

Environmental Impact Assessment (Draft)

August 2014

BHU: Green Power Development Project II (Part A: Hydropower Plant Component) Annexes H to P

Prepared by Druk Green Power Corporation Limited and Tangsibji Hydro Energy Limited for the Asian Development Bank

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Annex H: Terrestrial Ecological Report

Terrestrial Ecological Report

Summary

Three Biodiversity surveys were conducted in the Nikachhu Project area and its surroundings. The First Survey was conducted By BHUCORE, in July 2013 and edited by PWC, and the second was conducted in October by PWC and the third along the Transmission line in December 2013.

A. First Biodiversity report (Prepared by BHUCORE, revised by PWC)

1 Background

The study of Terrestrial Ecosystem in the proposed Nikachhu Hydropower Project was to acquire biological diversity information, the protected species, establish migratory species and routes, assess extent of impact due to project implementation in conjunction to earlier environmental assessment that was concluded in 2011. This study was envisaged mainly due to slight change of Lorim Dam Site (coordinates: from 27° 26' 55.41" N to **27° 26' 59.80 N** and 90° 22' 22.21"E to **90° 22' 20.10"E**) and Power House from Tangsibi to Norbuodi (coordinates: from 26° 27' 29.46"N to **27° 26' 58.9"N** and 90° 27' 17.90"E to **90° 26' 53.30"E**) which were seen geologically more stable as compared to earlier sites. Therefore an update of the environmental assessment study was felt necessary for the extended project location.

2 General Forest Setting

According to broad classification of vegetation zones in Bhutan (A.J Girerson and D.G Long, Flora of Bhutan) Nikachhu Hydropower Project falls under the cool broad leaved forest zone, which is synonymous to Temperate Forest or East Himalayan Wet Temperate forest indicative altitude range of 2000 – 2900 m. The forest in the study area can be classified into eight ecological patterns and they are top canopy, middle canopy, shrubs, ground flora, climbers, Ferns and epiphytes. Figure 2-1 below provides overview of vegetation type.



3 Methods and Tools

3.1 Transacts

The study area covered altitudinal range between 1900 to 2450 m, from the confluence of Nikachhu/ Mangdechhu up to Lorim (Dam) Wangdue/Trongsa National Highway point.

The coordinates of hydropower component locations such as Dam, ADITS, Muck Disposal Sites, staff colonies, temporary camps, surge shaft, power house were obtained from the map that was provided by the Druk Green Power Corporation Limited (DGPCL). These coordinates were entered into the Global Positioning System (GPS) equipment “Etrex Vista HC-X Garmin”. Reaching the project site each entered points were tracked to determine the location. Upon knowing the locations the laying of transacts were determined. Transect lines was taken at 90 degrees to contour line. **Table 3-1** provides transact details.

Table 3-1: Transact details

Particular	Length (m)	Coordinates at start of Transact		Number of plots	Highest Elevation (m)	Lowest Elevation (m)
		Easting	Northing			
Transact 01	250	90°22'29.30"E	27°27'1.14"N	05	2400	2320

Particular	Length (m)	Coordinates at start of Transact		Number of plots	Highest Elevation (m)	Lowest Elevation (m)
		Easting	Northing			
Transact 02	900	90°23'14.89"E	27°27'13.59"N	18	2404	2248
Transact 03	890	90°24'52.64"E	27°27'9.89"N	17	2543	2213
Transact 04	1000	90°26'19.78"E	27°27'8.12"N	20	2540	2168
Transact 05	780	90°27'24.65"E	27°28'8.48"N	15	2555	2319
Transact 06	1000	90°28'46.72"E	27°29'23.67"N	20	2502	1814

From the start point, 50 meter transect line is marked taking-up slope gradient. Reason, measuring up slope gradient was to choose the difference of altitude location to see vegetation diversity.

At "O" start point transect line, a peg to mark center point of the sample plot as "Transect Start" was fixed. 5 meter (m) either side of the transect line is marked for the sample plot making 10 m by 10 m or 100 square meter (m^2) area. A similar sample plot is marked at the end of 50 meter transect line as "Transect End", making 2 sample plots of 100 m^2 each, or making 200 m^2 sampling area as two plots were completed. The plot laying thus continued. Length of transect line center to center of plot is 50 m and inclusive of 5m either side of center line makes the transect line length 60 meters end to end. **Figure 3-1** illustrates plot layout.

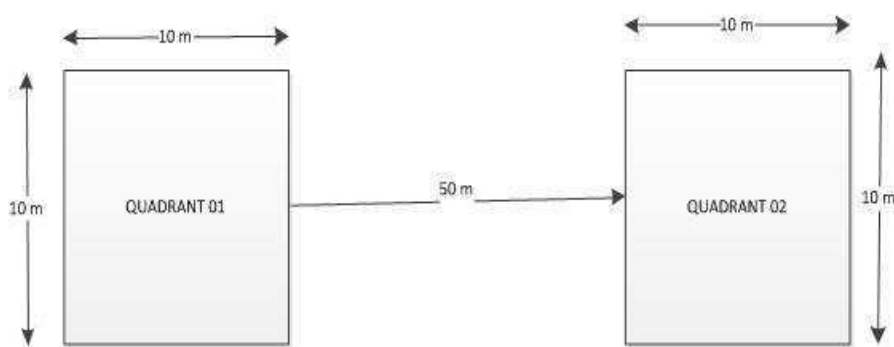


Figure 3-1: Transact and plot layout (not to scale)

3.2 Enumeration process

Appendix IV provides format to record enumeration of both plant and animal species. Recording of vegetation within sampling quadrant plot 100 m² was made considering canopy density of the forest cover. All the plants within this quadrant are made, noting the girth class in centimeter, height in meter for all tree species. Also complete recordings of other vegetation within the sample plot quadrants have been recorded taking consideration as shrub (s) Herb (h), climber (c), Fern (f), orchid (o) and Epiphytes.

Apart from complete vegetation recordings within sample plots, other vegetation along the transect lines were all been taken into record. Additional to floral recordings traces of wild life, avifauna, insects, arachnids, and reptiles were been taken into note. Some other information on wild life and fauna were asked to local cattle herders residing in the locality.

3.3 Floral Records

The floral records resulted out of enumeration are categorized into top canopy, middle canopy, shrubs, ground vegetation, climbers, Ferns, and orchids. Each is discussed below.

3.3.1 Top Canopy

Mostly composed of evergreen oaks (*Quercus glauca*, *Q.serrata*, *Q.lanata*), with occasional mixture of maple, magnolia, Ex-bucklandia populnea, Carpinus veminii have been noted towards the valley. Maximum tree population of Alder (*Alnus nepalensis*), have been noted in the study zone starting from Bangla Pokto, Tangsbi, Tashiling, Tshangkha and to Norboudi zone inclusive of Mangdechhu main Dam area. *Quercus griffithii*, deciduous oak do thrive in the vicinity of Tangsibji and Tshangkha area which were mainly protected by the individual households until recent time for leaf collection for cattle bedding and branches for mushroom cultivation. **Table 3-2** provides record of top canopy trees.

Table 3-2: Record of Top canopy trees

English Name	Botanical name	Local name	Use	National status	IUCN status
Oak	<i>Quercus glauca</i>	Dz[1]=Lathonp	Fire wood	none	NA (Not yet assessed)
Oak	<i>Q.serrata</i> ,	Dz=Thongp, Sha[2]=Thongpu shing	Plough, took handle	none	N.A
Oak	<i>Q.lanata</i>	Dz=Ghum shing	Fire wood	none	N.A

English Name	Botanical name	Local name	Use	National status	IUCN status
Oak	<i>Quercus griffithii</i>	Dz=Sisi shing	Furniture, fire wood, leave good for organic manure	none	N.A
maple,	<i>Acer campbellii</i>	Dz=Pchalam Sha=Sermiling shing	Wood Curving material, making bowls	none	N.A
magnolia,	<i>Magnolia campbellii</i>	Dz=Ngangong Sha=Ngawang shing	Cheap construction wood	none	N.A
	<i>Ex-bucklandia populnea</i>	Lho[3]=Pipla Sha=Lem shing	Good construction wood	none	N.A
Ash wood	<i>Carpinus veminii</i>	-	Sport goods	none	N.A
Alder	<i>Alnus nepalensis</i>	Dz=Gama	Cheap construction wood,	none	N.A

The figures below illustrate from top canopy vegetation.



Figure 3-2: View of top canopy vegetation

3.3.2 Middle canopy

Comprise of *Persea clarkeana*, *Rhododendron grande*, *R. arboreum*, *Rhus chinensis*, *Lyonia ovalifolia*, *Sorbus* sp *Symplocos* sp etc. Under grown regeneration noted mainly *Alunus* sp and *Symplocos* sp.

Table 3-3: Record of Middle canopy trees

English Name	Botanical name	Local name	Use	National status	IUCN status
A family of Avacado fruit	<i>Persea clarkeana</i>		Construction timber	none	N.A
Rhododendron	<i>Rhododendron grande</i>		Leave for butter wrapping	none	N.A
Rhododendron	<i>Rhododendron griffithianum</i>	Dz=Eto Meto rig			N.A
Rhododendron	<i>R.arboreum</i>	Eto-meto	Good flowering Avenue	none	N.A
Rhus	<i>Rhus chinensis</i>	Dz=Choka Sha=Roptang shing	Fruit collected for local medicine,	none	N.A
Rhus	<i>Rhus hookeri</i>	Sha=Jarshing, Jarsee Shing	Fruit yield edible black oil	none	N.A
Lacquer tree	<i>Rhus succedanea</i>	Dz=Say, Sey Sha=Say Shing	Trunk and Fruit latex used for lacquering or high quality furniture polish	none	N.A
	<i>Lyonia ovalifolia</i>	Dz=Zentoo	Good flowering plant	none	N.A
Symplocos	<i>Symplocos sp</i>	Dz/Shas=Domshi	Leave as mordant for dye, berry eaten by birds and eaten by bear	none	N.A
	<i>Sorbus sp</i>		Berry eaten by bear	none	N.A

Figure below depicts middle canopy vegetation.



Figure 3-3: Sample of middle canopy vegetation shrubs

Table 3-4: Record of Shrubs

English Name	Botanical name	Local name	Use	National status	IUCN status
Berberis	<i>Berberis aristata</i>	Dz=Kerpa tsang	Bark collected for medicine, vegetable dye	none	N.A
	<i>Viburnum erubescens</i>	Sha=Neptang shing	Good for live hedge	none	N.A
	<i>Viburnum cylindricum</i>	Sha=Ymling Shing	Seed yield oil	none	N.A
Daphne	<i>Daphne sp,</i>	Dz=Denag, Denag, Sha=Shugu-shing	Bark, for Bhutanese paper making	none	N.A
	<i>Edgeworthia gardnesi,</i>	Dz=Deyka	Bark, for Bhutanese paper making	none	N.A
	<i>Eurya serrata</i>			none	N.A
	<i>Zanthoxylum sp,</i>	Dz=Thnigay shing, Sha=Gee-shing	Fruit, Leeh and insect repellent	none	N.A
	<i>Zanthoxylum oxyphyllum</i>	Dz=Dretsang	-do-	none	N.A
smilax	<i>Smilax retusa</i>			none	N.A
	<i>Hypericum sp</i>	sp.Dz=Sonam Choejay	Leaves and young shoot for local tea material, grown for flower	none	N.A
	<i>Desmodium elegans</i>		Purple flower for avenue hedge	none	Least Concern
Rhododendron	<i>Rhododendron edgeworthii</i>	Dz=Tshethrim metok	Flower offered to alter		N.A
	<i>Aconogonum molle</i>	Dz=	Sour young shoot eaten	none	N.A
		Sha=Chokom			
	<i>Ligustrum indicum</i>		Good for hedge and avenue	none	N.A
	<i>Photinia integrifolia</i>			none	N.A

3.3.3 Ground Vegetation

Table 3-5: Record of Ground vegetation

English Name	Botanical name	Local name	Use	National Status	IUCN status
	<i>Elatastema sp</i>	Dz=Damburu –zuma		none	N.A
		Sha=Grimom -rig			
	<i>Arisaema sp</i>	Dz=Dowo		none	N.A
Fern	<i>Asplenium sp</i>		Indoor pot plant	none	N.A
	<i>Ainslinea aptera</i>			none	N.A
	<i>Oxalis sp</i>	Sha=Nera Mamphung	Fruit sour test eaten by children	none	N.A
	<i>Hedychium aurantiacum</i>	Sha=Borang saga			N.A

English Name	Botanical name	Local name	Use	National Status	IUCN status
	Oenanthe javanica	Sha=Zhemtse	Leaf and young shoot for pickle	none	Least Concern
	Piper mullesua	Med[1]: Pi-pi-ling		none	N.A
Grass like	Theropogon pallidus			none	N.A
	Ngaphalium sp			none	N.A
	Anaphalis sp			none	N.A
Strawberry	Fragaria nubicola	Dz=Tshema Tsshlu	Berry edible	none	N.A
Clover	Triflorium repens		fodder	none	N.A
	Galium aparine	Md:Zangtse	Med: collected for medicine	none	N.A
	Oxalis sp			none	N.A
Balsam	Strobilanthes sp		Fodder	none	N.A
Jancus	Juncus sp	Md:Dambukara	Marsh plant	none	N.A
	Pilea sp			none	N.A
Grass	Corex sp			none	N.A
	Thalictrum sp	Med:Ngangtsetrey	Root collected for medicine	none	N.A
	Leucas lanata			None (Herb)	N.A
	Scutellaria discolor			None(Herb)	N.A
Gentian	Halenia elliptica	Med:Chaktig	Collected for medicine	none	N.A
Ranunculus	Anemone revuleris	Sha=Wadepa Ngon metok		none	N.A

Climber

Rosa brononii (c), Rubus paniculata Sha=Omsha Zuroo (c), Actinida callosa Sha=Fangkholom sey, E/C= Wild Kiwi (c) Rubia cordifolia Dz=Tseod, Sha=Laningang roo (c) Vitis sp Sha=Janjanpur roo (c), Galium sp. (c), Hydrangea anomala (c) Herpetospermum pedunculatum Sha=Pokpo roo(c).

Table 3-6: Record of Climbers

English Name	Botanical name	Local name	Use	National Status	IUCN status
Rose	<i>Rosa brunonii</i>		Good hedge or flowering plant	none	N.A
climber	<i>Rubus paniculata</i>	Sha=Omsha Zuroo	Leaf taken as Pan substitute in eastern Bhutan	none	N.A
Wild Kiwi	<i>Actinidia callosa</i>	Sha=Fangkholom sey,	Fruit eaten,	none	N.A
Trade name=Manjit, Manjeto	<i>Rubia cordifolia</i>	Dz=Tseod, Sha=Laningang roo	Root good for food color, used as dye	none	N.A
	<i>Vitis sp</i>	Sha=Janjanpur roo	Wild variety for	none	N.A

English Name	Botanical name	Local name	Use	National Status	IUCN status
			Grape		
	<i>Hydrangea anomala</i>			none	N.A
	<i>Herpetospermum pedunculatum</i>	Sha=Pokpo roo	Fruit eaten as vegetable or pickle	none	

3.3.4 Ferns

Fern sp (F), Pteridium asculanta, Dz=Keam Sha=Pang Dawai (F) Asplenium sp (F), Suphagonus sp (F), Diplezium (Dz=Nakey) Drynaria sp (Sha=Benang-golapu), Cythea spinulosa (tree Fern), Adiantum sp (F),

Table 3-7: Record of Ferns

English Name	Botanical name	Local name	Use	Endangered/protected/endemic	IUCN status
Fern	Pteridium esculentum	Dz=Keam Sha=Pang Dawai	Young shoot boiled and eaten,	none	N.A
			Leaf good for green manure		
Fern	Asplenium sp		Good for indoor plant	none	N.A
Fern/	Sphagnum sp	Dz=Hangpe		none	
lichen		Shu=Punpu			N.A
Fern	Diplazium sp	Dz=Nakey	Shoot delicacy for Bhutanese dining table	none	N.A
Fern	Drynaria sp	Sha=Benang-golapu	Collected for medicine	none	N.A
Tree Fern	Cyathea spinulosa		Good indoor plant	Included in endangered red book list	N.A
	Adiantum sp		Good indoor plant	none	N.A

3.3.5 Epiphytes

Aechementhera sp (s), Rhododendron lindlye, Coelogyne corymbosa (o), Balbophyllum sp (o), Sorbus microphylla (s), Rhododendron dalhosie (s), Agapetis serpens, Dz/Shu= Enzeeboa, Vaccinium vacciniceum (s) Selaginella sp (F), Asplenium sp (F), Suphagonus sp (F), Colocasia sp, Sha=Bozong (h) Adiantum sp (F),

Table 3-8: Record of Epiphytes

English Name	Botanical name	Local name	Use	Endangered/protected/endemic	
Epiphytes	<i>Aechementhera</i>		Indoor	none	

English Name	Botanical name	Local name	Use	Endangered/protected/endemic	
	<i>sp</i>		decoration plant		N.A
Rhododendron	<i>Rhododendron lindleyi</i>	Dz=Eto-meto rig	-Do-	none	N.A
Rhododendron	<i>Rhododendron dalhousiae</i>	Dz=Eto-meto rig	-Do-	none	N.A
Orchid	<i>Coelogyene corymbosa</i>	Sha=Churchuribu rig	Flower petals eaten	none	N.A
orchid	<i>Bulbophyllum sp</i>		Ornamental plant	none	N.A
	<i>Sorbus microphylla</i>		Berry eaten by birds	none	N.A
Epiphytes	<i>Agapetes serpens</i> ,	Dz/Shu=Enzeeboa		none	N.A
	<i>Vaccinium vacciniaceum</i>			none	N.A
	<i>Selaginella sp</i>			none	N.A
	<i>Asplenium sp (F)</i> ,		Ornamental indoor plant	none	N.A
	<i>Sphagnum sp</i>			none	N.A
Colocasia	<i>Colocasia sp, (h)</i>	Sha=Bozong	Indoor plant		N.A
	<i>Adiantum sp (F)</i> ,		Indoor plant		N.A
	<i>Taxillus koempferi</i>	Dz=Lamtakey			N.A
		Sha=Khaine			

3.3.6 Orchids

Coelogyene corymbosa (o), Balbophyllum sp (o), Calanthe sp (o),Chilochista usneoides dz=Tsa Awadotizulma, Octochilus lanciliabius Md=Pusheltse, Dendrobium candidum (o), Orchid Sha=Sapin, Pintse.

Table 3-9: Record of Orchids

English Name	Botanical name	Local name	Use	Endangered/protected/endemic	IUCN Status
Orchid	<i>Coelogyene corymbosa</i>		Good indoor plant	none	N.A
Orchid	<i>Bulbophyllum sp</i>			none	N.A
Ground Orchid	<i>Calanthe sp</i>		Flowers eaten as vegetable, good indoor plant	none	N.A
Orchid	<i>Chiloschista usneoides</i>	dz=Tsa Awadotizulma		none	N.A
Orchid	<i>Octochilus sp</i>	Md=Pusheltse	Collected for Bhutanese medicine	none	N.A
Orchid	<i>Dendrobium candidum</i>	Sha=Sapin, Pintse.	Tuber used as glue	none	N.A

3.3.7 Floral Diversity Summary

The summary of floral diversity is provided in Table 10. As can be seen from below table the species diversity is highest at Dam area with 42 species per 100 m² and lowest around midway of the Head Race Tunnel alignment and the second rich diversity around powerhouse area. It is natural diversity the higher the lesser would be tree volume. This is depicted by Table 3-10.

Table 3-9: Summary of floral diversity from cumulative of plots per transact

Transact	No of trees per sample quadrant (Q)		Av. tree density per 100 m ²	Average volume of tree per plot m ³ (cft)	Species diversity per 100 m ²	Remarks
00	(Q1 - 2)=3 nos	(Q4-5)=8 nos	6	6.230m ³ (219.79cft)	41 species	
01	(Q1-9)=20 nos	(Q10 - 18)=7 nos	14	23.993m ³ (846.47cft)	30 species	
02	(Q1-5)=13 nos	(Q6-17)=9 nos	16	4.933m ³ (174.04cft)	25 species	
03	(Q1-6)=2 nos	(Q7-17)=0 nos	1	4.883m ³ (172.27cft)	14 species	
04	(Q1-10)=1 nos	(Q10-20) = 0 nos	1	4.715m ³ (166.35cft)	12 species	
05((Q1-7) =8 nos	(Q8-15) =0 nos	4	0.000m ³ (0.00cft)	25 species	
06	(Q1-10)=24 nos	(Q11-15)=0 nos	12	3.239m ³ (114.27cft)	26 species	
07	(Q1-10)=2 nos	(Q11-20) =1 no	2	9.279m ³ (327.36cft)	37 species	

Note: i) Diversity of species taken into consideration are all those plants species enumerated in all quadrants. Species of grass and the lichens have not been reflected in the vegetation list.

ii) Fifty (50) centimeter girth and above are considered into tree category. Biggest tree girth enumerated within the plot was 620 centimeter oak (*Quercus glauca*).

iii) 35.28cft equals 1m³

The species diversity in various hydropower project components is illustrated by **Figure 3-4**.

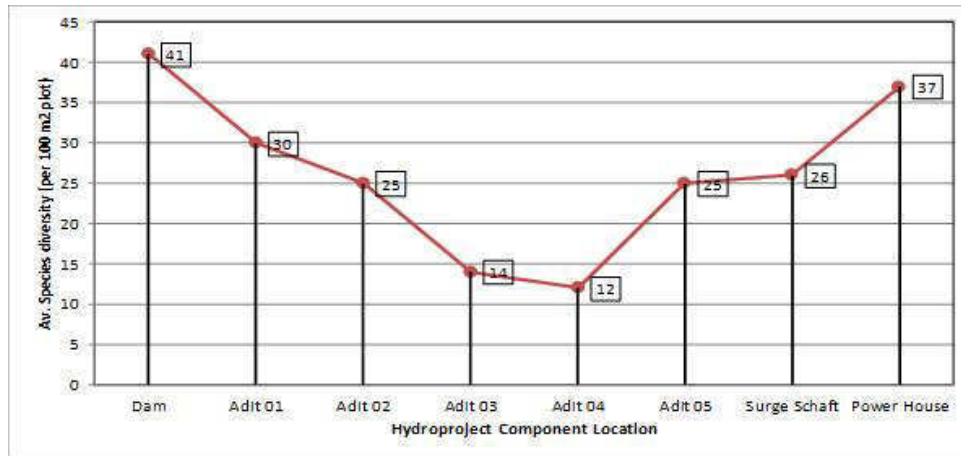


Figure 3-4: Species diversity in various hydropower project component locations

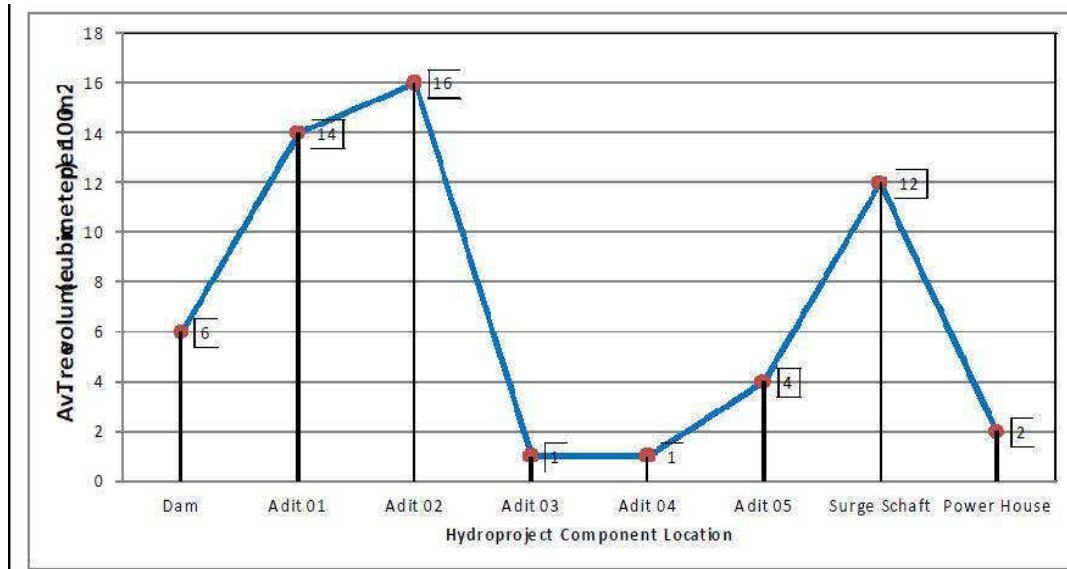


Figure 3-5: Estimation of average tree volume along transect line from Dam towards Power House

3.4 Faunal Records

3.4.1 Mammals

Sambar Deer (fresh hoof marks & dungs), Barking Deer (fresh hoof marks and Dung), Horry – bellied squirrel (spotted), Stripped Squarrel (spotted), and Assamese macaque (scats seen) were recorded during survey.

Mammals generally found in this zone as per locals and Jigme Singye Wangchuk National Park staff are as follows:

Tigers, *Panthera tigris*, Dz=Taa, Sha=Mayme Chenzin, Phuga Mayme, Kheylyu, Leopard, Dz=Zeeg Sha=Zeeg, Black panther, Sha=Khu Kheylyu, Dhole/Wild dog, Dz=Phaw, Sha=Romu, Leopard cat, *Prionailurus bengalensis*, Dz=Jazee, Sha=Jazee/Foskong ; golden cat, Dz/Sh=goong, Samber Deer, *Servus unicolor*, Dz/Sh=Shaw, Shou; Barking Deer, *Muntiacus muntjak* Dz=Kasha, Sha=Gasha, Gashu, Gash Tokpaling, Wild boar, *Sus scrofa*, Dz=Riphag, Sha= Borang Faakpa, Himalayan Black bear, Dz=Dom, Sha=Omsha Omshu; Serrows, Dz=Jha, Sha=Shangsha, Shangshu; Goral, Dz=Bjara, Basha, Bashu; Mongkey, Dza=Pcha, Sha=Zala, Zalu Kaptong, Common langur, Dz=Pcha-ka, Sha= Roksha, Rokshu, Golden langur (*trachypithecus geei*) Dz=Pcha-ka, Sha=Rokshu Serbu, (migratory); Porcupine *Histerix brachyura*, Dz=Bjithu, Sha=Zumphi, Red fox, *Vulpes Vulpes*, Dz=Haam, Sha=Shewlee; Common Otter, *Lutra lutra*. Dz/Sh/=Sam; Yellow-throated Martin, *Martes flavigula*, Dz=Hachu Ney Ney, Sha= Gagogmu; Bos gaurus, Gaur, dz=Rilang, Sha=Yeybu, Recent camera trap in the lower Nikachu zone.

