

Initial Environmental Examination – Main Report

Project No. 41155-013
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NEP: Electricity Transmission Expansion and Supply Improvement Project

Main Report – Chapter 5

Prepared by Nepal Electricity Authority for the Asian Development Bank.

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5 EXISTING ENVIRONMENTAL CONDITION

5.1 Physical Environment

5.1.1 Topography

The project has been divided into two section and discussed as below.

a. Khimti-Barhabise Section

The proposed route of this section of length 42.638km traverses through the Middle Mountain and hills. The alignment runs through several topographic features comprising of rugged hills with mild and steep slope, undulating land forms and flat terrain near those bajar. The altitudinal variation of the TL is between 2719 masl to 639 masl at Dobate, Lakuri Dada VDC and Sitali, Phulasi VDC respectively. The altitude of the starting point at Ghumaune, Phulasi VDC is 653 masl and terminal point of the TL at Sano Palati, Barhabise is 1415 masl. The altitudinal variation including the location and land use of the AP's are given in the Table 5-1 below.

Table 5-1: Altitudinal Variation including location and land use of Khimti-Barhabise Section

S.N	Angle Points	Elevation, masl	Land Use	Landmark	Address		
					Village	VDC	District
1	S/S Khimti	683	Cultivated Land	Boulder	Ghumaune	Phulasi-1	Ramechhap
2	AP 0	653		Concrete Pillar	Sitali		
3	AP 1	639					
4	AP 2	642	Cultivated Land	Concrete Pillar	Sitali	Melun-1	Dolakha
5	AP 3	716			Tinkhorja		
6	AP 4	718			Khanigaun	Melun-4	
7	AP 5	875			Khadakathok		
8	AP 6	829		Boulder	Dumre Dadā	Melun-5	
9	AP 7	810			Batule, Sorhabesi		
10	AP 8	774		Concrete Pillar	Piple Dhunga	Bhedapu-2	
11	AP 9	704		Boulder	Sakhe	Ghang Sukathokar -1	
12	AP 10	772		Concrete Pillar	Kaichale		
13	AP 11	744		Boulder	Dhulebeshi	Pawati-1	
14	AP 12	755					
15	AP 13	754		Concrete Pillar	Dhulebeshi Bagar		
16	AP 14	831			Jholunge	Pawati-2	
17	AP 15	943	Maddhe Shera				
18	AP 16	823	Cultivated Land		Chandra Khola	Pawati-3	
19	AP 17	870		Baluwa			
20	AP 18	893	Boulder	Dhamire	Pawati-6		
21	AP 19	899					
22	AP 20	899	Cultivated Land	Concrete Pillar	Odare	Pawati-6	
23	AP 21	1044	Charnawati CF			Fasku-1	
24	AP 22	1115			Guimu Thumka		
25	AP 23	1114			Piple Dada		
26	AP 24	1106	Cultivated Land		Bagairo Dada	Bhimeswor Municipality-6	
27	AP 25	1140	Sita Kunda CF		Kiratechhap		
28	AP 26	1205			Thulochaur		
29	AP 27	1228	Barren land		Gau Dada		
30	AP 28	1234	Cultivated Land		Dobate Chaur		
31	AP 29	1287				Bhimeswor M-8	
32	AP 30	1226			Ghogshila		
33	AP 31	1230	Barren land			Sugurephat	

S.N	Angle Points	Elevation, masl	Land Use	Landmark	Address			
					Village	VDC	District	
34	AP 32	1296	Cultivated Land		Bisuntol	Bhimeswor M-9	Dolakha	
35	AP 33	1221			Birauta			
36	AP 34	1232			Seraphat			
37	AP 35	1265			Kaule			
38	AP 36	1260	Amalekharka CF	Boulder	Kavre Bagar	Bhimeswor Municipality - 11		
39	AP 37	1311	Kupri Salleri CF		Baluwathumki			
40	AP 38	1298	Barren land		Chamawati			
41	AP 39	1339			Simbari			
42	AP 40	1392	Cultivated Land	Concrete Pillar	Sano Phurlung	Bocha-6		
43	AP 41	1396			Serabesi			
44	AP 42	1426	Barren land	Boulder	Ghatte Khola			
45	AP 43	1575			Khurpate			
46	AP 44	1633	Barren land	Concrete Pillar	Khahare Khola	Lakure Dada-2		
47	AP 45	1738	Cultivated Land	Boulder	Gairjabari			
48	AP 46	2004			Barren land	Concrete Pillar	Pani Umrane	Lakure Dada-1
49	AP 47	2123	Peheridada					
50	AP 48	2239	Cultivated Land	Concrete Pillar	Gagrenbari			
51	AP 49	2205			Namke Yan Mara CF	Namke Yan Mara CF		
52	AP 50	2190	Cultivated Land	Concrete Pillar	Yanmara	Lakure Dada-8		
53	AP 51	2296	Barren land		Tallo Pakha			
54	AP 52	2514	Cultivated Land		Phulbari Ghumti		Lakure Dada-9	
55	AP 53	2719	Dadar CF		Dobate			
56	AP 54	2375	Cultivated Land	Concrete Pillar	Gaude	Piskar-1	Sindhupalchok	
57	AP 55	2429			Kyala	Piskar-3		
58	AP 56	2593			Pakhure	Piskar-2		
59	AP 57	2590			Hile	Ghuskun-8		
60	AP 58	2087	Chokati GF	Boulder	Rani Pokhari	Choukati-5		
61	AP 59	1618	Barren land; Dware Khalde CF	Concrete Pillar	Champate			
62	AP 60	1233	Cultivated Land		Tathghaderi			Karthali-6
63	AP 61	1245	Barren; Shewase Okhrene CF		Unichaur			
64	AP 62	1549	Cultivated Land		Boulder	Dadakharka		karthali-8
65	AP 63	1785	Tunibote CF	Chyandada		Barhabise-5		
66	AP 64	1415	Cultivated Land			Phalate		Barhabise-6
67	S/S Barhabise	1415						

Source: Survey Report, PDD and Field Verification





The image is a screenshot of a Google Earth map. It displays a topographic profile of a region in India. The map shows a path with a black line representing the elevation profile. Key locations labeled on the map include Phalga, Bhatnagar, and Bhatnagar. The Google Earth logo is visible in the bottom right corner. The profile shows a significant elevation change, with a peak around the 15 km mark and a sharp drop-off towards the end of the profile.

Figure 5.2: Longitudinal Profile of Khimti-Barhabise Section





b. Barhabise-Kathmandu Section

The proposed route of this section of length 56.722 km traverses through the Middle Mountain and hill. The alignment runs through several topographic features comprising of rugged hills with mild and steep slope, undulating land forms and flat terrain. The altitudinal variation of the TL is between 1820 masl to 723 masl at Shankharapur Deupur VDC and Chandeni VDC respectively. The altitude of the starting point at Barhabise VDC is 1202 masl and terminal point of the TL at Changunarayan Municipality is 1352 m. The altitudinal variation including the location and land use of the AP's are given in Table 5-2 below.

Table 5-2: Altitudinal Variation including Location and Landuse of Barhabise-Kathmandu Section

Angle Points	Elevation, masl	Landuse	Name of Settlement/Village	VDC/Municipality* Ward No.	District
SS-B	1202	Cultivated land	Sano Palati	Barhabise-6	Sindhupalchowk
AP-0	1202	Cultivated land	Sano Palati	Barhabise-6	
AP-1	1124	Cultivated land	Sano Palati	Barhabise-1	
AP-2	973	Cultivated land	Jaletar, Thulo Palati	Barhabise-1	
AP-3	974	Cultivated land	Bakre	Ramche-8	
AP-4	1087	Cultivated land	Sayale		
AP-5	1181	Jogi Khoriya CF	Sayale		
AP-6	1325	Cultivated land	Sayale, Devithandada	Ramche-6	
AP-7	1287	Cultivated land	Badare	Ramche-6	
AP-8	1325	Cultivated land	Birauta	Ramche-3	
AP-9	1269	Cultivated land	Gairigaun	Ramche-5	
AP-10	1329	Cultivated land	Gairigaun		
AP-11	1187	Cultivated land	Topka	Mankha-1	
AP-12	1183	Cultivated land	Topka		
AP-13	1177	Cultivated land	Purano Gaun, Kanle dada	Mankha-8	
AP-14	942	Cultivated land	Dumrichaur		
AP-15	984	Cultivated land	Kamitar, Chimlingbesi		
AP-16	974	Cultivated land	Charghare, Chimlingbesi		
AP-17	903	Cultivated land	Chimlingbesi	Mankha-9	
AP-18	909	Cultivated land	Sanataar, Chimlingbesi		
AP-19	1067	Forest land,	Jurethumka	Phulpingdada-8	
AP-20	1251	Devasthan CF	Jogidada, Jalbari		
AP-21	1055	Cultivated land	Binjel, Ghummadada	Phulpingdada-6	
AP-22	1159	Barren land, Dharampani CF	Binjel, Chiyandada		
AP-23	851	Forest land, Phalate Kalika CF	Sundhe	Irkhu-7	
AP-24	879	Cultivated land	Dadakhel		
AP-25	1102	Cultivated land	Chilaunedada	Irkhu-7	
AP-26	1547	Cultivated land	Chilaune, Aduwabari		
AP-27	1684	Forest area; Rani Pokhari CF	Chipchipe, Chihandada	Irkhu-2	
AP-28	1510	Cultivated land	Dadaghar, Newargau	Irkhu-5	
AP-29	1449	Cultivated land	Panichaur	Irkhu-3	
AP-30	1451	Cultivated land	Majhgaun, Lamidada		
AP-30A	1261	Cultivated land	Anje dada	Thulo Sirubari-6	
AP-31	1259	Cultivated land	Harare		
AP-32	1273	Cultivated land	Bhulbhule	Thulo Sirubari-5	

Tamakoshi-Kathmandu 400 kV TL Project

Existing Environmental Condition

Angle Points	Elevation, masl	Landuse	Name of Settlement/Village	VDC/Municipality* Ward No.	District
AP-33	1305	Cultivated land	Kamidada		
AP-34	1393	Bushes, Rolpakha CF	Deurali, Narsingdada	Thulo Sirubari-4	
AP-35	1322	Cultivated land	Patpat, Narsingdada	Thulo Sirubari-3	
AP-36	1182	Tamakhani CF	Bajini, Tamakhani	Thulo Sirubari-4	
AP-37	728	Cultivated land	Jholunge	Bhotesipa-9	
AP-38	997	Thulitar CF	Thumla 3 Pakha	Bhotesipa-7	
AP-39	789	Cultivated land	Kabre, Majhi	Bhotesipa-3	
AP-40	723	Cultivated land	Bhairungtaar, Jogitar	Chandeni-3	
AP-41	776	Cultivated land	Krantitaar village	Chandeni-1	
AP-42	885	Cultivated land	Rayobari, Pauwa Akase	Mahadevsthan-1	
AP-43	1150	Pauwa CF	Baarko Chautarar	Mahadevsthan-3	Kavrepalanchowk
AP-44	847	Cultivated land	Siduntar, Archhale	Mahadevsthan-4	
AP-45	811	Cultivated land	Ganesh Thumka		
AP-46	846	Forest land, Dhaitar Dudepakha CF	Dhaitar, Dudepakha	Mahadevsthan-2	
AP-47	888	Cultivated land	Thulichaur	Nayagau-1	
AP-48	979	Cultivated land	Dadapakha	Nayagau-7	
AP-49	1028	Cultivated land	Nwarkhet		
AP-50	1252	Cultivated land	Masagaun, Jorgothdada	Shankharapur Deupur-4	
AP-51	1583	Cultivated land	Dadakhet	Shankharapur Deupur-2	
AP-52	1820	Batase CF	Naldun, Dhadgau	Shankharapur Deupur-6	
AP-53	1714	Cultivated land	Dhiblo, Dhadgau		Kathmandu
SS-1(H)	1420	Cultivated land	Lapsipedi	Shankharapur Deupur-5	
SS(H)	1408	Cultivated land	Lapsipedi, Pakheta Chaur		
AP-54	1499	Cultivated land	Bimire		
AP-55	1789	Barren land, Kusum CF	Daksamdada, Kartike Bhanjyang	Shankharapur*	
AP-56	1501	Cultivated land	Ghatte khet		
AP-57	1421	Cultivated land	Beshi	Mahamanjushree Nagarkot*	
AP-58	1397	Cultivated land	Beshi		
AP-59	1405	Cultivated land	Kartike khola	Shankharapur *	
AP-60	1394	Barren land	Paluwabari		
AP-61	1383	Barren land	Khoriya		Bhaktapur
AP-62	1379	Forest land, Manedada CF	Chiyandada, Khoriya	Chagunarayan *	
AP-63 (SS)	1352	Cultivated land	Mayaldada		

Source: Survey Report (2015), PDD and Field Verification

Note: In Barhabise-Kathmandu section, the landmark for all APs is concrete pillar





Figure 5.3: Google Image of Topography of Barhabise-Kathmandu Section

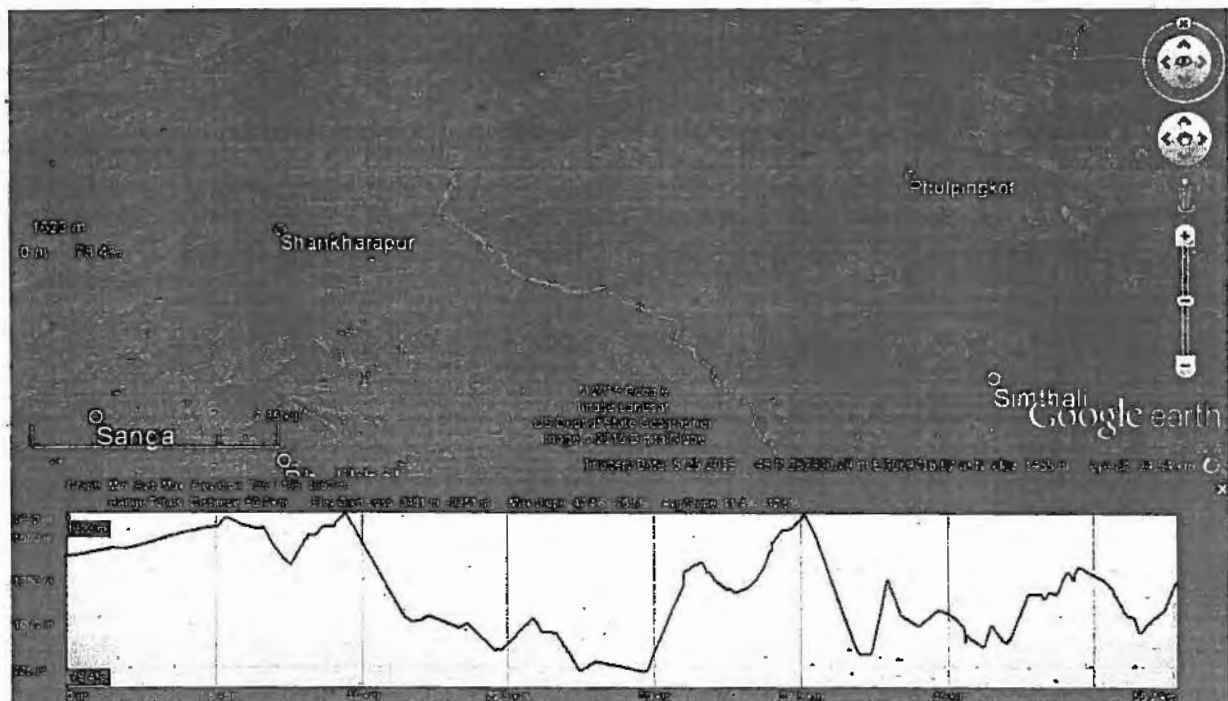


Figure 5.4: Longitudinal Profile of Barhabise-Kathmandu Section

5.1.2 Land Use

The main land use pattern of the project area is cultivated land, forest (community, government and private), grazing land and barren land. The alignment avoids densely populated areas, major structures, protected areas and dense forests. The other land uses along the alignment consists of road crossings, rivers, rivulets, river beaches and TL. Along the alignment,

approximately 64.067 % of the TL alignment passes through the cultivated land, 18.283% through forest and 17.65% through others (barren land, Bush, Grassland, Cutting Cliff, Sand, Water Body, road crossings and river crossings etc.). The landuse is presented as Table 5-3, 5-4 and 5-5 below. Figure 5.5 and Figure 5.6 is the landuse Map of the affected VDCs and Municipality along the TL alignment. Figure 5.7 shows the typical landuse pattern along the alignment.

