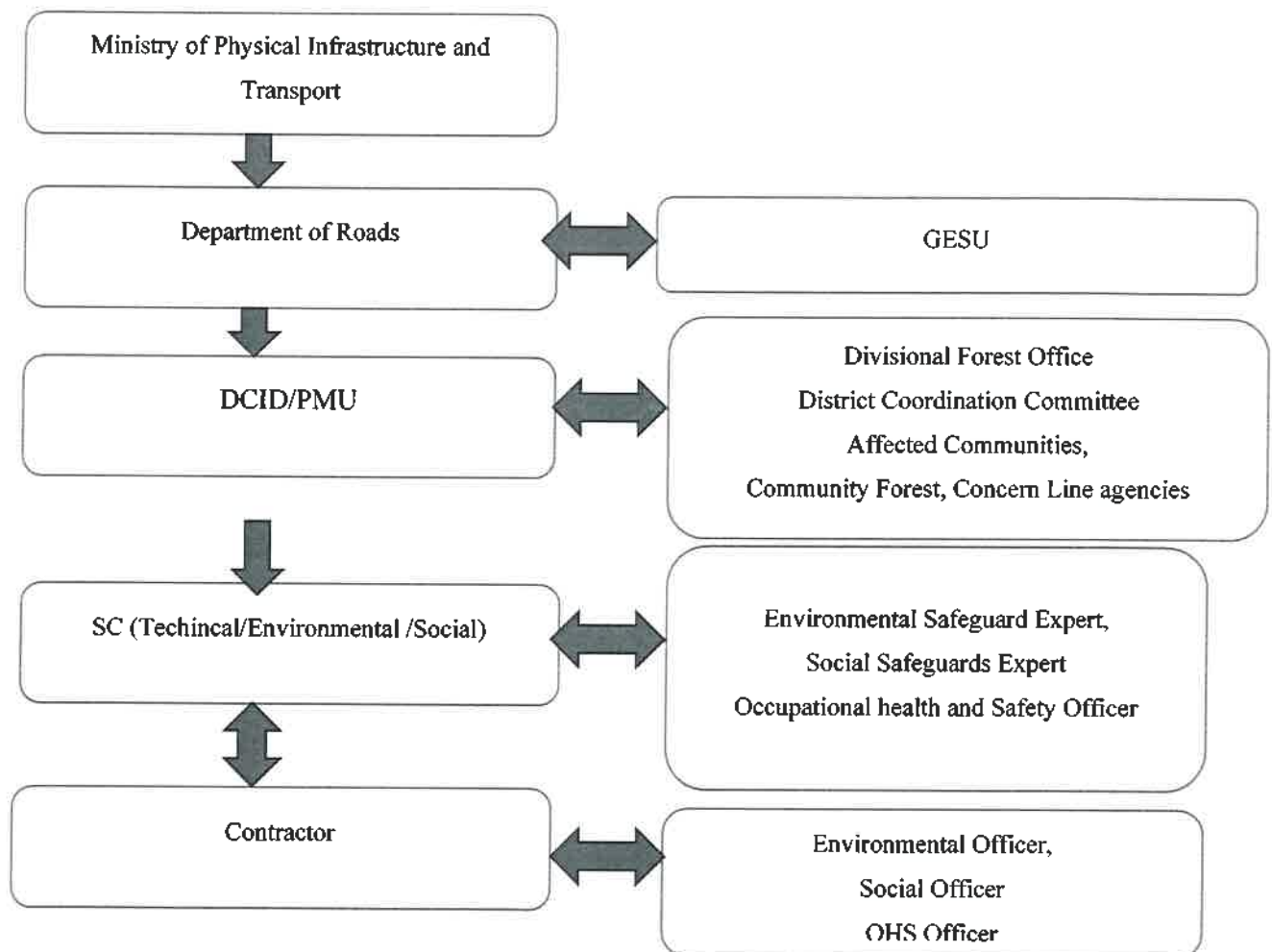


Figure 33: Organizational setup for environmental monitoring



10.5 Grievance Redress Mechanism

A grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of affected people's concerns, complaints, and grievances about the social and environmental performance of the project. These issues will be addressed through acknowledgement, evaluation and corrective action and response approach. The GRM aims to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address affected people's concerns.

First Level GRM-Site Specific

The first level and most accessible and immediate contact for the fastest resolve of grievances are the contractors, and supervision consultants on site. Prior to construction of any works, the DCID/Project Management Unit (PMU) Site Project Office (Project Manager) will ensure local community meetings are held to notify local residents. If any complaints arise, the contractors, consultants, and Site Project Office can immediately resolve the complaint on site. The Site Project Office address, phone number will be available for project affect area and construction sites. Any person with a grievance related to the project works can contact the project to file a complaint. The Site Project Office will have a safeguards focal person to field and resolve complaints. The safeguards (environment and resettlement) focal person will document the complaint, and immediately address and resolve the issue with the contractor within 1-2 days if the complaint remains unresolved at the field level. The Site Project Office may seek the assistance of the consultant safeguards specialists (the environmental specialist or social safeguards specialist) to resolve the issue. The Site Project Office safeguards focal person will notify the DCID/PMU safeguards focal person that a complaint was received, and whether it was resolved. The safeguards focal person of site project office will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location, and (v) how the complaint was resolved.