Note: Dz=Dzongkha, Sh=Schachop, Kh=Khengkha, Eng/C=English common name

Table 3-10: Record of Mammals (spotted and reported by locals/park staff)

English Name	Scientific name	Spotted during survey (Y/N)	Reported by locals (Y/N)	National status	Migratory	IUCN status
Sambar Deer	<i>Servus unicolor</i>	Y				N.A
Barking Deer, Dz=Kasha	<i>Muntiacus mutjak</i>	Y				N.A
Hoary –bellied squirrel	<i>Callosciurus pygerythus</i>	Y				N.A
Stripped Squarrel		Y				
Assamese macaque Dz=Pcha, Sh=Zala	<i>Macaca assamensis</i>	Y	,			Near Threatened
Common langur		N	Local/Park			N.A

English Name	Scientific name	Spotted during survey (Y/N)	Reported by locals (Y/N)	National status	Migratory	IUCN status
Golden Langur, Kh=Raksha	<i>Trachypithecus geei</i>	N	Local/park	Endemic		Endangered
Tigers, Dz=Taa	<i>Panthera tigris</i>	N	Local/park	Protected	Migrate to south	N.A
Common Leopard	<i>Panthera pardus</i>	N	-Do-	protected	local	N.A
Black panther		N	-Do-	protected		N.A
Dhole/ Wild dog	<i>Cuon alpinus primaevus</i>	N	-Do-			N.A
Leopard cat	<i>Prionailurus bengalensis</i>	N		Protected		Least Concern
Asiatic golden cat,	<i>Catopuma temmincki</i>	N	-Do-	Protected		N.A
Wild boar	<i>Sus scrofa</i>	N	-Do-			Least Concern
Himalayan Black bear La dom	<i>Ursus thibetanus Laniger</i>	N	-Do-	protected		N.A
Himalayan Serow, Dz= Jha, Sh=Shanhsha	<i>Capricornis sumatraensis</i>	N	-Do-	protected		Vulnerable
Porcupine	<i>Histerix brachyura</i>	N				N.A
Red fox	<i>Vulpes Vulpes</i>	N				Least concern
Common Otter	<i>Lutra lutra</i>	N				Near Threatened
Yellow-throated Martin Dz=Hachu Ney Ney	<i>Martes flavigula</i>	N				Least Concern
Gaur, Dz/Sh=Rilang	<i>Bos gaurus</i> ,.	Recent camera trap in the lower Nikachu zone (by JSWNP staff)		Protected		Vulnerable

3.4.2 Avifauna

Table 3-11: Record of Avifauna

English Name	Scientific name	Spotted during survey (Yes)	Reported by locals (Y/N)	National status	Migratory [1] (Y/N)	IUCN status
1) White- throated laughing thrush,	<i>Garrulax albogularis</i>		As per spotting record of JSWNP		N	Least Concern
2) Green-backed tit,	<i>Parus monticolus</i>		-do-		N	Least Concern

English Name	Scientific name	Spotted during survey (Yes)	Reported by locals (Y/N)	National status	Migratory [1] (Y/N)	IUCN status
3) Grey bushchat (Sha=Drin-drin Kha)	<i>Saxicola ferrea</i>	Yes			N	Least Concern
4) Whiskered yuhina	<i>Yuhina flavicollis</i>	Yes			N	Least Concern
5) Chestnut –crowned laughing thrush	<i>Garrulax erythrocephalus</i>	Yes			N	Least Concern
6) Rufous sibia,	<i>Heterophasia capistrata</i>		-do-		N	Least Concern
7) Black drongo,	<i>Dicrurus macrocercus</i>	Yes			N	Least Concern
8) Streaked laughing thrush,	<i>Garrulax lineatus</i>	Yes			N	Least Concern
9) White-throated fantail,	<i>Rhipidura albicollis</i>		-do-		N	Least Concern
10) Yellow-Billed blue magpie,	<i>Urocissa flavirostris</i>	Yes			N	Least Concern
11) White- collared blackbird,	<i>Turdus albocinctus</i>	Yes			N	Least Concern
12) Oriental turtle dove,	<i>Streptopelia orientalis</i>	Yes			N	Least Concern
13) Blue whistling thrush,	<i>Myophonus caeruleus</i>	Yes			N	Least Concern
14) Spotted fork-tail,	<i>Enicurus scouleri</i>		-do-		N	Least Concern
15) Wedge-tailed green pigeon,	<i>Treron pompadora</i>		-do-		N	Least Concern
16) White-browed fulvette,	<i>Alcippe vinipectus</i>		-do-		N	Least Concern
17) Oriental cuckoo,	<i>Cuculus saturatus</i>	Yes			N	Least Concern
18) Russet sparrow,	<i>Passer domesticus</i>	Yes			N	Least Concern
19) Streak-breasted scimitar babbler,	<i>Pomatorhinus ruficollis</i>		-do-		N	Least Concern
20) Common hoopoe,	<i>Upupa epops</i>	Yes			N	Least Concern
21) Blue-capped rock thrush	<i>Monticola cinclorhynchus</i>	Yes			N	Least Concern
22) Large-billed crow	<i>Corvus macrorhynchos</i>	Yes			N	Least Concern
23) Nepal house martin,	<i>Delichon nipalensis</i>	Yes			N	Least Concern
24) Red-vented bulbul,	<i>Pycnonotus cafer</i>	Yes			N	Least Concern
25) Long-tailed shrike,	<i>Lanius schach</i>	Yes			N	Least Concern
26) White-tailed nuthatch,	<i>Sitta himalayensis</i>	Yes			N	Least Concern
27) Long-tailed minevet,	<i>Pericrocotus ethologus</i>	Yes			N	Least Concern
28) Chestnut –tailed minla,	<i>Minla strigula</i>	Yes			N	Least Concern
29) Great barbet,	<i>Megalaima virens</i>	Yes			N	Least Concern
30) Steppe eagle,	<i>Aquila nipalensis</i>	Yes			N	Least Concern
31) Broad-billed warbler,	<i>Acrocephalus aedon</i>		-do-		N	Least Concern

English Name	Scientific name	Spotted during survey (Yes)	Reported by locals (Y/N)	National status	Migratory [1] (Y/N)	IUCN status
32) Erusain jay,	<i>Garrulus glandarius</i>	Yes			N	Least Concern
33) Golden-throated barbet,	<i>Megalaima franklinii</i>		-do-		N	Least Concern
34) Crimson sunbird,	<i>Aethopyga siparaja</i>		-do-		N	Least Concern
35) Black bulbul,	<i>Hypsipetes leucocephalus</i>		-do-		N	Least Concern
36) Blue rock thrush,	<i>Monticola solitarius</i>	Yes			N	Least Concern
37) Rufous-vented tit,	<i>Parus rubidiventris</i>	Yes			N	Least Concern
38) Black throated tit	<i>Aegithalos concinnus</i>	Yes			N	Least Concern
39) Rufous-winged fulvette,	<i>Alcippe castaneiceps</i>		-do-		N	Least Concern
40) Mrs. Gould's sunbird,	<i>Aethopyga gouldiae</i>	Yes			N	Least Concern
41) Striated laughing thrush,	<i>Garrulax striatus</i>	Yes			N	Least Concern
42) Hoary-throated barwing,	<i>Actinodura nipalensis</i>		-do-		N	Least Concern
43) Stripe-throated yuhina,	<i>Yuhina gularis</i>	Yes			N	Least Concern
44) Grey-cheeked warbler,	<i>Seicercus poliogenys</i>	Yes			N	Least Concern
45)	45) <i>Anthus roseatus</i>		-do-		N	Least Concern
46) White-rumped munia	<i>Lonchura striata</i>		-do-		N	Least Concern
47)	<i>Gadwall</i>		-do-		N	Least Concern
48) Ward's-Trogon	<i>Harpactes wardi</i>		-do-	Rare/Endangered	N	Near threatened

3.4.3 Reptile

01 and half feet long with white and black patch spotted snake seen at the vicinity of view point seen at night, and another snake almost brown with dull white patch stripes over a meter long was seen killed other side of unidentified another. Figure 3-6 is a snake found along Trongsa Highway smashed by vehicle.



**Figure 3-6: Pit Viper (protobothrops)
(*Ptyas nigromarginata*)**



Figure 3-7: Green rat snake

3.4.4 Insect Butterfly and moth

Ludlo's saw tail Butterfly was spotted dead in Transect 06. Divers of butterflies specially moths been spotted in this time of the season apart from some photographs identification was not done due to non-availability of taxonomist in such field including insects. Blue Pansy and Hill Jezebe are illustrated by Figures 3-8 and 3-9.



Figure 3-8: Blue Pansy



Figure 3-9: Hill Jezebe

4 Observation & Discussion

4.1 General

On the left bank of Nikachhu where whole hydropower project components lie there are no primary forests that are ecologically intact. The forest are heavily grazed by the cattle, the right that local people enjoy to rear their livestock. From Dam, Bangla Pokto, Tangsbi, Tashicholing Tshangkha and Norbuodi all the way to the Trongsa View point composition of tree species are mainly mixed Oak Dz=Lathomp, (*Quercus glauca*, *Q.serrata*, *Q.griffithii*, *Q. lanata*) and Alder Dz=Gama Shing. Oaks are mainly used for fire wood. Alder trees although not valuable for timber due to its softness and prone to insect attacks, local people still use timber as pine species ideal for timber are far. Valuable timber tree species as *Exbucklandia populnea*, *Acer Campbellii* and *Carpinus veminae* (Ash) seen in this forest belt are very negligible in terms of quantity. Very rare regeneration of this top canopy vegetation been noticed.

Middle canopy plant species comprise of *Persea clarkeana*, *Rhododendron grande*, *R.arboreum*, *Rhus chinensis*, *Lyonia ovalifolia* etc. Of all under grown regeneration seen during the survey were mainly *Alunus* sp and *Symplocos* sp . Other small trees such as *Rhus succedenia* Dz/Sha=Sey shing, that yield lacquer, *Litsea* sp that yield insect repellent from fruit have also been noted.

Some economic shrub plants as *Daphne* sp, *Edgeworthii* *gardenaria* which yields good material for traditional paper from its bark and *Berberis aristata* root collected for traditional medicine are found but in negligible population.

climbers and woody twiners like Wild kiwi (*Actina collasa*) Sha=Fhangkholom Sey edible fruit found in this forest zone could be a potential for economic venture.

4.2 Assessment of impacts

4.2.1 Flora

The Western portion to Dam Site falls partly within the territory of Jigme Singye Wangchuk National Park (JSWNP). Hence a portion of it at the Dam Site would be submerged which is unavoidable since Nikachu river being the boundary to Park. In terms of percentage loss relative to the size of the Park it is less than 0.01% which is really negligible.

The survey shows vegetation coverage is maximum by very low valuable lumber species trees as oak, Alnus, Perisia, and other miscellaneous species in this zone. The survey report also shown traces of wild Herbivores. Herds of local cattle spotted grazing in this forest zone during survey. Cattle hoof prints are noted in all the sample plots which indicate there is no forest in the project area that is not grazed by the cattle.

Despite availability of sparse high value timber species the other plants present in this forest zone as Climber, Rhododendron, shrubs Herbs, orchids and rich epiphytic diversity qualifies ecologically healthy. The richness of ground flora including fodder species as grasses and other palatable plants found in the open space and at the fringe of high forest have the greater role played by the biotic factors mainly from those Herbivores both wild and domestic present in the zone.

Although it do not directly relates to the upcoming Nikachu Hydro Project it seems necessary to make a mention here about the effect of side income generation to local residents due to the death of Bamboo forest in the upper limits of forest in this zone. The natural death of bamboo in Nikachu catchment belt (*Phenomenal characteristics of bamboo species is that it dies after flower and fruiting known as “gregarious flowering”. All bamboo plants from the same stock or source of seed from the same parent will flower in the same year*) has deprived the local people making products for sale and to add on their livelihood.

The Borinda grossa Dz=Baa, Sha=shée in the upper pine/conifer zone have all been dried after its gregarious flowering starting middle of 2010. The survey team noted only one family in Chendeji High Way belt (used to be several families making bamboo mate for side income) making bamboo mate for sale. On inquiry husband and wife said that they managed to select some remaining green bamboo culms from far remote areas and do not pay back worth to their many days work input. They said is now their last effort making bamboo mate. Such bamboo as Borinda grossa takes close to a decade to mature the stock after the gregarious flowering and mass natural seeding.

As regards the ecological recession in this area it will be site specific and will be of temporary nature which the mitigation measure needs to be addressed by replenishing the muck disposal ADIT sites with plantation. The whole forest belt along the vicinity of proposed project zone, (from Dam Site to Power House) are mostly of degraded forest and are used as pasture by the local households of Ngala, Drangla, Tangsibji and Trshiling villages . Local residence from

Ngala and Drangla village are seen camping in the vicinity of proposed Dam Site with the herds of cattle and horses. Similarly 03 households from Tangsibji Village are seen still camping in Bangla Pokto with their cattle herds at this time of the year. A substantial chunk of forest area between Bangla Poto to Tsheringma Drupchu has been developed into village pastures. According to reliable local information the pasture in this belt were developed during early 1990s. Over hundred hectares of forest area in this same belt, after a kilometer short of Bangla Pokto to Tsheringma Drupchu is been allotted as Community Forest very recently.

Medicinal plants identified are *Berberis aristata*, *Artimesia vulgaris*, *Verbuscom thapsus*, *Plantago tibetica*, and *Rubia cordifolia*. These plants are most common and found scattered in the vicinity of village and open meadows.

Golden Langur migrates in summer to this zone, reported first observed during 2006 and 2008, along High Way between Bangla Pokto to Neemto Zam chu and project sites. Golden Langur however was not spotted during the survey time (July 2012) which was otherwise generally expected to be in this area. Birds spotted during the survey are mostly local migratory type.

There is a Biological corridor (BC) connecting Jigme Wangchuk National Park (JWNP) and Wangchuk Centennial Park measuring some 4.2 km. The biological corridor falls between ADIT 01 and ADIT 03. There are no boundary pillars fixed for the BC nor for National Parks but natural borders such as rivers and mountain ridges are used. In here the BC falls between two tributaries of Nikachhu namely Nyalalum Chhu and Bangla Chupa.

In terms of forest submersion at the Dam Site it does not hold any threatened species. As regards the Biological corridor there are no deterrent threats from the proposed project.

5 References

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Second Field report and Biodiversity Survey

A second biodiversity survey was conducted in the second and third week of October, 2012 using the same quadrat sizes as previous survey (10m²; 5m²;1m²) along eight transects at various locations within the project site. A total of 82 plots were surveyed wherein data on Vegetation, wildlife and birds were collected. The level of disturbance was also noted.

Table 1: Transect locations and plot numbers

No	Transect	Location	Coordinates		No of plots	Elevation
1	Transect 1	Dam site	90°22'11.4"	27°27'02.8"	20	2301-2342
2	Transect 2	Muck disposal 2	90°24'54.6"	27°26'52.9"	4	2316-2356
3	Transect 3	Muck disposal 3	90°26'47.7"	27°27'02.6"	11	2160-2326
4	Transect 4	Muck disposal 4	90°28'05.6"	27°27'57.4"	4	2221-2275
5	Transect 5	Muck disposal 4b	90°28'46.4"	28°27'59.1"	4	2229-2300
6	Transect 6	Muck disposal 5	90°28'21.7"	27°27'79.9"	7	2155-2247
7	Transect 7	Muck disposal 6	90°29'13.1"	27°29'36.0"	6	2177-2254
8	Transect 8	Power house area	90°28'51"	27°28'38.3"	26	1753-2215
	TOTAL				82	

In addition to each survey, information on vegetation and wildlife was also collected during site visits to each individual site (dam site, power house site, muck disposal sites, adits) in 2012.

Dam Site Area

The Dam site area is at a place called Sibdizim. Along with the Dam, a Temporary office, Staff colony, Labour camps, stores and workshops will be constructed. An Access road of 3.5km will be built to this site. Two muck disposal sites as well as aggregate crushing plant and Batching and mixing plants are also located here.

The river bed level at the Dam Site is at an elevation of 2,262m upto 2500m. The vegetation at the dam site area is mostly evergreen oak forest mixed with higher altitude broadleaf species. The main tree species found in this area are *Quercus griffithii*, *Quercus lamellose*, *Quercus lanata*, *Persea clarkeana*, *Acer Campbellii*, *Alnus nepalensis*, *Betula alnoides*, *Erythrina arborescens*, *Lyonia ovalifolia*, *Persea bootanica*, *Juglans regia*. The second canopy comprises mostly of smaller trees like *Rhododendron arboreum*, *Daphne sureil*, *Persea clarkeana*, interspersed with *Pinus wallichiana*, *Castanopsis hystrix* and smaller oaks.

The vegetation on both sides of the river is very similar since they are both at the same elevation. While the forest looks dense from the outside, the understory is not as dense as the tree cover does not give enough sunlight for the understory to flourish.

The biodiversity survey conducted indicated that flora density was highest at the dam site with 41 species per 100 m². Some of the shrub species here are *Berberis aristata*, *Daphne sureil*, *Eurya acuminata*, *Ligustrum confusum*, *Persea sp.* *Rubus ellipticus*, *Aconogonum mollee*, *Rhus chinensis*, *Sorbus species*, *Symplocos paniculata*, *Toricellia tilifolia*. The ground cover is more

diverse and mainly dominated by comprises of *Artemesia* and *Arundinaria species*, *Elastostema platyphyllum*, *Eupatorium*, *Pilea species*, *Pteridium aquilinum*, *Elsholtzia fruticosa*, *Hedychium*, *Cautleya*, *Oxalis*, and many more. The following table shows the species that are expected to be submerged once the dam is constructed.

Adit 1 is about a km away from the Dam site. Access to adit will require clearance of 2.6km. Here the vegetation is similar to the dam site area and the top canopy is dominated by *Quercus griffithii*, *Quercus lamellose*, *Quercus lanata*, *Persea clarkeana*, *Alnus nepalensis*, *Betula alnoides*, *Persea species*, *Castanopsis hystrix* and *Rhododendron arboreum* , The second canopy comprises mostly of smaller oak trees, *Daphne sureil*, *Persea clarkeana*, *Lyonia ovalifolia*, *Carpinus viminea*, *Viburnum*, *Berberis*, *Rubus*, *Hedysarum*, *Gaultheria*, *Aconogonum mollee*, *Eleocarpus*, *Ilex* and Bamboo among others. The Herb and ground cover comprises mostly of Ferns such as *Pteridium*, *Asplenium* and *Drymaria species*. *Eupatorium Crassocephalus crepidioides*, *Cynoglossum* *Hypericum*, *Gnaphalium*. *Potentilla*, *Artemesia*, *Desmodium*, *Arisaema*, *Leucas*, *Campylotropis*, *Galium*, *Anselia*, *Ophiopogon* and *Geranium* are some of the more common ground cover species. Climbers such as *Vitis*, *Hemiphragma*, *Smilax* are also quite common.

Adit II

Adit II is located near Badela Chu, in Taktshang Nye area. The muck disposal site has been identified below the Highway, Access to adit II will require clearance of 2.6km. The forest is mostly broadleaved interspersed with Oaks. The dominant species here are At lower levels *Castanopsis hystrix* and *Castanopsis tribuloides*, *Quercus lamellose*,

Quercus. lanata, *Quercus. Griffithii*, *Lyonia ovalifolia*, *Alnus nepalensis* and *Pinus wallichiana* appear. The shrub layer comprises of *Berberis aristata*, *Edgeworthia gardneri*, *Elsholtzia fruticosa*, *Eurya serrata*, *Eurya acuminate*, *Gaultheria fragrantissima*, *Viburnum cylindricum*, *Viburnum cylindricum* *Artemesia dubia* Besser, *Rubus ellipticus* and *Aconogonon molle*. The ground cover comprises mostly of *Anaphalis triplinervis*, *Ainsliaea aptera*, *Gentiana pedicellata*, *Girardiana diversifolia*, *Eupatorium odoratum*, *Fragaria nubicola*, *Persicaria nepalensis*, *Hedychium ellipticum*, *Hemiphragma herterophyllum* and *Pteridium aquilinum*.

Adit III will be located north of Tangsibji village. The project proposes to widen the existing Tangsibji farmroad and extend it by 2.5km to the muck disposal site. The site is located close to human settlement (North of Tangsibji village) in an open and once grazing land of the community. There is a canal providing water for the micro-hydroelectricity project located below the National Highway, which also serves irrigation water for paddy cultivation for the major Tangsibji Geog.

The area is used as Sokshing (forest that is used for collection of leaf litter and pine needles). The dominant trees in this area are *Quercus glauca*, *Quercus griffithii*, *Quercus lanata*, *Rhododendron arboreum*, *Erythrina arborescens*, *Castanopsis hystrix*, *Lyonia ovalifolia*, *Rhus chinensis* interspersed with *Pinus wallichiana*.

The understorey and shrub layer is quite sparse and mainly dominated by smaller oak trees and *Lyonia ovalifolia* and *Rhus chinensis*. The dominant shrubs are *Edgeworthia gardneri*, *Elsholtzia fruticosa*, *Eurya serrata*, *Gaultheria fragrantissima*, *Hedychium ellipticum*, *Hedysarum sikkimense*, *Saurauia napaulensis*, *Viburnum cylindricum*, *Viburnum cylindricum* *Artemesia dubia* Besser, *Rubus ellipticus*, *Aconogonon molle* and *Tetradium daniellii*.

The ground cover comprises mostly of Cotoneaster microphylla, Anaphalis triplinervis, Ainsliaea aptera, Gentiana pedicellata, Girardiana diversifolia, Eupatorium odoratum, Fragaria nubicola, Persicaria nepalensis, Hedychium ellipticum, Halenia elliptica, Inula cappa, Hemiphragma herterophyllum and Pteridium aquilinum.

Adit 4 leads to muck disposal sites 4 and 5 which are just below the highway, so therefore the length of road required is only 990m. . The Forest is mostly disturbed scrub forest and is also heavily used for grazing. The dominant tree species are *Alnus nepalensis*, *Quercus griffithii*, *Betula alnoides*, *Lyonia ovalifolia*, *Quercus lanata*, *Rhododendron* and *Benthamedia capitata*.

The shrub layer comprises of species like Rhus chinensis, smaller Quercus, Rhododendrons and Lyonia or Castanopsis trees. Other shrubs include Eurya serrata, Viburnum cylindricum, Hedysarum sikkimense, Aconogonon molle, Eupatorium odoratum and Rubus ellipticus.

The ground cover is mostly dominated by *Eupatorium adenophorum*, *Hedychium ellipticum*, *Cautleya gracilis*, *cirsium verutum*, *Bidens pilosa*, *Carex nubigena*, *Oxalis corniculata*, *Anaphalis triplinervis*, *Desmodium elegans* and *Pteridium aquilinum*.

Adit V. This is just below the national highway and therefore only 220m road will be required to be cleared. Species biodiversity here is not high as it's a highly disturbed scrub forest. The dominant trees are *Alnus nepalensis*, *Lyonia ovalifolia*, *Quercus lanata*, *Quercus griffithii*, *Erythrina arborescens*, *Benthamedia capitata*, *Daphne sureil*, *Rhus chinensis*, *Toricellia tiliifolia* and *Rhododendron*.

The shrub layer comprises of smaller trees of *Alnus*, *Benthamedia*, *Rhododendrons*, *Rhus chinensis*, *Berberis aristata*, *Elsholtzia fruticosa*, *Eurya acuminate*, *Eurya acuminate*, *Rosa brunonii*, *Arundinaria*, *Viburnum erubescens* and *Rubus ellipticus*.

The ground cover is sparse and comprises mostly of *Artemesia dubia* Besser, *Eupatorium odoratum*, *Pteridium aquilinum*, *Anaphalis triplinervis*, *Carex nubigena*, *Desmodium elegans*, *Fragaria nubicola*, *Hedychium ellipticum*, *Hedychium spicatum*, *Rubus ellipticus*, *Nepeta laevigata* and *Ophiopogon intermedius*.

The Power House complex is located approximately 300 m upstream to Mangdechhu dam, at Norbuodi. Although access road facilities constructed by Mangdechhu Hydropower Project shall be used as access, additional access to adits and powerhouse, labour camps, store and workshop, Power house colonies and Power house cavity will be constructed.

The elevation of the Power House Complex area ranges from 1810 to 2400m. Here the forest is mostly dominated by Broadleaf forest and Oaks such as *Quercus griffithii*, *Quercus lanata*.

Other dominant species are *Alnus nepalensis*, *Betula alnoides*, *Rhododendron* species, *Erythrina arborescens*, *Juglans regia*, *Persea bootanica*, *Lyonia ovalifolia*, *Fraxinus*, *Albizia* species, *Magnolia*, *Ex-bucklandia populnea*, *Carpinus viminalis*, *Macaranga* species and *Pinus wallichiana*.

The middle-storey is dominated by small trees such as *Alnus nepalensis*, *Quercus griffithii*, *Quercus lanata*, *Rhododendrons*, *Erythrina arborescens*, *Docynia indica* and *Lyonia ovalifolia*. The shrub layer is dominated by *Arundinaria* species, *Eurya acuminata*, *Daphne sureil*, *Berberis aristata*, *Elaeagnus parvifolia*, *Brassaiopsis mitis* Clarke, *Aconogonum molle*, *Symplocos paniculata*, *Measa chisia*, *Viburnum erubescens*, *Solanum khasianum*, *Rubus ellipticus*, *Rosa brunoii*, *Girardiana diversifolia* and *Rhus chinensis*. The ground cover comprises mostly of *Desmodium elegans*, *Artemesia*, *Eupatorium odoratum*, *Hedychium ellipticum*, *Pilea anisophylla*, *Poa annua* and *Pteridium aquilinum* among others.

Data from the biodiversity surveys as well as the site visits have been compiled and summarized according to their abundance in the quadrats and during site visits.

Table 2. Abundance of species in each quadrat.