Table 5-3: Land Use of Khimti-Barhabise Section

S.N	Land System	Land Type	Area (ha)	Percentage (%)
1	Agricultural	Cultivation	100.05	51.00
2	Vegetation	Forest	42.4	21.60
		Bush	28.28	14.40
		Grassland	13.48	6.86
3	Others	Barren	5.02	2.55
		Cutting Cliff	0.00	0.00
		Sand	5.68	2.90
		Water Body	1.37	0.69
Total			196.28	100.00

Table 5-4: Land Use of Barhabise-Kathmandu Section

S.N	Land System	Land Type	Area (ha)	Percentage (%)
1	Agricultural	Cultivation	189.9192	74.09
2	Vegetation	Forest	40.3510	15.74
		Bush	12.8733	5.02
		Grass	4.1586	1.62
3	Others	Cutting Cliff	4.0572	1.58
		Sand	3.2586	1.27
		Water Body	0.9887	0.39
		Barren land	0.7150	0.28
Total			256.3216	100.00

Table 5-5: Land Use of Tamakoshi-Kathmandu TL along the alignment

S.N	Land System	Land Type	Khimti-Barhabise Section	Barhabise-Kathmandu Section	Total	Percentage %
1	Agriculture	Cultivation	100.050	189.919	289.969	64.067
2	Vegetation	Forest	42.400	40.351	82.751	18.283
		Bush	28.280	12.873	41.153	9.093
		Grass	13.480	4.159	17.639	3.897
3	Others	Cutting Cliff	5.020	4.057	9.077	2.006
		Sand	0.000	3.259	3.259	0.720
		Water Body	5.680	0.989	6.669	1.473
		Barren land	1.370	0.715	2.085	0.461
Total			196.280	256.322	452.602	100.00

Source: GIS Analysis



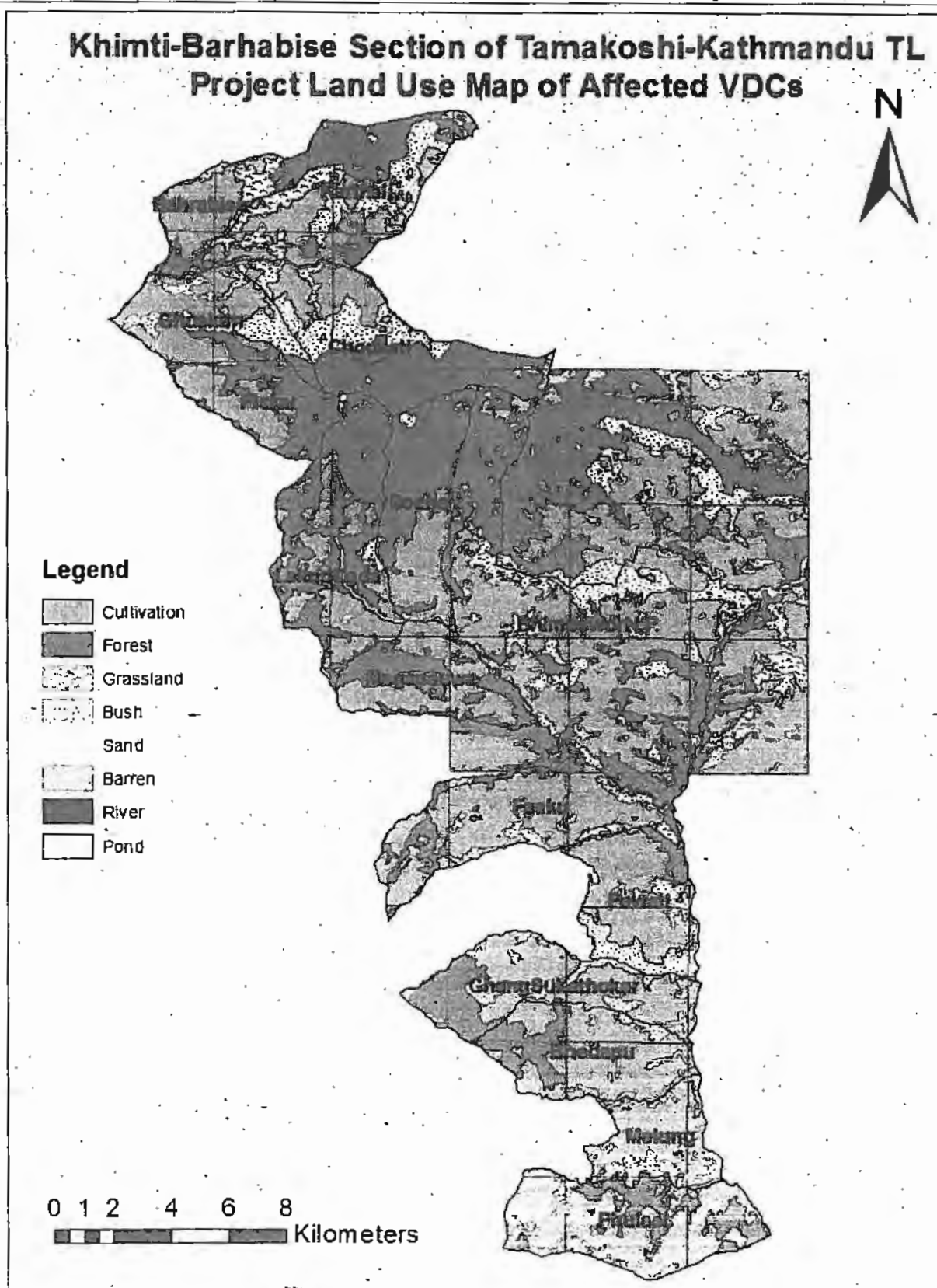


Figure 5.5: Land Use Map of Affected VDCs of Khimti-Barhabise Section

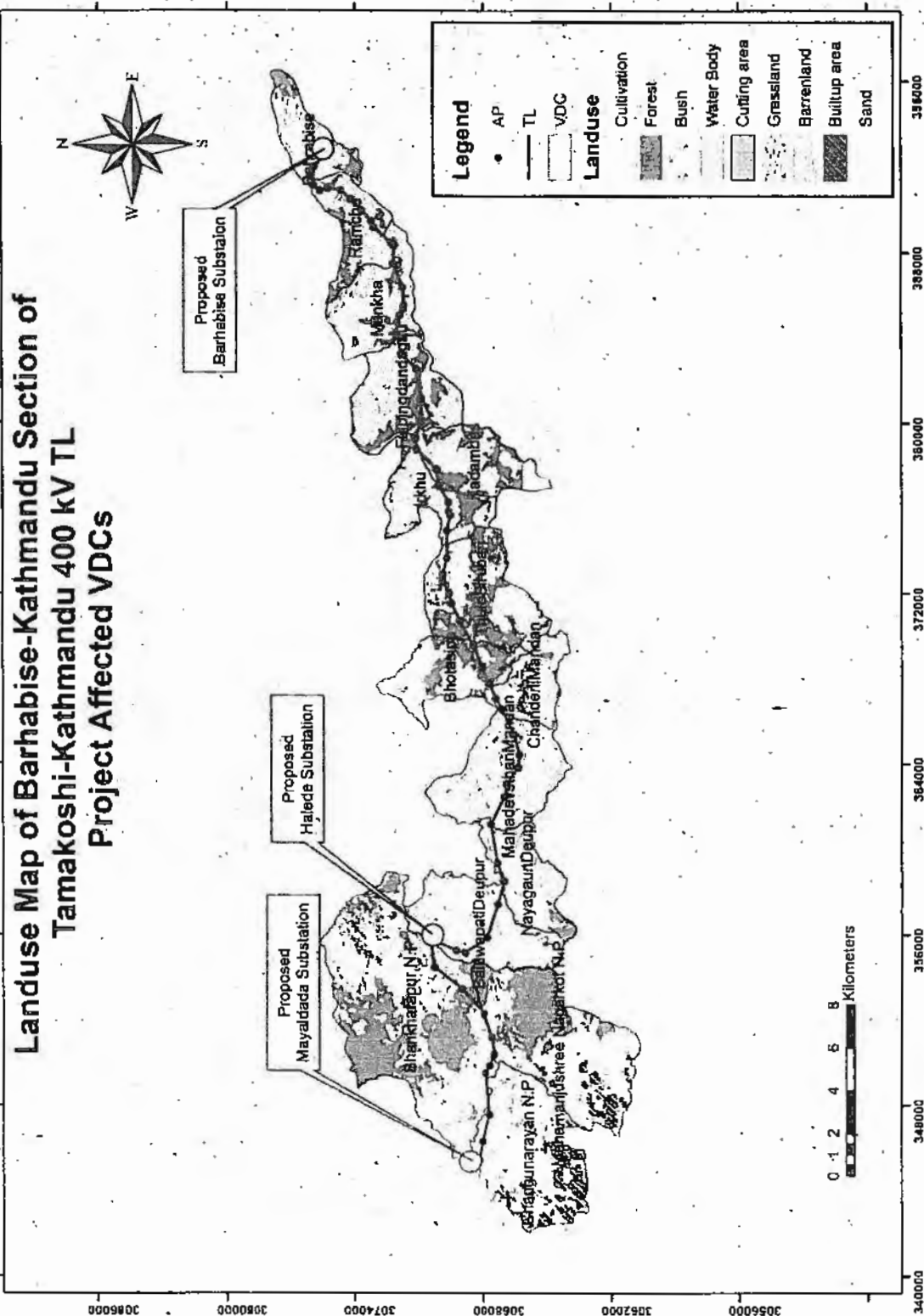


Figure 5.6: Land Use Map of Affected VDCs of Barhabise-Kathmandu Section

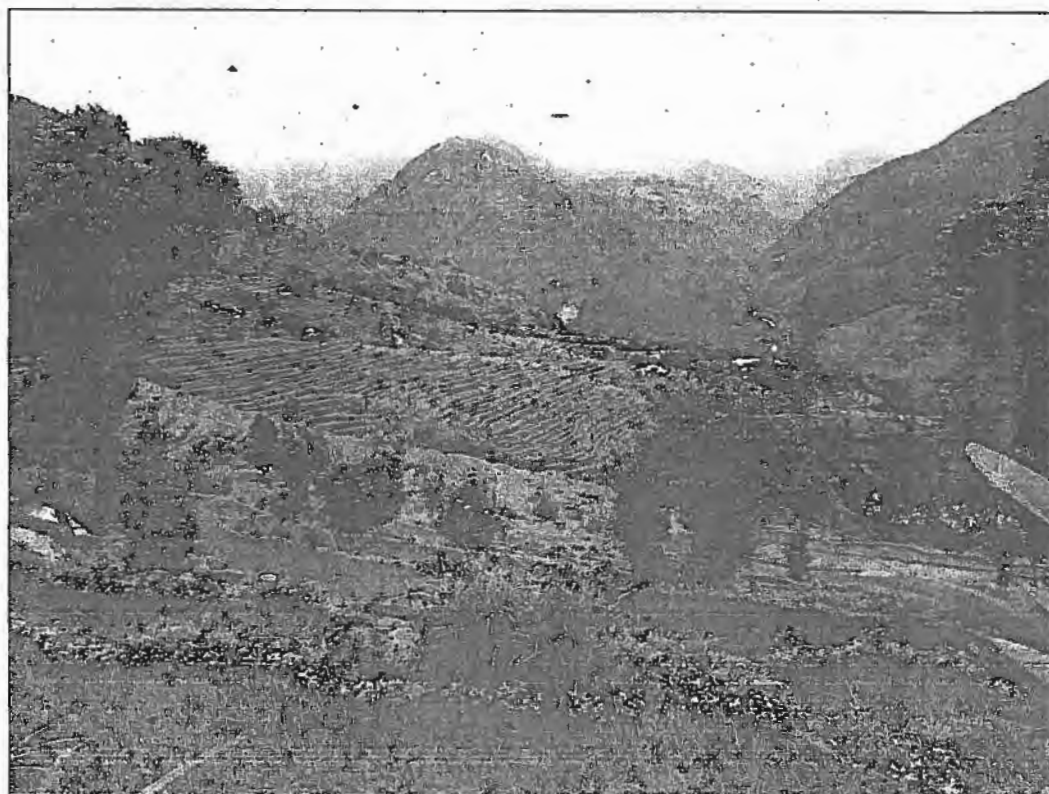


Figure 5.7: Land Use Pattern along the Alignment

5.1.3 Climate

Sub-tropical and tropical climates prevail in the project area. The project area experiences seasonal variations, with wet monsoons from June to September and dry weather from October to May. The Table 5-6 below lists the climatic data such as minimum and maximum temperature, maximum monthly rainfall of the project affected districts.

Table 5-6: Climatological Data of the Project Area

S.No.	District	Climatic Zone	Temperature (°C)		Max. Monthly rainfall (mm)
			Max.	Min.	
1	Ramechhap	Sub-tropical-Temperate	34.0	2.3	444 in August
2	Dolakha	Sub-Tropical, Tropical	36.5	6.2	327 in July
3	Sindhupalchowk	Sub-tropical-Temperate	32.5	5.0	347 in August
4	Kavrepalanchowk	Sub-Tropical, Tropical	21.8	12.2	588 in July
5	Bhaktapur	Sub-tropical	18.8	10.4	588.9 in July
6	Katmandu	Sub-tropical	25.9	13.1	382.4 in August

Source: District Profile of Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu

5.1.4 Geomorphology and Geology

The proposed alignment of TL passes through the Middle mountains and Hill represented by low grade metamorphic rocks such as phyllite, quartzite and slate. During the field visit it was observed that some APs of the TL are located at relatively flat and stable areas covered by colluvial and alluvial deposit. Landslide event was noticed along RoW near AP 29 and AP 14, which may pose risk to the towers.

The major part of Barhabise-Kathmandu Section passes along Ranimatta formation. Similarly, other geology formation types found along the stretch are Sarung Khola formation, Galyang formation, Ghanapokhara formation, Lakharpata formation, Naudanda formation, Shiprin Khola formation, Syangja Khola formation, Uilen formation, etc. The physiography, geological formation and soil type along the TL route is presented in figures below.