Second Level- Project level

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

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

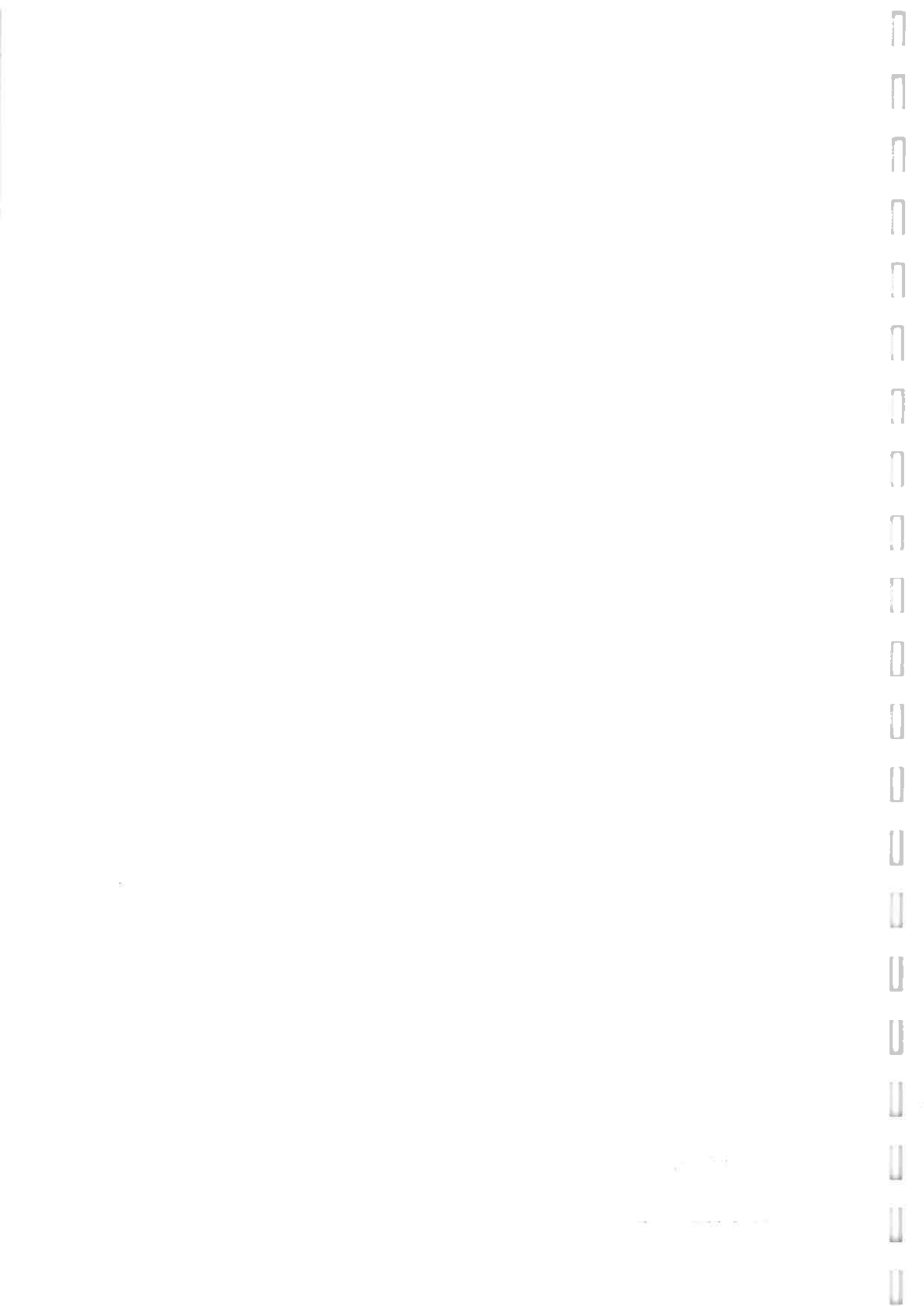
Third Level GRM- Department Level

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

Fourth Level GRM- Court of Law

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





11. CONCLUSION

The proposed Butwal - Gorusinghe road is an existing 2 lanes and will improve 4 lanes road including all bridges. This road will support capacity, quality, and safety improvements of the East -West Highway (EWH). Implementation of the proposal will have significant beneficial impacts on human life, such as income generation from employment, skill enhancement during the construction stage. The upgraded road will provide smooth, easy and quick access, eliminat existing traffic congestion and reduction in roadway accidents. Most importantly, the upgrading of the road will reduce transportation cost and travel time and, running costs of vehicles such as fuel economy, reduction in wear and tear of vehicle parts due to better riding quality. The trans-boundary impact will be that the upgraded highway will be Asian Highway (AH2) standard and will benefit transportation of goods. Consequently, the transportation of goods and services from India via Krishnagar will be easier, faster. The Butwal – Gorusinghe road section is support to providing better connectivity to the people of Lumbini Province and the rest of the country.