Description	Class
0-25% of quadrats; sighted during site visit	Less Common
26-50% of quadrats	Common
51-75% of quadrats	Fairly abundant
>75% of quadrats	Abundant

Table 3. Top Canopy plant species

No.	Scientific Name	Family	Habit	IUCN status
1	<i>Acer campbellii</i>	Aceraceae	Tree	N.A
2	<i>Acer sikkimensis</i>	Aceraceae	Tree	N.A
3	<i>Alnus nepalensis</i>	Betulaceae	Tree	N.A
4	<i>Benthamidia capitata</i>	Cornaceae	Tree	N.A
5	<i>Betula alnoides</i>	Betulaceae	Tree	N.A
6	<i>Carpinus viminea</i>	Betulaceae	Tree	N.A
7	<i>Castanopsis hystrix</i>	Fagaceae	Tree	N.A
8	<i>Daphne sureil</i>	Thymelaeaceae	Shrub	N.A
9	<i>Docynia indica</i>	Rosaceae	Tree	N.A
10	<i>Erythrina arborescens</i>	Fabaceae	Tree	N.A
11	<i>Ex-bucklandia populnea</i>	Hamamelidaceae	Tree	N.A
12	<i>Ficus nerifolia</i>	Moraceae	Tree	N.A
13	<i>Fraxinus floribunda</i>	Oleaceae	Tree	N.A
14	<i>Juglans regia</i>	Juglandaceae	Tree	Near Threatened
15	<i>Lyonia ovalifolia</i>	Ericaceae	Tree	N.A

No.	Scientific Name	Family	Habit	IUCN status
16	<i>Macaranga pustulata</i>	Euphorbiaceae	Tree	N.A
17	<i>Magnolia campbellii</i>	Magnoliaceae	Tree	N.A
18	<i>Measa chisia</i>	Myrsinaceae	Shrub	N.A
19	<i>Persea bootanica</i>	Lauraceae	Tree	N.A
20	<i>Persea clarkeana</i>	Lauraceae	Tree	N.A
21	<i>Pinus wallichiana</i>	Pinaceae	Tree	Least Concern
22	<i>Quercus glauca</i>	Fagaceae	Tree	N.A
23	<i>Quercus griffithii</i>	Fagaceae	Tree	N.A
24	<i>Quercus lamellosa</i>	Fagaceae	Tree	N.A
25	<i>Quercus lanata</i>	Fagaceae	Tree	N.A
26	<i>Quercus serrata</i>	Fagaceae	Tree	N.A
27	<i>Rhododendron arboreum</i>	Ericaceae	Tree/Shrub	N.A
28	<i>Rhododendron grande</i>	Ericaceae	Tree	N.A
29	<i>Rhododendron lindleyi</i>	Ericaceae	Shrub	N.A
30	<i>Rhus chinensis</i>	Euphorbiaceae	Tree	N.A
31	<i>Toricellia tiliifolia</i>	Cornaceae	Tree	N.A
32	<i>Tsuga dumosa</i>	Pinaceae	Tree	Least Concern
33	<i>Schima wallichii</i>	Theaceae	Tree	N.A

Table 4. Middle canopy and shrub species

No.	Scientific Name	Family	Habit	IUCN status
1	<i>Aconogonon molle</i>	Polygonaceae	Shrub	N.A
2	<i>Actinidia strigosa</i>	Actinidiaceae	Shrub	N.A
3	<i>Agapetes serpens</i>	Ericaceae	Shrub	N.A
4	<i>Aster albescens</i>	Compositae	Shrub	N.A
5	<i>Aralia sp.</i>	Araliaceae	Shrub	N.A
6	<i>Arundinaria gigantea</i>	Pinaceae	Shrub	N.A
7	<i>Berberis asiatica</i>	Berberidaceae	Shrub	N.A
8	<i>Berberis insignis</i>	Berberidaceae	Shrub	N.A
9	<i>Berberis praecipua</i>	Berberidaceae	Shrub	N.A
10	<i>Brassaiaopsis mitis</i>	Araliaceae	Shrub	N.A
11	<i>Buddleja paniculata</i>	Buddlejaceae	Shrub	N.A
12	<i>Callicarpa macrophylla</i>	Verbanaceae	Shrub	N.A
13	<i>Campylotropis speciosa</i>	Leguminosaceae	Shrub	N.A
14	<i>Cassia tora</i>	Caesalpiniaceae	Shrub	N.A
15	<i>Chirita urticifolia</i>	Gesneriaceae	Shrub	N.A
16	<i>Chromolaena odorata</i>	Asteraceae	Shrub	N.A
17	<i>Cotoneaster</i>	Rosaceae	Shrub	N.A

No.	Scientific Name	Family	Habit	IUCN status
	<i>microphyllus</i>			
18	<i>Cyathula capitata</i>	Amaranthaceae	Shrub	N.A
19	<i>Daphne bholua</i>	Thymelaeaceae	Shrub	N.A
20	<i>Daphne sureil</i>	Thymelaeaceae	Shrub	N.A
21	<i>Desmodium elegans</i>	Fabaceae	Shrub	Least Concern
22	<i>Edgeworthia gardneri</i>	Thymelaeaceae	Shrub	N.A
23	<i>Elatostema platyphullum</i>	Urticaceae	Shrub	N.A
24	<i>Eleagnus parvifolia</i>	Elaeagnaceae	Shrub	N.A
25	<i>Elsholtzia fruticosa</i>	Lamiaceae	Shrub	N.A
26	<i>Elsholtzia eriostachya</i>	Lamiaceae	Shrub	N.A
27	<i>Erythrina arborescens</i>	Fabaceae	Tree	N.A
28	<i>Eupatorium odoratum</i>	Asteraceae	Shrub	N.A
29	<i>Eurya acuminata</i>	Theaceae	Shrub	N.A
30	<i>Eurya serrata</i>	Theaceae	Shrub	N.A
31	<i>Gaultheria fragrantissima</i>	Ericaceae	Shrub	N.A
32	<i>Girardinia diversifolia</i>	Urticaceae	Shrub	N.A
33	<i>Hedysarum sikkimense</i>	Leguminosaceae	Shrub	N.A
34	<i>Hypericum calycinum</i>	Hypericaceae	Shrub	N.A
35	<i>Hypericum hookerianum</i>	Hypericaceae	Shrub	N.A
36	<i>Indigofera dosua</i>	Leguminosaceae	Shrub	N.A
37	<i>Inula cappa</i>	Compositae	Shrub	N.A
38	<i>Inula hookeri</i>	Compositae	Shrub	N.A
39	<i>Ilex aquilinum</i>	Aquifoliaceae	Shrub	N.A
40	<i>Justicia adhatoda</i>	Acanthaceae	Shrub	N.A
41	<i>Leycesteria formosa</i>	Caprifoliaceae	Shrub	N.A
42	<i>Ligustrum indicum</i>	Oleaceae	Shrub	N.A
43	<i>Ligustrum compactum</i>	Oleaceae	Shrub	N.A
44	<i>Neillia rubiflora</i>	Rosaceae	Shrub	N.A
45	<i>Oenanthe javanica</i>	Apiaceae	Shrub	Least Concern
46	<i>Oxytropis williamsii</i>	Leguminaceae	Shrub	N.A
47	<i>Pilea pumila</i>	Urticaceae	Shrub	N.A
48	<i>Piper pedicellosum</i>	Piperaceae	Shrub	N.A
49	<i>Photinia integrifolia</i>	Rosaceae	Shrub	N.A
50	<i>Rosa brunonii</i>	Rosaceae	climbing Shrub	N.A
51	<i>Rosa sericea</i>	Rosaceae	Shrub	N.A
52	<i>Rubus ellipticus</i>	Rosaceae	Shrub	N.A
53	<i>Rubus biflorus</i>	Rosaceae	Shrub	N.A
54	<i>Sarcococca saligna</i>	Buxaceae	Shrub	N.A

No.	Scientific Name	Family	Habit	IUCN status
55	<i>Saurauia napaulensis</i>	Saurauiaceae	Tree/Shrub	N.A
56	<i>Scutellaria discolor</i>	Lamiaceae	Shrub	N.A
57	<i>Smilax retusa</i>	Smilacaceae	Climber	N.A
58	<i>Sorbus microphylla</i>	Rosaceae	Tree/Shrub	N.A
59	<i>Symplocos paniculata</i>	Symplocaceae	Shrub	N.A
60	<i>Vaccinium nummularia</i>	Ericaceae	Shrub	N.A
61	<i>Viburnum cylindricum</i>	Caprifoliaceae	Shrub	N.A
62	<i>Viburnum erubescens</i>	Caprifoliaceae	Shrub	N.A
63	<i>Zanthoxylum oxyphyllum</i>	Rutaceae	Shrub	N.A
64	<i>Ilex aquilinum</i>	Aquifoliaceae	Shrub	N.A

Table 5. Ground vegetation

No.	Scientific Name	Family	Habit	IUCN status
1	<i>Ageratum adenophora</i>	Asteraceae	Herb	N.A
2	<i>Ageratum conyzoides</i>	Asteraceae	Herb	N.A
3	<i>Ainsliaea aptera</i>	Asteraceae	Herb	N.A
4	<i>Anaphalis busua</i>	Compositae	Herb	N.A
5	<i>Anaphalis triplinervis</i>	Compositae	Herb	N.A
6	<i>Arthraxon quartianus</i>	Gramineae	Grass	N.A
7	<i>Arabis laevigata</i>	Cruciferae	Herb	N.A
8	<i>Arisaema consanguineum</i>	Araceae	Herb	N.A
9	<i>Arisaema erubescens</i>	Araceae	Herb	N.A
10	<i>Artemisia indica</i>	Asteraceae	Herb	N.A
11	<i>Arundinaria sp.</i>	Poaceae	Cane	N.A
12	<i>Axonopus compressus</i>	Gramineae	Grass	N.A
13	<i>Bidens pilosa</i>	Asteraceae	Herb	N.A
14	<i>Borinda sp.</i>	Poaceae	Grass	N.A
15	<i>Brachiaria ramosa</i>	Gramineae	Grass	Least Concern
16	<i>Campanula colorata</i>	Campanulaceae	Herb	N.A
17	<i>Carex nubigena</i>	Cyperaceae	Sedge	N.A
18	<i>Cautleya gracilis</i>	Zingiberaceae	Herb	N.A
19	<i>Cirsium verutum</i>	Asteraceae	Herb	N.A
20	<i>Clinopodium umbrosum</i>	Labiatae	Herb	N.A
21	<i>Clintonia sp.</i>	Liliaceae	Herb	N.A
22	<i>Commelina benghalensis</i>	Commelinaceae	Herb	Least Concern
23	<i>Conyza candensis</i>	Compositae	Herb	N.A
24	<i>Conyza stricta</i>	Compositae	Herb	N.A
25	<i>Crassocephalum</i>	Asteraceae	Herb	N.A

No.	Scientific Name	Family	Habit	IUCN status
	<i>crepidioides</i>			
26	<i>Cyanotis cristata</i>	Commelinaceae	Herb	Least Concern
27	<i>Cyanotis vaga</i>	Commelinaceae	Herb	N.A
28	<i>Cynodon dactylon</i>	Gramineae	Grass	N.A
29	<i>Cynoglossum curcaturum</i>	Boraginaceae	Herb	N.A
30	<i>Cyperus cyperoides</i>	Cyperaceae	Sedge	N.A
31	<i>Digitaria ciliaris</i>	Gramineae	Grass	N.A
32	<i>Echinochloa colona</i>	Gramineae	Grass	Least Concern
33	<i>Eleusine indica</i>	Gramineae	Grass	Least Concern
34	<i>Eupatorium adenophorum</i>	Asteraceae	Shrub	N.A
35	<i>Fagopyrum dibotrys</i>	Polygonaceae	Herb	N.A
36	<i>Fragaria nubicola</i>	Rosaceae	Herb	N.A
37	<i>Galium aparine</i>	Rubiaceae	Herb	N.A
38	<i>Galium elegans</i>	Rubiaceae	Herb	N.A
39	<i>Gentiana pedicellata</i>	Gentianaceae	Herb	N.A
40	<i>Geranium wallichianum</i>	Geraniaceae	Herb	N.A
41	<i>Geranium procurrens</i>	Geraniaceae	Herb	N.A
42	<i>Hedychium ellipticum</i>	Zingiberaceae	Herb	N.A
43	<i>Hedychium spicatum</i>	Zingiberaceae	Herb	N.A
44	<i>Halenia elliptica</i>	Gentianaceae	Herb	N.A
45	<i>Impatiens sulcata</i>	Balsaminaceae	Herb	N.A
46	<i>Imperata cylindrica</i>	Gramineae	Grass	N.A
47	<i>Juncus ochraceus</i>	Juncaceae	Grass	N.A
48	<i>Leucas ciliata</i>	Lamiaceae	Herb	N.A
49	<i>Leucas lanata</i>	Lamiaceae	Herb	N.A
50	<i>Lycopodium clavatum</i>	Lycopodiaceae	club Moss	N.A
51	<i>Nepeta laevigata</i>	Lamiaceae	Herb	N.A
52	<i>Gnaphalium hypoleucum</i>	Asteraceae	Herb	N.A
53	<i>Oplismenus burmannii</i>	Poaceae	Grass	N.A
54	<i>Ophiopogon intermedius</i>	Liliaceae	Grass like plant	N.A
55	<i>Oxalis corniculata</i>	Oxalidaceae	Herb	N.A
56	<i>Paspalum distichum</i>	Gramineae	Grass	N.A
57	<i>Pennisetum clandestinum</i>	Gramineae	Grass	N.A
58	<i>Persicaria nepalensis</i>	Polygonaceae	Herb	N.A
59	<i>Persicaria runcinata</i>	Polygonaceae	Herb	N.A
60	<i>Pilea anisophylla</i>	Urticaceae	Herb	N.A
61	<i>Pilea umbrosa</i>	Urticaceae	Herb	N.A
62	<i>Poa annua</i>	Gramineae	Grass	Least Concern

No.	Scientific Name	Family	Habit	IUCN status
63	<i>Polypogon fugax</i>	Gramineae	Grass	N.A
64	<i>Potentilla indica</i>	Rosaceae	Herb	N.A
65	<i>Potentilla microphylla</i>	Rosaceae	Herb	N.A
66	<i>Primula denticulata</i>	Primulaceae	Herb	N.A
67	<i>Ranunculus diffusus</i>	Ranunculaceae	Herb	N.A
68	<i>Rubia manjith</i>	Rubiaceae	Herb	N.A
69	<i>Rumex nepalensis</i>	Polygonaceae	Herb	N.A
70	<i>Saussurea deltoidea</i>	Asteraceae	Herb	N.A
71	<i>Selaginella numularia</i>	Selaginellaceae	spike Moss	N.A
72	<i>Siegesbeckia orientalis</i>	Compositae	Herb	N.A
73	<i>Setaria pumila</i>	Gramineae	Grass	N.A
74	<i>Solanum khasianum</i>	Solanaceae	Herb	N.A
75	<i>Sphagnum Moss</i>	Sphagnaceae	Moss	N.A
76	<i>Strobilanthes wallichii</i>	Acanthaceae	Herb	N.A
77	<i>Taraxacum sp</i>	Asteraceae	Herb	N.A
78	<i>Thalictrum foliolosum</i>	Ranunculaceae	Herb	N.A
79	<i>Theropogon pallidus</i>	Liliaceae	Herb	N.A
80	<i>Thysanolenia latifolia</i>	Poaceae	Grass	N.A
81	<i>Trifolium repens</i>	Fabaceae	Herb	N.A
82	<i>Urtica dioica</i>	Urticaceae	Herb	N.A
83	<i>Viola wallichiana</i>	Violaceae	Herb	N.A

Table 6. Orchids

No.	Scientific Name	Family	IUCN status
1	<i>Coelogyne corymbosa</i>	Orchidaceae	N.A
2	<i>Balbophyllum sp</i>	Orchidaceae	N.A
3	<i>Calanthe tricarinata</i>	Orchidaceae	N.A
4	<i>Chiloschista usneoides</i>	Orchidaceae	N.A
5	<i>Octochilus lanciliabius</i>	Orchidaceae	N.A
6	<i>Dendrobium candidum</i>	Orchidaceae	N.A
7	<i>Anthogonium gracile</i>	Orchidaceae	N.A
8	<i>Sunipia scariosa lindly</i>	Orchidaceae	N.A
9	<i>Satyrium nepalense</i>	Orchidaceae	N.A
10	<i>Plantanthera clavigera</i>	Orchidaceae	N.A
11	<i>Habenaria arietina</i>	Orchidaceae	N.A
12	<i>Spiranthes sinensis</i>	Orchidaceae	N.A
13	<i>Coelogyne raizadae</i>	Orchidaceae	N.A

No.	Scientific Name	Family	IUCN status
14	<i>Coelogyne shuttesii</i>	Orchidaceae	N.A
15	<i>Dendrobium porphyrochilum</i>	Orchidaceae	N.A
16	<i>dendrobium hookerianum</i>	Orchidaceae	N.A
17	<i>dendrobium longicornu</i>	Orchidaceae	N.A
18	<i>Otochilus fuscus</i>	Orchidaceae	N.A
19	<i>Otochilus lancilabius</i>	Orchidaceae	N.A
20	<i>Dendrobium sp.</i>	Orchidaceae	N.A

Table 7. Ferns.

No.	Scientific Name	Family	Habit	IUCN status
1	<i>Adiantum pedatum</i>	Pteridaceae	Maidenhair Fern	N.A.
2	<i>Asplenium trichomanes</i>	Aspleniaceae	Maidenhair spleenwort	N.A.
3	<i>Cystopteris protrusa</i>	Dryopteridaceae	Fern	N.A.
4	<i>Diplazium sp</i>	Athyriaceae	Cliff Fern	N.A.
5	<i>Drynaria sp</i>	Polypodiaceae	basket Fern	N.A.
6	<i>Osmunda sp.</i>	Osmundaceae	Fern	N.A.
7	<i>Oleandra wallichii</i>	Oleandraceae	Fern	N.A.
8	<i>Polystichum munitum</i>	Dryopteridaceae	western swordFern	N.A.
9	<i>Pteridium esculantum</i>	Dennstaediaceae	Fern	N.A.
10	<i>Pteridium aquilinum</i>	Dennstaediaceae	Fern	N.A.

Table 8. Climbers

No.	Scientific Name	Family	Habit	IUCN status
1	<i>Actinida callosa</i>	Actinidiaceae	woody vine	N.A
2	<i>Clematis buchananiana</i>	Ranunculaceae	climbing stems	N.A
3	<i>Cotoneaster microphyllus</i>	Rosaceae	mat forming shrub	N.A
4	<i>Dioscorea deltoidea</i>	Dioscoreaceae	climber	N.A
5	<i>Hemiphragma herterophyllum</i>	Scrophulariaceae	Herb/creeping plant	N.A
6	<i>Herpetospermum pedunculatum</i>	Curcubitaceae	climbing plant	N.A
7	<i>Hydrangea anomala</i>	Hydrangeaceae	climbing shrub	N.A
8	<i>Parthenocissus semicordata</i>	Vitaceae	climber	N.A
9	<i>Photinia integrifolia</i>	Rosaceae	epiphytic shrub	N.A
10	<i>Rosa brunonii</i>	Rosaceae	climbing shrub	N.A
11	<i>Rubia cordifolia</i>	Rubiaceae	climber on shrub	N.A
12	<i>Rubia manjit</i>	Rubiaceae	climber	N.A

No.	Scientific Name	Family	Habit	IUCN status
13	<i>Rubus paniculata</i>	Rosaceae	climbing shrub	N.A
14	<i>Senecio scandens</i>	Compositae	climber	N.A
15	<i>Smilax mytilus</i>	Smilacaceae	climber	N.A
16	<i>Smilax retusa</i>	Smilacaceae	climber	N.A
17	<i>Vitis sp</i>	Vitaceae	woody climber	N.A
18	<i>Zanthoxylum oxyphyllum</i>	Rutaceae	woody climber	N.A
19	<i>Periploca calophylla</i>	Periplocaceae	liana	N.A
20	<i>Hemiphragma heterophyllum</i>	Scrophulariaceae	creeping plant	N.A
21	<i>Senecio scandens</i>	Asteraceae	climber	N.A
22	<i>Smilax mytilus</i>	Smilacaceae	climber	N.A

Fungi

During the field survey, the following pictures show the fungi that were encountered were photographed for further identification.

Amanita sp.



Laetiporus sp.



Trichaptum abietinum



Lycopodon sp.



Xeromphalina campanella



Unidentified sp.



WILDLIFE

39% of the plots had some sign of wildlife in them. The most abundant sign was that of Barking deer, followed by Wild Pigs, Sambar and Monkeys. Wild pig and Macaques were also directly sighted during field visits. Barking deer, Wild pigs and monkeys are considered as pests by some farmers due to crop damage. Other significant species that were not encountered during the survey but are present in the area include the Tiger, Common leopard, Wild Dogs, Serow, Sloth bear, Macaques, Otters, Porcupines and Langurs.

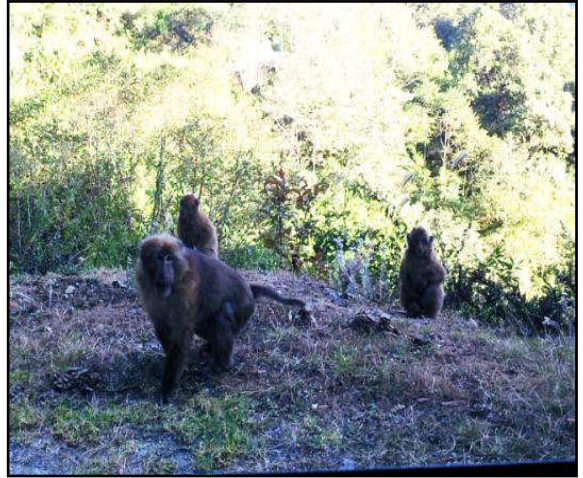
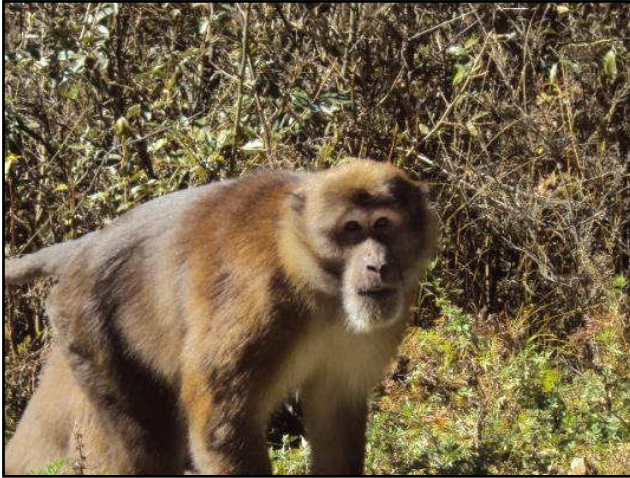
Table 9. Plots and wildlife signs in transects

Plot No.	T1a	T1b	T2	T3	T4	T5	T6	T7	T8a	T8b	Total
1	D(f)	0	0	D(f)	0	0	0	0	D(f) S(f)	D(f)	4
2	0	D(f)	0	0	D(f)	0	0	0	S(f)	wp(rp)	4
3	D(f)	D(f)	0	0	0	0	0	D(f)	M(s)	wp(rp)	5
4	B(e)	0	0	wp(w)	0	0	0	D(f)	D(d)	0	4
5	wp(r)	D(d)		0			0	0	wp(rp)	wp(r)	4
6	0	0		0			0	0	0	0	0
7	D(f)	0		0			D(f)		0	0	2
8	D(d)	D(f)		D(f)					D(f)	0	4
9	0	D(f)		0					wp(r)	wp(wp)	3
10	0	0		0					D(f)	JF(d)	2
11				0						0	0
12										0	0
13										0	0
14										0	0
15										0	0
16										0	0
	6	5	0	3	1	0	1	2	8	6	32
Total Plots	10	10	4	11	4	4	7	6	10	16	82

Legend:

D(f): Barking deer (footprints)
 B(e): Black Bear (eating signs)
 D(d) Barking deer (droppings)
 WP(w): Wild pig (wallowing signs)
 WP(r): Wild pig (rooting)
 WP (rp): Wild Pig (resting place)
 S(f): Sambar (footprints)
 S(d): Sambar (droppings)
 M(s): Monkey (sighting)
 JF(d): Jungle fowl (dropping)

Assamese macaques



Pit viper



Table 10: Birds in the project site

Sl. No.	Common name	Scientific Name	IUCN status
1	Ashy-throated Warbler	<i>Phylloscopus pulcher</i>	Least Concern
2	Black drongo	<i>Dicrurus macrocercus</i>	Least Concern
3	Black throated tit	<i>Aegithalos concinnus</i>	Least Concern
4	Blue Whistling Thrush	<i>Myophonus caeruleus</i>	Least Concern
5	Chestnut-tailed Minla	<i>Minla strigula</i>	Least Concern
6	Chestnut-crowned Laughingthrush	<i>Garrulax erythrocephalus</i>	Least Concern
7	Eurasian Jay	<i>Garrulus glandarius</i>	Least Concern
8	Great Barbet	<i>Megalaima virens</i>	Least Concern
9	Green-backed Tit	<i>Parus monticolus</i>	Least Concern
10	Grey-headed canary Flycatcher	<i>Culicicapa ceylonensis</i>	Least Concern
11	Grey-backed Shrike	<i>Lanius tephronotus</i>	Least Concern
12	Hill Partridge	<i>Arborophila torqueola</i>	Least Concern
13	Hill Prinia	<i>Prinia atrogularis</i>	Least Concern
14	Large-billed Crow	<i>Corvus macrorhynchos</i>	Least Concern
15	Lemon-rumped warbler	<i>Phylloscopus proregulus</i>	Least Concern
16	Gould's Sunbird	<i>Aethopyga gouldiae</i>	Least Concern
17	Nepal House Martin	<i>Delichon nipalensis</i>	Least Concern
18	Olive-backed Pipit	<i>Anthus hodgsoni</i>	Least Concern
19	Oriental turtle Dove	<i>Streptopelia orientalis</i>	Least Concern
20	Plumbeous Water- redstart	<i>Rhyacornis phaenicuroides</i>	N.A
21	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Least Concern
22	Rufous-bellied Niltava	<i>Niltava sundara</i>	Least Concern
23	Rufous Sibia	<i>Heterophasia capistrata</i>	Least Concern
24	Russet Sparrow	<i>Passer rutilans</i>	Least Concern
25	Short-billed Minivet	<i>Pericrocotus brevirostris</i>	Least Concern
26	Spotted Forktail	<i>Enicurus maculatus</i>	Least Concern
27	Striated Laughingthrush	<i>Garrulax striatus</i>	Least Concern
28	Streaked Laughingthrush	<i>Garrulax lineatus</i>	Least Concern
29	Verditer Flycatcher	<i>Eumyias thalassina</i>	Least Concern
30	White-tailed Nuthatch	<i>Sitta himalayensis</i>	Least Concern
31	Whiskered Yuhina	<i>Yuhina flavicollis</i>	Least Concern
32	Whistler's Warbler	<i>Seicerus whistleri</i>	N.A
33	White -throated Fantail	<i>Rhipidura albicollis</i>	Least Concern
34	White Wagtail	<i>Motacilla alba</i>	Least Concern
35	Yellow-bellied Fantail	<i>Rhipidura hypoxantha</i>	Least Concern
36	Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>	Least Concern

Sl. No.	Common name	Scientific Name	IUCN status
37	Yellow-browed Tit	<i>Sylviparus modestus</i>	Least Concern

HUMAN INFLUENCE

There are many threats to wildlife, but human-related activities are the main threats. For each plot and transect, the human influence in the area was recorded one of four categories from 0 (no disturbance) to 4 (very High) disturbance.