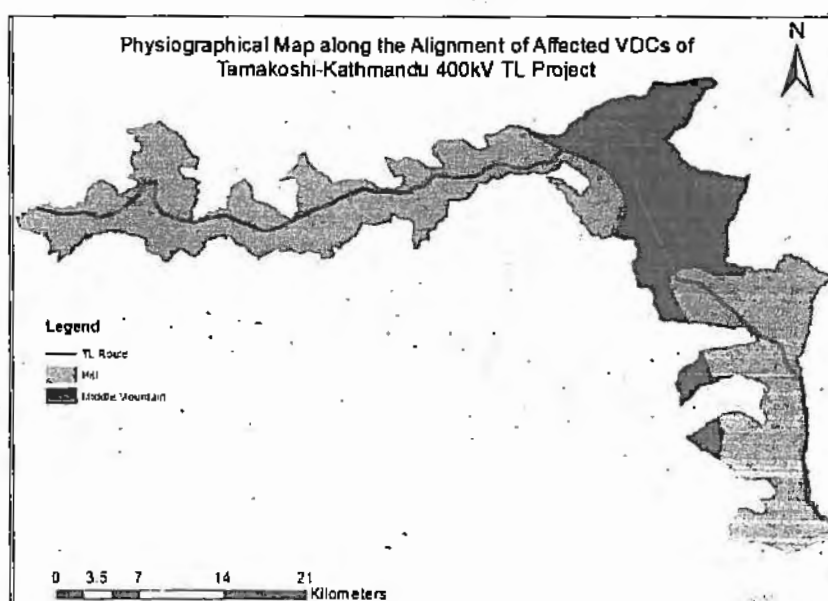


Figure 5.8: Physiographical Map along the Alignment

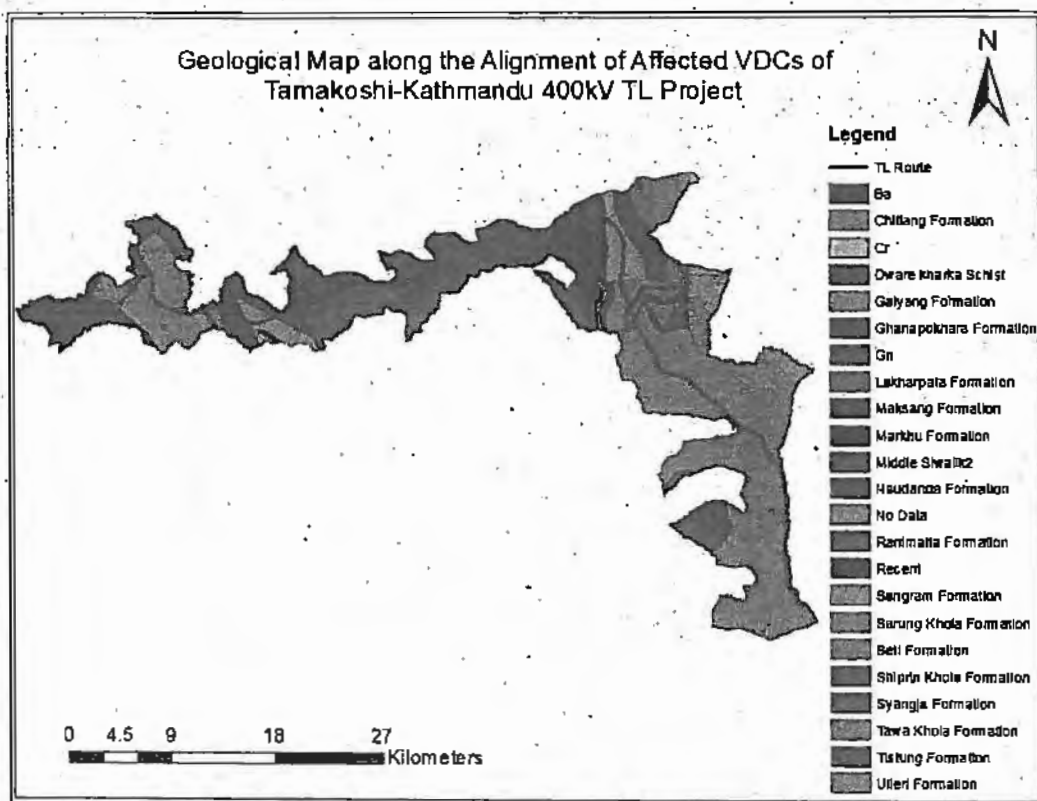


Figure 5.9: Geological Map along the Alignment

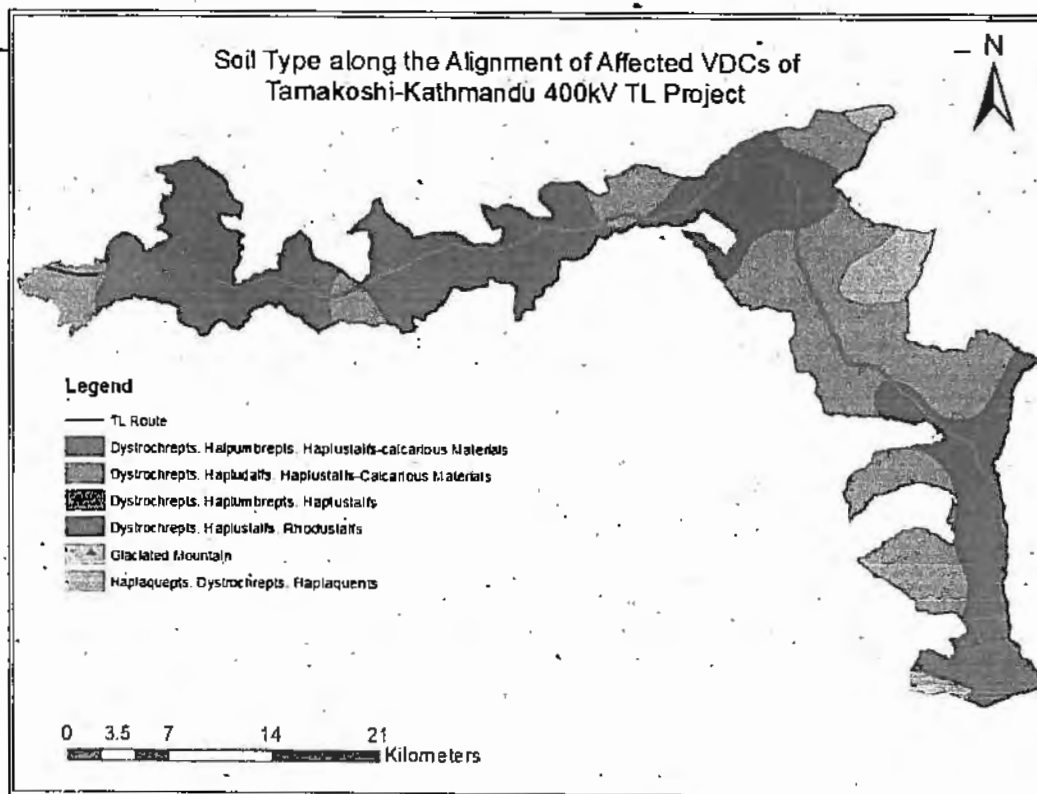


Figure 5.10: Soil Type along the Alignment

5.1.5 Seismology

Nepal is the 11th most earthquake-prone country in the world. Ever since the first recorded earthquake of 1225 AD that killed one-third of the population of Kathmandu Valley, Nepal has experienced a major earthquake every few generations. Earthquake of Baisakh 12, 2072 is evident of such incidents. This project is situated in seismic zone factor of 1 which is not good from the seismic point of view but as a whole of country Nepal it is satisfactory that this alignment does not pass through the most dangerous seismic zone.

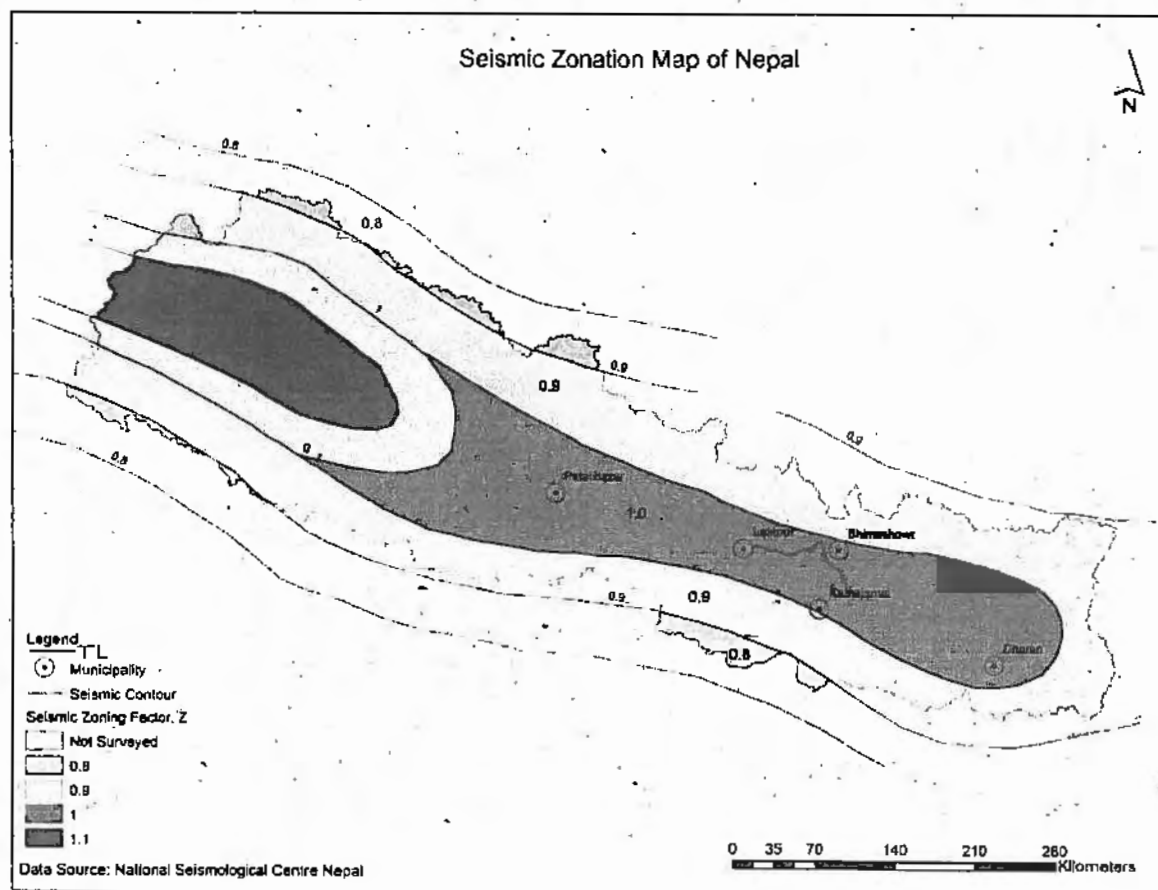


Figure 5.11: Seismic Map of Nepal

The following figure shows the seismic zone factor in Nepal and where this project alignment lies in the map. As the seismic zoning factor increases the level of seismicity increases. So from above map, the proposed Tamakoshi-Kathmandu 400 kV transmission line alignment passes through the zone which has seismic zone factor 1.

5.1.6 Air and Noise Quality

The proposed TL passes mainly through the hill ridge, nose of the hills avoiding roads and settlements and market centers. However, at some stretches, it traverses along the right-of-way of motorable gravel and earthen roads and even the highway.

During the field visit it was observed that the major stretch of the linear project stretch traverses through rural setting with minimum industrial activities. The main source of air pollution along the alignment is due to the vehicular movement along the earthen road. Other sources of air

pollution along the alignment are household fire, fugitive dust particles created by the movement of public vehicles along the access road to the settlements and vehicular emissions. However, the transportation density and frequency of the vehicles along the road is not very high. Therefore, the overall status of air quality at the immediate project area can be considered to be satisfactory and within the range of acceptable limits.

However, air and noise pollution may be felt by the local people of market places residing in market areas like Ghumaune village, Kharidhunga, Sano Palati, Lapsipedi, Nagarkot Bazar, Changunarayan area etc. The overall noise levels along the alignment can be considered to be within the acceptable limits.

5.1.7 Water Quality

The water quality of river and other water bodies along the TL route appear to be unpolluted. However, dumping of solid wastes into the river was observed at some stretches. But, the water quality of the streams close to the settlement areas has a high potential of microbiological contamination as the banks are used for open defecation and other household purposes by the local people. The other sources of water pollution along the alignment where pollution is evident is due to soil erosion, open defecation in water bodies, dumping of household waste near the river and construction of road etc.

5.1.8 Watershed Conditions and Drainage Patterns

a. Khimti-Barhabise Section

The alignment traverse through the middle hilly region to high hill of Nepal. The watershed condition of the project area as per Watershed condition in the districts of Nepal, CIMOD is as follows.

Table 5-7: Watershed Condition of the Districts along Khimti-Barhabise Section

S.No.	District	Watershed Condition
1	Ramechhap	Fairly Good
2	Dolakha	Good
3	Sindhupalchowk	Good

The watershed of the proposed TL route including the substations proposed at Khimti and Barhabise is observed to be fairly intact and stable. The major rivers which cross the alignment of this section include Tamakoshi River, Charnawati River and Sunkoshi River. The river crossing along the alignment are presented in the Table 5-8 below.

Table 5-8: River Crossing along Khimti-Barhabise Section

S.N	Stretch between		Major and Minor River Crossing		Number of Small Rivulets
	From	to	Name	Number	
1	S/S Khimti	AP 0	-	-	1
2	AP 1	AP 2	Milti River	1	-
3	AP 5	AP 6	Simpani Khola	1	-
4	AP 7	AP 8	Phadke Khola	1	-
5	AP 8	AP 9	Ladke Khola	1	-
6	AP 12	AP 13	Ghyani Khola	1	-
7	AP 13	AP 14	Tamakoshi River	1	-
8	AP 14	AP 15	-	-	2



ivers which cross the alignment of this section include Bhotekosi River, Balephi River, Indrawati River and Manahara River. The river crossing along the alignment are presented in the Table 5-10.