The environmental impacts of the proposed upgrading of BG road are likely to have minimal adverse impact. Few impacts have been identified high significance due to the proposed project. Most of which are localized and temporary in nature and residual impact will be minimum after implemetating mitigate measures. Land use pattern (agriculture land and forest land) of RoW will be changed into asphalt road. Landslide area from Ch 590+550 to 591+000, slope will not disturbe and additional lane at right side will not construct. Due to operation of Hot mix plant, batching plant, crusher plant and construction activities will increase air, noise and water pollution significancely during construction. New embankment erosion will be occurred due to widening of road. Construction of bridges and culverts will disturbe the river water way and surface water quality of the rivers will be deteriorated. About 15 km of the proposed road falls in forest area. Around 7,114 nos trees from RoW will be cleared, impact will be significance, but to ameliorate this impact compensated through compensatory plantation. Compensatory plantation at a ratio of 1:10, 71,140 tree seedlings will be planted, further bio-engineering works, plantation at median and road side/avenue tree plantation will be done to ameliorate forest area losses. Forest fencing will be damage during widening of the road and approximately 35 km of fencing will be reinstated. In forest area, road width has been minimized in the design, width of road has been proposed 24m, which reduce significance number of tree clearance and impact on forest and wildlife habitat. For



minimization of impact on wildlife crossing, modified wildlife crossing facilities especially underpass will be constructed. Most of the impacts identified and predicted are of minimal, temporary, reversible and short term nature associated with construction phase. Awareness on wildlife co-existence and regulation of illegal wildlife hunting to the community residing in the area is recommended which will help lessen poaching triggered wildlife movement in the periphery of highway. Further, 127 private structures, 206 community structures and 2,358 public utilities will be affected by the project which will be the significant impacts during construction stage. All private structures will be compensated as per Resettlement Plan (RP) and existing laws. Public structures and utilities will be relocated, reinstated with consultation of concern stakeholders. Labours and local people will be prone to adverse health effects and accidents relating to construction activities.

During the operation stage, soil erosion and scouring of embankment slopes due to monsoon rain, blockage of cross drainage structures will lead to drainage problems, water logging, and erosion. Community Health and safety risk will be increase due to increase in traffic during operation.

All identified adverse impacts will be mitigated. The detail mitigation measures are to be fully complied as mentioned in the EMP and EMoP. NRs. 528,345,484 is proposed for environmental mitigation and enhancement measures.

Analyzing the overall aspect of the environment, the IEE of the project ascertains that the project will have not any significant residual environmental impacts by implementing all the mitigation measures described in the EMP. This IEE is sufficient for this project and further environmental assessment or EIA is not necessary.



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IEE for Upgrading of Butwal-Gorusinghe Road (50km)

Comments and Suggestions Response Matrix on IEE:

SN	Comments	Response
1	Relocation cost and its plan (public utilities) detail मा उल्लेख गर्ने	The relocation cost of the public utilities is provided in Table 65 under Environmental mitigation and enhancement costs (Page no 194-185). Separate Guideline for public utilities shifting is prepared and attached in Annex XXI . The detailed list of affected community structures is attached in Annex XIV-B; Summary is given in Table 5 (Page no 8) .
2	Source of construction material (quarry site) RoW भित्र हो? Approved quarry site के कस्तो हो यो? यो बारे खुलाउने	The detail of sources of construction materials is provided in Chapter 3.9.2 & Table 17 (Page no 35-37) . "These quarry and borrow pit are beyond RoW, and proposed based on the suitability and availability of construction materials. As far as possible approved locations will be used for extraction of construction materials. Before extraction benchmark will be fixed and extracted within permissible level".
3	Agricultural loss/Standing crops को loss ले पार्ने प्रभाव report मा उल्लेख गर्ने	The detail impact of agricultural loss/standing crops is provided in Chapter 7.2.4-A-8 (Page no 138) , and its mitigation measures are provided in Table 63-EMP of road- Loss of agriculture land/standing crops (Page no 176) .
4	Tourism development को scope due to this road construction बारे खुलाउने	The scope of tourism development due to road construction is added under Chapter 7.1-9 (Page no 122) and Table 63-A, EMP of road (Page no 153-154) .
5	Top soil management को part पनि report मा उल्लेख गर्ने	The detail of top soil management is given in Chapter 7.2.1-B-2 (Page no 125) and Table 63-B EMP of road (Page no 156-157) . "Topsoil will be stockpile in designated location. Top soil will be used for plantation work. Top soil (0-25 cm) from the productive land will be collected and stored for reuse as final dressing of embankment for bio-engineering works. 40,000 Sqm for road embankment protections and 3,240 Sqm bridge and river side slope protection will be done by applying bio-engineering technique (Grass plantation, Brush layering, and Tree/Shrub plantation) with combination of civil structures. Further, it will be reused in medians plantation, and site restoration (camps, quarry and borrow pit)".
6	Bridge को part बाट study गर्दा एउटा separte chapter बनाएर	The details of bridge are mentioned in Chapter 3.1.1.2 (Page 15-16) . Salient feature of bridges and span arrangement is provided in Table 9 (Page no 17-18) and