- 0: None (no grazing, fire, logging)
- 1 Low - Undisturbed forest but with a few signs of human presence can be found
- 2: Medium - Fairly undisturbed under-story vegetation but with some signs of human presence.
- 3: High – Forest is grazed, trees cut and under-story vegetation disturbed
- 4: Very High: Very disturbed and degraded wildlife habitat and highly disturbed under-story vegetation due to grazing, human signs, lopping of trees

Table 11. Disturbance in various plots

Disturbance category	Plots	% of plots
No disturbance	17	21
Low disturbance	3	4
Medium Disturbance	0	0
High Disturbance	23	28
Very High disturbance	39	48
	82	

Over 75% of the plots were in disturbed areas indicating high signs of grazing, cutting of trees, collection of firewood or leaves for fodder. One reason for the high disturbance could be due to the sites already being heavily visited by the project staff.

Table 12: Plants that will be submerged by the dam construction

No.	Scientific Name	Family	Habit
1	<i>Acer campbellii</i>	Aceraceae	Tree
2	<i>Acer hookeri</i> *	Aceraceae	Tree
3	<i>Aconogonon molle</i>	Polygonaceae	shrub
4	<i>Actinida callosa</i>	Actinidiaceae	woody vine
5	<i>Adiantum pedatum</i>	Pteridaceae	Maidenhair Fern
6	<i>Agapetes serpens</i>	Ericaceae	shrub
7	<i>Ageratum conyzoides</i>	Asteraceae	Herb
8	<i>Ainsliaea aptera</i>	Compositae	Herb
9	<i>Albizia julibrissin</i>	Mimosaceae	Tree
10	<i>Alnus nepalensis</i>	Betulaceae	Tree
11	<i>Anaphalis busua</i>	Asteraceae	Herb
12	<i>Anaphalis triplinervis</i>	Asteraceae	Herb
13	<i>Anemone rivularis</i>	Ranunculaceae	Herb
14	<i>Anthogonium gracile</i>	Orchidaceae	Orchid
15	<i>Arisaema consanguineum</i>	Araceae	Herb
16	<i>Arisaema erubescens</i>	Araceae	Herb
17	<i>Arisaema nepenthiodes</i> *	Araceae	Herb
18	<i>Aristolochia griffithii</i> *	Aristolochiaceae	Herbs(climber)
19	<i>Artemisia indica</i>	Asteraceae	shrub
20	<i>Arthraxon quartianus</i>	Gramineae	Grass
21	<i>Arundinaria sp.</i>	Poaceae	Cane
22	<i>Asplenium sp.</i>	Aspleniaceae	Fern
23	<i>Asplenium trichomanes</i>	Aspleniaceae	Maidenhair spleenwort
24	<i>Aster albescens</i>	Compositae	Shrub
25	<i>Axonopus compressus</i>	Gramineae	Grass
26	<i>Balbophyllum sp</i>	Orchidaceae	Orchid
27	<i>Begonia spp.*</i>	Begonaceae	Herb
28	<i>Benthamidia capitata</i>	Cornaceae	Tree
29	<i>Berberis aristata</i>	Berberidaceae	Shrub
30	<i>Berberis insignis</i>	Berberidaceae	Shrub
31	<i>Berberis praecipua</i>	Berberidaceae	shrub
32	<i>Betula alnoides</i>	Betulaceae	Tree
33	<i>Bidens pilosa</i>	Asteraceae	Herb
34	<i>Borinda sp.</i>	Poaceae	Grass
35	<i>Brachiaria ramosa</i>	Gramineae	Grass
36	<i>Calanthe tricarinata</i>	Orchidaceae	Orchid
37	<i>Campylotropis speciosa</i>	Leguminosaceae	Shrub
38	<i>Capillepedium assimile</i>	Poaceae	Grass
39	<i>Carex sp.</i>	Cyperaceae	Sedge
40	<i>Carpinus veminii</i>	Corylaceae	Tree
41	<i>Cassia tora</i>	Caesalpinaceae	shrub
42	<i>Castanopsis hystrix</i>	Fagaceae	Tree
43	<i>Cautleya gracilis</i>	Zingiberaceae	Herb
44	<i>Chiloschista usneoides</i>	Orchidaceae	Orchid
45	<i>Chromolaena odorata</i>	Asteraceae	Shrub
46	<i>Cirsium verutum</i>	Asteraceae	Herb

No.	Scientific Name	Family	Habit
47	<i>Clematis buchananiana</i>	Ranunculaceae	climbing stems
48	<i>Coelogyne corymbosa</i>	Orchidaceae	Orchid
49	<i>Coelogyne raizadai</i>	Orchidaceae	Orchid
50	<i>Coelogyne shuttesii</i>	Orchidaceae	Orchid
51	<i>Cotoneaster microphyllus</i>	Rosaceae	Shrub
52	<i>Crassocephalum crepidioides</i>	Asteraceae	Shrub
53	<i>Cyanotis cristata</i>	Commelinaceae	Herb
54	<i>Cyanotis vaga</i>	Commelinaceae	Herb
55	<i>Cyathula capitata</i>	Amaranthaceae	Shrub
56	<i>Cynoglossum furcatum</i>	Boraginaceae	Herb
57	<i>Cyperus cyperoides</i>	Cyperaceae	Sedge
58	<i>Cystopteris protrusa</i>	Dryopteridaceae	Fern
59	<i>Daphne bholua</i>	Thymelaeaceae	Shrub
60	<i>Daphne sureil</i>	Thymelaeaceae	Shrub
61	<i>Datura suaveolens</i>	Solanaceae	Shrub
62	<i>Dendrobium candidum</i>	Orchidaceae	Orchid
63	<i>Dendrobium hookerianum</i>	Orchidaceae	Orchid
64	<i>Dendrobium longicornu</i>	Orchidaceae	Orchid
65	<i>Dendrobium porphyrochilum</i>	Orchidaceae	Orchid
66	<i>Desmodium elegans</i>	Fabaceae	Shrub
67	<i>Dichrocephala integrifolia</i>	Asteraceae	Herb
68	<i>Dioscorea deltoides</i>	Dioscoreaceae	climber
69	<i>Diplazium sp.</i>	Athyriaceae	Fern
70	<i>Drynaria sp</i>	Polypodiaceae	basket Fern
71	<i>Drynaria Propinqua*</i>	Polypodiaceae	Fern
72	<i>Dryopteris spp.*</i>	Dryopteridaceae	Fern
73	<i>Elastotema platyphyllum</i>	Urticaceae	Shrub
74	<i>Elsholtzia fruticosa</i>	Lamiaceae	Shrub
75	<i>Elsholtzia eriostachya</i>	Lamiaceae	Shrub
76	<i>Enkianthus deflexus*</i>	Ericaceae	shrub
77	<i>Eria spp.*</i>	Orchidaceae	orchids
78	<i>Erythrina arborescens</i>	Fabaceae	Tree
79	<i>Eupatorium adenophorum</i>	Asteraceae	Shrub
80	<i>Eupatorium odoratum</i>	Asteraceae	Herb
81	<i>Eurya acuminata</i>	Theaceae	shrub
82	<i>Fagopyrum dibotrys</i>	Polygonaceae	Herb
83	<i>Ficus spp.*</i>	Moraceae	climber
84	<i>Fragaria nubicola</i>	Rosaceae	Perennial Herb
85	<i>Galinsoga parviflora</i>	Asteraceae	Herb
86	<i>Galium aparine</i>	Rubiaceae	Herb
87	<i>Gaultheria fragrantissima</i>	Ericaceae	Shrub
88	<i>Gentiana pedicellata</i>	Gentianaceae	Herb
89	<i>Geranium nepalensis</i>	Geraniaceae	Herb
90	<i>Geranium procurrens</i>	Geraniaceae	Herb
91	<i>Geranium wallichianum</i>	Geraniaceae	Herb
92	<i>Girardinia diversifolia</i>	Urticaceae	Shrub
93	<i>Gnaphalium hypoleucum</i>	Asteraceae	Herb

No.	Scientific Name	Family	Habit
94	<i>Gonanthus pumilus</i>	Araceae	Herb
95	<i>Habenaria arietina</i>	Orchidaceae	Orchid
96	<i>Halenia elliptica</i>	Genrriaceae	Herb
97	<i>Hedychium ellipticum</i>	Zingiberaceae	Herb
98	<i>Hedysarum sikkimense</i>	Leguminosaceae	shrub
99	<i>Hemiphragma herterophyllum</i>	Scrophulariaceae	Herb/creeping plant
100	<i>Herpetospermum pedunculatum</i>	Cucurbitaceae	Climber
101	<i>Hottuynia cordata</i>	Saururaceae	Herb
102	<i>Hydrangea anomala</i>	Hydrangeaceae	shrub
103	<i>Hypericum calycinum</i>	Hypericaceae	shrub
104	<i>Ilex aquilinum</i>	Aquifoliaceae	shrub
105	<i>Impatiens edgeworthii</i>	Balsaminaceae	Herb
106	<i>Impatiens stenantha</i> *	Balsaminaceae	Herb
107	<i>Isodon coetsa</i>	Lamiaceae	Herb
108	<i>Juglans regia</i>	Juglandaceae	tree
109	<i>Leucas ciliata</i>	Lamiaceae	Herb
110	<i>Leycesteria formosa</i> *	Caprifoliaceae	Herb
111	<i>Ligustrum confusum</i> *	Oleaceae	Shrub
112	<i>Listera (Neottia) pinetorum</i> *	Orchidaceae	Orchids
113	<i>Lonicera spp.</i> *	Caprifoliaceae	Herb
114	<i>Lycopodium clavatum</i> *	Lycopodiaceae	Fern
115	<i>Lycopodium serrata</i> *	Lycopodiaceae	Fern
116	<i>Lyonia ovalifolia</i>	Ericaceae family.	Tree
117	<i>Macaranga pustulata</i>	Euphorbiaceae	Tree
118	<i>Merrillioanax alpinus</i> *	Araliaceae	shrub
119	<i>Monotropastrum humile</i> *	Orobanchaceae	Herb
120	<i>Neillia rubiflora</i>	Rosaceae	Shrub
121	<i>Nepeta laevigata</i>	Lamiaceae	Herb
122	<i>Nephrolepis cordifolia</i> *	Dryopteridaceae	Fern
123	<i>Octochilus lancilabius</i>	Orchidaceae	Orchid
124	<i>Oenanthe javanica</i>	Apiaceae	Shrub
125	<i>Oleandra pistillaris</i> *	Oleandraceae	Fern
126	<i>Oleandra wallichii</i>	Oleandraceae	Fern
127	<i>Onychium siliculosum</i> *	Pteridaceae	Fern
128	<i>Ophiopogon intermedius</i>	Liliaceae	Grass like plant
129	<i>Osbeckia nepalensis</i>	Melastomataceae	Herb
130	<i>Osmunda sp.</i>	Osmundaceae	Fern
131	<i>Otochilus fuscus</i>	Orchidaceae	Orchid
132	<i>Otochilus lancilabius</i>	Orchidaceae	Orchid
133	<i>Oxalis corniculata</i>	Oxalidaceae	Herbaceous plant
134	<i>Oxytropis williamsii</i>	Leguminaceae	Shrub
135	<i>Paris polyphylla</i> *	Trilliaceae	Herb
136	<i>Parthenocissus semicordata</i>	Vitaceae	climber
137	<i>Periploca calophylla</i>	Periplocaceae	liana
138	<i>Persea bootanica</i>	Lauraceae	Tree
139	<i>Persea clarkeana</i>	Lauraceae	Tree
140	<i>Persicaria nepalensis</i>	Polygonaceae	Herb

No.	Scientific Name	Family	Habit
141	<i>Persicaria runcinata</i>	Polygonaceae	Herb
142	<i>Philadelphus spp.*</i>	Hydrangeaceae	shrub
143	<i>Photinia integrifolia</i>	Rosaceae	epiphytic shrub
144	<i>Pilea anisophylla</i>	Urticaceae	Herb
145	<i>Pilea umbrosa</i>	Urticaceae	Herb
146	<i>Pinus wallichiana</i>	Pinaceae	Tree
147	<i>Piper mellesua</i>	Piperaceae	Shrub
148	<i>Plagiogyria spp.*</i>	Plagiogyriaceae	Fern
149	<i>Plantanthera clavigera</i>	Orchidaceae	Orchid
150	<i>Poa annua</i>	Gramineae	Grass
151	<i>Polypogon fugax</i>	Gramineae	Grass
152	<i>Polystichum munitum</i>	Dryopteridaceae	western swordFern
153	<i>Potentilla indica</i>	Rosaceae	Herb
154	<i>Potentilla microphylla</i>	Rosaceae	Perennial Herb
155	<i>Primula denticulata</i>	Primulaceae	Herb
156	<i>Pteridium aquilinum</i>	Polypodiaceae	Fern
157	<i>Pteridium esculantum</i>	Dennstaedtiaceae	Fern
158	<i>Polysticum nepalensis*</i>	Dryopteridaceae	Fern
159	<i>Pyrola spp.*</i>	Pyrolaceae	Herb
160	<i>Pyrrosia boothii</i>	Polypodiaceae	Fern
161	<i>Quercus griffithii</i>	Fagaceae	Tree
162	<i>Quercus lamellosa</i>	Fagaceae	Tree
163	<i>Quercus lanata</i>	Fagaceae	Tree
164	<i>Rhododendron arboreum</i>	Ericaceae	Tree/shrub
165	<i>Rhododendron grande</i>	Ericaceae	Tree/shrub
166	<i>Rhododendron edgeworthii</i>	Ericaceae	Shrub
167	<i>Rhododendron griffithianum</i>	Ericaceae	Shrub
168	<i>Rhododendron dalhousiae var rhabdotum</i>	Ericaceae	Shrub
169	<i>Rhododendron lindleyi</i>	Ericaceae	Shrub
170	<i>Rhododendron camilliflorum</i>	Ericaceae	Shrub
171	<i>Rhus chinensis</i>	Euphorbiaceae	shrub
172	<i>Ribes spp.*</i>	Grossulariaceae	Shrub
173	<i>Rosa brunonii</i>	Rosaceae	climbing shrub
174	<i>Rosa sericea</i>	Rosaceae	Herb
175	<i>Roscoea alpina*</i>	Rosaceae	Herb
176	<i>Rubia cordifolia</i>	Rubiaceae	climber on shrub
177	<i>Rubia manjit</i>	Rubiaceae	Herb
178	<i>Rubus ellipticus</i>	Rosaceae	shrub
179	<i>Rubus paniculata</i>	Rosaceae	shrub
180	<i>Rumex nepalensis</i>	Polygonaceae	Herb
181	<i>Satyrium nepalense</i>	Orchidaceae	Orchid
182	<i>Schima wallichii</i>	Theaceae	Tree
183	<i>Schefflera impressa*</i>	Araliaceae	Shrub
184	<i>Schisandra neglecta*</i>	Schisandraceae	Herb/climber
185	<i>Scurrula elata*</i>	Loranthaceae	Herb
186	<i>Selaginella numularia</i>	Selaginellaceae	spike Moss
187	<i>Selinum wallichianum (DC)*</i>	Umbelliferae	Herb

No.	Scientific Name	Family	Habit
188	<i>Senecio scandens</i>	Asteraceae	Hard climber
189	<i>Smilacina</i> spp.*	Liliaceae	Herb
190	<i>Smilax mytilus</i>	Smilacaceae	climber
191	<i>Smilax retusa</i>	Liliaceae	Climber
192	<i>Solanum khasianum</i>	Solanaceae	Herb
193	<i>Sorbus microphylla</i>	Rosaceae	Small tree/shrub
194	<i>Sphagnum</i> Moss	Sphagnaceae	Moss
195	<i>Spiranthes sinensis</i>	Orchidaceae	Orchid
196	<i>Streptopus simplex</i>	Liliaceae	Herb
197	<i>Strobilanthes wallichii</i>	Acanthaceae	Herb
198	<i>Sunipia scariosa</i> lindly	Orchidaceae	Orchid
199	<i>Symplocos paniculata</i>	Symplocaceae	shrub
200	<i>Symplocos sumantia</i> *	Symplocaceae	Shrub
201	<i>Tetradium fraxinifolium</i> *	Rutaceae	Tree
202	<i>Thalictrum foliolosum</i>	Ranunculaceae	Herb
203	<i>Thalictrum virgatum</i>	Ranunculaceae	Herb
204	<i>Theropogon pallidus</i>	Liliaceae	Herb
205	<i>Toricellia tiliifolia</i>	Cornaceae	Tree
206	<i>Triflorum repens</i>	Leguminosea	Herb
207	<i>Tsuga dumosa</i>	Pinaceae	Tree
208	<i>Tupistra nigra</i> *	Asparagaceae	Herb
209	<i>Urtica dioica</i>	Urticaceae	shrub
210	<i>Vaccinium nummularia</i>	Ericaceae	Shrub
211	<i>Viburnum cylindricum</i>	Caprifoliaceae	shrub
212	<i>Viburnum erubescens</i>	Caprifoliaceae	shrub
213	<i>Vitis</i> sp	Vitaceae	woody vine
214	<i>Viola bhutanica</i> Hara*	Violaceae	Herb
215	<i>Vittaria</i> spp.*	Vittariaceae	Fern
216	<i>Vinacetoxicum hirundinaria</i> *	Asclepiadaceae	Herb
217	<i>Zanthoxylum oxyphyllum</i>	Rutaceae	woody climber

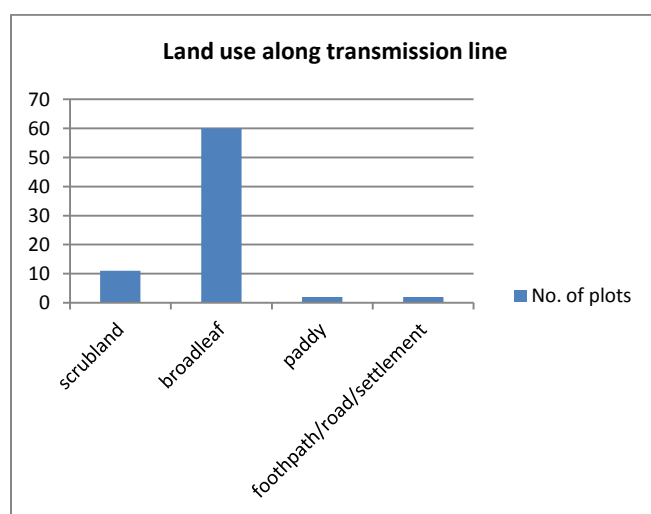
(All species are from both banks, but * are additional species recorded from right bank of river/park side)

B. Biodiversity report for Transmission Line

Background: The proposed 132kV transmission line with 18.6Km and 19.2Km respectively is aligned mostly in the Government Reserved land/forest with few numbers of towers falling under private land and community forest. The first and the preferred route with 18.6Km is diverted via Raphey top crossing the existing 66kV line at Tower No.7 & T8.

Along the alignment for the Transmission line a total of 74 plots were randomly selected at intervals of approximately 250m each. Within these plots, data was collected on vegetation, wildlife, birds as well as additional information on signs of disturbance were noted. 80% of the alignment fell under broadleaf forest, while 15% was in Scrub forest and the remaining 3% in agricultural land or community forest or crossing footpath or road.

Graph 1: Land use along transmission line



Below is a brief description of how the vegetation changes as one proceeds along the transmission line alignment (From TL 1 to TL 56). The typical structure of these forests includes the following layers: a top canopy comprising of tall mature trees; a shade-tolerant middle canopy comprising smaller mature trees; shrub layer, comprising mostly woody or herbaceous plants; followed by the ground cover.

Within the Warm broadleaf forest, the dominant trees are Oaks, especially *Quercus griffithii*, *Quercus Lamellosa* and *Quercus Lanata*. Other species include *Alnus nepalensis*, *Docynia indica*, *Juglans regia*, *Lyonia ovalifolia*, *Exbucklandia populnea*, *Daphne phyllum*, *Symplocos ramossima*, *Maesa chisea* and *Daphne bholua*. The middle shrub layer comprises mostly of younger tree species of *Quercus*, *Rhododendrons*, *Symplocos* and other species like *Ardisia macrocarpa*, *Berberis aristata*, *Brassaiopsis mitis*, *Dichroa fibrifuga*, *Toricella tiliifolia*, *Daphne bholua*, *Leucosceptrum*, *Viburnum cylindricum*, *Cinnamomum bejolghota*, *Samraria nepalensis* and *Arundinaria*. The ground species include mostly common species like *Artemisia vulgaris*, *Eupatorium adenophorum*, *Inula cappa*, *Rubus ellipticus* and *Urtica parviflora*. There are also

climbers like *Hedera nepalensis*, *Agapetes serpens*, Orchids, and ferns like *Pteridium aquilinum*, *Diplazium esculentum*, *Drynaria* and *Pteris wallichiana*. Grass species include *Poa annua*, *Anthraxon*, *Borinda*, *Cynodon dactylon* and *Cyperus cyperoides*.

Moving further onwards towards TL14, the vegetation is not as dense as it passes close to the Mangdechu Dam colony area and the Taktse Community Forest. Here the oaks are not as dominant but other tree species such as *Castanopsis hystrix*, *Daphniphyllum*, *Ex-bucklandia populnea*, *Symplocos ramossima*, *Symplocos glomerta*, *Lyonia ovalifolia*, *Maesa chisia*, *Rhododendron arboretum*, *Toricellia tiliifolia*, *Prunus cerasoides*, *Alnus nepalensis* and *Viburnum* are found. The middle lower trees and shrubs comprise of *Viburnum cylindricum*, *Eurya acuminata*, *Dichroa fibrifuga*, *Daphne bholua* and *Berberis aristata*. The ground vegetation is dominated largely by *Eupatorium adenophorum*, *Anaphalis triplinervis*, *Ancelia aptera*, *Cirsium falconeri* and ferns like *Pteridium aquilinum*, *Diplazium esculentum*, *Pteris wallichiana* and other species like *Smilax*, *Solanum virginianum* and *Swertia chirata*. Orchids like *Cymbidium*, *Otochilus lanciliabius*, *Dendrobium candidum*, and *Coelogyne* are also found.

Continuing onwards towards TL25, other trees species such as *Michelia doltsopa*, *Prunus cerasoides*, *Persea bootanica*, *Rhus wallichii*, and Oaks (*Quercus griffithii*, *Quercus glauca*, *Quercus semicarpifolia*, *Quercus lanata*) are observed again with *Symplocos*, *Lyonia ovalifolia*, *Exbucklandia populnea*, *Maesa chisia* and *Rhododendrons*. The middles storey is almost the same as before but also including species like *Nellia rubiflora*, *Lindera pulcherra*, *Viburnum cylindricum*, *Edgeworthia gardneri*, *Ilex aquilinum*, and *Cotoneaster microphyllus*. Additional ground species observed include *Tupistra chinensis*, *Solanum khasianum*, *Smilax ovalifolia*, *Raphidophora*, *Hemiphragma heterophyllum*, *Inula cappa*, *Pilea umbrosa*, *Potentilla fruticosa*, *Lycopodium clavatum*, *Glienchenia gigantean*, *Vanda cristata* and *Oleandra pistillaris* and *Otochilus* species.

Photo 1: Photo showing forest cover along TL



The density of trees is much lower moving towards TL42 as the forest is mostly scrub forest with fewer trees and scantier understory and barren land. Tree species are mostly *Quercus lanata*, *Quercus semicarpifolia*, *Quercus griffithii*, *Alnus nepalensis*, *Rhus wallichii*, *Maesa chisia*, *Lyonia ovalifolia*, *Castanopsis hystrix*, *Docynia indica*, *Symplocos ramossima*, *Exbucklandia populnea*, *Rhododendron* and *Schima wallichii*. The scanty shrub layer comprises mostly of *Artemisia vulgaris*, *Eupatorium adenophorum*, *Rubus ellipticus*, *Berberis aristata*, *Maesa chisia*, *Leucocephalum species*, *Zanthoxylum* and *Indigofera dosua*. Even the ground vegetation is scanty comprising mainly of *Pteridium aquilinum*, *Eupatorium adenophorum*, *Osbeckia stellata*, small *Rhododendrons*, *Anaphalis triplinervis*, *Artemisia vulgaris*, *Rubus ellipticus* and some grass species like *Poa annua* and *Arthraxon species*.

Photo 2: Photo showing vegetation cover along TL



From TL40, the TL passes through private land, plantation forest and scrubland interspersed with forest land. The main trees species are *Castanopsis hystrix*, *Lyonia ovalifolia*, *Quercus lanata*, *Symplocos ramossima*, *Pinus roxburghii* and *Schima wallichii*. As the elevation drops and the climate is warmer, the vegetation becomes more sub-tropical, with species like *Duabanga grandiflora*, *Alnus nepalensis*, *Bischofia javanica*, *Rhus chinensis*, *Pinus roxburghii*, *Ficus roxburghii*, *Ficus semicordata*, and *Quercus lanata* in Langthel and Yurmo. Overall tree density is not very high along the TL, with a maximum of 14 trees per 100 m².

Shrubs include *Berberis aristata*, *Ardisia macrocarpa*, *Edgeworthia gardneri*, *Dichroa fibrifuga*, *Viburnum erubescens*, *Mahonia nepalensis*, *Brassaiopsis mitis*, *Daphne bholua*, *Viburnum cylindricum*, *Maesa chisia*, *Eurya acuminatum*, *Rhododendron arboreum*, *Symplocos glomerata*, *Viburnum cylindricum*, *Ilex species*, *Cotoneaster microphylla*, *Elaeagnus parvifolia*,

Rubus ellipticus, *Eupatorium adenophorum*, *Zanthoxylum species*, *Vaccinium myrtillus*, *Rhododendron vaccinoide*s, *Indigofera dosua*, *Aconogonum molle*, *Datura suaveolens*, *Adhatoda vasica* and *Arundinaria species*

Herbs include *Artemisia vulgaris*, *Artemisia indica*, *Leucas ciliata*, *Inula cappa*, *Leucosceptrum species*, *Eupatorium adenophorum*, *Urtica parviflora*, *Anaphalis triplinervis*, *Cirsium falconeri*, *Solanum virginianum*, *Smilax ovalifolia*, *Swertia chirata*, *Pilea umbrosa*, *Ainsliaea aptera*, *Elatostema platyphyllum*, *Hedychium ellipticum*, *Elshotzia fruticosa*, *Osbeckia stellata*, *Oxalis corniculata*, *Pilea anisophylla*, *Colocasia esculenta* and *Pilea umbrosa*.

Ground cover includes *Polygonum runcinatum*, *Hydrocotyle javanica*, *Fragaria nubicola*, *Lycopodium clavatum* (moss), *Poa annua* (turf grass), *Hemiphragma heterophyllum* (creeping plant), *Potentilla fruticosa*, *Potentilla microphylla*, *Tupistra chinensis*, *Osbeckia stellata*, *selaginella sp* (spike moss),

Climbers include *Raphidophora species*, *Hedera nepalensis* and *Agapetes serpens*. Ferns include *Diplazium esculentum*, *Pteris wallichiana*, *Oleandra pistillaris*, *Glienchenia gigantea*, *Pteridium aquilinum* and *Drynaria propinqua*, *Adiantum caudatum*, *Asplenium sp*.