Table 5-10: River Crossing along Barhabise-Kathmandu Section

S.N	Stretch between		Major and Minor River Crossing		No. of Rivulet	Others
	From	to	Name	No.		
1	AP 0	AP 1	Sachi Khola	1	1	
2	AP 1	AP 2			2	
3	AP 2	AP 3	Bhotekosi River	1	-	
4	AP 4	AP 5			2	
5	AP 6	AP 7			1	
6	AP 7	AP 8			2	
7	AP 8	AP 9	God Khola	1	1	
8	AP 9	AP 10	Amale Khola	1		
			Archale Khola	1		
9	AP 10	AP 11	Kanle Khola	1		
10	AP 12	AP 13	-	-	2	
11	AP 13	AP 14	Khukure Khola	1	2	
			Gotha Khola	1		
12	AP 14	AP 15	-	-	2	
13	AP 17	AP 18	-	-	1	
14	AP 18	AP 19	Adheri Khola	1	-	
15	AP 19	AP 20	Khahare Khola	1	-	
16	AP 20	AP 21	-	-	1	
17	AP 21	AP 22			3	
18	AP 22	AP 23	-	-	1	
19	AP 23	AP 24	Balephi Khola	1		
20	AP 25	AP 26	-	-	1	
21	AP 27	AP 28	-	-	1	
22	AP 28	AP 29	-	-	1	
23	AP 30	AP 30A	-	-	1	
24	AP 30A	AP 31	Dalma Khola	1	1	
			Kaule Khola	1		
25	AP 31	AP 32	-	-	2	
26	AP 32	AP 33	-	-	1	
27	AP 36	AP 37	Jhyari Khola	1	1	
28	AP 37	AP 38	-	-	4	
29	AP 38	AP 39	-	-	2	
30	AP 39	AP 40	Indrawati River	1	-	
31	AP 40	AP 41	-	-	1	
32	AP 41	AP 42	-	-	2	
33	AP 44	AP 45	Cha Khola	1	-	Pond -1
34	AP 45	AP 46			-	Fish Pond-1
35	AP 46	AP 47	Cha Khola	2	1	
36	AP 47	AP 48	-	-	7	
37	AP 48	AP 49	-	-	4	
38	AP 49	AP 50	Cha Khola	2	5	
39	AP 50	AP 51	Harre Khola	1	7	
40	AP 51	AP 52	-	-	3	
41	AP 53	SS-1(H)	Saglo Khola	1	3	

S.N	Stretch between		Major and Minor River Crossing		No. of Rivulet	Others
	From	to	Name	No.		
42	SS-1(H)	SS(H)	-	-	1	
43	SS(H)	AP 54	Ghatte Khola	1	2	
44	AP 54	AP 55	Bajani Khola	1	3	
45	AP 55	AP 56	Kattike Khola Gadyadi Khola	1 1	2	
46	AP 56	AP 57	-	-	2	
47	AP 57	AP 58	Ghatte Khola	2	-	
48	AP 58	AP 59	-	-	2	
49	AP 59	AP 60	-	-	1	
50	AP 60	AP 61	Manahara Khola	4	1	
51	AP 61	AP 62	-	-	4	
52	AP 62	AP 63(S/S)	-	-	4	
Total				34	91	

5.1.9 Land Stability/ Erosion

a. Khimti-Barhabise Section

One major landslide has occurred near AP 29 causing instabilities for tower foundation. Due to earthquake of Baishak 12 and 29, area near AP 29 has been swayed away leading to transfer of this point to the next one. And one landslide due to erosion of bank by Tamakoshi River near AP 14 was observed. This landslide has not affected the AP but if proper measures not applied in time, may cause the instabilities in near future. The figure below shows the landslide and its crack near AP 29 and AP 14.

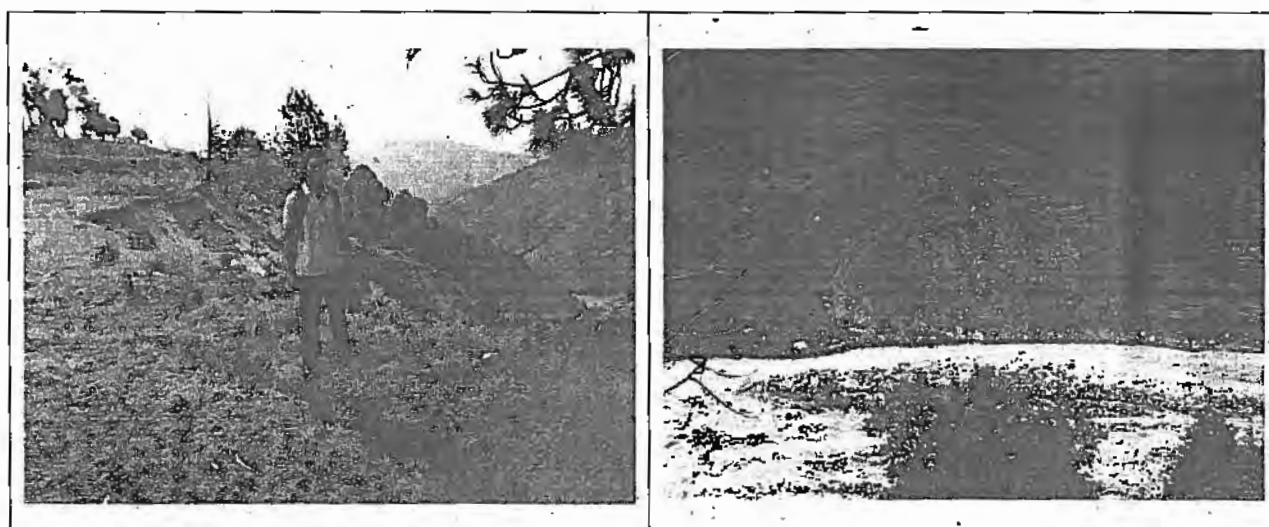


Figure 5.12: (a) Landslide and its Crack near AP 29 and (b) Bank Erosion near AP 14

Although most of the angle towers are located on relatively stable areas, some angle towers are located on sites susceptible to erosion and instabilities, some near the feeder road and some near the pole of distribution lines. The Table 5-11 below shows lists of the angle towers located on fragile topography observed during the field visit.



Table 5-11: List of Critical Angle Points of Khimti-Barhabise Section

S.No.	Angle Points	Type of problem	Remarks
1	AP 14	Bank erosion near AP about 35m downhill	River band protection measure required
2	AP 29	Major Landslide	Point need to be shifted
3	AP 46	Distribution pole within 5m periphery	Pole need to be shifted
4	AP 54	Located down Feeder Road	Protection works needed along some stretch

b. Barhabise-Kathmandu Section

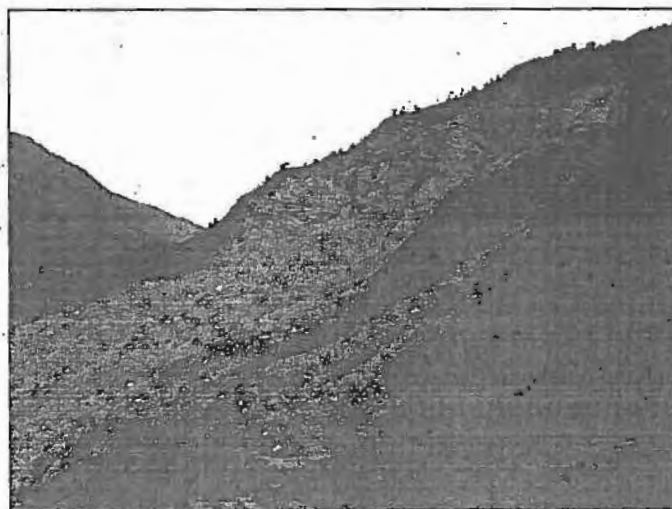
Although most of the angle towers are located on relatively stable areas, some angle towers are located on sites susceptible to erosion and instabilities, some near the feeder road and some near the pole of distribution lines. The Table 5-12 below shows lists of the angle towers located on fragile topography observed during the field visit.

Table 5-12: List of Critical Angle Points of Barhabise-Kathmandu Section

S.No.	Angle Points	Type of problem	Remarks
1	AP 10	Located near Jure landslide	
2	AP 20	Located at ridge and cracks are seen about 20 m above the point	Ridge cutting is necessary.
3	AP 14, AP 15 and AP 52	Distribution pole within 12m, 4m and 7m periphery respectively	Poles need to be shifted
4	AP 22, AP 44	Located above Feeder Road.	Protection works needed along some stretch

5.1.10 Crossings of Other Utilities

Apart from the land use and river crossing, this section of alignment of Tamakoshi-Kathmandu 400kV TL crosses highways, feeder roads, foot track, existing 132kV TL, 66kV TL, 33kV, 11kV TL, 220V distribution lines, some physical structures like Settlement, Hut, Towers, Canal, Fish Ponds, Goths, Desander, Toilets etc.

**Figure 5.13: Jure Landslide between AP 10 and AP 11**

From AP 10 to AP 11, the proposed alignment crosses Jure landslide which is about 640m in length. Although the stability of land consisting AP 10 is good and construction of suspension tower possibility in between is low, both tower need to be designed properly. Similarly from AP 44 to AP 45 and from AP 45 to AP 46, the proposed alignment crosses Fish ponds. So proper mitigation steps should be taken along these section.

The field verification for other structures as mentioned above was carried out. The list of crossings along the alignment has been presented as Table 5-13 and Table 5-14 below.

Table 5-13: Summary of other crossings along Khimti-Barhabise Section

S. N	Stretch		Highway Crossing		Feeder Road Crossing	Foot Track Crossing	Settlements along ROW	Other Physical Structure
	From	to	Name	No				
1	AP 0	AP 1	Charikot-Khimti	1	-	-	2	Water Tap
2	AP 1	AP 2	-	-	-	1	-	-
3	AP 2	AP 3	Charikot-Khimti	1	-	1	1	-
4	AP 3	AP 4	Charikot-Khimti	2	1	-	2	132kV tower
5	AP 4	AP 5	-	-	2	-	1	-
6	AP 5	AP 6	-	-	1	-	-	-
7	AP 6	AP 7	-	-	-	1	-	-
8	AP 7	AP 8	-	-	2	1	1	2 Canals
9	AP 8	AP 9	-	-	-	-	2	2 Goths
10	AP 9	AP 10	-	-	-	1	-	1 Canal
11	AP 15	AP 16	-	-	-	1	2	-
12	AP 21	AP 22	-	-	-	-	1	-
13	AP 22	AP 23	-	-	3	-	-	-
14	AP 24	AP 25	-	-	-	2	-	-
15	AP 26	AP 27	-	-	-	3	-	-
16	AP 27	AP 28	-	-	-	2	-	-
17	AP 28	AP 29	-	-	-	3	-	-
18	AP 29	AP 30	-	-	1	-	1	-
19	AP 30	AP 31	-	-	-	1	-	-
20	AP 31	AP 32	-	-	-	1	1	-
21	AP 32	AP 33	-	-	-	1	-	-
22	AP 33	AP 34	-	-	-	1	-	-
23	AP 35	AP 36	-	-	1	-	-	Desander
24	AP 36	AP 37	-	-	1	1	-	-
25	AP 38	AP 39	-	-	-	2	-	-
26	AP 39	AP 40	-	-	-	1	-	-
27	AP 40	AP 41	-	-	-	1	-	Hut
28	AP 41	AP 42	-	-	-	1	-	-
29	AP 42	AP 43	-	-	1	-	-	-
30	AP 43	AP 44	-	-	-	2	-	-
31	AP 44	AP 45	-	-	-	1	-	-
32	AP 45	AP 46	-	-	1	-	2	-
33	AP 46	AP 47	-	-	3	1	-	Hut
34	AP 47	AP 48	Jiri	1	1	-	-	-
35	AP 48	AP 49	Jiri	1	-	-	-	-
36	AP 50	AP 51	-	-	-	3	1	-
37	AP 51	AP 52	-	-	1	1	1	-
38	AP 52	AP 53	Jiri	1	1	2	-	-
39	AP 53	AP 54	-	-	-	-	-	-



S. N	Stretch		Highway Crossing		Feeder Road Crossing	Foot Track Crossing	Settlements along ROW	Other Physical Structure
	From	to	Name	No				
40	AP 54	AP 55	-	-	1	-	-	-
41	AP 55	AP 56	-	-	1	-	-	-
42	AP 58	AP 59	-	-	1	-	-	-
43	AP 59	AP 60	-	-	1	1	3	-
44	AP 60	AP 61	-	-	1	1	-	-
45	AP 62	AP 63	-	-	1	-	-	-
46	AP 63	AP 64	-	-	1	1	1	-
47	AP 64	S/S Barhabise	-	-	1	-	2	1 Toilet
Total				7	31	38	24	-

Table 5-14: Summary of other crossings along Barhabise-Kathmandu Section

S.N o.	Stretch		Highway Crossing		Feeder Road Crossing	Foot Track Crossing	Settlement along ROW	Other Physical Structure
	From	To	Name	No.				
1	AP 0	AP 1	-	-	-	3	-	-
2	AP 1	AP 2	-	-	-	2	-	2- 11kV
3	AP 2	AP 3	Araniko	1	-	1	-	33kV TL; 11kV TL
4	AP 3	AP 4	-	-	2	2	-	-
5	AP 4	AP 5	-	-	-	3	-	132kV TL
6	AP 5	AP 6	-	-	1	-	-	-
7	AP 6	AP 7	-	-	1	-	-	11kV TL
8	AP 7	AP 8	-	-	-	2	-	220V line
9	AP 8	AP 9	-	-	1	2	-	2-11kV TL; 220 V line
10	AP 9	AP 10	-	-	-	1	-	-
11	AP 10	AP 11	-	-	-	2	-	Jure Landslide
12	AP 12	AP 13	-	-	3	3	7 Temporary house	Hut; 2-220V line 11kV TL
13	AP 13	AP 14	-	-	-	3	-	220V line
14	AP 14	AP 15	-	-	4	-	-	-
15	AP 15	AP 16	-	-	1	-	-	220kV TL; 11kV TL
16	AP 18	AP 19	-	-	1	1	-	-
17	AP 19	AP 20	-	-	1	2	-	-
18	AP 20	AP 21	-	-	1	3	-	-
19	AP 21	AP 22	-	-	2	-	-	11kV TL
20	AP 22	AP 23	-	-	2	-	-	-
21	AP 23	AP 24	-	-	1	1	-	-
22	AP 25	AP 26	-	-	2	6	-	2-220V line; 11 kV TL; 33 kV TL
23	AP 27	AP 28	Dolalghat-Chautara	1	1	1	-	11 kV TL
24	AP 28	AP 29	-	-	-	1	-	220 V line
25	AP 30	AP 30A	-	-	1	2	-	-
26	AP 30A	AP 31	-	-	-	3	-	-
27	AP 31	AP 32	-	-	-	1	-	-
28	AP 32	AP 33	-	-	-	-	-	11 kV TL
29	AP 33	AP 34	-	-	1	-	-	-
30	AP 34	AP 35	-	-	2	2	-	220 V line; 11 kV TL
31	AP 35	AP 36	-	-	3	1	-	-
32	AP 36	AP 37	-	-	7	-	-	11 kV TL
33	AP 37	AP 38	-	-	4	-	-	11 kV TL



S.N o.	Stretch		Highway Crossing		Feeder Road Crossing	Foot Track Crossing	Settlement along ROW	Other Physical Structure
	From	To	Name	No.				
34	AP 38	AP 39	-	-	-	1	-	-
35	AP 39	AP 40	-	-	-	1	-	220 V line
36	AP 40	AP 41	-	-	2	-	-	-
37	AP 41	AP 42	-	-	1	-	-	220 V line
38	AP 42	AP 43	-	-	1	-	-	-
39	AP 43	AP 44	-	-	1	-	-	-
40	AP 44	AP 45	-	-	2	4	-	Fish Pond; Bridge 11 kV TL; 66 kV TL
41	AP 45	AP 46	-	-	1	1	-	Fish Pond
42	AP 46	AP 47	-	-	4	-	-	-
43	AP 47	AP 48	-	-	-	1	-	220 V line; 11 kV TL
44	AP 50	AP 51	-	-	-	2	-	-
45	AP 51	AP 52	-	-	2	1	-	2-220 V line
46	AP 52	AP 53	-	-	1	-	-	220 V line
47	AP 53	SS-1(H)	-	-	7	1	-	2-220 V line; 11 kV TL
48	SS(H)	AP 54	-	-	-	1	-	-
49	AP 54	AP 55	-	-	2	2	-	220 V line
50	AP 55	AP 56	-	-	6	1	-	-
51	AP 57	AP 58	-	-	1	-	1	220 V line
52	AP 58	AP 59	-	-	1	-	6	220 V line
53	AP 59	AP 60	-	-	1	-	5	-
54	AP 60	AP 61	-	-	3	-	-	-
55	AP 61	AP 62	-	-	1	-	-	-
	AP 62	AP(SS)	-	-	2	-	-	-
Total				2	81	64	-	-

5.1.11 Air Traffic

a. Khimti-Barhabise Section

A domestic airport exist in Manthali and Jiri which is located approximately 11.9 km. south and 15.34 km. west from the proposed alignment. The airport and entry point can be seen in the Google map.

b. Barhabise-Kathmandu Section

Tribhuvan International Airport exist in Kathmandu which is located approximately 8 km South-West from the proposed Changuarayan substation of the alignment. A domestic airport exist in Jiri which is located approximately 37.7 km South-East from the proposed alignment. The airport and entry point can be seen in the Google map.