SN	Comments	Response
	वातावरणीय विश्लेषण गर्नु पर्ने	separate EMP has been prepared for bridges and provided in Table 64 (Page no 179-183) .
7	Construction period उल्लेख गर्ने	Project is planned to start from September 2023 and construction of roads and bridges is estimated to complete within 3 years and Performance Based Monitoring (PBM) works including defect liability period (DLP) will be additional 5 years. The project implementation schedule is presented in Chapter 3.10 (Page no 39) & Table 21 (Page no 40) .
8	Air pollution को content लाई विभिन्न phase of study मा गर्नु पर्ने; कम हुन दिन mitigation plan के हो उल्लेख गर्नुपर्ने	The details of impact resulting on air quality including estimated carbon emission is given under Chapter 7.2.1-B-11 (Page no 128) and its details mitigation measures during construction and operation phase are provided in EMP Table 63- under Adverse impacts mitigation measures/Physical Environment/ Construction Phase/Air, Noise Pollution and Vibration (Page no 161-162), Operation and Maintenance phase- page 164 .
9	रुखको विवरण पेश गर्दा RoW को कति? वनको क्षेत्रको कति यसरी separate गरेर विवरण उल्लेख गर्नुपर्ने	The loss of trees from the forest section and other sections are separate and presented under Chapter 5.2.2 (Page no 76-77) . Approximately 5,102 numbers trees from RoW of forest section and 2,012 trees from RoW of other section will be removed.
10	Landslide prone area बारे mitigation measures बारे design मा उल्लेख गर्ने	The mitigation measures for Landslide prone area is provide in Table 63-B; EMP of Road (Page no 157) .
11	PVMC and DLP clear गरेर उल्लेख गर्ने	It is not PVMC it is PBM. PBM period including DLP will be 5 years and it is provided in salient feature under Chapter 3.3 & Table 8 (Page no 15) and also provide under Chapter 3.10- Project Construction Schedule Table 21 (Page no 39) .
12	Cutting and Fill volume clear गर्ने; Fill material कहाँ कसरी व्यवस्थापन गर्ने, खुलाउने	"About 272,883 cubic meters of cut material will generate and most of the cut material will be used as fill material for embankment construction and road material can be used as the base or sub-base or for backfilling of retaining structures" provided under Chapter 3.9.4 (Page no 38) . EMP Table 63 –under Physical environment/During construction phase- Spoil generation (Page no 160) .
13	U-Turn बारे report मा उल्लेख गर्ने	A detail of U-turn is provided under Table 56-2 (Page no 120) . "The space between two U-Turn not closer than 500 m in Urban Area whereas 3 km in Rural area". Typical design of U-Turn is attached in Annex IV .
14	Public toilet को व्यवस्थापन पछि	The management of public toilet is provided under

SN	Comments	Response
	कसरी हुन्छ? खुलाउने	Chapter 7.1-8 (Page no 121) & Table 63-A, EMP of Road (Page no 153). "Public toilet at Goringhe Chowk, way to Sandhikharka (Ch 634+950) will be upgraded into a gender responsive/universal access facility. The project will support for construction of public toilet and its management will be done by Buddha Bhumi Municipality ."
15	Training को part लाई need assessment गर्नु पर्ने	For skill training, project will conduct the need assessment during the construction period and as per demand of need assessment will be provided related training to the project affected peoples. Table 63-A; EMP of road (Page no 151).
16	Compensatory plantation को लागि चाहिने जग्गा बारे report मा उल्लेख गर्ने; यसको व्यवस्थापन बारे उल्लेख गर्ने	The land required for compensatory plantation is provided in Table 63-B; EMP of road (Page no 165-166). "Approximately 44.46 ha land will be required for plantation. The detail guideline for compensatory plantation plan is given in Annex- XVI ."