Orchids include *Calanthe sp*, *Eria coronaria*, *Phalaenopsis sp*. *Vanda cristata*, *Cymbidium cyperifolium*, *Gastrochilus sp.*, and *Dendrobium candidum*, *Coelogyne corymbosa* and *Bulbophyllum sp*.

Mushrooms that can be found there include *Amanita sp.*, *Lactarius piperatus*, *Laetiporus sp.*, *Lycoperdon sp.*, *Trichaptum abietinum*, *Boletus sp.*, *Laccaria sp.*, *Ramaria sp.* A list of all species recorded is provided in the Annex.

Human influence/disturbance of the forest

The main threat to forest cover and integrity is human activity. In each surveyed plot, the level of human influence in the area was recorded according to the following categories:

- 0: None (no grazing, fire, logging);
- 1: Low (undisturbed forest, but with a few signs of human presence);
- 2: Medium (fairly undisturbed under-story vegetation, but with some signs of human presence);
- 3: High (forest is grazed, trees cut and under-story vegetation disturbed); and,
- 4: Very High (very disturbed and degraded habitat; highly disturbed under-story vegetation due to grazing, human activities, logging of trees).

The most significant finding from the field assessment was that in all plots Disturbance was rated as 'High'. This reflects the high use of the site for grazing, cutting of trees, collection of firewood or leaves for fodder. This is examined further below. Basically, the TL extends from

below and the moves above the National Highway from Trongsa to Zhemgang, and all along the Transmission line alignment, it criss crosses access roads to the Mangdechhu project Dam Axis site runs parallel to the 66KV and 400 KV lines or crosses some footpath.

Table 1: Proximity to access roads and other structures along TL

Tower location	Elevation	Accessibility/Adjacent structures along TL
Pothead	2040	Mangdechhu dam site, take off point
OOP1	2067	below national Highway, near grazing land
TL6	2110	Mangdechhu dam axis Road, old footpath
TL7	2060	opposite mangdechu dam colony
TL8	2047	parallel to existing 66KV, T60, T61
TL9	2035	above Highway, Crossing 66KV
TL10	2054	Access road to Mangdechu Dam colony area
TL12	2126	Mangdechu Dam colony top and Taktse Road, old footpath
TL13	2247	Road to cremation ground, Approach road to Taktse College, old footpath
TL21	2104	Parallel to 66KV
TL24	2091	Above 66KV line
TL27-TL42	2060	Access road to Samcholing MSS school and Kuengarabten Nunnery Centre
TL40	2156	under Taktse community forest
TL43-TL50		Old footpath, Approach road to Mangdechu Surge shaft
TL52	1488	Parallel to 400KV/D/C line, private land
TL53	1426	Crossing 400KV D/C line
TL54	1296	Parallel to 400KV/D/C line, private land
TL55	1295	Parallel to 400 KV, D/C line
TL56	1238	Parallel to 400 KV, D/C line

The field assessment concluded that the project area does not contain any pristine forest as the entire area has been heavily grazed by the cattle, or used for collection of leaf litter, or revegetated recently as community forests.

Photo 3: Photos along transmission line



The picture shows the alignment of the existing 66kV line. The proposed 132kV line is aligned parallel to this line just above it. The picture below shows the same 66kV line and the access road to the Mangdechhu colony below it.



Photo 4: The village and the Highway just below the TL



Photo 5 and 6: The vegetation and forest cover along the proposed alignment



Table 2: List of Plant species recorded from Project site

No.	Scientific Name	Family	Habit
1	<i>Aconogonon molle</i>	Polygonaceae	Shrub
2	<i>Adhatoda vasica</i>	Acanthaceae	Shrub
3	<i>Agapetes serpens</i>	Ericaceae	semiclimbing shrub
4	<i>Ainsliaea aptera</i>	Compositae	Herb
5	<i>Alnus nepalensis</i>	Betulaceae	Tree
6	<i>Anaphalis busua</i>	Compositae	Herb
7	<i>Anaphalis triplinervis</i>	Compositae	Herb
8	<i>Ardisia macrocarpa</i>	Myrsinaceae	Shrub
9	<i>Artemesia vulgaris</i>	Asteraceae	herb
10	<i>Artemisia indica</i>	Asteraceae	Herb
11	<i>Arundinaria sp.</i>	Poaceae	Cane
12	<i>Asplenium sp.</i>	Aspleniaceae	fern
13	<i>Berberis aristata</i>	Berberidaceae	Shrub
14	<i>Berberis praecipua</i>	Berberidaceae	Shrub
15	<i>Bischofia javanica</i>	Bischofiaceae	Tree
16	<i>Brassaiopsis mitis</i>	Araliaceae	Shrub
17	<i>Bulbophyllum affine</i>	Orchidaceae	Orchid
18	<i>Calanthe sp.</i>	Orchidaceae	Orchid
19	<i>Castanopsis hystrix</i>	Fagaceae	Tree
20	<i>Cautleya gracilis</i>	Zingiberaceae	Herb
21	<i>Cinnamomum bejolghota</i>	Lauraceae	Tree
22	<i>Cirsium falconeri</i>	Asteraceae	Herb
23	<i>Cirsium verutum</i>	Asteraceae	Herb
24	<i>Coelogyne corymbosa</i>	Orchidaceae	Orchid
25	<i>Cotoneaster microphyllus</i>	Rosaceae	Shrub
26	<i>Cymbidium cyperifolium</i>	Orchidaceae	Orchid
27	<i>Cyperus Cyperoides</i>	Cyperaceae	Grass
28	<i>Daphne bholua</i>	Thymelaeaceae	Shrub
29	<i>Daphniphyllum calycinum</i>	Daphniphyllaceae	Shrub
30	<i>Daphniphyllum sp.</i>	Daphniphyllaceae	Tree
31	<i>Datura suaveolens</i>	Solanaceae	Shrub
32	<i>Dendrobium candidum</i>	Orchidaceae	Orchid
33	<i>Dichroa febrifuga</i>	Hydrangeaceae	shrub
34	<i>Diplazium esculentum</i>	Athyriaceae	fern
35	<i>Docynia indica</i>	Rosaceae	Tree
36	<i>Duabanga grandiflora</i>	Sonneratiaceae	Tree
37	<i>Edgeworthia gardneri</i>	Thymelaeaceae	Shrub
38	<i>Eleagnus parvifolia</i>	Elaeagnaceae	Shrub

No.	Scientific Name	Family	Habit
39	<i>Eria coronaria</i>	Orchidaceae	Orchid
40	<i>Erythrina arborescens</i>	Leguminaceae	Tree
41	<i>Eupatorium adenophorum</i>	Asteraceae	Herb
42	<i>Eupatorium odoratum</i>	Asteraceae	Shrub
43	<i>Eurya acuminata</i>	Theaceae	T/S
44	<i>Eurya acuminata</i>	Theaceae	Shrub
45	<i>Exbucklandia populnea</i>	Hamamelidaceae	Tree
46	<i>Ficus roxburghii</i>	Moraceae	Tree
47	<i>Ficus semicordata</i>	Moraceae	Tree
48	<i>Fragaria nubicola</i>	Rosaceae	Herb
49	<i>Gastrochilus</i>	Orchidaceae	Orchid
50	<i>Gleichenia gigantea</i>	Glienchianaceae	Fern
51	<i>Hedera nepalensis</i>	Araliaceae	Climber
52	<i>Hemiphragma heterophyllum</i>	Scrophulariaceae	creeping plant
53	<i>Hydrocotyle javanica</i>	Apiaceae	Herb
54	<i>Ilex aquifolium</i>	Aquifoliaceae	Shrub
55	<i>Indigofera dosua</i>	Leguminosaceae	Shrub
56	<i>Inula cappa</i>	Asteraceae	Herb
57	<i>Juglans regia</i>	Juglandaceae	Tree
58	<i>Leucas ciliata</i>	Lamiaceae	Herb
59	<i>Lindera pulcherrima</i>	Lauraceae	Tree/Shrub
60	<i>Lindera pulcherrima</i>	Lauraceae	Tree/Shrub
61	<i>Lycopodium clavatum</i>	Lycopodiaceae	club Moss
62	<i>Lycopodium clavatum</i>	Lycopodiaceae	Moss
63	<i>Lyonia ovalifolia</i>	Ericaceae	Tree
64	<i>Measa chisia</i>	Myrsinaceae	Shrub
65	<i>Michelia doltsopa</i>	Magnoliaceae	Tree
66	<i>Mikania micrantha</i>	Asteraceae	vine
67	<i>Neillia rubiflora</i>	Rosaceae	Shrub
68	<i>Oleandra pistillaris</i>	Oleandraceae	Fern
69	<i>Ophiopogon wallichianus</i>	Convallariaceae	herb
70	<i>Osbeckia stellata</i>	Melastomataceae	Herb
71	<i>Persea bootanica</i>	Lauraceae	Tree
72	<i>Persea clarkeana</i>	Lauraceae	Tree
73	<i>Phalaenopsis sp.</i>	Orchidaceae	Orchid
74	<i>Pilea umbrosa</i>	Urticaceae	Herb
75	<i>Pinus roxburghii</i>	Pinaceae	Tree
76	<i>Poa annua</i>	Poaceae	grass
77	<i>Polygonum runcinatum</i>	Polygonaceae	Herb
78	<i>Potentilla indica</i>	Rosaceae	weedy plant

No.	Scientific Name	Family	Habit
79	<i>Potentilla microphylla</i>	Rosaceae	Herb
80	<i>Prunus cerasoides</i>	Rosaceae	Tree
81	<i>Pteridium aquilinum</i>	Dennstaedtiaceae	Fern
82	<i>Pteris wallichiana</i>	Pteridaceae	Fern
83	<i>Quercus glauca</i>	Fagaceae	Tree
84	<i>Quercus griffithii</i>	Fagaceae	Tree
85	<i>Quercus lamellosa</i>	Fagaceae	Tree
86	<i>Quercus lanata</i>	Fagaceae	Tree
87	<i>Quercus semicarpifolia</i>	Fagaceae	Tree
88	<i>Rhododendron arboreum</i>	Ericaceae	tree
89	<i>Rhus chinensis</i>	Anacardiaceae	Tree
90	<i>Rhus wallichii</i>	Anacardiaceae	Tree
91	<i>Rubus ellipticus</i>	Rosaceae	Shrub
92	<i>Sauraria nepalensis</i>	Saurariceae	Tree
93	<i>Schima wallichii</i>	Theaceae	Tree
94	<i>Selginella</i>	Selaginellaceae	Spikemoss
95	<i>Senecio scandens</i>	Asteraceae	Climber
96	<i>Smilax myrtilus</i>	Smilacaceae	Climber
97	<i>Solanum khasianum</i>	Solanaceae	Herb
98	<i>Sorbus microphylla</i>	Rosaceae	Shrub
99	<i>Swertia chirata</i>	Gentianaceae	Herb
100	<i>Symplocos glomerata</i>	Symplocaceae	Tree/Shrub
101	<i>Symplocos paniculata</i>	Symplocaceae	Shrub
102	<i>Symplocos ramosissima</i>	Symplocaceae	tree/shrub
103	<i>Toricellia tiliifolia</i>	Toricelliaceae	Tree
104	<i>Tupistra sp.</i>	Convallariaceae	Herb
105	<i>Urtica dioica</i>	Urticaceae	Herb
106	<i>Urtica parviflora</i>	Urticaceae	Herb
107	<i>Vaccinium myrtillus</i>	Ericaceae	Shrub
108	<i>Vanda cristata</i>	Orchidaceae	Orchid
109	<i>Viburnum cylindricum</i>	Axodaceae	Shrub
110	<i>Viburnum erubescens</i>	Axodaceae	Shrub
111	<i>Yushinia microphylla</i>	Poaceae	Bamboo
112	<i>Zanthoxylum armatum</i>	Rubiaceae	Tree
113	<i>Zanthoxylum oxyphyllum</i>	Rutaceae	Shrub

Wildlife

A wide variety of fauna inhabits the forested areas in Trongsa due to its high forest cover and diversity in elevation and forest types.

During the Biodiversity survey, the study of faunal distribution and its occurrence was conducted by looking at specific plots of 10x10m, every 250m along a transect running parallel to the Transmission line. Within each plot, observations on Visual observation of wildlife signs (rooting, feeding, resting, fecal droppings, foot prints, or wildlife sounds were recorded. Also, during public consultation meetings, additional information on wildlife presence was also discussed.

From a total of 74 plots, wildlife signs were found in 23 plots. Species signs that were observed during mammalsurveys include those of Sambar Deer (footprints), Barking Deer (sighted, as well as foot prints and dung), Wild Pigs (resting/wallowing place, footprints) and Assamese Macaque (sighted). All of these four species are considered as pest species and responsible for crop damage and endless sleep for farmers who spend hours protecting their crops from these species.

Graph 2: Percentage of Plots with wildlife signs in them

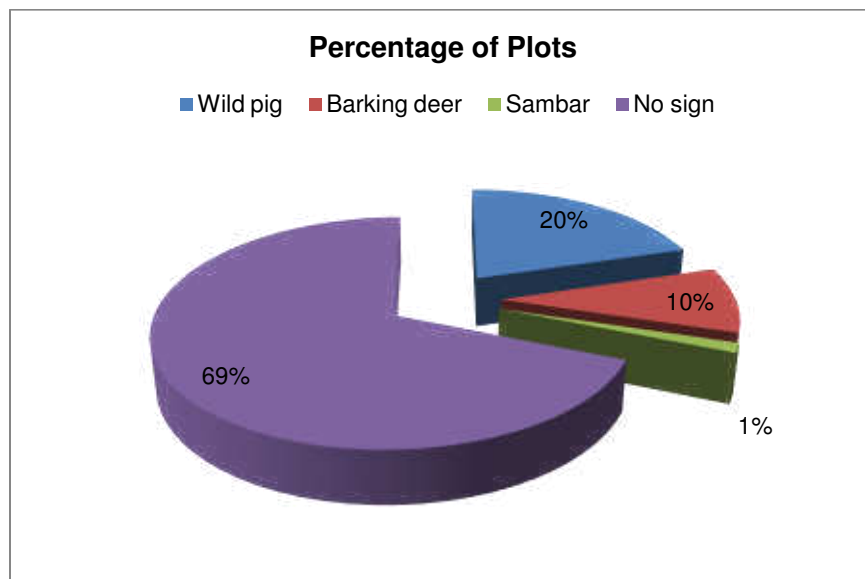


Table 3: Types of wildlife signs found during biodiversity survey

Plot No.	Wildlife species	Sign type	No. of signs
1	Wild pig	resting pl.	1
2	Barking deer	dung	1 clump
7	Barking deer	dung	1 clump
7	Wild pig	rooting	1
8	Wild pig	rooting	1
9	Barking deer	footprint	3
12	Barking deer	dung	1
19	Barking deer	footprint	3
25	Wild pig	rooting	1
30	Wild pig	rooting	1
32	Jungle fowl	scratching	many
33	Sambar	footprint	4
34	Barking deer	spotted	1
37	Wild pig	resting place	1
38	Wild pig	rooting	1
39	Barking deer	footprint	1
44	Wild pig	Rooting	1
45	Wild pig	wallowing	1
46	Wild pig	rooting	1
49	Wild pig	wallowing	1
52	Wild pig	nesting	1
55	Wild pig	rooting	1
60	Wild pig	footprint	1
65	Wild pig	rooting	1
	TOTAL plots		23

Much of the lower slopes in the Project area comprises of Agricultural Land. In the warmer **Broad-leaved Forest that occurs along the** Trongsa – Zhemgang Road there are signs of high anthropogenic disturbances including heavy grazing and lopping so signs of wildlife are much lower.

Based on the forest type and lower level of disturbance higher up on the slopes, the rarer and more elusive species like Leopards, Bears, Capped Langur, Goral, Gray Langur, Himalayan Black Bear, Indian Porcupine, Little Himalayan Rat, Jungle Cat, Leopard Cat and Otter are expected.

Table 4: Status of Wildlife present in the project area.

No.	Common Name	Scientific Name	Expected in project area	Status in Bhutan	IUCN status
1	Leopard	<i>Panthera pardus</i>	Yes	Sch-I	Near threatened
2	Clouded Leopard	<i>Neofelis nebulosa</i>	Yes	Sch-I	Least Concern
3	Leopard Cat	<i>Prionailurus bengalensis</i>	Yes	Sch-I	Least Concern
4	Asiatic Black Bear	<i>Ursus thibetanus</i>	Yes	Sch-I	Vulnerable
5	Wild pig	<i>Sus scrofa</i>	Yes		Least Concern
6	Wild dog	<i>Cuon alpinus</i>	Yes		Least Concern
7	Barking deer	<i>Muntiacus muntjak</i>	Yes		Least Concern
8	Sambar	<i>Cervus unicolor</i>	Yes		Least Concern
9	Indian crested porcupine	<i>Hystrix indica</i>	Yes		Least Concern
10	Grey langur	<i>Semnopithecus entellus</i>	Yes		Least Concern
11	Tiger	<i>Panthera tigris tigris</i>	Yes	Sch-I	Endangered
12	Goral	<i>Naemorhedus goral</i>	Yes		Near threatened
13	Indian gray mongoose	<i>Herpestes edwardsii</i>	Yes		Least Concern
14	Bengal fox	<i>Vulpes bengalensis</i>	Yes		Least concern
15	Assamese macaque	<i>Macaca assamensis</i>	Yes		Near threatened
16	Capped Langur	<i>Trachypithecus pileatus</i>	Yes		Vulnerable
17	Himalayan Serow	<i>Capricornis thar</i>	Yes		Near threatened
18	Jungle cat	<i>Felis chaus</i>	Yes		Least concern
19	Yellow-throated Marten	<i>Martes flavigula</i>	Yes		Least concern
20	Gaur	<i>Bos gaurus</i>	Yes	Sch-I	Vulnerable
21	Little Himalayan Rat	<i>Niviventer eha</i>	Yes		Least concern

Schedule I means that the species is included in the Schedule I of the Species and Nature Conservation Act of Bhutan.*

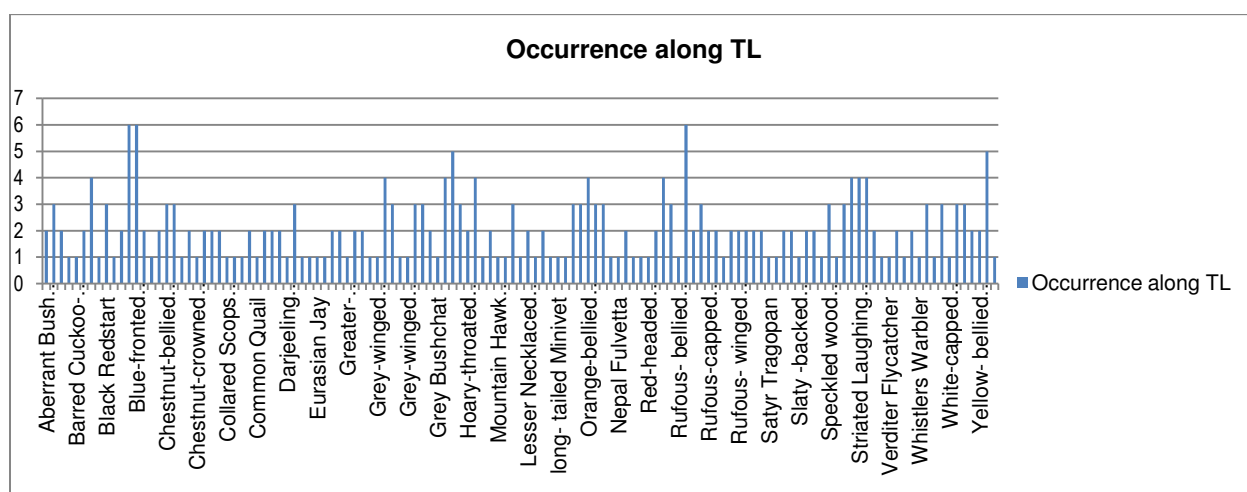
*** The project area is taken to mean within about 5 km of the specific project component footprints.*

Given the presence of the National Highway, the extent of degraded forests and the cleared RoW, and level of human disturbance, it is expected that this area is much less important to the rarer wildlife compared to the undisturbed great expanse of suitable habitat on the higher more remote altitudes away from the villages and the highway

Birds

A total of 123 species of birds were recorded in and around the Project site. These are presented in the table. From these the Rufous-necked Hornbill (*Aceros nipalensis*) is listed as Vulnerable in IUCN and a totally protected species listed in Schedule-I of the Forest and Nature Conservation Act, 1995. The Satyr Tragopan and the Yellow-rumped Honeyguide are both listed as 'Near threatened' in the IUCN Red List. All of these three species were recorded once during the field survey, the Satyr Tragopan near the Taktse Community Forest area, and the Yellow-rumped Honeyguide and the Rufous-necked Hornbill (2 Male and 1 Female) near the top of Kuengrabten.

Graph 3: Frequency of bird occurrence along transects



Many of the species that are found in the project site fall in the "Least Concern" category. These include Thrushes, Bulbuls, Laughing thrushes, Robins, Tree pies, Eagles, Mynas, Minlas, Fulvetta, Honeyguides, Leafbird, Magpie, Fantails, Warblers, Babblers, Pigeon, Wallcreeper, Prinia, Fork tail, Sparrow, Crows, Redstarts, Pheasants and many more.

Table 5: List of birds recorded in project site

S/No	Common Name	Scientific Name	Status in Bhutan	IUCN status
1	Aberrant Bush Warbler	<i>Cettia flavolivacea</i>		LC
2	Ashy Wood Pigeon	<i>Columba pulchricollis</i>		LC
3	Ashy-throated Warbler	<i>Phylloscopus maculipennis</i>		LC
4	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>		LC
5	Barred Cuckoo-dove	<i>Macropygia unchall</i>		LC
6	Black Bulbul	<i>Hypsipetes leucocephalus</i>		LC
7	Black Redstart	<i>Phoenicurus ochruros</i>		LC
8	Black-faced Laughingthrush	<i>Garrulax affinis</i>		LC
9	Black-tailed Crake	<i>Amaurorhynchus bicolor</i>		LC
10	Black-throated Tit	<i>Aegithalos concinnus</i>		LC
11	Blue Whistling Thrush	<i>Myophonus caeruleus</i>		LC
12	Blue-fronted Redstart	<i>Phoenicurus frontalis</i>		LC
13	Blue-throated Barbet	<i>Magalaima asiatica</i>		LC
14	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>		LC
15	Brownish-flanked Bush Warbler	<i>Cettia fortipes</i>		LC
16	Chestnut-bellied Rock-thrush	<i>Monticola rufiventris</i>		LC
17	Chestnut-crowned laughingthrush	<i>Garrulax erythrocephalus</i>		LC
18	Chestnut-crowned Warbler	<i>Seicercus castaniceps</i>		LC
19	Chestnut-tailed Minla	<i>Minla strigula</i>		LC
20	Chestnut-tailed Starling	<i>Strunus malabaricus</i>		LC
21	Collared Owlet	<i>Glaucidium brodiei</i>		LC
22	Oriental Scops Owlet	<i>Otus sunia</i>		LC
23	Common Buzzard	<i>Buteo buteo</i>		LC
24	Common Hoopoe	<i>Upupa epops</i>		LC
25	Common Kestrel	<i>Falco tinnunculus</i>		LC
26	Common Myna	<i>Acridotheres tristis</i>		LC
27	Common Quail	<i>Conturnix conturnix</i>		LC
28	Common Tailorbird	<i>Orthotomus sutorius</i>		LC
29	Coral-billed Scimitar-babbler	<i>Pomatorhinus ferruginosus</i>		LC
30	Himalayan cutia	<i>Cutia nipalensis</i>		LC
31	Darjeeling Woodpecker	<i>Dendrocopos darjellensis</i>		LC
32	Dark-throated Thrush	<i>Turdus ruficollis</i>		LC
33	Eurasian Jay	<i>Garrulus glandarius</i>		LC
34	Eurasian Tree Sparrow	<i>Passer montanus</i>		LC
35	Eurasian Treecreeper	<i>Certhia familiaris</i>		LC
36	Eurasian Woodcock	<i>Scolopax rusticola</i>		LC
37	Golden-throated Barbet	<i>Magalaima franklinii</i>		LC
38	Great Barbet	<i>Magalaima virens</i>		LC

39	Greater Necklaced Laughingthrush	<i>Garrulax pectoralis</i>		LC
40	Green-backed Tit	<i>Parus monticolus</i>		LC
41	Green-tailed Sunbird	<i>Aethopyga nipalensis</i>		LC
42	Grey Bushchat	<i>Saxicola ferreus</i>		LC
43	Grey Treepie	<i>Dendrocitta formosae</i>		LC
44	Grey Wagtail	<i>Motacilla cinerea</i>		LC
45	Grey-backed Shrike	<i>Lanius tephronotus</i>		LC
46	Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>		LC
47	Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i>		LC
48	Grey-winged Blackbird	<i>Turdus bouboul</i>		LC
49	Hill Partridge	<i>Arborophila torqueola</i>		LC
50	Hill Prinia	<i>Prinia atrogularis</i>		LC
51	Hoary-throated Barwing	<i>Actinodura nipalensis</i>		LC
52	Hodgson's Redstart	<i>Phoenicurus hodgsoni</i>		LC
53	Kalij Pheasant	<i>Lophura luecomelanos</i>		LC
54	Large Niltava	<i>Niltava grandis</i>		LC
55	Large-billed Crow	<i>Corvus macrorhynchos</i>		LC
56	Lemon-rumped Warbler	<i>Phylloscopus proregulus</i>		LC
57	Lesser necklaced Laughingthrush	<i>Garrulax monileger</i>		LC
58	Little Bunting	<i>Emberiza pusilla</i>		LC
59	Little Forktail	<i>Enicurus scouleri</i>		LC
60	Little-pied Flycatcher	<i>Ficedula westermanni</i>		LC
61	Long-tailed Minivet	<i>Pericrocotus ethologus</i>		LC
62	Long-tailed Shrike	<i>Lanius schach</i>		LC
63	Long-tailed Thrush	<i>Zoothera dixonii</i>		LC
64	Maroon-backed Accentor	<i>Prunella immaculata</i>		LC
65	Mountain Bulbul	<i>Hypsipetes mccllellandii</i>		LC
66	Mountain Hawk-eagle	<i>Nisaetus nipalensis</i>		LC
67	Olive-backed Pipit	<i>Anthus hodgsoni</i>		LC
68	Orange-flanked Bush Robin	<i>Tarsiger cyanurus</i>		LC
69	Oriental Magpie-robin	<i>Copsychus saularis</i>		LC
70	Oriental Turtle Dove	<i>Streptopelia orientalis</i>		LC
71	Plain-backed Thrush	<i>Zoothera mollissima</i>		LC
72	Plumbeous Water Redstart	<i>Rhyacornis fuliginosa</i>		LC
73	Pygmy Wren Babbler	<i>Pnoepyga pusilla</i>		LC
74	Red-billed Chough	<i>Pyrrhocorax pyrrhocorax</i>		LC
75	Red-headed Bullfinch	<i>Pyrrhula erythrocephala</i>		LC
76	Red-vented Bulbul	<i>Pycnonotus cafer</i>		LC
77	Rock Pigeon	<i>Columbia livia</i>		LC
78	Rufous-bellied Niltava	<i>Niltava sundara</i>		LC
79	Rufous-breasted Accentor	<i>Prunella strophia</i>		LC