Moreover, project officials consulted with local authority of Civil Aviation at Manthali, Jiri, and Kathmandu regarding probable disturbance of the proposed TL to the flying route of air plane. And it was concluded that the proposed Tamakoshi-Kathmandu 400 kV TL will not disturb to the air traffic of Kathmandu and Jiri airport. A letter from CAAN has been attached in Appendix A.

5.2 Biological Environment

According to Forest and Vegetation Types of Nepal (TISC, 2000), forest vegetation in the proposed project area consist of mainly Schima-Castanopsis, Hill Sal, Lower Temperate Oak, Chir Pine and Broadleaved forest. However, Khote salla (*Pinus roxburghii*) and Patula salla (*Pinus patula*) plantation forests are also found. The dominant species are few forming pure or mixed association of species. Due to the diversity of local topography and climate, the flora varies from place to place and from district to district.



Figure 5.14: TL passing through CF in Sindhupalchowk

Tree species are well represented by the deciduous and evergreen types. Major plants species found are Khote salla (*Pinus roxburghii*), Uttish (*Alnus nepalensis*), Chilaune (*Schima wallichii*), Bajh (*Quercus sps*), Sal (*Shorea robusta*) Kyamuno (*Cleistocalyx operculata*), Patula salla (*Pinus patula*) etc. Likewise, mainnon-timber forest products (NTFPs) including medicinal herbs found are Lokta (*Daphne bholua*), Argeli (*Edgeworthia grdeneri*), Kurilo (*Asparagus sps*), Nagbeli (*Lycopodium sps*), Chirayito (*Swertia chirayita*), Amala (*Embllica officinalis*) etc.

Mammals such as Salak (*Manis pantadactyla*), Barking deer (*Muntiacus muntjak*), Jackal (*Canis aureus*), Leopard (*Panthera pardus*), Porcupine (*HystrixIndica*), Rhesus Monkey (*Macaca mulata*), Malsapro (*Martes flavigula*), Squirrel (*Fuinambulas palmaurum*) etc. are reported in the forest of project affected area.

Kalij (*Lephura leucomelana*), Common Myna (*Acridotheres tristis*), House Swift (*Apus affinis*), House Crow (*Corvussplendens*), Spotted Dove (*Streptopelia chinensis*) and House Sparrow (*Passer domesticus*). Cuckoo (*Eudyanamus sp*), etc. are reported bird species along the forest of project area. Katle (*Neolissocheius hexagonolepsi*) and Asla (*Schizothorax sps*) are the fish found along the rivers where from TL RoW passes.

Based on the available detailed survey report of the proposed TL alignment, out of 129 angle points (APs) 26 are located in the forest which will require 0.585 ha forest area (area occupied by each tower pad = 15 m X 15 m). Similarly, an estimated number of 40 suspension towers are to be placed in forest area.

The proposed project area does not fall in protected area (national parks, wildlife sanctuary, buffer zone and conservation area) or environmentally sensitive area.



Figure 5.16: TL passing through Sal forest in Kavre Palanchok district



Figure 5.15: TL passing through Pine forest in Dolakha

5.2.1 Community Forest/Leasehold Forest/Government Forest

Total number of community forests (CFs) in five districts is 1,667, out of which there are 51 community forest along the AP and TL RoW. Likewise, leasehold forests (LHF) are affected in Sindhupalchowk district only where total number of LHF is 396. In addition, there are 4 government forests in Sindhupalchowk and Kavrepalanchowk districts (2 in each district) and 2 LHF in Sindhupalchowk district. Total 126.06 ha of forest area will be acquired by the project at Right of Way (RoW) in which CFs area is 113.94 ha, GFs area is 9.96 ha and LHF area is 2.16 ha. List of forests is given in Table 5-15 and summary of forest status about type, number and area of the forests is given in Table 5-16. Refer Appendix D-I for the details about the individual forests.

Table 5-15: List of Project Affected CFs/LHFs/GFs

District	VDC/Municipality	Ward	Name of CF/LHF/GF	Affected area (ha)	Total area (ha)
Dolakha	Melung	1	Sitalidevi	0.2898	13.15
		3,4	Rumti Ramche	2.53	39.00
	Ghayng Sukathokar	1	Paleke Sajhe ko Sahukhoria	0.9798	82.24
	Pawoti	8	Khahare Bhadaure	2.185	71.38
		2	Baluwaa Bhumethan	3.22	81.81
		6	Mulpani	2.99	61.25
	Fasku	1	Charnawoti	7.3738	125
	Bhimeswor Municipality	6	Sitakund	7.751	154.92
		11	Amale Kharka	5.3682	7.31
		11	Kupri Salleri	3.9928	45.45
		8	Kamalamai	0.713	57.4
		8	Shim Sungure	0.92	31.00
		8	Bichaur	1.127	56.00
		11	Dhade	3.7122	19.97
	Boch	6	Chitreshwor	3.036	2.28
	Lakuridada	1	Namke Yanmara	3.013	160.88
Sindhupalchowk	Dhuskun	2,8	Ratochaur	1.403	190.93
	Chokati	7	Tunibot Kalleri	0.2162	85
		5,7	Ranipokhari	6.739	



District	VDC/Municipality	Ward	Name of CF/LHF/GF	Affected area (ha)	Total area (ha)
	Karthali		Manthala GF		
		6	Uneu Danda	0.2162	16.50
		7	Dware Khalde Ban	2.6818	62.97
	Barhabise	4,6	Sewashe Okhreni	0.138	7.89
	Ramche	8	Sisneri Ban	0.5014	19.229
		7	Jogi Khoriya Ban	0.805	32.6
		3	Ramchebhir	0.644	45.5
	Mankha	6	Sisnedhansar Ban	0.4232	15.69
		6	Chimling Besi Ban	1.38	17.84
		8,9	Devasthan Ban	1.656	62.50
		1,6	Phurkesalla Mahabhir	1.4996	74.11
		1	Koledada ko bhir GF	1.49	
		1	Salghari pakha	2.6726	48.56
		9	Jurethumka	1.1638	39.34
	Phulpingdanda	8	Dharampani	2.8382	100.00
		4,5,6	Chapbote Binjel Ban	3.22	30.00
		6,7,9	Phalate kalika	3.6386	50
	Irkhu	7	Ambote Sinhadevi	1.4076	50.12
		2	Rani Pokhari Ban	1.6514	33.33
		7	Harrebhir LHF	1.242	3
		3	Golma khola LHF	0.92	5
	Thulosirubari	6	Jhyali Khola	1.0212	7.8
		4	Rolpakha CF	3.9652	142.25
		5	Chyandada Narayandevi	0.2806	8.92
		3,5	Tamakhani	3.2154	105.83
	Bhotsipa	4	Deurali Thulochaur	1.909	5.45
		7	Thulitar Ban	2.7324	120.86
		7,9	Tinpakhe Dabi Ban	4.5126	105.00
	Piskar	1,2,3	Dadar	5.1474	199.6
Kavre Palanchok	Mahadevsthan	8	Pauwa	1.8446	12.25
		3	Ratamata GF	0.851	
		2	Dhaitar Duda Pakha	1.0304	25.85
		3	Salleni Baguwa Pakha	1.3018	64.25
	Nayagau	1	Naulo Danda	1.9734	6.25
	Naldum	6	Batase Ban	1.012	43.24
	Shankharapur Deupur	4	Shankharapur GF	0.92	
Bhaktapur	Changunarayan Municipality	4	Mane Dada	1.012	2.48
Kathmandu	Shankarapur Municipality		Lambu danda	2.4058	68.66
			Kusum	3.22	170.00
	Total		57	126.06	3,087.84

Source: Forest Survey, 2015

Source: Field survey, 2015 & DFO Profile of Bhaktapur, Kathmandu, Kavrepalanchowk, Sindhupalchowk and Dolakha districts.

Note: In Sindhupalchowk district, total no. of LHF is 396 covering 1958.4 ha of area with 3474 households.

Table 5-16: Summary of Forest Status in Project Affected Districts

District	Total forest area (ha)	Community Forest		Total hhs (no)	Affected CF		Affected GF		Affected LHF		Total	
		No	Area (ha)		No	Area (ha)	No	Area (ha)	No	Area (ha)	No	Area (ha)
Bhaktapur	2,133	62	1,937.08	9,193	1	1.01					1	1.01
Kathmandu	14,118	173	6,143.34	20,372	2	5.63					2	5.63
Kavrepalanchok	77,552	546	24,578.50	47,128	5	7.16	2	1.77			7	8.93
Sindhupalchowk	57,531	519	31,390.40	57,075	27	50.94	2	8.19	2	2.16	31	61.29
Dolakha	101,500	367	28,250.93	34,964	16	49.20					16	49.20
Total	252,834	1,667	92,300.25	168,732	51	113.94	4	9.96	2	2.62	57	126.06

Source: Field survey, 2015 & DFO Profile of Bhaktapur, Kathmandu, Kavrepalanchowk, Sindhupalchowk and Dolakha districts.

Note: In Sindhupalchowk district, total no. of LHF is 396 covering 1958.4 ha of area with 3474 households.

5.2.2 Protected Species of Flora and fauna

Table 5-17 shows the status of protected flora and fauna according to the Government of Nepal legislation, CITES appendixes and IUCN red list data.

Table 5-17: Protected Species of Flora and Fauna

S. No.	Local Name	Scientific Name	IUCN Red list data	CITES category	GoN
1	Monkey	<i>Macaca mulatta</i>	LC		
2	Fox	<i>Canis aureus</i>	LC		
3	Leopard	<i>Panthera pardus</i>	NT		
4	Chinese pangolin (Salak)	<i>Manis pentadactyla</i>		II	Protected by National Park and Wildlife and Conservation Act, 2020 (1973)
5	Dumsi	<i>Hystrix indica</i>	LC		
6	Kalij	<i>Lophura leucomelanos</i>	LC		
7	Sal	<i>Shorea robusta</i>	LC		Banned for commercial extraction, transportation and export
8	Walnut	<i>Juglans regia</i>	NT		Banned for commercial extraction, transportation and export

LC – Least Concern, NT – Not Threatened

5.2.3 Ethno Botany/ Plant Resource Use Pattern

The major timber yielding trees of the project area are Sal (*Shorea robusta*), Khote Salla (*Pinus roxburghii*) and Chilaune (*Schima wallichii*). Common fodder species are Kutmero (*Litsea monopetala*), Khaniyo (*Ficus semicordata*), Kavro (*Ficus lacor*), Dabdabe (*Garuga pinnata*), Tanki (*Bauhinia purpurea*), and Bamboo (*Dendrocalamus*). Most all the trees are used as



firewood depending upon their availability. Chiraito (*Swertia chiraita*), Lokta (*Daphne bholua*), Amala (*Embllica officinalis*), Kurilo (*Asparagus racemosus*), Bans (*Dendrocalamus* sp.), Argeli (*Edgeworthia gardeneri*), Nagabelli (*Lycopodium* sp.) are the common Non Timber Forest Products (NTFP) of the project area. These NTFPs are the source of income for the local people for the improvement of their livelihood.

5.3 Socio-economic and Cultural Environment

5.3.1 General Introduction of the Project affected District

The proposed 400 kV TL project is located in six districts (Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu) of Janakpur and Bagmati Zone, Central Development Region of Nepal. The total area of 6 districts is 14,651 Sq. km. According to the data of CBS 2011, the total population of the six districts is 31,07,829 with 15,69,561 male and 15,38,268 female which occupies 11.73% of the total population of the country (2,64,94,504). The average population density of six districts is 1263 (persons/km²). There are 7,41,986 HHs and the average household size of the six districts is 4.37. Similarly, the average literacy rate of the six districts is 70%. The economically active population of Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur and Kathmandu districts are 54.15, 54.75, 56.11, 59.48, 67.72 and 70.19 respectively. The average urban population of six districts is 48.75% although there is no any municipality in Ramechhap (0 urban populations). The demographic Characteristics of the project affected districts are given in Table 5-18.

5.3.2 Socio-economic Features of the Project VDCs/ Municipalities

The proposed alignment traverses through the 26 VDCs and 4 municipalities of six districts of Central Development Region of Nepal. Government of Nepal has added 72 new municipalities across the country on May 8, 2015 (25, Balshakh 2072) under Local Self Governance Act 1999. The proposed TL passes through 3 new municipalities (Mahamanjushree, Nagarkot, Chagunarayan and Shankharapur). The map showing the project affected VDCs/Municipalities is presented in Figure 2.2. The 99.36 km long TL is started from proposed substation site of New Khimti at Ghumaune village, Phulasi VDC of Ramechhap district to proposed substation at Sano Palati Barhabise VDC of Sindhupalchowk district. From proposed Barhabise substation the line reaches to proposed Lapsipedi substation and finally terminates at Chagunarayan substation of Bhaktapur district. As per Electricity Regulations, 2050 (1993), the right of way is taken as 23 meters on either side from the center of the TL.

5.3.2.1 Demography

According to the National Population Census 2011, the total population of the project VDCs/ Municipalities is 215784 with 101823 (47.19%) males and 113961 (52.81%) females. The female population is higher as compared with the male population. The population of the project VDCs/Municipalities covers only 6.94% of the total population of the project affected districts (3107829). The total number of households is 50367 with average household size 4.28. The household size in Shankharapur municipality is highest (4.69) and least at Tauthali VDC (3.56). The average population density of the project VDCs/Municipalities is 316 persons/sq.km which is higher than the average population density 212 persons/sq.km of the project affected districts. The population density in Chokati VDC is least (96 persons/sq.km) and highest in Chagunarayan municipality (1165 persons/sq.km) among the project affected VDCs/Municipalities. Detail demographic characteristics of the project affected VDCs/Municipalities is presented in the Table 5-19.

Table 5-18: Demographic Characteristics of the Project affected District

District	Ramechhap	Dolakha	Sindhupalch howk	Kavrepalanchow k	Bhaktapur	Kathmandu	Total
Total Population	202646	186,557	287,798	381,937	304,651	1,744,240	3,107,829
Male	93,386	87,003	138,351	182,936	154,884	913,001	1,569,561
Female	109,260	99,554	149,447	199,001	149,767	831,239	1,538,268
Total No. of HHs	43,910	45,688	66,688	80,720	68,636	436,344	741,986
Average HH size	4.62	4.08	4.32	4.73	4.44	4	4.37
Population Density (person/km ²)	131	85	113	274	2560	4416	1263
Sex Ratio (Male per 100 Females)	85.5	87.5	92.6	91.9	103.4	109.8	95
Urban Population (%)	-	12.08	5.42	26.25	100	100	48.75
Population below 5 years (%)	7.91	8.44	8.17	7.33	6.51	6.4	7
Elderly Population 75+ Years (%)	3.03	3.05	2.73	2.42	1.91	1.51	2
% of Economically active population (15-60 yrs)	54.15	54.75	56.11	59.48	67.72	70.19	60
% of Literacy Rate (6 years & above)	62.24	62.78	59.59	69.8	81.68	86.25	70
Total Area of the Districts (Sq. km)	1546	2191	2542	1396	2560	4416	14651
% of District Population compared with Country's	0.76	0.7	1.09	1.44	1.15	6.58	11.73

Source: CBS 2011

Table 5-19: Demographic Characteristics of the Project affected VDCs/ Municipalities

District	VDC/ Municipality*	Population			Total HHs	Average HH size	Pop. Density (person/km ²)	Sex Ratio (Males /100 Females)
		Total	Male	Female				
Ramechhap	Phulasi	5,733	2,594	3,139	1,284	4.46	246	82.64
	Melung	3,566	1,596	1,970	836	4.27	319	81.02
	Bhedapu	3,705	1,596	2,109	918	4.04	201	75.68
	Pawati	4,573	2,049	2,524	1,109	4.12	270	81.18
	Ghyang Sukathokar	4,230	1,942	2,288	1,032	4.10	207	84.88
Dolakha	Fasku	4,338	1,877	2,461	1,117	3.88	179	76.27
	Magapauwa	2,950	1,339	1,611	780	3.78	188	83.12
	Bocha	2,799	1,182	1,617	775	3.61	156	73.1
	Lakuridada	3,713	1,734	1,979	924	4.02	134	87.62
	Bhimeshwor*	22,537	10,489	12,048	6,076	3.71	390	87.06
Sindhupalchowk	Chokati	2,497	1,163	1,334	627	3.98	96	87.18
	Piskar	2,286	1,115	1,171	538	4.25	182	95.22
	Dhuskun	2,926	1,336	1,590	759	3.86	181	84.03
	Karthali	3,347	1,608	1,739	836	4.00	128	92.47
	Barhabise	7,117	3,519	3,598	1,683	4.23	678	97.8
	Ramche	4,092	2,028	2,064	999	4.10	361	98.26
	Mankha	7,752	3,698	4,054	1,860	4.17	501	91.22
	Fulpindada	4,802	2,305	2,497	1,054	4.56	256	92.31
	Kadambas	3,372	1,472	1,900	834	4.04	243	77.47
	Irkhu	3,443	1,555	1,888	751	4.58	277	82.36
	Thulo Sirubari	5,987	2,632	3,355	1,331	4.50	268	78.45
	Bhotasipa	4,618	2,084	2,534	994	4.65	316	82.24
Kavrepalanchowk	Tauthali	2,762	1,255	1,507	776	3.56	113	83.28
	Chandeni	3,265	1,500	1,765	782	4.18	343	84.99
	Mahadevsthan	8,166	3,890	4,276	1,873	4.36	369	90.97
	Naya gaun	4,417	1,984	2,433	951	4.64	346	81.55
	Shankharapur	6,023	2,943	3,080	1,292	4.66	295	95.55
Bhaktapur	Mahamanjushree Nagarkot*	22,908	10,927	11,981	4936	4.64	659	91.55
	Chagunarayan*	32,522	16,065	16,457	7,234	4.50	1165	97.14
	Shankarapur*	25,338	12,346	12,992	5,406	4.69	421	95.04
Total		215,784	101,823	113,961	50,367	4.28	316	111.92

5.3.2.2 Settlements

Dense as well as scattered forest, barren land, cultivated land and scattered settlements are found in the project area. The main settlements of the VDCs/Municipalities through which the TL passes are Milti bazaar-Sitali, Tinkhoriya gau, Matyangri basti, Khanigaun, Kalleri basti, Kaichale gaun, Odare gaun, Gurung gaun, Kiratechhap basti, Thapa basti, Syasi, Okhre, Gargenbari, Swara gaun, Tallo pakha gaun, Phulbarighumti, Kharidhunga, Beshi tole, Kuwapani basti, Kotabari gaun, Gairi gaun, Kamitar Tole, Chimling Beshi gaun and others. The Table 5-20 shows the name of settlements and their locations by districts.

Table 5-20: List of Settlements through which TL passes

S.No.	Settlement	VDC/Municipality*Ward No.	District
1	Milti bazaar, Sitali	Phulasi-1	Ramechhap
2	Sital besu basti	Melung-1	Dolakha
3	Kalleri basti, Thamidada basti	Bhedapu	Dolakha
4	Dihi gaun	Bhedapu	Dolakha
5	Odare gaun	Pawati	Dolakha
6	Gurung gaun	Fasku	Dolakha
7	Kiratechhap basti	Bhimeshwor*	Dolakha
8	Gaudada basti	Bhimeshwor*	Dolakha
9	Thapa basti	Mankha	Sindhupalchowk
10	Syasi	Lakuri dada	Dolakha
11	Okhre	Lakuri dada	Dolakha
12	Tallo pakha gaun	Lakuri dada	Dolakha
13	Phulbarighumti gaun	Lakuri dada	Dolakha
14	Kharidhunga	Lakuridada	Dolakha
15	Dadakharka	Piskar	Sindhupalchowk
16	Pokhare basti	Piskar	Sindhupalchowk
17	Manichaur	Karthali	Sindhupalchowk
18	Phalate	Barhabise	Sindhupalchowk
19	Sano palate	Barhabise	Sindhupalchowk
20	Beshi Tole	Ramche-8	Sindhupalchowk
21	Badare Tole	Ramche-6	Sindhupalchowk
22	Kotabari gau	Ramche-3	Sindhupalchowk
23	Gairigaun	Ramche-5	Sindhupalchowk
24	Kanle dada	Mankha-1	Sindhupalchowk
25	Kamitar Tole	Mankha-6	Sindhupalchowk
26	Chimlingbeshi gaun	Mankha-6	Sindhupalchowk
27	Chilaune basti	Irkhu-6	Sindhupalchowk
28	Dada gau basti	Irkhu-5	Sindhupalchowk
29	Sahu tole	Irkhu	Sindhupalchowk
30	Goth basti	Irkhu	Sindhupalchowk
31	Bhulbhule gaun	Thulo sirubari	Sindhupalchowk
32	Bajini gaun	Thulo sirubari	Sindhupalchowk
33	Jholunge basti	Bhotesipa	Sindhupalchowk
34	Majhi gaun	Chandeni	Kavrepalanchowk
35	Rayobari	Mahadevsthan	Kavrepalanchowk

S.No.	Settlement	VDC/Municipality*Ward No.	District
36	Kunta bazaar	Mahadevsthan	Kavrepalanchowk
37	Tallo Haledi	Shankharapur	Kavrepalanchowk
38	Beshi gau	Mahamanjushreee Nagarkot *	Bhaktapur
39	Khoriya gau	Chagunaraya*	Bhaktapur
40	Ittakhel	Shankharapur*	Kathmandu

Source: Field Survey, 2015

5.3.2.3 Caste and Ethnicity

The project area is a multi-ethnic composition of different origins, cultures, language and religion. Altogether 26 castes/ethnic groups are found in the project area. The dominant caste groups in the project area are Chhetri (25.54%), Tamang (21.36%), Newar (19.70%) and Brahmin Hill (15.34%) which covers 81.94% of the total population.

Government of Nepal has categorized 59 castes/ethnic groups as indigenous and tribal group. Under this provision, there is 65.24% population in the project affected VDCs that fall under this category of Indigenous and Tribal groups. The identified indigenous and tribal groups of the project affected VDCs are Tamang, Newar, Magar, Gurung, Rai, Sherpa, Jirel, Bhujel, etc. The Dalits community (Kami, Damai and Sarki) covers 5.6% of total population of the project area. In the same way, the highly marginalized caste group Thami (2.45%), Danuwar (0.75%) and Majhi (0.56%) are also found in the project area. Hyolmo (0.12%) is the only caste group that is found in Phulasi VDC. The population distribution by caste/ethnic groups is presented in the Appendix E-V.

From the field visit and KII, it was observed that there are mixed cast groups residing besides the TL corridor. However, it was found that between AP59-AP60, within the distance of 150m, there is Thami Settlement. In the same way, near to AP40, there is Majhi Settlement. Besides this, it was not found any other special cast group settlement along the TL route.

5.3.2.4 Mother Tongue and Religion

Nepali (61.82%) is the main language widely spoken in the project area. Beside this, Tamang followed by Newar, Thami, Danuwar and others are main language used in project area.

In field observation we found that the main language is Nepali because most of the tribal people also use national language to communicate. Detail of population distribution of the project area by mother tongue is presented in Appendix E-V. Hindu and Bouddha are the major religion of the people of project area. According to district level information Hindu are 75.43%, followed by Bouddha (20.26%), Christian (2.09%), Muslim (0.77%) and Prakriti (0.78%) in the project affected districts. (Demographic Profile of Nepal 2013/14).

However, during field observation and KII, it was observed that Hinduism and Buddhism are the major religion adopted by the different caste group of the project area. Islam, Kirat and Christian are the other minor religion residing in the project area. Dashain, Tihar, Holi, Krishna Janmasthan, Lhosar, Udhauli, Ubhauri, Buddha Jayanti and different Jattras are the major festival celebrated by Hindus and Buddhists in the project area.

5.3.2.5 Education and Literacy

According to National population census 2011, the total population (5 years and above) of the project area is 199531. Of the total population (population of age 5 and above years), the average literacy rate of the project area is 63.29% consisting 72.54% male and 55.45% female literacy rate. Women literacy is very low in comparison in male. Literacy status of affected VDCs/Municipalities is low in comparison of district 70.39% and slightly low in comparison to nation 65.94%.

In field observation we find most of the people are aware about education of their children either boy or girl. This shows the awareness towards education is increasing. This also indicates the educational status of the project affected VDC is satisfactory. However, dropout from school is seen high to girls rather than boys. Details about VDCs/Municipalities literacy rate is presented in Appendix E-V.

According to district source, there are 3785 primary schools, 2141 lower secondary schools, 1457 secondary schools, and 570 higher secondary schools in the project affected district. Bachelor and Masters' Degree education facility are also available in project affected districts. Educational institutions status of district is presented in Appendix E-V.

However, from the field visit, it is observed that over 90% of school buildings in Sindhupalchowk and Kavrepalanchowk district have suffered damage due to the devastating earthquake occurred on April 25. Most of the schools have crumbled to the ground and the entire classroom is completely destroyed. Reconstruction and retrofitting of these school buildings may take 2-3 years.

Now these schools are operating with temporary and transitional learning centers without any physical facilities such as building/class room, toilet, drinking water, sports ground, furniture, athletics materials and library. As per the local people, almost all schools of the project area require external support for physical facility improvement.

5.3.2.6 Migration

Due to presence of infrastructures, better facilities, and fertile cultivated land, the in-migration pattern from hilly area to Terai region is common practice in the project area. The out-migration, especially the young generation migrates to abroad seeking for employment is also common. Malaysia, Qatar and Dubai are the main destinations in abroad to most of the migrant. Hence, remittance is the prominent source of income for most landless, poor, and marginalized households of the project area.

The in-migration to the center Kathmandu for various purposes like business, employment, study and medical services is also common in the project area.

Unemployment, lower educational level, low agricultural production and desire of improving quality of life as well as social trend are the main reasons of migration in the project area. Migration has helped to improve socio-economic status of the local people of the project area and positive impact on local economy.

5.3.2.7 Gender Status

The influence of the society is male dominated in the project area. However, the population of female (52.81%) is higher than male (47.19%) in the project area. There are fundamental challenges of gender equality in the project area. Domestic and social burden fall on the women as they are expected to undertake all the domestic chores like fetching water, cooking, washing, food processing, household maintenance, hygiene and sanitation activities and looking after the children in addition to feeding their families. The result is that rather than being able to concentrate on activities that earn income, many women spend majority of their time undertaking domestic activities. In regards to land and property ownership, women are known to have a say on them. The literacy rate of women in the project area is low (55.45%) as compared with the male literacy rate (72.54%).

The decision making process on economic activities is mostly exercised by the both male and female. However, women have lack of access to land and property holding and restrictions on family inheritance. The result is that rather than being able to concentrate on activities that earn income, many women must spend the majority of their time undertaking domestic activities. The average daily wage/labor rate of women in the project affected area is only NRs. 300-500 which is low as compared with male NRs. 500-700.

5.3.2.8 Economically Active Population and Economic Activities

According to CBS 2011, the total population of age 15 to 59 years of the project affected VDCs/Municipalities is calculated to be 128474 which is 59.54% of the total population of the project affected VDCs/Municipalities. Hence, there is 59.54% population categorized as economically active. Similarly, there is 40.46% dependent population of which 31.45% are below 15 years and 9.01% are senior citizen (sixty years and above age). The dependency ratio in the area is 1:1.47, this is very high, as every 100 people who are working have to support 147 dependents unemployment.

Agricultural is the main source of income for the majority of people in the project area. Food crops such as rice, wheat, maize and millet are grown for food. Cash crops such as potato, beans and seasonal vegetables are grown by some subsistence farmers for their daily consumption purpose. Livestock is farmed for meat and milk.

From field observation, it is observed that potato farming is famous in Shankharapur Municipality, Kathmandu which is farmed two to three seasons a year. In the same way, Mahadevsthan VDC of Kavrepalanchok is also the pocket area for seasonal as well as off-seasonal vegetable farming. The vegetables for Kathmandu valley is supplied from this VDC. The milk for DDC is also carried from the VDCs of Kavrepalanchowk district. Thus livestock farming is also a major income generating source for these VDCs.

5.3.2.9 Occupation and Employment

The major occupation of the people of the project area is subsistence as well as professional farming. The Kavrepalanchowk district is the pocket area for food crops and vegetable farmings. After farming, the people are engaged in trade/business, service, labor, manufacturing, transportation and foreign employment. Since there are many new projects running in the project area (Sindhupalchowk and Dolakha district), the majority of unskilled people are engaged in daily wage activities in the projects operating there.



5.3.2.10 Public Health, Drinking Water and Sanitation

In the health sector, there is a district level hospital with posts of MBBS medical superintendents in the district headquarter of all the project affected districts and at least one sub-health post is available in each VDC.

However, after the devastating earthquake of April 25, the health facilities in the affected district have been severely damaged. The only one hospital of Ramechhap district is completely damaged. Out of total 321 health facilities of project affected districts, 43 health posts are completely damaged and 154 are partially damaged (Source: Gov. of Nepal, Disaster Risk Reduction Portal, NEOC, MoHA).

Tap/Piped water, spout water, uncovered as well as covered well/kuwa, river/stream and tube well are the sources of water for drinking and other purposes. About 73.40% of households use Tap/Piped water in the project area. Firewood is the major source of cooking. However, kerosene and LP gas are also being used by some households in the market area.