80	Rufous-capped Babbler	<i>Stachyris ruficeps</i>		LC
81	Rufous-gorgeted Flycatcher	<i>Ficedula strophciata</i>		LC
82	Rufous-necked Hornbill	<i>Aceros nipalensis</i>	Sch-I	V
83	Rufous sibia	<i>Heterophasia capistrata</i>		LC
84	Rufous-vented Yuhina	<i>Yuhina occipitalis</i>		LC
85	Rufous-winged Fulvetta	<i>Alcippe castaneiceps</i>		LC
86	Russet Sparrow	<i>Passer rutilans</i>		LC
87	Rusty-cheeked Scimitar -babbler	<i>Pomatorhinus erythrogeus</i>		LC
88	Rusty-flanked Treecreeper	<i>Certhia nipalensis</i>		LC
89	Satyr Tragopan	<i>Tragopan satyra</i>		near Threatened
90	Scaly Thrush	<i>Zoothera dauma</i>		LC
91	Scaly-breasted Munia	<i>Lonchura punctulata</i>		LC
92	Scarlet Minivet	<i>Pericrocotus flammeus</i>		LC
93	Slaty-backed Forktail	<i>Enicurus schistaceus</i>		LC
94	Slender-billed Scimitar Babbler	<i>Xiphirhynchus supercilialis</i>		LC
95	Small Niltava	<i>Niltava macgrigoriae</i>		LC
96	Solitary Snipe	<i>Gallinago solitaria</i>		Lc
97	Speckled Wood Pigeon	<i>Columba hodgsonii</i>		Lc
98	Spotted Forktail	<i>Enicurus maculatus</i>		LC
99	Streak-breasted Scimitar Babbler	<i>Pomatorhinus ruficollis</i>		LC
100	Striated Bulbul	<i>Pycnonotus striatus</i>		LC
101	Striated Laughingthrush	<i>Garrulax striatus</i>		LC
102	Striated Prinia	<i>Prinia crinigera</i>		LC
103	Stripe-throated Yuhina	<i>Yuhina gularis</i>		LC
104	Ultramarine Flycatcher	<i>Ficedula supercilialis</i>		LC
105	Verdicter Flycatcher	<i>Eumyias thalassinus</i>		LC
106	Wallcreeper	<i>Tichodroma muraria</i>		LC
107	Wedge-tailed Green Pigeon	<i>Treron sphenurus</i>		LC
108	Whiskered Yuhina	<i>Yuhina flavicollis</i>		LC
109	Whistler's Warbler	<i>Scircercus whistleri</i>		LC
110	White Wagtail	<i>Motacilla alba</i>		LC
111	White-browed Bush Robin	<i>Tarsiger indicus</i>		LC
112	white-browed fulvetta	<i>Alcippe vinipectus</i>		LC
113	White-capped Water Redstart	<i>Chaimarrornis leucocephalus</i>		LC
114	White-collared Blackbird	<i>Turdus albocinctus</i>		LC
115	White-throated Fantail	<i>Rhipidura albicollis</i>		LC
116	White-throated Laughingthrush	<i>Garrulax albogularis</i>		LC
117	Yellow-bellied Fantail	<i>Rhipidura hypoxantha</i>		LC
118	Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>		LC
119	Yellow-rumped Honeyguide	<i>Indicator xanthonotus</i>		near threatened

120	Orange bellied leafbird	<i>Chloropsis hardwickii</i>		LC
121	Nepal Fulvetta	<i>Alcippee nipalensis</i>		LC
122	Orange bellied leafbird	<i>Chloropsis hardwickii</i>		LC
123	Nepal Fulvetta	<i>Alcippee nipalensis</i>		LC

Other orders

Till date no specific surveys have been specifically conducted on Amphibians and Reptiles in Trongsa dzongkhag. Thus there is no baseline information on species that thrive there. During the field surveys, snakes such as Pit viper (*protobothrops*) and Green rat snake (*Ptyas nigromarginata*) were recorded from the Nikachhu project area. Amphibians are usually found in moist places and near water bodies. Flat tailed Gecko (*Hemidactylus platyurus*) and the common Garden lizard (*Calotes versicolor*) can also be found there. Lizards found in Mangdechu include Eastern green calotes (*Calotes jerdoni*), Draco (*Draco dussumieri*), Green Keelback (*Macropisthodon plumbicolor*), Banded Krait (*Bungarus fasciatus*), Python (*Python molurus*) and Common skink (*Mabuya carinata*). (MHPA, no date).

The tadpole could belong to an *Amolops* sp. since this group of frogs inhabits mountain rapids. Other species of frogs spotted in the Mangdechu area include East Asian Tree Frog (*Polypedates leucomystax*), Giant tree frog (*Rhacophorus maximus*), Himalayan torrent frog (*Amolops marmoratus*), Himalayan bull frog (*Pea leibigii*), Tree frog (*Polypedates spp.*) and Leaping frog (*Rana erythraea*) (MHPA, no date).

There is a good diversity of Macro invertebrates at the project site. These include Flies (Diptera), Beetles such as the Rhinoceros beetle, dung beetle, Ladybird, Stag beetle, (Coleoptera), Grasshoppers and Crickets (Orthopterans), Aphids (Hemiptera), Stoneflies (Plecoptera), Mayflies (Ephemeroptera), Caddis flies (Trichoptera), Dragonflies and damselfly (Megaloptera), Moths and Butterflies (Lepidoptera), Bees and Wasps and Ants (Hymenoptera), Spiders (Araneae), Leeches (Clitellata), Ticks (Acarina) and Worms (Oligochaeta).

49 species of butterflies were reported from the Mangdechhu area. These are mainly from the families Papilionidae, Nymphalidae, Pieridae, Hesperidea and Lycaenidae.

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Photos from the survey

Photo 1: *Aureoboletus thibetanus*



Photo 2: *Calocera viscosa*



Photo 3: *Gomphus floccossus*



Photo 4: *Ramaria botrytis*



Photo 5: damsite vegetation



Photo 6: *Rosa sericea*



Photo 9: Snake among vegetation



Photo 10: Aconogonum mollee



Photo 11: Cymbidium sp.



Photo 12: Butterfly on Dulhadea cappa



Annex I: Aquatic Report

A Report on the Aquatic Biodiversity Survey of Nikachu and Mangdechu Hydropower Project Areas

1. INTRODUCTION

Assessment of pre-project biodiversity status and environmental integrity of any area is critical to understand the impact of developmental project. While the BHUCORE had conducted the environmental assessment for Nikachu and Mangdechu hydropower project areas as part of ESIA for Nikachu Hydropower Project, **there was a need to supplement the BHUCORE assessment**, Aquatic biodiversity of the recommended sites was conducted in the first week of December 2012 **by staff from the College of Natural Resources**. The focus of the survey was to assess the ichthyo-fauna, macroinvertebrates, and zooplankton diversity. Attempt was also made to assess the quality of water using macroinvertebrates along with other physical parameters of water. Besides, other habitat parameters at sampling sites were also studied. For the assessment of the fish fauna however, the survey timing was not the best, but this survey provided opportunity to assess the aquatic biodiversity of the waters in the project areas during the cold season.

2. METHODOLOGY AND BASELINE DATA

2.1 Study areas and sampling sites

The survey was carried out in the proposed Nikachu Hydropower Project area and ongoing Mangdechu Hydropower project (MHPP) area as these two projects are cascade projects whereby the water from Nikachu tailrace is to be released above the Mangdechu dam . The area was divided into four sections, viz., section above Nikachu dam site, section between Nikachu dam site and Mangdechu-Nikachu confluence, section between Mangdechu dam site and Mangdechu-Nikachu confluence, and section between Mangdechu-Nikachu confluence and M HPP tailrace tunnel. Eight sampling sites were chosen within the four sections so as to be able to monitor the impact of project on the aquatic ecology during project implementation and also after commissioning of the project. Besides these eight sites, three additional sites were also

sampled to help make the sampling more comprehensive. Figure 1 gives the location of sampling sites and table 1 gives the distribution and coordinates of sampling sites within different sections.

Figure 1. Distribution of sampling sites.

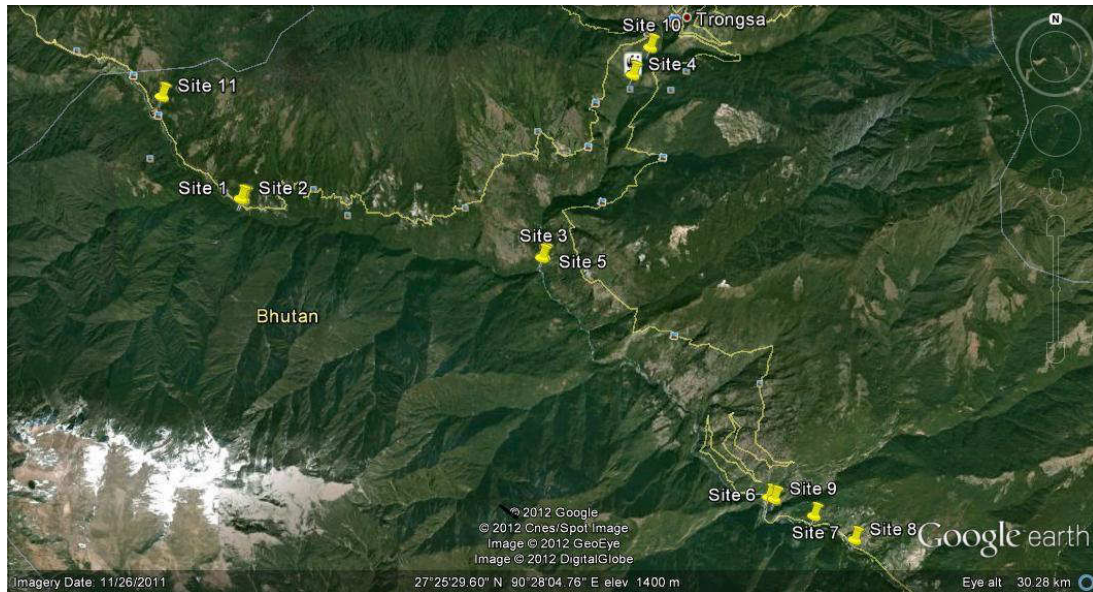


Table 1. Sampling sites along with coordinates.

Sections	Sampling Site No.	Coordinates	Remarks
1. Above Nikachu Dam Site	Site 1	N27°26'54.04" E090°22'23.96"	
2. Between Nikachu Dam Site & Mangdechu-Nikachu Confluence	Site 2	N27°26'55.54" E090°22'26.26"	
	Site 3	N27°26'00.57" E090°27'47.40"	
3. Between Mangdechu Dam site & Mangdechu-Nikachu Confluence	Site 4	N27°28'58.07" E090°29'28.03"	150 m below Mangdechu ADIT2
	Site 5	N27°26'02.11" E090°27'99.04"	
4. Between Mangdechu-Nikachhu Confluence & Mangdechu Tailrace	Site 6	N27°22'00.78" E090°32'04.06"	
	Site 7	N27°21'43.14" E090°32'52.79"	At Mangdechu tailrace tunnel.
	Site 8	N27°21'18.88" E090°33'40.08"	
5. Additional sites	Site 9	N27°22'00.14" E090°32'07.85"	Yurmong stream
	Site 10	N27°29'23.95" E090°29'47.20"	Above Mangdechu diversion channel
	Site 11	N27°28'32.73" E090°21'01.04"	Chendebji stream

2.2 Water and habitat parameters in and around sampling sites

Water and habitat parameters which are important to aquatic biodiversity were assessed at all the sampling sites. The physical parameters of water and habitat parameters are dealt separately below.

2.2.1 Physical parameters of water: The tests were conducted in the field using HANNA pH/EC/TDS/Temperature meter, HI 991300 for conductivity, TDS and water temperature. The water temperature was also measured using thermometer. The relative humidity and air temperature was measured using HANNA HI9564-HI9565 portable water resistant thermo hygrometer. The pH and chemical parameters could not be measured due to lack of chemicals and equipments. Still than the parameters were not felt so necessary to be measured as BHUCORE's initial report found the parameters much below the upper acceptable limits of national standards laid by NEC.

The conductivity varied between 82-110 μ S/cm, water temperature between 5-12°C, TDS between 41-56ppm, air temperature from 9.2-24.4°C and relative humidity between 42.6-66.1%. There were no any unusual values of these parameters, and the values spread between expected values corresponding to the time of the day these parameters were measured and the altitude of the sites (Table 2).

Table 2. Physical parameters of water at different sites with altitude, date and time of sampling.

Parameters	Sites										
	1	2	3	4	5	6	7	8	9	10	11
Conductivity (μ m/s)	82	82	117	*	90	*	105	110	*	*	*
TDS (ppm)	41	41	57	*	44	*	52	56	*	*	*
Water Temp.(°C)	7	7	9	7.5	9	5	10.5	12	9.5	7.9	5.5
Air Temp. (°C)	9.2	9	18.3	13.4	21.2	17.7	18.7	24.4	17.5	16.9	9.3
Humidity (%)	60.5	60.3	42.6	66.1	44.4	52.8	52.7	45.1	55.7	48.4	70.3
Altitude (m)	2251	2177	1466	1818	1390	1014	990	977	1080	1782	2433
Sampling time	2.40 pm	3.50 pm	11.30 am	10.50 pm	12.30 pm	3.30 pm	1.45 pm	10.45 am	3.00 pm	12.10 pm	4.05 pm
Sampling date	1/12/ 12	1/12/ 12	2/12/1 2	4/12/ 12	2/12/ 12	3/12/ 12	3/12/ 12	3/12/ 12	3/12/ 12	4/12/ 12	4/12/ 12

*Parameters were not measured.

2.2.2 Habitat parameters: In-river habitat parameters like river microhabitats (pools, riffles, runs and cascades), nature of river bottom particles, presence of logs or large woody debris and naturally-occurring organic materials(leaves and twigs) in the rivers, and water appearance were visually assessed and recorded into field record sheets at each site. Likewise, the river bank and channel characteristics like river bank and the channel shape, river width, depth and velocity, along with riverside cover and presence of any human land-use within estimated distance of 50 meters from the river bank for about a distance of 100 meters along the river bank at each site were also recorded in the field data sheet.

The microhabitats along both rivers at sampling sites were mainly riffle with side pools, while site 2 below Nikachu dam had mixed of riffle, pool, run and cascade, site 3 (above Nikachu-Mangdechu confluence) had characteristically cascade stretching almost about 200 meters, and the site 10 (above Mangdechu diversion tunnel) had cascade and short waterfalls. When it comes to the nature of bottom particles the sites had mixed of silt, sand, gravel, cobbles and boulders with maximum components being gravels, cobbles and boulders. The sites 1, 2,4,5,6 and 10 had also bedrock as the stream bottom component. Almost all the sites also had logs or large woody debris and naturally-occurring organic materials. The water appearance was clear in all the sites, except at site 5 between Mangdechu dam and Mangdechu-Nikachu confluence, where the water appearance changed from clear to very turbid within 10 to 15 minutes from the time of sampling probably due to release of muck at the worksites above the sampling site.

The river bank and the channel shape were mainly steeply sloping ($>30^\circ$) at all the sites. It was measured using clinostat. Also, all the sites, except sites 9 and 11 had certain portions of the bank on both the sides or on one side of the river with vertical/undercut banks. The estimated average river width of Nikachu at different sites ranged between 14-30 meters, while that of Mangdechu ranged between 20-30 meters. The estimated depths ranged from 1.5-3 meters at Nikachu sites and 1.5-3.5 meters in Mangdechu. The velocity of the rivers at their thalweg ranged from 1m/s to 2.5m/s. There was minimal land-use by human along both the rivers at all the sites. But the sites 3 and 5 were being used by people of Tshangkha village for grazing and site 8 had terrace on the right bank and suspension bridge across the Mangdechu. The other sites (4, 6, 7 and 9) had ongoing works of MHPP. Besides, the site 9 (Yurmong stream) was being dammed and channelized for the construction of new bridge, and site 11 (Chendebji stream) has

national highway crossing across it. The streamside cover along almost all the sites was mainly of trees along with tall grasses and ferns. Boulders and rocks were also prominent features along the banks. The vegetation types and major trees found along the sites are discussed below under section 2.2.3.

2.2.3 Vegetation structures found beside the sampling sites: Around sites 1 & 2 the vegetation were predominantly of *Quercus lamellosa*, *Q. glauca*, *Rhododendron* spp., *Symplocos* sp., *Tetradium* sp., and bamboo. These species were mostly of the members of the cool broadleaved forest species. In the sites 3 and 5 around the confluence area of Mangdechhu and Nikachu, the vegetation was mostly of the warm broadleaved forest consisting of *Schima wallichii*, *Rhus chinensis*, *Rhododendron arboreum*, *Symplocos* sp., *Quercus griffithii*, *Talauma hodgsonii*, *Indigofera dosua* and bamboo. In the Langthel and Yurmong areas where sites 6, 7 and 8 were located, the vegetation primarily consisted of the subtropical species like the *Duabanga grandiflora*, *Alnus nepalensis*, *Bischofia javanica*, *Rhus chinensis*, *Datura suaveolens*, *Adhatoda vasica*, *Opuntia vulgaris*, *Pinus roxburghii*, *Ficus roxburghii*, *F. semicordata*, and *Quercus lanata*.

2.3 Aquatic Diversity

The major focus of the aquatic diversity was on fish, macroinvertebrates and zooplanktons. The following subsections discuss materials and method used for the study along with taxonomic diversity of the three principal groups of organisms under this study along with other organisms sighted during the survey or whose signs of presence were sighted at the sampling sites.

2.3.1 Materials and method: A combination of convenience and purposive survey methods was used for the assessment of aquatic diversity in the study areas. For fish sampling, cast net and seine net were used for generic species collection but for the benthic species single hook was used. In case of macroinvertebrates we used D-frame net to sample and for planktons the sampled water was filtered through 30-µm mesh net and the net was flushed with 4% formalin into the sample collection bottles. The identification of fishes and macroinvertebrates were done using appropriate guide books and literatures available in the field itself, and identification of macroinvertebrates were aided by use of field microscopes. But for the zooplanktons we fixed and preserved samples in 4% formalin and were identified in laboratory

using high power microscopes. Besides, samples of macroinvertebrates were fixed in 10% formalin and preserved in 70% alcohol for further identification and confirmation in the laboratory.

2.3.2 Fish diversity: The water was cold, ranging from 7°C to 12°C, in the sampling sites during the survey (Table 3). Post monsoon seasonal migration of fishes from high water to warm water region was over. Yet the following species of fishes were sampled from different sampling sites during the survey:

Schizothorax richardsonii, the local Snow trout or the Asala (Figure 2), was the most abundant fish species found during the biodiversity survey. This species was collected from many sampling sites of Mangdechu (site 5, 6, 7 & 8).



Figure 2: *Schizothorax richardsonii*

However, in the sampling sites 4 and 9, the sites below and above Mangdechu dam site respectively, the presence of fish was not detected which could be attributed to high disturbances, especially due to muck getting into the river or due to use of explosives. While this species is not known to be a migratory species, it does exhibit seasonal movement – entering smaller tributaries during monsoon and returning back to deep water in post monsoon.

In the Nikachu sites 1 and 2, except the site near the confluence of Mangdechu and Nikachu (site 3 & 5), Brown trout (*Salmo trutta*)-figure 3, was found but not the Asala. The Yurmong stream site (site 9) had several juveniles of *S. richardsonii*, measuring 7–21 cm in length. This indicates that small tributaries of Mangdechu are breeding grounds for this fish species. However, fingerlings of *S. richardsonii* were found in the stagnated or shallow pools of water beside the main stretch of Mangdechu (site 8). The specimen collected from the Mangdechu had ovaries with mature eggs. This indicates that the Asala continues to breed over the winter season as well, perhaps taking



Figure 3: *Salmo trutta*

advantage of low water volume in the rivers.

Two juvenile specimens of *Schistura* sp. and *Psilorhynchus homaloptera* (figure 4) were collected from a pool near the sampling site 8. These benthic species are subtropical species and are mostly found in warm waters, primarily inhabiting small rivers and streams. However, other associate species of the warm water were missing in the pool. The pool was at about a km below the Mangdechu HPP tailrace tunnel.



Figure 4: *Psilorhynchus homaloptera*

3.2.2 Macroinvertebrates Diversity: All the sampling sites were rich in macroinvertebrates (Figure 5 & Table 3). The most common and abundant macroinvertebrates were of orders Plecoptera (stoneflies), Ephemeroptera (mayflies) and Trichoptera (Caddisflies).



Figure 7. Macroinvertebrates in site 1.

The next common orders were Odonata (Dragonfly & damselfly), Megaloptera and Diptera (True flies). Besides these orders, aquatic worms and flatworms (planarians) were there in different sites.

3.2.2.1 Stonefly (Plecoptera): Stoneflies belong to the order Plecoptera and are sensitive to water pollution. They are found in relatively clean waters. All the sites had stoneflies belonging to one family, viz., Perlidae, the so called common stonefly.



Figure 8. Common stonefly at Chendebji.

3.2.2.2 Mayflies (Ephemeroptera): Mayflies belong to the order Ephemeroptera and are very common members of freshwater macroinvertebrates. The members of Ephemeroptera range in their tolerance to pollution from tolerant to sensitive. The order was the most abundant among all the orders in the sampled sites and was represented by family Baetidae, Heptageniidae (Flathead mayfly) and Oligoneuriidae (Brush-legged mayfly).



Figure 9. Members of Heptageniidae (Flathead mayfly), Oligoneuriidae (Brush-legged mayfly) & Baetidae at site 3.

3.2.2.3 Caddisflies (Trichoptera): Caddisflies belong to the order Trichoptera and are fairly tolerant to water pollution. The order is very common in the rivers and streams in Bhutan and it was well represented in all the sites in the survey area. The major families were Hydropsychidae, Polycentropodidae and Rhyacophilidae. The most abundant family was Hydropsychidae of these three families at the sampled sites, while the Rhyacophilidae was represented by *Himalopsyche* sp.



Figure 10. Members of Hydropsychidae (site 1), Polycentropodidae (site 8) & Rhyacophilidae (site 1).

3.2.2.4 Dragonflies (Odonata): The dragonflies belong to order Odonata and include true dragonflies and damselflies. The nymphs of dragonfly were present in sites 1, 2, 3, 7 and 8. The adult dragonflies belonging to three different families, viz., Cordulegastridae, Libellulidae and Aeshnidae, were observed at a side channel forming a pool at site 8. The sites 1, 2 and 7 had larva of *Epiophlebia laidlawi*, a relict species belonging to family Epiophlebiidae that has only three known extant species in the world.



Figure 11. *Epiophlebia laidlawi* at site 1 & 3.



Figure 12. Nymphs of Libellulidae at sites 3 & 7, and adult mountain hawk (*Cordulegaster* sp.) at site 8.

3.2.2.5 Other orders of Macroinvertebrates: The other common orders of macroinvertebrates present in the sampling sites were order Diptera (true flies) with three families Tipulidae (crane fly larvae), Chironomidae (midge fly larvae) and Athericidae (watersnipe larvae), and order Megaloptera with one family Corydalidae consisting of dobsonfly larvae. The site 8 also had adult water strider in the pool inhabited by Balitorid and Psilorhynchoid juveniles.



Figure 13. Dobsonfly(site 1), watersnipe fly(site 1), midge fly (site 3), crane fly (site 8) larvae & water beetle (site

3.2.3 Zooplanktons: Zooplanktons a range of macro and microscopic animals and have representatives of almost all major taxa particularly the invertebrates. Zooplanktons are important components of any aquatic ecosystem where they function as link in the transformation of energy from producers (phytoplanktons) to consumers. In the rivers they are mainly found in the storage zones where volumes of water are essentially stationary in the river

channels. In the sampling sites the zooplanktons were represented by ciliates (Paramecium and choanoflagellates), rotifers and chrysomonads.

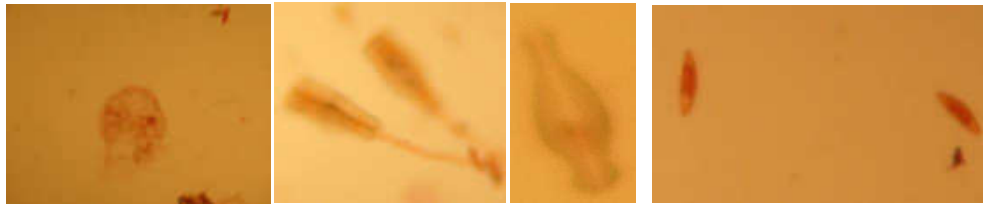


Figure 14. Rotifer (site 2), Choanoflagellate (site 1), Chrysomonad (site 6) & Paramecium (site 6).

Table 3. Distribution of aquatic fauna within sites.

Taxonomic group	Sites										
	1	2	3	4	5	6	7	8	9	10	11
Schizothorax richardsonii	-	-	+	-	+	-	+	+	-	-	-
Schizothorax richardsonii	-	-	-	-	+	+	+	+	-	-	-
Salmo trutta	+	+	-	-	-	-	-	-	-	-	-
Psilorhynchus homaloptera	-	-	-	-	-	-	-	+	-	-	-
Perlidae	+	+	+	+	+	+	+	+	+	+	+
Baetidae	+	+	+	+	+	+	+	+	+	+	+
Heptageniidae	-	-	+	+	-	+	+	+	-	+	+
Oligoneuriidae	+	+	-	-	+	+	+	+	-	+	+
Hydrosychidae	+	+	+	+	+	+	+	+	-	+	+
Polycentropodidae	+	+	+	-	+	+	-	+	-	+	+
Rhyacophilidae	-	-	+	+	-	-	-	+	-	-	-
Epiophlebia laidlawi	+	+	+	-	-	-	+	-	-	-	-

Tipulidae larvae)	-	+	+	-	+	-	-	-	-	-	-
Chironomidae	-	+	+	+	-	-	-	+	-	-	-
Athericidae	+	+	+	-	-	+	+	-	-	-	-
Corydalidae	+	+	+	-	+	-	+	-	-	+	+
Paramecium sp.	+	+	+	-	-	-	+	-	-	-	-
Chrysomonad	+	+	+	-	+	-	-	+	-	-	-

*The symbols – (absence), + (presence)

3.2.4 Other Aquatic Fauna: Few other important aquatic fauna observed during sampling are discussed below:

3.2.4.1 Water shrew: A water shrew was observed getting over a stone by the river bank below the Mangdechu dam construction site (site 4). A worker from the dam site said that the river has many such shrews in the water beside the Mangdechu dam construction site. It is unclear if the abundance of water shrew in the water around the dam site is due to less competition for food which is attributed to the absence of fishes which otherwise could hunt for the same macroinvertebrates.