On the average 29719 households (77.35% of total households) in the project area are equipped with toilet facilities. This indicates that the level of awareness particularly towards the use of toilet is satisfactory in the project area. However, still a large portion of population of the project area use open defecation along the river or in the open fields (Source: CBS 2011). Recently Dolakha district has been declared "Open Defecation Free Area." So sanitation condition was found satisfactory in the project area. The prevailing diseases in the project areas reported are gastro-intestinal, TB, typhoid, jaundice, etc.

The finding of field visit and KIIs also indicates that most of the households in the project area use tap/piped water connected directly to the water sources. But the water supply and sanitation system of the project area has been disrupted due to devastating earthquake. All the toilets as well as houses are collapsed. The households, who are forced to live in temporary shelter, go to the open field, bushes and riversides for defecation.

5.3.2.11 Infrastructure

a. Transportation

The project area is accessible by road and facilitated through market centers, telecommunication, electricity and postal services. The project districts have direct road link to Kathmandu and all the affected VDCs have road network to district headquarters through gravel and earthen motorable road and some higher stretch through foot trail. The major roads that link the project area are Amiko highway, Barhabise-Budepa, Barhabise-Dhuskun-Piskar, Balefi-Tembathan, Lamosanghu-Jiri, Mudhe-Melung, Nayapul-Fasku-Pawati, Tamakoshi-Manthali and Jorpati-Mulpani-Sakhu. The bus service to Kathmandu is available from the nearest city Jiri, Manthali, Chautara, Dhulikhel, Melamchi and Nagarkot.

b. Communication

Communication services such as mobile, CDMA and landline phone are available in most of the VDCs of the project area. Modern communication facilities like television, cable-network, e-mail, internet and fax are available in the project area. Availability of some of the local and national newspapers and magazine are observed in all parts of project area, district headquarters and major markets. Local FM radio services are also available in the project area.

c. Energy

Electricity is one of the major sources of energy for lighting in the project area. Almost all project affected VDCs/Municipalities are fully electrified through the national grid system or through solar power. Similarly, fuel wood is the main source of energy for cooking in the project area. Kerosene and LP gas are also used particularly in market centers.

d. Market Centers and other Service Facility

Charikot, Kharidhunga, Barhabise, Jiro kilo, Kunta bazaar, Dhulikhel, Banepa, Nagarkot, Sankhu are the major markets and trade centers of the project area. The average distance of these market centers from the proposed TL corridor is ranged from 500m to 25 km. The other service facilities available in and around the project area are health post, health care centers, agriculture service center, veterinary center, postal service, educational institutions, police office, cooperative office and banking service, etc.

e. Others

Local irrigation programmes are also on work in project affected areas. Ghyang khola Irrigation Upper and Lower, Ghyangkhola Bhataghari, Ghyangkhola Khannagi Irrigation, Andheri khola Budhathoki Irrigation Canal, Andherikhola Irrigation Canal, Gairi khola Irrigation Canal, Fadkekhola irrigation project of Melung, Singe-Chainpur Irrigation project and Mahadevsthan Irrigation project are major irrigation project working in the project area.

The local governmental organizations are located in all VDCs. The agriculture, livestock and public health services centers are also located in the project areas. In the field of finance and Banking sector, various micro finance, saving and credit cooperation are working in the project area.

5.3.2.12 Law and Order

The existing law and order situation of the project area was observed to be normal. The District Administration Office and police office have maintained the law and order in the area.

5.3.2.13 Religious and Cultural Places

There are various religious/ cultural sites spreading over in the project area. They are Shlv mandirs, Devithan, Bhairavthan, Gumbas. Nagarkot is the famous touristic place in the project area. Chagunarayan temple (filed as World Heritage Centre) is also within the project area. However, there are no archaeological sites of significant importance in the core project area.

5.3.2.14 Mining Sites

The project area or the project district (Kharidhunga) is famous for slate stone mines in Nepal. There are many slate stone industries in settlement Kharidhunga through where the TL passes.

5.3.2.15 INGOs and NGOs Activities

There are many NGOs/INGOs, clubs, cooperatives, mother groups, etc. that are working in the field of water supply, sanitation, sports, women awareness, family planning, saving mobilization and income generating activities in the project area.

5.3.2.16 Tourism Activities

The project affected districts are rich in natural, cultural and historical touristic attractions. Kathmandu and Bhaktapur are the center for tourism. Dhulikhel, Kayre; Charikot, Dolakha are

other attracted places for tourists. There are many viewpoints, trekking routes and other enjoyable places and things that attract the tourists in the project area.

5.3.3 Profile of the Project Affected Households

5.3.3.1 Population and Households

Households survey of 197 households from project affected VDCs/Municipalities have been conducted. The surveys reveal that the total population of the project affected, sample household is 1170 of which 599 (51.97%) are male and 571 (48.80%) are female. Similarly, the average households size and sex ratio of the project affected households are 5.9 and 1.05 respectively. As per the broad age group classification, the majority of population falls in the age group of 15-59 year, which comprised of 65.73% population. Similarly, the total dependent population (population of the age group 0-14 years and senior citizen-age group of 60 year and above) is 401 (34.27%).

Table 5-21: Distribution of Surveyed Households and Population in the project area

Districts	Population				Households	
	Male	Female	Total	Sex Ratio	Total	Average HH Size
Ramechhap						
Dolakha	204	200	404	1.02	59	6.8
Sindhupalchowk	316	302	618	1.05	108	5.7
Kavrepalanchowk	43	39	82	1.10	15	5.5
Bhaktapur	27	23	50	1.17	10	5.0
Kathmandu	9	7	16	1.29	5	3.2
Total/Ave.	599	571	1170	1.05	197	5.9

Source: Household Survey, 2015

Table 5-22: Distribution of Population by Broad Age Groups

Districts	Broad Age Group			Population
	0-14 years	15-59 years	60 and above	
Ramechhap				
Dolakha	88	260	56	404
Sindhupalchowk	134	416	68	618
Kavrepalanchowk	24	47	11	82
Bhaktapur	9	28	7	44
Kathmandu	3	18	1	22
Total/Ave.	258	769	143	1170
Percentage	22.05	65.73	12.22	100.00

Source: Household Survey, 2015

Type of family

Nuclear type of family is dominant in the project affected households. Of the total 197 households, 116 (58.88%) households are categorized as nuclear type and the rest 81 (41.12%) are joint type.

Marital status

Of the total 1170 population, 599 (51.20%) are married and 516 (44.10%) are unmarried. Similarly, the population of widow/widower and separator are 53 and 2 (4.53% and 0.7%).

5.3.3.2 Religion

Hinduism and Buddhism are the two main religions followed by project affected households. The majority of the project affected households 85.79% are Hindu followed by Buddhist 13.71%. There are also some Christian households (0.51%) in the project affected area.

Table 5-23: Distribution of Surveyed Households by Religion

Districts	Religion						HHs
	Hinduism		Buddhism		Christian		
	HHs	%	HHs	%	HHs	%	
Ramechhap							
Dolakha	56	94.92	3	5.08		0.00	59
Sindhupalchowk	93	86.11	14	12.96	1	0.93	108
Kavrepalanchowk	11	73.33	4	26.67		0.00	15
Bhaktapur	4	40.00	6	60.00		0.00	10
Kathmandu	5	100.00		0.00		0.00	5
Total	169	85.79	27	13.71	1	0.51	197

Source: Household Survey, 2015

5.3.3.3 Mother Tongue

Nepali and is the main mother tongues spoken by the surveyed households. About 85.79% of the surveyed households speak Nepali language and after Nepali Tamang language (13.71%) is also spoken. One household of Dolakha district speaks Thami language as its mother tongue.

Table 5-24: Distribution of Surveyed Households by Spoken Language

Districts	Spoken Language						HHs
	Nepali		Tamang		Thamj		
	HHs	%	HHs	%	HHs	%	
Ramechhap							
Dolakha	55	93.22	3	5.08	1	1.69	59
Sindhupalchok	94	87.04	14	12.96		0.00	108
Kavrepalanchowk	11	73.33	4	26.67		0.00	15
Bhaktapur	4	40.00	6	60.00		0.00	10
Kathmandu	5	100.00		0.00		0.00	5
Total	169	85.79	27	13.71	1	0.51	197

Source: Household Survey, 2015

5.3.3.4 Occupation

Agriculture is the main occupation of the surveyed households. About 35.76% of the surveyed households have adopted agriculture as a main occupation. The percentage of households occupied other than agriculture is service; inside the country (11.05%), Labor wage 18.07 % (9.88%, inside the country and 8.19%, outside the country), and students (22.50%) business and small industry (6.11%) and households work (6.24%). The Table 5-25 depicts the detail of the occupational distribution of the surveyed households.



Table 5-25: Occupational Composition of Surveyed Population (14 to 59 years) by Sex

Major Occupations	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
Agriculture	87	22.31	188	49.60	275	35.76
Business & Small Industry	35	8.97	12	3.17	47	6.11
Labor wage(In country)	59	15.13	17	4.49	76	9.88
Labor wage(Outside country)	48	12.31	15	3.96	63	8.19
Service(Inside country)	66	16.92	19	5.01	85	11.05
Student	93	23.85	80	21.11	173	22.50
Household Work	0	0.00	48	12.66	48	6.24
Unable	2	0.51		0.00	2	0.26
Total	390	100.00	379	100.00	769	100.00

Source: Household Survey, 2015

5.3.3.5 Literacy

From the household survey, it is revealed that 84.19% of the surveyed populations are literate with male literacy rate 89.82 % and female literacy rate 78.28%.

Table 5-26: Literacy Status (6 years and above) of Project affected Population

Literacy Status	Male		Female		Total	
	No.	%	No.	%	No.	%
Illiterate	57	10.18%	116	21.72%	173	15.81%
Literate	503	89.82%	418	78.28%	921	84.19%
Total	560	100.00	534	100.00	1094	100.00
Percentage	51.19		48.81		100.00	

Source: Household Survey, 2015

Of the literate population, percentage of having Primary Level, Lower Secondary Level, Secondary Level, SLC, Intermediate Level and Bachelors Level education are 24.86, 13.46, 18.13, 6.84, 13.25 and 8.03 respectively. Population having literate only is 15.42%. The Table 5-27 describes the educational attainment among the literate population of the sample households.

Table 5-27: Educational Attainment among the Literate Population of the Project Area

Educational Attainment	Male		Female		Total	
	No.	%	No.	%	No.	%
Literate only	60	11.93	82	19.62	142	15.42
Primary Level	128	25.45	101	24.16	229	24.86
Lower Secondary	67	13.32	57	13.64	124	13.46
Secondary	92	18.29	75	17.94	167	18.13
SLC	40	7.95	23	5.50	63	6.84
Intermediate	74	14.71	48	11.48	122	13.25
Bachelors and above	42	8.35	32	7.66	74	8.03
Total (Literate)	503	100.00	418	100.00	921	100.00

Source: Household Survey, 2015

5.3.3.6 Land Ownership status and Holding size

Households survey shows that hundred percent of the sampled households have their own land for cultivation. The average land holding size of the surveyed households is estimated to be 0.711ha. The higher landholding size is in the households of Dolakha district (0.862) and the lower landholding size is in the households of Kathmandu district (0.122). The Table 5-28 represents the average holdings size of the households of the surveyed population of the affected districts.

Table 5-28: Land Holding of the Surveyed Household

Districts	HHs	Irrigated Khet(ha)	Bari(ha)	Pakho-Bari(ha)	Total(ha)	ha/HH
Dolakha	59	25.995	22.729	2.143	50.867	0.862
Sindhupalchok	108	38.759	32.995	3.846	75.6	0.700
Kavrepalanchowk	15	3.814	4.056		7.87	0.525
Bhaktapur	10	2.615	2.5		5.115	0.512
Kathmandu	5	0.612			0.612	0.122
Total	197	71.795	62.28	5.989	140.064	0.711
Average		0.364	0.316	0.030	0.711	

Source: Household Survey, 2015

Land Holding Size

Surveyed households have been classified on the basis of different landholding categories such as marginal, small, medium, and large. Majority of the households i.e. 60.32% are categorized as small type families having own land ranges from 0.5 ha to 2.0 ha whereas 19.69% are marginal farmers having land less than 0.5 ha. 10.37% of households are medium type having land 2.0 ha to 4.0 ha and the rest 9.63% are large type families having land more than 4 ha. The distribution of the land holding size on the basis of holding category is shown in Table 5-29.

Table 5-29: Distribution of Households by Landholding Size

Landholding Categories*		Households		Total Area	
Category	Size of holding(ha)	No.	%	Area(ha)	%
Marginal	Up to 0.5	97	49.24	27.577	19.69
Small	0.5 - 1.0	57	28.93	40.071	28.61
	1.0 - 1.5	25	12.69	29.384	20.98
	1.5 - 2.0	9	4.57	15.022	10.73
Medium	2.0 - 4.0	6	3.05	14.527	10.37
Large	>4	3	1.52	13.482	9.63
Total		197	100.00	140.064	100.00

Source: Household Survey, 2015

*Landholding Categories based on Rural Credit Review Study 1991/92, Nepal Rastra Bank (Central Bank of Nepal), 1999

Land Holding size by type of land

Low land irrigated paddy field (khet), up land (bari) and sloppy land (pakho bari) are the main land types owned by surveyed households. On the basis of type of land, the holding size of irrigated paddy field is highest i.e. 0.364ha followed by bari (0.316ha) and pakho bari (0.030ha).

Land Transaction

From the household survey, it is revealed that there was only in a few extent land transaction occurred during last year. The detail of the land transaction is given Table 5-30.

Table 5-30: Land Transaction of the Project Affected Households

Districts	Yes	No	Total
Dolakha	3	56	59
Sindhupalchowk		108	108
Kavrepalanchowk	1	14	15
Bhaktapur	1	9	10
Kathmandu		5	5
Total	5	192	197
Percentage	2.54	97.46	100.00

Source: Household Survey, 2015

5.3.3.7 Agriculture

The main cereal crops grown by the surveyed households are paddy, maize and millet. Similarly, cash crop like potatoes and oilseeds are also the major production to some surveyed households of project area. From the households' survey, the total production of paddy, maize, millet and potatoes are 186,180 MT, 70,040 MT, 36,460 MT and 151,470 MT respectively. Similarly, the average yield of paddy, maize, millet and potatoes are 3.06 MT/ha, 1.92 MT/ha, 1.17 MT/ha and 7.66 MT/ha respectively. The detail of the major crops, production and yield are presented in Table 5-31.

Table 5-31: Major Crop Area Coverage, Production and Yield for the Surveyed HH

Description	Major Crops			
	Paddy	Maize	Millet	Potato
Total Cropped Area	60.934	36.522	31.107	19.784
Total Production (MT)	186,180	70,040	36,460	151,470
Yield (MT/ha)	3.06	1.92	1.17	7.66

Source: Field Survey, 2015

5.3.3.8 Income Pattern

Households survey shows that the total average annual income of the surveyed households is Rs. 3,99,783. Of the total income share of agriculture and animal husbandry is highest i.e. Rs. 1,05,096 (26.29%) followed by remittance (23.11%), service (20.58%), business (15.33%), daily wages/porter (10.70%) and others. The Table 5-32 depicts the detail of the income sources of the surveyed households from different sectors.

Table 5-32: Annual Households Income by Type of Income in the Project Area

Income Source	Average Income	%
Agriculture and animal husbandry Income	105096	26.29
Service	82260	20.58
Business	61279	15.33
Daily Wages/Porter	42787	10.70
Pension/Bridddha Bhatta	12538	3.14
Remittance	92401	23.11
Bonus	3421	0.86
Total Average Income	399783	100.00

Source: Household Survey, 2015

Table 5-33: Average Annual Income of Surveyed Households

Districts	Annual Average Income from Different Sources					
	Agriculture		Non-Agriculture		Total	
	Rs.	%	Rs.	%	Rs.	%
Ramechhap						
Dolakha	76370	16.21	394881	83.79	471251	100.00
Sindhupalchok	114229.4	29.16	277548	70.84	391778	100.00
Kavrepalanchowk	109780	43.41	143133	56.59	252913	100.00
Bhaktapur	173770	44.43	217300	55.57	391070	100.00
Kathmandu	95400	50.91	92000	49.09	187400	100.00
Average	1,05,096		2,94,686		3,99,783	
Percentage	26.29		73.71		100.00	

Source: Household Survey, 2015

5.3.3.9 Expenditure Pattern

The average expenditure of the surveyed households is Rs. 3,29,220. The share of expenditure on non-food item is higher i.e. 51.33% as compared to food item (48.67%). Among the non-food items, the larger portion of expenditure is for education i.e. 12.30%. After education, people spend more income on clothing (11.16%) and to celebrate festivals (11.12%). The distribution of expenditure pattern among the surveyed households is different in different VDCs. The income and expenditure pattern of the surveyed households shows that the total average annual saving is Rs. 70,563.

Table 5-34: Average Annual Expenditure of the Households

Districts	Expenditure Heading								Expense
	Food Items	Clothing	Education	Medicine	Festival	Fuel	Communication/ Electricity	Transport	
Dolakha	48.63	13.37	10.17	4.93	11.93	3.63	4.54	2.8	398123
Sindhupalchok	48.42	10.11	14.03	3.16	10.67	4.51	5.63	3.47	312152
Kavrepalanchowk	46.88	10.97	9.83	5.87	12.54	4.17	5.93	3.81	243510
Bhaktapur	52.72	8.96	10.16	3.17	10.28	5.87	4.71	4.13	308200
Kathmandu	51.75	12.83	11.91	2.11	8.56	6.12	3.78	2.94	184000
Avg./ Percent	48.67	11.16	12.30	3.87	11.12	4.33	5.23	3.32	329220

Source: Household Survey, 2015

5.3.3.10 Drinking Water

Public tap and Piped water Supply are the two major sources of drinking water of the surveyed population. Household survey shows that 52.79% of the surveyed households use public tap in their homes where 40.61% of surveyed households use pipe water supply for drinking purpose. 1.52% of surveyed households use Spout for drinking purpose. The household survey shows that the available supply of drinking water is sufficient throughout the year.

Table 5-35: Source of Drinking Water of the Households

Districts	Source							
	Piped Water		Well/Tube well		Public Tap		Spout	
	Hhs	%	Hhs	%	Hhs	%	Hhs	%
Dolakha	27	45.76	2	3.39	30	50.85		0.00
Sindhupalchok	42	38.89	3	2.78	60	55.56	3	2.78
Kavrepalanchok	6	40.00	1	6.67	8	53.33		0.00
Bhaktapur	3	30.00	4	40.00	3	30.00		0.00
Kathmandu	2	40.00		0.00	3	60.00		0.00
Total	80	40.61	10	5.08	104	52.79	3	1.52

Source: Household Survey, 2015

5.3.3.11 Source of Energy

Cooking Fuel

Fuel wood, LP gas and Bio-gas are the main sources of energy for cooking purpose of the surveyed households. About 53.81% of the surveyed households use fuel wood for cooking purpose while 45.69% use LP gas and 0.01% use Bio gas. The households who use LPG as main source of cooking also use fuel wood. Fuel wood is collected mostly from community forest and private forest. About 36.55% of the households collect fuel wood from community forest while 26.42% collect from own (private) forest and 6.60% of the households purchase from the market.

Table 5-36: Source of Energy for the HHs for Cooking Purpose

Districts	Source					
	Fuel wood		Biogas		LPG	
	No.	%	No.	%	Hhs	%
Ramechhap						
Dolakha	40	67.80		0.00	19	32.20
Sindhupalchowk	52	48.15		0.00	56	51.85
Kavrepalanchok	11	73.33	1	0.07	3	20.00
Bhaktapur	2	20.00		0.00	8	80.00
Kathmandu	1	20.00		0.00	4	80.00
Total	106	53.81	1	0.01	90	45.69

Source: Household Survey, 2015

Note: The households who use LPG as main source of cooking also use fuel wood.

Lighting Fuel

Household survey shows that all the surveyed households (100%) use electricity for lighting purpose.

5.3.3.12 Health and Sanitation

On the average, 89.34% of the surveyed households have their own toilet for defecation. Similarly, nearby forest area and open field are used by only 10.66% households respectively. Management of solid waste disposal seems to be satisfactory in the surveyed households. Three methods such as dump at safe place, burn and buried have been adopted by the surveyed households for the management of solid waste disposal. About 39.09% of the households have dumped the solid waste at safe place, while 22.84% buried in nearby house and 27.92% burnt the solid waste.

Table 5-37: Households having Toilet in the Project Area

Districts	Toilet facility		
	Yes	No	HHs
Ramechhap			
Dolakha	56	3	59
Sindhupalchowk	93	15	108
Kavrepalanchok	12	3	15
Bhaktapur	10		10
Kathmandu	5		5
Total	176	21	197
Percentage	89.34	10.66	100.00

Source: Household Survey, 2015

Table 5-38: Methods of Solid Water Disposal in the Project Area

Districts	Location							
	Dump at Safe Location		Burn		Buried		Others	
	HHs	%	HHs	%	HHs	%	HHs	%
Ramechhap								
Dolakha	27	45.76	13	22.03	12	20.34	7	11.86
Sindhupalchowk	41	37.96	35	32.41	21	19.44	11	10.19
Kavrepalanchok	6	40.00	2	13.33	5	33.33	2	13.33
Bhaktapur	2	20.00	3	30.00	5	50.00		0.00
Kathmandu	1	20.00	2	40.00	2	40.00		0.00
Total	77	39.09	55	27.92	45	22.84	20	10.15

Source: Household Survey, 2015

5.3.3.13 Knowledge and Attitude Regarding the Project

Knowledge

Out of total 197 project affected households, 130 (65.99%) households have knowledge about the proposed project and its activities. According to the surveyed households, the main sources of information about the project activity are through the NEA employees, neighbors and others. About 50.77% of the households got information from NEA employees, 27.69% got information through neighbors and 21.54% have knowledge through newspapers and others.

Table 5-39: Knowledge about the Project

Districts	Yes	No	Total
Ramechhap			
Dolakha	32	27	59
Sindhupalchowk	78	30	108
Kavrepalanchok	14	1	15
Bhaktapur	3	7	10
Kathmandu	3	2	5
Total	130	67	197
Percentage	65.99	34.01	100.00

Source: Household Survey, 2015

Attitude

About 87.31% of the households have shown their positive attitude towards the proposed project while 6.60% of the households are against the project activities and 5.08% are neutral.

Table 5-40: Attitude Regarding the Project by Type

Districts	Type			
	Positive	Negative	Neutral	No detail Information
Ramechhap	3			
Dolakha	54	3	1	1
Sindhupalchowk	99	1	7	1
Kavrepalanchok	12	3		
Bhaktapur	5	3	2	
Kathmandu	2	3		
Total	172	13	10	2
Percentage	87.31	6.60	5.08	1.02

Source: Household Survey, 2015

5.3.3.14 Expectation from the Project

The expectations of the project affected families are mainly for good compensation for the land and property, employment, electricity facility and local development. However, majority (68.02%) of the households have shown their interest for good compensation. Similarly, 18.78% of the households have shown their expectation for employment and 13.20% for local development.

Table 5-41: Expectation from the Project

Districts	Expectation			
	Good Compensation	Employment	Electricity Facility	Local Development
Dolakha	37	13		9
Sindhupalchowk	79	18		11
Kavrepalanchok	7	4		4
Bhaktapur	7	1		2
Kathmandu	4	1		
Total	134	37		26
Percentage	68.02	18.78	0.00	13.20

Source: Household Survey, 2015

5.3.3.15 Description of the house of the Project affected Families

a. House

By wall type

Hundred percent of the surveyed households have their own house for residence. The wall of houses is usually constructed mud and stone/brick, wood, bamboo and galvanized zinc sheet. About 77.66% of the houses of the surveyed households are made up of mud and stone/brick wall followed by cement/stone/brick wall houses (17.26%) and wooden wall (5.08%).

Table 5-42: Houses by Type of Wall

District	Wall Type			
	Cement & Stone/Bricks	Mud and Stone Bricks	Wooden Wall	Total
Dolakha	8	45	6	59
Sindhupalchowk	20	86	3	109
Kavrepalanchok	3	12	0	15
Bhaktapur	2	7	1	10
Kathmandu	1	3	1	5
Total	34	153	10	197
Percentage	17.26	77.66	5.08	100

Source: Household Survey, 2015



By roof type

Wooden, zinc plates and stone type roof are prevalent in the surveyed households. Majority of the households (57.87%) have their house with galvanized zinc sheet followed by Tiles (15.23%) and RCC (14.21%). Stones are also used on roof by 12.69% households.

Table 5-43: Houses by Roof Type

District	Roof Type			
	Tiles	Zinc Plates	RCC	Stones
Dolakha	14	35	4	6
Sindhupalchok	7	64	18	19
Kavrepalanchok	1	11	3	
Bhaktapur	8		2	
Kathmandu		4	1	
Total	30	114	28	25
Percentage	15.23	57.87	14.21	12.69

Source: Household Survey, 2015

By floor type

Mud and Cement are used on floor by the surveyed households. About 81.73% of surveyed households use mud on their floor while the remaining 18.27% households use cement on their floor.

Table 5-44: Houses by Floor Type

Districts	Floor Type		
	Mud	Cement	Wooden
Dolakha	52	7	
Sindhupalchok	85	23	
Kavrepalanchok	12	3	
Bhaktapur	8	2	
Kathmandu	4	1	
Total	161	36	
Percentage	81.73	18.27	0.00

Source: Household Survey, 2015

By no. of Storey

Two storey houses are common among the surveyed households. About 52.28% of the households have their house with 2 storey where 39.09% of households have 3 storey houses and only 8.63% households have one storey houses.

Table 5-45: Houses by No. of Storey

Districts	No. of Storeys		
	1	2	3
Dolakha	5	24	30
Sindhupalchok	6	58	44
Kavrepalanchok	4	9	2
Bhaktapur	2	7	1
Kathmandu		5	
Total	17	103	77
Percentage	8.63	52.28	39.09

Source: Household Survey, 2015



5.4 Public Consultation

5.4.1 Background

As key stakeholders in development, the citizens have right to know and to be involved in information exchange and decision-making that affects their lives, resources and properties from implementation of a development project. This citizen right is protected by the Right to Information Act 2064 BS (2007), Right to Information Rules, 2065 BS (2009) and Environmental Protection Regulation 2054 BS (1997).

Public consultation and information disclosure from the beginning is also important to reduce misunderstandings and successful implementation of a project. It is a process of both information giving and listening issues and concerns of public for planning and successful implementation of project with full support of the stakeholders.

5.4.2 Consultation

A series of public consultations was carried out in different places during preparation of IEE for Tamakoshi-Kathmandu 400 kV TL project. Project affected people and other stakeholders were informed and consulted about the land acquisition, structures relocation and compensation issues, impact and mitigation measures.

PRA with local stakeholders of the affected VDCs were used as the main tools of community consultation and information dissemination for preparation the IEE report. Similarly, key informant interviews, household survey of the directly project affected households, and informal meeting/consultation with the key stakeholders of the project area were also used as other tools of community consultation.

During the consultations, the participants were requested to express their views, concerns/issues regarding the project as well as they were informed regarding the project and its activities. Information such as project purpose, project type, impact area, likely impacts and potential opportunities due to project implementation were provided to the people during the consultation. Checklists, topic guide and questionnaire were developed to facilitate the PRA, KIs, and HHs survey. During the field visits, emphasis was placed on consultation with affected communities and people living in adjoining areas, to inform them about the proposed project and give them an opportunity to express their views. Altogether 28 VDC/Municipality level PRAs and 25 KIs were conducted in the project area (Table 5-46).

Table 5-46: Sample distribution

District	VDC/Municipality*	Number	
		VDC level PRA	KIs
Dolakha	Melung	1	1
	Bhedapu	1	1
	Ghang Sukathokar	1	1
	Pawati	1	1
	Fasku	1	1
	Bhimeswor*	1	1
	Lakuridanda	1	1
	Boch	1	1
Sindhupalchok	Piskar	1	1
	Chokati	1	1



District	VDC/Municipality*	Number	
		VDC level PRA	Kills
Sindhupalchok	Karthali	1	1
	Barhabise	2	1
	Ramche	1	1
	Mankha	1	1
	Fulpingdanda	1	1
	Irkhu	1	1
	Thulosirubari	1	1
	Bhotasipa	1	1
Kavrepalanchok	Chandeni Mandan	1	1
	Mahadevstah	1	1
	Nayagaun	1	1
	Shankharapur Deupur	1	1
Bhaktapur	Mahamanjushree	2	1
	Nagarkot*		
	Changunarayan*	2	1
Kathmandu	Shankharapur*	1	1
Total		28	25

5.4.3 Key Issues/Concerns Raised in PRA, Kills and Informal Meetings

During the community consultation several issues and concerns were raised by the people. All the local people of the project area have positive attitude regarding the construction of project. However some of the people in project area suggested transmission should be constructed with less impact on valuable land and go through riverside/barren land. The major issues/concerns are related to good compensation of assets on time, local development, shifting the route alignment from the emerging city, employment, livelihood support, transparency in project activities and environment protection. The project area is highly affected due to the recent earthquake so some of the participants raised the issue of project assistance in local development. The key issues/concern raised by the local people during community consultations is summarized in Table 5-47.

Table 5-47: Summary of Key Issues/Concerns of Local People

S. No.	Key Issues /concerns	Details of Issues/Concerns
1	Livelihood	<ul style="list-style-type: none"> • Employment to local people as per their skill • Skill development training. (House wiring, Driving, Auto mobile repairing and maintenance) • Support for Agriculture • Fishery training to the locals of Majhi community
2	Infrastructure development/ community support	<ul style="list-style-type: none"> • Support for Educational Institution (library, laboratory equipments, toilet, furniture, teaching and sports materials) • Support for drinking water (intake, source improvement) • Protect/conservate cultural and religious places. • Support for upgrading the exiting Ama Samuha, CFUGs offices
3	Compensation	<ul style="list-style-type: none"> • Compensation should be given on the basis of prevailing market price • Construction of the Project Should be started after completion of Compensation process

S. No.	Key Issues /concerns	Details of Issues/Concerns
4	Alignment	<ul style="list-style-type: none">• The route of transmission should go through riverside instead of cultivated land as far as possible.
5	Others	<ul style="list-style-type: none">• Maintain transparency in project activities• Create trust among the local people• The TL should go by minimizing the environmental effect as well as damaging agricultural land.• Involved local people in project activities• Avoidance of false assurance to local people• The illegal hunting of wild animals and outer disturbance to community forest should be controlled.