3.2.4.2 Otter: Scats or droppings of otter were observed in the sampling sites of Mangdechu below the confluence. No such signs of the presence of otter were observed around the dam sites of Mangdechu and the sampling sites at Nikachu. It was not clear how far the otter would migrate up stream along the Mangdechu.

3.2.4.3 Tadpoles: Tadpoles of frogs were observed at the sampling sites of Mangdechu and Nikachu confluence (site 3). However, it was not possible to determine its taxonomic identity. The tadpole could belong to an *Amolops* sp. since this group of frogs inhabits mountain rapids.

4. IMPACTS

Any human activities along the river will definitely have impact on the aquatic biodiversity. The possible impacts due to Nikachu HPP on the fishes, macroinvertebrates, zooplanktons and other organisms is change of natural flow regime and land use changes along the rivers. Current assessment of land use along sampling sites show minimal human disturbance and the quality of water as can be deduced by looking at macroinvertebrates diversity is good. Once both the projects are commissioned, a major impact could be due to totally dewatered region between Nikachu dam and Mangdechu dam to the Mangdechu tailrace tunnel especially during lean seasons when other tributaries to both the rivers within the dewatered area become themselves very less or dry up.

For the fishes local distribution will be impacted because of dams as well due to change in water discharge regime. It could be also impacted change in macroinvertebrate diversity as the macroinvertebrates provide food for the fishes. For the macroinvertebrates the change in in-stream or in-river condition like presence or absence of naturally-occurring organic materials and bigger logs (snags), and change in river bed materials could have impact. For zooplanktons the change in river flow regime may change the amount of storage zones along the rivers and could either lead to increase or decrease in number. However, at the dams the number could go high due to more water residence time as zooplanktons require longer time for development.

5. MITIGATION AND MANAGEMENT PLAN

5.1 Fish Diversity: Brown trout is an exotic species introduced widely in Bhutan. It is less adapted to mountain rapids and its population density seems to depend on the severity of seasonal floods. It is a cold water species and can survive low water temperature, but moves to deeper water during winter. Construction of dam is not likely to have much effect on the species. However, this is a game fish and therefore needs restocking if its population declines below certain level.

Conservation of Snow trout requires protection of its natural habitats, streams and rivulets in particular which help fingerlings to grow. This benthic feeder has suckorial disc and are adapted to mountain rapids. However, like for any other fish species, high-head dams are obstacle even to

the short distance upstream or downstream seasonal migration. Since the fish ladders or automated bucket lifts do not facilitate fish migration in rivers with high-head dams, genetic drift can be avoided by catching fish from any side of the dam and releasing them to the other side on a regular basis.

Monitoring fish population on either side of the dam needs to be done regularly with established scientific protocols. For reasons, particularly to give scientific rigour and avoid vested interests, independent researchers from established organization with research capacity should be encouraged to monitor such programmes.

7.2 Macroinvertebrates and zooplanktons: For the macroinvertebrates and zooplankton diversity the microhabitats along the rivers need to be maintained with minimal disturbance. Therefore, proper muck disposal during construction phase and maintaining the natural regime of other tributaries is essential. Other important factor is to minimize the water pollution by human use and for this project activities should follow set standards set by concerned agencies.

For dragonfly the maintenance of natural vegetation structure along the rivers is important as it acts as visual cue for habitat selection by the parent generation for laying eggs for next generation. Though there is a relict species, *Epiophlebia laidlawi* in the project area, the nymph of the species was recorded elsewhere in the country and also at the head waters of Nikachu, and therefore if those places are taken care of there is minimal impact on the species.

The monitoring of the macroinvertebrates along the project area and the tributaries using accepted protocols and application of adaptive management of the river sections within project area is recommended for maintenance of ecological integrity to the maximum extent possible, so as to have minimum impact on its current composition.

Though it is economically not viable to maintain the current status of the instream fauna, but it could be done to optimal level possible. For this, the project could also specify an environmental flow regime that could include minimum flows, flood sequences with specified magnitudes, return intervals and frequencies for maintenance of channel characteristics and triggering key biological events, a seasonal pattern of flows, and rates of rise and fall of flow which are similar to natural responses to rain events.

Annex J: Socio-economic Report

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Abbreviations/Acronyms & Glossary

BHU	Basic Health Unit
CGI	Corrugated Galvanized Iron
DGCPL	Druk Green Power Corporation Limited
GNHC	Gross National Happiness Commission
GT	Geog Tshogde
Hh	Household
KW	Kilowatt
M&E	Monitoring & Evaluation
MS	Micro Soft
MW	Mega watt
NHPP	Nikachhu Hydro Power Project
ORC	Outreach Clinic
PHCB	Population & Household Census
RNR	Renewable natural Resources
RP	Resettlement Plan
SIA	Social Impact Assessment

Executive Summary

With the mandate to manage existing power generating facilities as well as to accelerate hydro-power development in the country, the DGPCL will develop the 115 MW Nikachhu Hydro-power Project in Trongsa dzongkhag. This document, the Social Impact Assessment is part of the feasibility studies carried out for the NHPP to describe the social impacts of the project. The objective of the SIA is aimed at taking stock of the current socio-economic situation of the population living in the area and to identify impacts and vulnerability.

The SIA was carried out using the sample survey method with structured questionnaires administered on 127 households sampled in the villages amounting to 73% of the total households in the project villages under Tangsibji village and indirectly benefiting villages under Drakten geog. Among those interviewed, 71% were women and also 67% women headed households. The data shows that an extended family form of residence prevalent with a household size of 4.3 persons and sex ratio of 1.22 females for each male. Populations are mostly young with 36% in the youth category and with 58% of the economically active population supporting a 48% of the dependent population. The population also shows a low level of divorcees (28%) and widows (8%).

The majority of the population is engaged in farming for their livelihoods with low levels of participation in business. The level of skills in construction trades is also low. However, off-farm work opportunities are available with the project area providing substantial opportunities to use such skills. Morbidity is low in the villages. Education levels among the population are also low with 60% who have never been to school.

Land is the main productive asset owned but up to 72% of the dry land is used and up to 75% of the wetland is similarly utilization showing in-optimal land utilization due to wild life predation, water insufficiency and farm labour shortages. Yields of paddy are low though the maize yields are comparable to national averages. Few horticultural crops are sold. Use of farm inputs and credit is low implying low investments in agriculture. Livestock rearing especially of improved cattle breeds seems to be on the rise as an important means for supplementing incomes of the people through sale of dairy produce.

The farmers are relatively affluent owning big houses and with good access to basic services such as electricity, water and sanitation. Access to services such as health, education, RNR and economic and political institutions is also noted to be good for the population. Though there were not many that lived below the poverty line, incomes were still moderate with most of the income earned from agriculture. Farmers were noted to own many of the household assets indicating presence of disposable income to purchase such assets. Expenditure on non-consumption heads such as education, religious ceremonies as such exceeded the consumption expenditure indicating a diversified expenditure base of farmers. There are as yet few shops and businesses in operation in the project area.

The main types of vulnerability faced are crop failure and loss of livestock and illness and injury although these were not so serious as to incapacitate farmers. Levels of disability are low in the area. Only 7 households faced income poverty in that they earned less than the stipulated Nu. 1,097 a month

designated as the poverty line in Bhutan. Widowhood and divorce is also low. In total 13 farmers had land holding below 1 acre. From this we can deduce that though vulnerability is low, it is present in some form or the other. However, compounding of vulnerabilities and what this means in terms of being affected by project impacts has been taken up in the RP.

In the planning phase of the project, people have been consulted and they have participated in discussions, the household survey and in leading the teams to their land and resources during the feasibility study. They have high expectations in terms of benefiting from the project mostly in enhancing their livelihoods and their access to social and economic infrastructure and institutions. They are eager to receive the project and to participate. Other agencies such as the GNHC, Ministry of Finance, DGPCL will operate through the procedures to ensure implementation of the project with the assistance of the private sector and assistance of donors as relevant. No form of opposition from any individual or pressure group has been discerned till date implying that people are buying-in to the project and through good implementation and adequate consultation a post-completion win-win situation for all is expected.

Chapter 1: The Project

1.1 Background

The Druk Green Power Corporation Limited (DGPCL), established in 2008, is mandated to manage existing power generating facilities and to accelerate hydropower development in the country. The company currently operates five power plants with an installed capacity of 1,480 MW. It is responsible for the operation and maintenance of the power plants after construction. On Royal Government of Bhutan (RGoB) approval to develop the 208 MW Nikachhu Hydro Power Project (NHPP), DGPCL recently commissioned the Feasibility Studies of which among others constituted the Social Impact Assessment (SIA) detailed in this report.

From an estimated total hydropower potential of 30,000 MW, about 5% has been harnessed amounting to an installed capacity of 1,480 MW till date from the 5 hydro-power plants across the country. Further, a total of 10 projects (10,000 MW capacity) have been selected jointly by the Governments of Bhutan and India for development of by 2020. These 10 projects have different implementation modalities such as bi-lateral development by the two governments, joint ventures between government corporations of the two countries and sole implementation by Druk Green Power Corporation. DGPCL will implement 4 projects on its own of which the Government approved Nikachhu Hydro Power Project (NHPP) is among them that the DGPCL will implement on this mode.¹

1.2 Description of the Project

Nikachhu Hydropower Project is located about 5 hours' drive from Thimphu towards East, on the river Nikachhu (a tributary of Mangdechhu with the catchment north and south of the road running from Pele La to Tangsibji), between 3 km (approximately) downstream of the Chhunabchhu confluence and the Nikachhu/Mangdechhu confluence in Trongsa District, Bhutan. The environmental and social assessment was once concluded in 2011 with dam locations at Lorim (27°26'55.41"N and 90°22'22.21"E) and Power House location at Tangsibji Village (27°26'29.46" N and 90°27'17.90"E). Although the locations seemed feasible the costs of the project was assessed to be substantial. Moreover continued geological investigations revealed Power House location options in more stable locations. As such, the changed locations and scope of the project necessitated additional social and environmental assessments.

1.3 Project Components

The Project components which will be spread over the project area are described in this section. The location of the project components from the onset had the broad objective of ensuring, that as far as possible, the facilities would be constructed on government land so that there is minimal impact on land and livelihoods of villagers.

(a) Adits

¹ Sourced from <http://www.drukgreen.bt/Content2.aspx?c=114>. See link for complete list of projects to be developed by 2020.

Adits are potentially the least damaging to private land and property since adits are all constructed underground. The table below shows five adits to be constructed which will cut across most of the villages in the project area namely Serpochen which is the main dam and intake area, Tashiling and lastly Norbuodi which will host the surge shaft and power house. In total 13.74 km of adits are planned.

Table 1: Details of adits to be constructed

ADIT	Length (m)
ADIT-1	509.81
ADIT-2	830.74
ADIT-3	523.35
ADIT-4	693.95
ADIT-5	791.31
ADIT to surge shaft top	463.00
ADIT to BVC	369.00
Total (m)	4,181.16

(b) Muck disposal sites, batching plants, colonies and camps

A number of other structures to be constructed on the land surface are muck disposal sites, batching plants, colonies and temporary worker camps. The table below shows the amount of land that each of these structures will occupy. As mentioned before, to the extent possible, during the design phase, these have been located on government land but where unavoidable; some private land will be affected. As noted an area extent of 273.14 acres will be required to locate these facilities. The area and type of private land impacted will be detailed out in the Resettlement Plan document.

Table 2: Details of muck disposal to be constructed

Muck Disposal Area	Locations	Area m ²
Disposal site- I	Upstream of dam	44,605.00
Disposal site- II	Downstream of dam	23,373.00
Disposal site- III	Near Silt Flushing Tunnel	46,990.00
Disposal site-IV	Adit -1	55,958.00
Disposal site- V	Adit -2	72,996.00
Disposal site- VI	Adit – 3	83,055.00
Disposal site- VII	Aidt – 4	29,303.00
Disposal site- VIII	Common disposal site at Tsangkha	73,116.00

Muck Disposal Area	Locations	Area m ²
Disposal site- IX	Adit- 5	51,631.00
Disposal site- X	Surge Shaft area	41,198.00
Disposal site- XI	Pressure Shaft area	16,593.00
Disposal site- XII	Power House area	71,000.00
Total		609,818.00

(c) Approach road

Most approach roads to muck disposal sites, adits, surge shaft, power house and colonies have their off take from the national highway and existing farm roads. The table below shows that in total 13.37 km of approach roads will be constructed leading to the different structures.

Table 3: Details of access roads to be constructed

No.	Access Road (s) to:	Approximate Length (km)	Place
1	Surge Shaft	3.467	Norbuodi
2	Adit I	2.584	Serpochen
3	Adit II	2.572	Badela/Tsembla
4	Adit III (Option 1: Tsheringma Drupchhu)	2.491	Tsheringma Drupchu
5	Adit III (Option 2: Tashiling)	1.326	Tashiling
6	Adit IV	0.474	Tashiling
7	Adit V	0.155	Norbuodi
8	To Main Access Tunnel (MAT): PH (From MHPA Dam)	0.305	MHPA Dam
Total		13.374	

(d) Transmission line

The transmission line is also a component which will evacuate power from the NHPP power house to join the grid at Yurmu. Some 18.92 km of transmission lines entailing 64 towers will be required. The towers will be located mostly in government reserved forest land but some amount of land where the towers will be located in private land and will acquire 10 acres of land.

1.4 Objectives of the Social Impact Assessment

The overall purpose of the SIA is to assess and analyze the social impacts of the proposed project.

The objective of the SIA is to produce an independent and robust Social Impact Assessment Report that will satisfy best practice and applicable national and international requirements. The social impact assessment process should be built on the following three elements:-

- a detailed assessment of the socio-economic conditions of the people who may be negatively/positively affected;
- a detailed study of the impacts in terms of the extent of land acquisition, crop and tree loss, displacement, livelihoods and employment impacts, aesthetic impacts, cultural impacts (both tangible and non-tangible), community impacts, demographic impacts, development impacts, economic impacts, gender impacts, health impacts, impacts on vulnerable groups and indigenous peoples, infrastructural impacts, institutional impacts, leisure and tourism impacts, political impacts (good governance, human rights, democratization etc.), poverty impacts, psychological impacts, resource impacts (access and ownership of resources), and impacts on social and human capital;
- a detailed plan to mitigate the identified impacts and an assessment of the costs of such measures. It is essential to generate key indicators based on the social impact assessment in order to facilitate monitoring. Most essential of all is that the impact assessments should be transparent, participatory, and verifiable. This section of the work will be contained in the Resettlement Plan (RP) document.

1.5 Methodology

1.5.1 Sampling criteria, survey and data collection

The approach and methodology proposed here are best practices of international application - advocated and mainstreamed into loan portfolio projects by the World Bank and the Asian Development Bank. These procedures have been applied in Bhutan with a notable measure of success. Described below are a summary of the approach and methods. The approach and methods are organized below by broad activities carried out in the assessment.

Stakeholder analysis

A stakeholder is any person, group or institution that has an interest in a development activity, project or programme. This definition includes intended beneficiaries and intermediaries, winners and losers, and those involved or excluded from decision-making processes. The stakeholders were met and information collected in focus groups or in key informant interviews. The table below summarizes the stakeholders and nature of engagement during the study: -

Table 4: Stakeholder by type and expected engagement

No.	Stakeholder	Type of stakeholder	Activity planned for engagement during study
1.	DGPCL	Primary	Discussions on project and secondary data collection.
2.	Local government (Tangsibji, Drakten)	Secondary	Views on project and its development prospects. Participation in the project,
3.	Community members impacted by project	Primary	Perceptions on benefits and adverse impacts. Views on compensation packages. A survey planned in the catchment villages taking roughly 30% sample households of both impacted and non-impacted households to establish the socio-economic baseline. A Census of all impacted persons, their property and

			discussions to gather their views, hopes and fears about losses.
4.	Businesses	Secondary	Perceptions on benefits and adverse impacts on their livelihoods. Purposively sampled business by category (hotels, shop keepers, contractors, taxis)

The output of this exercise is a matrix listing the stakeholders describing their interests, potential project impact on them (positive, negative or neutral) and relative priority of their interest. From this the 'influence' and 'importance' of stakeholders can be assessed. Influence refers to how powerful a stakeholder is. Importance refers to those stakeholders whose problems, needs and interests are the priority of DGPC's intervention - if these 'important'; stakeholders are not assisted effectively then the project cannot be deemed a 'success'. By combining influence and importance, stakeholders can be classified into different groups, which will help identify assumptions and the risks, which need to be managed through project design. Stakeholder analysis can contribute to the process of deciding how the key stakeholders are to be included in the project. Note that 'key' refers to high importance, high influence, or both. The second output of this exercise will be Stakeholder participation Plan - a matrix describing the type of participation (inform, consult, partnership, control) required of stakeholders by stage (identification, planning, implementation, implementation and monitoring) in the project.

Consultations

Consultations are an important component of social (impact) assessments. These events are crucial to test acceptance or opposition of the project by beneficiaries. Since this assignment attempts to cover the extended joint project area, the previous SIA and concurrent consultations carried out for the reduced scope already will contain much information on consultations. These will be referred to as a point of reference to design and carry out additional consultations for people living within the extended area.

In the appraisal stage project affected persons need to be consulted on their perceptions of the project, opinions on losses and discussion on the compensation package, sharing information on procedures and rates of compensation, as well as understanding their needs for better implementation of the RP. Once the RAP is prepared it needs to be disclosed to the project affected people in a meeting. The land and property impacted, the rates of compensation calculated, procedures for land acquisition and compensation as well as provision of a grievance redressal mechanism has to be explained. The output of the consultations describes discussions and agreement/recommendation on each point with a list of signatures of all persons attending the consultations.

Socio-economic Survey

It is necessary to understand the socio-economic profile of people living in the area where the project will be implemented for several reasons. Firstly, from the socioeconomic profile, the core social issues can be accentuated such as the economic status and socio-economic differentiation of people to categorize and to focus on the truly vulnerable populations based on variables such as age, marital status, income, employability, food security, land holdings, disability and income. Secondly, from the survey, information on perceptions of people on the project can be aggregated to ascertain the level of buy-in to the project. Thirdly, impacts on people and their property or livelihoods can also be identified through the survey.

The socio-economic study will be carried out through a survey among a selected sample of households from each village within the primary influence area of the project using a structured questionnaire. It

may be noted here that the sample selected in the earlier study was small and therefore was not representative. Those not covered in the sample earlier will be covered. So it would be useful to have the database of interviews and data collected by Kyongkhon Consultancy Services.

This will be supplemented by a few interviews with key informants such as the Dzongda, Gup and tshogpa. The purpose of carrying out a key informant interview with the tshogpa is to solicit support for effective implementation of the surveys and consultation, understand local social dynamics, triangulate information on vulnerable populations and also to get their views and perceptions about the project. The interview with the Dasho Dzongda and Gup will provide the views of the local administration and the level of buy-in to the project besides providing the historical and developmental context the project is in. The key informant interview will be conducted using a semi-structured questionnaire.

Resettlement Plan (RP)

The proposed Nikachhu HP will acquire land for construction of project infrastructure such as: access roads, powerhouse, dam, surge shaft, offices, residential colonies, muck disposal sites and stone quarries. However, it is expected that most land acquired would fall in government-owned territory averting need to acquire private land. Acquisition of land may induce involuntary resettlement and impact on cultural properties of significance. The survey team visited all the sites identified for the facilities and coordinates have been taken and the areas mapped. These were verified during the Socio-economic Survey by the Social Assessment Team, owners identified and consultations conducted besides coming up with tentative quantities of land or properties affected and costs worked out as compensation.

It may be noted here that a RP has been prepared for all the facilities to be established in 2010-2011. However, besides the dam located at Lorim, all other facilities have been relocated. The RP for these will be taken up and the earlier RP updated. Besides, in this study, the earlier affected persons and properties of the Dam, if any, will be re-validated. The earlier study identified 19 households who were affected.

The RP will contain several important components namely an entitlement framework that spells out who is eligible for what and on what basis. The RP will also contain a section on the valuation of land and affected properties. The RP will also describe the procedures for compensation and resettlement assistance. A work plan will be drawn up indicating the milestones for achieving RP objectives besides a detailed budget for carrying out the RP and the compensation package. An M&E framework and institutional arrangements for carrying out the RP will be described. Disclosure of the RP through a community meeting with affected persons as well as making available a translated version of the RP in the local government office and with village tshogpas of villages having Project Affected Persons populations will be done.

1.5.2 Survey Instruments and training

A number of methods and tools have been used to gather information for the SIA and the RP. These are described below:-

(a) SIA

- The primary method used for the SIA was the household sample survey method wherein the sample of respondents to be interviewed was pre-calculated to determine the number of respondents to interview. The respondents were selected randomly from the frame which

consisted of the villages that benefit or would be impacted directly by the project (e.g. villages under Tangsibji geog) and villages that would indirectly benefit or be impacted by the project (e.g. villages under Drakten geog). The survey team used a structured socio-economic survey questionnaire as the primary tool to collect quantitative data.

- Other tools used were semi-structured checklists to gather qualitative information to assess impacts as well as perceptions of benefits from key informants such as the Geog Tshogde personnel and village tshogpas.

(b) Resettlement Plan

- As opposed to selecting a sample for the socio-economic survey, the RP exercise was carried out as a census wherein all affected people were interviewed and consulted. While the affected people also responded to the generic socio-economic questionnaire, in addition, a structured questionnaire containing questions to build up their asset inventory and to assess the extent of impacts on property (land, structures) as well as livelihoods formed the key tool used to gather both quantitative and qualitative information from affected persons.
- Additionally, the focus group discussion method was used to carry out consultations with affected persons. This method was chosen particularly because there are only 11 affected persons. This method seemed suitable for a group of such a size. A checklist of open-ended questions was prepared and used with affected persons.

1.5.3 Data analysis and reporting

Preceding the survey, enumerators were trained on survey methods and techniques. The tools for the survey were discussed in detail in the language to be used in interviews at village level. Data was collected by a survey team comprising of 6 enumerators, 1 Supervisor and the Consultant over a period of one week. The data was cleaned by the Supervisor at the end of each day during the survey. One more round of cleaning was done once all the data was entered in MS Excel. The data was then transferred to SPSS for data summary and preliminary analysis. The Consultant also carried out an intensive web search to assimilate secondary information and statistics on Trongsa district and Tangsibji geog. Data in tables or represented by graphs as well as photos were judiciously placed in MS Word processor used for preparing the Report.

1.5.4 Outline of the Report

Chapter 1 opens the Report providing a brief background on DGPC, its mandate and work and the genesis of the SIA. The NHPP location and project components are also discussed in this section as well. The objectives of the SIA and the methodology and tools employed in the study to achieve the objectives have been elaborated by the areas of inquiry namely the socio-economic survey, stakeholder analysis, resettlement plan, the consultations.

Next, in Chapter 2, Trongsa District and Tangsibji geog are briefly described providing basic statistics on development facilities available.

Chapter 3 is the largest in volume of content as it contains the findings of the socio-economic survey and discusses demography, occupations, health and education status, land ownership and utilization, agricultural and livestock production, housing and access to basic services, access to credit and

savings, income, asset ownership and consumption (used interchangeably with expenditure), enterprises and vulnerability.

Chapter 4 very briefly outlines the stakeholder consultations commencing with a stakeholder analysis as well as explicating information dissemination.

In Chapter 5, perceptions of benefits and adverse impacts of the Project of people are explained. Note that a large part of the narrative in section 4.3 entitled Stakeholder Exchange and Outcomes is relevant here but has not been reproduced.

Chapter 6 provides some conclusions on some of the key findings.

Chapter 2: Project Area

2.1 Trongsa District

Trongsa (meaning new village in the local dialect) is a district located in the central region of Bhutan. It is historically important as the seat of Kings of Bhutan who administered the country from this Dzongkhag. The origin of the place is attributed to Yongzin Ngagi Wangchuk, a historical personality in Bhutan who established a meditation centre in 1543 attracting disciples which steadily grew into a settlement. The Trongsa Dzong and the Ta Dzong (watch tower now converted to a museum) are important cultural landmarks in Bhutan. The dzongkhag is located in the heart of the country. It covers an area of about 1807 km², with elevation ranging from 800 meters to 4,800 meters above sea level with a total population of about 14,977 (estimated) in 2011 with a growth rate of 1.4%. As per the PHCB 2005, Trongsa has 2,739. It shares boundaries with Bumthang dzongkhag to the northeast, Wangdiphodrang dzongkhag to the west and Zhemgang dzongkhag to the south.

Despite formidable rugged terrain in most part of the dzongkhag, the blacked topped East-West highway and the Trongsa-Gelephu highway passes through the dzongkhag connecting almost all geogs serving as the main economic artery. Though the East-West and Trongsa-Gelephu highway passes through the dzongkhag, settlements are still remote due to lack of feeder roads. Remoteness and rugged terrain makes delivery of services difficult and costly. Still, every Geog in the dzongkhag has a BHU, RNR center and a School each providing basic services. Trongsa dzongkhag consists of five geogs namely, Drakteng, Korphu, Nubi, Langthil and Tangsibji. The dzongkhag is further divided in two Constituencies - Nubi Tangsibji and Drakteng Langthil for electoral purposes.

Some important data on developmental facilities is provided below.

Table 5: Statistics on development facilities for Trongsa and Bhutan

No.	Development facility	Quantity Trongsa	Quantity Bhutan	Remarks
1.	Schools	24 nos.	606	Statistical Yearbook of Bhutan (2011)
2.	Hospitals	1 nos.	31	Statistical Yearbook of Bhutan (2011)
3.	BHUs	7 nos.	181	Statistical Yearbook of Bhutan (2011)
	ORCs	21 nos.	518	Statistical Yearbook of Bhutan (2011)
4.	RNR Centers	5 nos.	139	Statistical Yearbook of Bhutan (2011)
5.	Irrigation canals	85 nos.		Not available (will be updated for Final Report)
6.	Farm roads	94.92 km	8,366	
7.	Feeder roads	24.20 km		Statistical Yearbook of Bhutan (2011)
7.	Telephone connections	631 nos.	27,490	Annual InfoCom & Transport Statistical Bulletin (2012)
8.	Internet connections	151 nos.	139,896	Annual InfoCom & Transport Statistical Bulletin (2012)
9.	Temples	93 nos.		Not available (will be updated for Final Report)

2.2 Tangsibji geog

Tangsibji is one of the geogs (county) of Trongsa located about an hour's drive away before reaching Trongsa from Thimphu. It is inhabited by people known as Man dips who speak Mangdechhu, a dialect spoken in Tangsibji geog and a few villages under Drakten geog such as Taktse, Yuesa and Tashidingkha. Both these terms are derived from the river Mangduechhu which drains the area.

The Geog consists of seven villages, 232 households and a population of 1,848 persons according to the PHCB-2005. It covers an area of 372 km² with Wangdiphodrang Dzongkhag to the west, Langthil Geog to the south and Drakteng Geog to the east.

The east-west highway runs through the Geog acting as a main artery for economic development. Most villages are remote yet 4 farm roads have been constructed. Paddy, rice, maize and vegetables are the major crops grown.

There are two micro hydels in the Geog at Chendebji and Tangsibji respectively. The micro hydel at Tangsibji village was established in 1987 with a generating capacity of 0.03 MW benefits 53 households. The micro hydel at Chendebji was established very recently in 2005 with a generating capacity of 70 KW benefiting 31 households. All villages now have electricity supply. Besides the Trongsa Dzong, the most popular and sacred monument, Chendebji chorten is located within this Geog. There are 14 lhakhangs (temples) in the geog.

Chapter 3: Findings - Socio-economic situation

3.1 Demography

An adult member of each sampled household was invited for the interview. The household was selected on the criteria that it was to be from one of the benefiting villages. As the data in table 6 shows, a total of 127 respondents were interviewed. From the frame provided in a previous Report² of 174 households was a calculated sample of 120 households. However, in the survey, a total of 127 households were enumerated. This takes the survey coverage to 73% of the total households in the villages under Tangsibji and Drakten villages respectively. As also noted in the table, 3 villages of Tangsibji, Tsangkha and Drangla were covered with 61 households covered from these villages under Tangsibji which will be directly benefiting from the Nikachhu HPP. Under Drakten geog, the villages of Changrey, Kingarapten, Taktse, Yuesa and Tashidingkha which will be indirectly benefiting from the NHPP were covered as well. It is important to note that 71% of the respondents were women as compared to just 29% of men indicating that women are more available for village-based interviews than their men counterparts.

Table 6: No. and percentage of respondents by sex and village

Village	Sex of respondent					
	Female		Male		Total	
	No.	%	No.	%	No.	%
Tangsibji geog						
Tangsibji	23	26	7	19	30	24
Tsangkha	20	22	4	11	24	19
Drangla	2	2	5	14	7	5
Drakten geog						
Changrey	4	4	1	3	5	4
Kingarapten	14	16	9	24	23	18
Taktse	4	4	5	13	9	7
Yuesa	13	14	1	3	14	11
Tashidingkha	5	6	2	5	7	5
Total	90	71	37	29	127	100

The data in table 7 below also shows an overwhelming majority of women respondents in the position as heads of households (67%) as opposed to men who also head households (33%). It is important to clarify here that the 'head of household' concept was explained to the respondent to mean *'the person in the household who took major decisions and was responsible for the welfare of other members of the family.'* With this working definition, respondents could identify the household head. Also, being women-headed in Bhutan does not necessarily imply that the person and household as such is vulnerable. Women who head

² Social Impact Assessment, Kyinkhor Consultancy Services, December 2010

households in many cases are not widows or divorced but enjoy this status in the homes by virtue of them not only owning the land but also participating in decisions about farming, use of family budget and reproductive (continuity of household activities) tasks as well. It can be seen too, that from both affected and non-affected households' women predominate as household heads. Therefore, from this we can conclude that in Bhutan as compared to other countries in the region – such as Nepal or India, the status of being a woman heading a household, by itself is not to be construed as the women being vulnerable. There are other social variables such as marital status, age, disability, landholding, economic situation in the household and productive capacity of the household (labour) which can be examined together with household status to ascertain vulnerability.

Table 7: No. and percentage of respondents if HH head by sex and affected project affected status

Type of Respondent	If Respondent head of household											
	No				Yes				Total			
	Sex of respondent				Sex of respondent				Sex of respondent			
	Male		Female		Male		Female		Male		Female	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Not affected	3	15	17	85	30	31	67	69	33	28	84	72
Affected	0	0	4	100	4	67	2	33	4	40	6	60
Total	3	12	21	87	34	33	69	67	37	29	90	71

Data on the relationship of family members to the household head shows that largely besides the household heads and their spouses (husbands or wives), sons and daughters and brothers and sisters live together. This indicates that the form of residence people reside in which appear as nuclear are actually extended with sons and daughters living in with their parents. This is common in both affected and non-affected households. This is not necessarily bad as older parents often take care of the younger children and cattle while the adults can work in the fields. The elder are also guaranteed care in proximity to relatives in their old age indicating that family links are still strong.

Table 8(a): No. and percentage of HH members' relation to Hh head by sex and affected project affected status

Type of Respondent	Relation to Hh Head															
	Wife husband		Son daughter		Grandchild		Niece nephew		Father Mother		Sister Brother		Son daughter-in-law		Brother sister-in-law	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Not affected	92	18	143	28	9	2	21	4	47	9	27	5	16	3	6	1

Type of Respondent	Relation to Hh Head															
	Wife husband		Son daughter		Grandchild		Niece nephew		Father Mother		Sister Brother		Son daughter-in-law		Brother sister-in-law	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Affected	7	15	11	23	0	0	0	0	4	8	1	2	12	25	0	0
Total	99	18	154	28	9	2	21	4	51	9	28	5	28	5	6	1

Table 8(b): No. and percentage of Hh members' relation to Hh head by sex and affected project affected status

Type of Respondent	Relation to Hh Head													
	Grandfather Grand mother-in-law		Father Mother-in-law		Other relative		Servant		Other		Head		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Not affected	19	4	9	2	5	1	2	0	0	0	112	22	508	100
Affected	1	2	1	2	0	0	0	0	0	0	10	21	47	100
Total	20	4	10	2	5	1	2	0	0	0	122	22	555	100

In the table below, the total number of persons living in the surveyed households is 555 persons of which 45% are males and 55% are females. Data on the age of household members in categories shows that 58% of the total population is economically active (between the ages of 16 and 60 years) and support 42% of the total of dependent population (less and equal to 15 years and 61 years and above). The household size is 4.3 persons, slightly lower than the national average of 5 members a household. The ratio works out at 1.22 females for each male which is fairly uniform. The median age present in the population is 34 years. Youth (aged 25 years and below) comprise of 36% of the population implying a relatively young population present in the project area.

Table 9: No. and percentage of Hh members' age in categories by sex and affected project affected status

Respondent type	Sex	Age in categories											
		15 years and below		16 to 25 years		26 to 35 years		36 to 60 years		61 years and above		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Not affected	Male	57	25	26	11	35	15	65	29	44	19	227	100
	Female	63	22	34	12	48	17	92	33	44	16	281	100
Affected	Male	8	35	4	17	1	4	7	30	3	13	23	100
	Female	6	25	4	17	5	21	7	29	2	8	24	100
Total	Male	65	26	30	12	36	14	72	29	47	19	250	100
	Female	69	22	38	12	53	14	99	32	46	15	305	100

The data shows that 28% were unmarried while 53% were married. Also, 11% had been married at one time but were currently widowed or divorced.

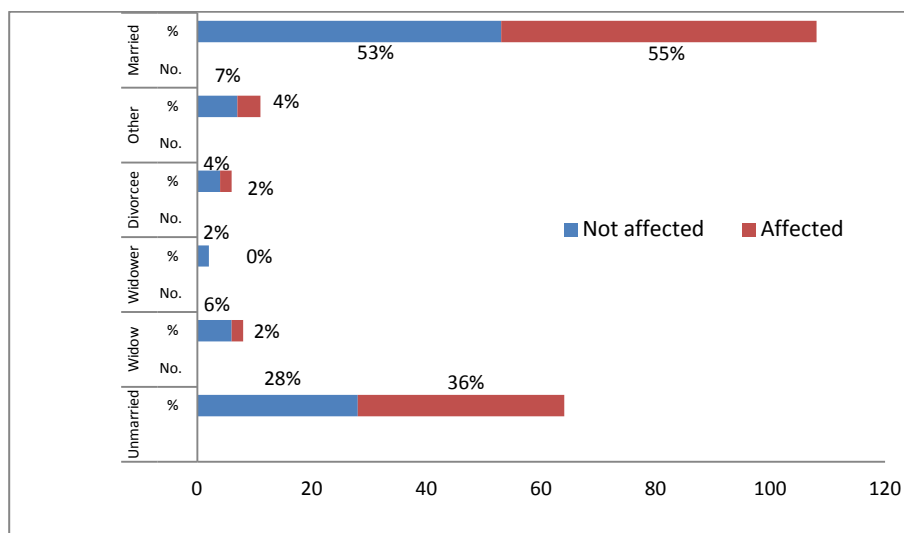


Figure 1: Percentage of Hh members' marital status by sex and affected project affected status

3.2 Occupation, employment and livelihoods

In terms of the types of occupation people presently follow, it can be seen that 66% are in farming while 12% are engaged in other vocations such as business, civil servants and in private sector. Also, 22% are currently students. The data shows that currently occupations are not diversified which also mirrors the low development of the market economy wherein a large part of the populations work in subsistence agriculture while entrepreneurial activities and rural industrialization remain low.

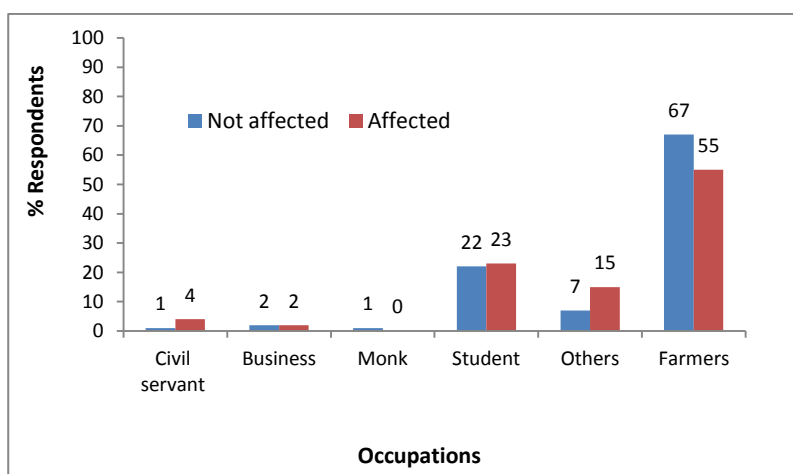


Figure 2: Percentage respondents in occupations by type and affected status

People are not highly skilled with nearly half the respondents among both affected and non-affected households possessing no skills. There are a few that are into carpentry and masonry and women practice weaving. Skills development is one area that the Project could consider for development especially for the economically active population who could work on the project to supplement their income.

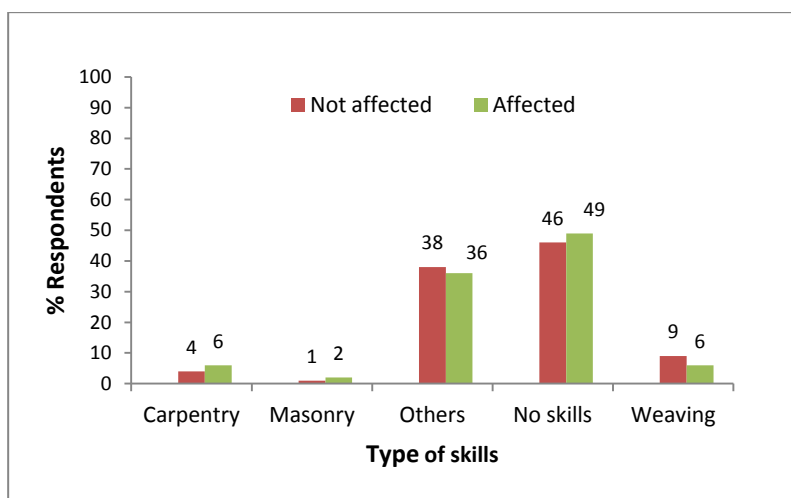


Figure 3: Percentage of household members' types of skills possessed by project affected status

Off-farm work opportunities seem to be more available in the directly benefiting/impacting villages of Tangsibji geog than Drakten geog owing to its proximity to the district head office as well as possibly more developmental works in this area creating job opportunities with contractors as semi-skilled or unskilled labour. The daily wage rate averages Nu. 300/day for men but women is reportedly paid lower wages of Nu. 200 to 250 a day owing to the perception that they cannot perform strenuous tasks and are therefore less effective in such work as compared to men.

3.3 Health and Education

Health

Morbidity data collected during the interviews showed that 16 people fell sick in the last year. All patients were from the non-affected group who suffered from illnesses like cough and cold – which was the most common, followed by diseases like stomach pain, headaches, ulcer body pain, diabetes, high blood pressure, heart disease, body pain. The data shows that people do not easily fall.

Education attainment

Data on education attainment shows that 60% of the populations have not had education. From the non-literate population, 57% are females. Only 23% have studies till primary school and a further 7% studies till high school. From among those that have studied, females exceed males in both primary school and high school levels indicating a higher rate of drop-out of

females as compared to males owing to the fact that more female drop-outs are living in the villages. Overall, the data shows a low level of educational attainment among the population.

Table 10: No. and percentage of Hh members' educational attainment by sex and affected project affected status

Respondent type	Sex	Educational attainment															
		Primary (Class VI or less)		High school (Class VII to Class X)		Higher secondary (Class XI to Class XII)		Graduate		Monastic education		Non-formal		No education		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Not affected	Male	48	21	16	7	8	3	2	1	18	8	5	2	130	57	227	100
	Female	66	23	18	6	5	2	3	1	0	0	6	2	183	65	281	100
Affected	Male	6	26	1	4	1	4	0	0	2	9	0	0	13	56	23	100
	Female	7	29	4	17	2	8	1	4	0	0	0	0	10	42	24	100
Total	Male	54	22	17	7	9	4	2	1	20	8	5	2	143	57	250	100
	Female	73	23	22	7	7	2	4	1	0	0	6	2	193	63	305	100

3.4 Land ownership and Utilization

The land data shows that dry land holdings are similar between affected and non-affected households although affected households on an average seem to own smaller parcels of wetland. The data also shows that sharecropping is not commonly practiced. The data indicates that the area of land utilized for farming is not optimum. The proportion of land cultivated to land owned in terms of dry land ranges from 69% to 72%. Similarly, between 70% and 75% of the wet land is cultivated by both affected and non-affected households. Land utilization is not optimized. Though leaving land fallow for some years could be good for regeneration of fertility, however, it would have consequences for food security. Inadequate household labour, hilly terrain hindering effective farm mechanization and wild life predation on crops are some reasons that farmers may be leaving more land fallow over time.

3.5 Agricultural Production

The production data of crops shows that in affected households the production of crops as compared to non-affected households is higher many because of the higher number of non-affected households to affected (12 non-affected households to each affected household). Overall, the paddy yield shows a median yield of 883 kg/acre whereas the median yield of maize is 1,120 kgs/acre. The Tangsibji geog average yield per acre for rice is 1,053 kg/acre while the maize yield is 798 kg/acre. The national average for paddy yields is 1,122 kg/acre while for maize it is 866 kg/acre. The data reflects the fact that while paddy yields are not up to the geog and national averages, the study area farmers have yields of maize higher than the geog and national average yields.

Further, only small quantities of mainly a few types of vegetables such as potato, chili, cabbage, greens, beans etc. are sold although most seems to be consumed at the household level. While

affected households 1% of their paddy, 14% of their maize, 70% of their potato and 67% of their chili while non-affected households sold 15% of their paddy, 10% of their maize, 70% of their potato and 46% of their chili. This goes on to show that local cereals like paddy and maize are consumed at the household whereas vegetables are a source of income which farmers sell small quantities to supplement their income. Similarly, the non-affected household shows less than an acre devoted to the cultivation of vegetables implying that commercial vegetable production is not practiced at the moment suggesting a subsistence form of agriculture where most is consumed in the household and smaller production surpluses are sold in the market.

Besides irrigation and credit discussed in another section, farmers also use a few other inputs which are discussed here. Farmers in the project area are noted to use very low quantities of inorganic fertilizers (average of 18 kg used) and chemical pesticides (average of less than half a kg) suggesting almost an organic form of farming in practice. Other inputs such as improved seeds and seedlings are used. Mechanization is also low with very few owning power tillers, rice hullers, threshers, winnowers and oil expellers.

The data shows that overall; from the 92 respondents who used irrigation channels to irrigate their paddy from both affected and non-affected households, 71 farmers (77%) mentioned that water was not enough for irrigation. From those that mentioned limited water received for their crops, the majority claimed that water was not sufficient during transplantation owing mainly to limited water received from the source which is determined by the intensity of rainfall in any given year. Other minor reasons mentioned are seepage, ineffective maintenance regime of the canals. Reliable availability of irrigation would be an important parameter to enhance crop production for villagers in the project area to diversify into horticulture (vegetables and fruits). There seem to be opportunities for people to re-invest savings from dairy income to drip and sprinkler irrigation for vegetable production to meet the substantial demand for vegetables by both the Nikachhu and Mangdechhu hydropower workers.

One of the pressing issues confronted in farming across the country is wildlife predation on crops which has remained an unresolved problem till date. It is believed by villagers that the health of the forests as well as the extent of forest coverage in the district (which currently stands at 84%) besides the strong conservation policies and thereby ban on poaching of animals has led to an increase in wild animals. The data below shows the types of animals damaging crops. Rats, monkeys, boars and porcupines seem to be the common predators on crops.

Table 11: No. of respondents' experience of wild life damage to crops by animal

Type of wild animal damaging crop	No.
Deer	2
Monkey	63
Boar	54
Rats	106
Others (porcupine)	34
Others (Sambhar deer)	17
Others (birds)	19

3.6 Livestock Production

In terms of livestock owned the data shows that people keep only a few types of livestock such as cows and poultry. Since the villages are proximate to the road, rearing of horses is rare. It is pertinent to note

that the affected persons group averaged a cattle holding of 2 improved breed cows whereas the non-affected group had an average of at least 1 improved breed cow. This indicates that villagers are into small-scale backyard dairy farming. People consume small numbers of animals (cattle) but mainly maintain them for drought and farm yard manure. Animal husbandry as such forms a part of an integrated farming system. Few poultry is also consumed. Since meat is widely available in the market, farmers purchase meat available in butcher shops in Trongsa.

Wildlife predation on animals is increasingly on the rise. The data in the table below shows that predation by wolves, tiger, leopard and wild dogs seem to be common in the villages visited. Many farmers reported not having received compensation out of the insurance scheme paid out to protect the tiger suggesting that the system for verification of kills, processing of documents and compensation could be more made for efficient to ensure quick compensation for farmers who lose their domestic animals.

Table 12: No. and percentage of respondents' experience of wild life predation on livestock by animal

Type of wild animal killing livestock	No.
Tiger	21
Leopard	18
Wild Dog	18
Wolves	27
Others	7

3.7 Housing and access to basic services

Irrespective of being affected and non-affected, the table below shows that majority of the households were constructed in the last decade, on the period between 1992 and 2002 and all the houses built during this period have CGI roofs, stone walls and stone and wood floors. This seems to be the most typical type of house in the villages visited. Houses built in the earlier decade ending 1991 also were of the same type. The data shows that the non-affected respondents being larger in number also had a few respondents that report other types of houses as well such as wood and cement based walls and floors. On an average the villagers had 8 rooms for dwelling purposes excluding the kitchen and toilet which by Bhutanese standards is fairly well endowed in terms of space and size of houses. The type and size of houses can be considered as an economic indicator so it can be said that the communities visited especially in Tangsibji geog, owning well-built large houses are well-off.

Table 13: No. and percentage of respondents' house type by year built and affected status

Type of house owned	Type of Respondent															
	Affected							Not affected								
	Year House Constructed category							Year House Constructed category								
	1992 to 2012		1972 to 1991		Total			1992 to 2012		1972 to 1991		1971 or before		Total		
	No	%	No	%	No			No	%	No	%	No	%	No		

Type of house owned	Type of Respondent													
	Affected							Not affected						
	Year House Constructed category							Year House Constructed category						
	1992 to 2012		1972 to 1991		Total		1992 to 2012		1972 to 1991		1971 or before		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
CGI roof, stone walls and stone/wood floors	8	80	2	20	10	100	76	70	22	20	10	9	108	100
CGI roof, wood walls and wood floors	0	0	0	0	0	0	2	100	0	0	0	0	2	100
CGI roof, cement walls and floors	0	0	0	0	0	0	7	100	0	0	0	0	7	100
Total	8	80	2	20	10	100	85	73	22	19	10	9	117	100

In terms of access to other basic services such as safe drinking water, sanitation and electricity, the data reveals that all households covered in the survey had access to electricity and sanitation. There were, however, 5 non-affected households and 1 affected household without access to drinking water. It is evident that households in the project area have access to the most basic services which the government is able to provide for villagers.

In terms of the developmental facilities provided by the government at the geog and villages level, the data shows that by far the most visited governmental facilities provided in the project areas in Bhutan are the road used to travel to other facilities, markets, schools and health facilities such as the BHU and hospital. Other less frequented facilities are the RNR office as well as the Forest Range Office which also provide extension services to farmers by visiting the villages. The data is suggestive of good usage of basic services by villagers.

The data in table 17 summarizes the locations of the facility by village. The facilities present in the geog are relatively proximate and accessed in one hour of walk from the villages. The district head office is one hour's drive from Tangsibji and about 2 hours drive away from Kingarapten. The information shows that developmental facilities are provided and located at accessible distances from the villages. In descending order of frequency of visits per year to facilities the most visited facilities are the road (average of 102 times); Market (10 times); Community school (4 times); Primary school (3 times); Forest Range Office (2 times); RNR Center, ORC, Hospital, Dzongkag (once).

Table 14: Location of development facilities by village

Village	BHU	School	RNR Center	Gup's Office	Market	District HQ	Nearest motorable road
Tangsibji	Tashiling	Namgaycholing	Tashiling	Tashiling	Tashiling	Trongsa	Tangsibji Farm Road
Tsangkha	Tashiling	Tashiling	Tashiling	Tashiling	Tashiling	Trongsa	Highway
Drangla	Tashiling	Chendebji	Tashiling	Tashiling	Tashiling	Trongsa	Highway
Changrey	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Trongsa	Highway

Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Trongsa	Highway
Taktse	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Trongsa	Highway
Yuesa	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Trongsa	Highway
Tashidingkha	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Kingarapten	Trongsa	Highway

3.8 Access to credit and savings

Access to economic institutions and instruments such as credit and loans are necessary for local economic development. However, data collected reveals generally that while 4 affected households on an average availed loans of around Nu. 27,778 and 33 non-affected households took loans averaging Nu. 57,223. While non-affected persons availed loans ranging from Nu. 20,000 to Nu. 3,000,000, affected persons took loans ranging from Nu. 1,000 to Nu. 600,000. The data shows that the incidence of people taking loans is quite low indicating a risk-averse behavior of villagers. Most took loans for reasons such as house renovations, buy improved breed dairy cattle, business investments and a few borrowed money for education of their children. All availed loans from the banks.

Farmers saved a median amount of Nu. 10,000 used mainly for education of children, consumption, conduct of religious ceremonies, medical treatment, purchase of agricultural inputs and house renovation. It is evident that most savings are spent on household expenses such as consumption, education of children and medical treatment implying that tertiary education and tertiary medical care are not always available for which people have to spend leaving less funds for capital investments.

3.9 Income, Asset ownership and Expenditure

The table below shows data on income among affected and non-affected households segregated by income earned from agriculture sources (sale of agriculture and livestock produce and animals) and non-agriculture sources such as remittances, off-farm labour, business, skilled labour, pottering and weaving). The data shows that the median income earned from agricultural sources is substantially more and roughly double than that earned from non-agricultural sources. This suggests that there is huge scope for further enhancing income from agricultural activities such as horticulture and dairy farming since a ready market will be created once there is an influx of workers for the NHPP. However, farmers also need to make investments in such enterprises and therefore the question of assets, savings and loans come into play to take advantage of the market created by the NHPP for their produce.

Table 15: Statistics on annual income of respondents' by agriculture & non-agriculture sources and affected status

Statistics		Total income agriculture sources		Total income non-agricultural sources		Total income	
		Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Mean		72,100	37,981	42,960	30,604	115,060	68,568
Median		52,500	17,000	17,800	15,000	80,500	40,500
Minimum		12,000	0	0	0	21,600	0
Maximum		215,000	642,105	140,000	600,000	305,000	692,105
Percentiles	25	23,500	5,000	2,750	0	53,750	17,000
	50	52,500	17,000	17,800	15,000	80,500	40,500
	75	1,05,000	45,000	91,250	38,000	1,66,750	83,000

The graphs below show that while affected households derive 56% of their income from agriculture sources, the affected households earn 63% of their income from agriculture. This shows that farmers already have a comparative advantage in activities at farm level as they are proficient with the techniques of farming, have productive assets such as land, labour and basic machines and therefore are in a favourable position to enhance production with technical advice from the extension service in improved agricultural technologies.

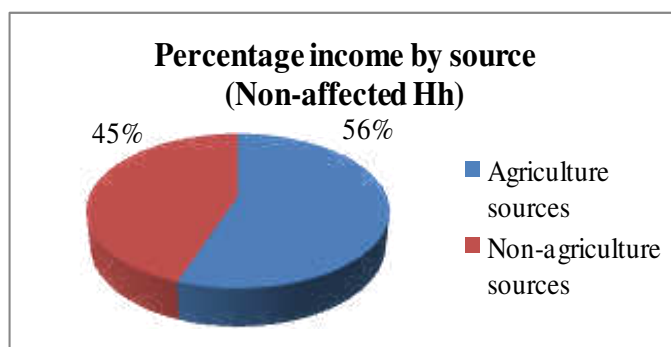


Figure 4: Percentage income of non-affected HH by source

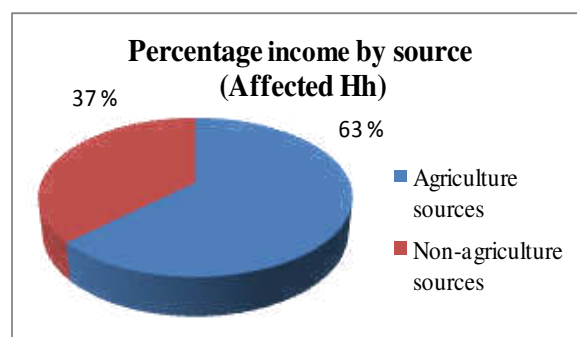


Figure 5: Percentage income of affected HH by source

Often incomes are under-reported so a household assets inventory can be useful to assess consumptive behavior and holdings of people. The data in the tables below show that farmers in both affected and non-affected households seem to be relatively well endowed with most of the household necessities but also have invested in luxury goods such as TVs, cars, refrigerators and archery bows indicating that farmers do hold dispensable income after costs of living which they can spend on such items.

Table 16: No. and percentage of affected household respondents' affirmation on possession by asset type

Asset type		No	%
Asset owned - radio	Yes	6	60
	No	4	40
Asset owned - TV	Yes	7	70
	No	3	30
Asset owned - refrigerator	Yes	7	70
	No	3	30
Asset owned – bicycle	Yes	1	70
	No	9	30
Asset owned - motorbike	Yes	1	10
	No	9	90
Asset owned - car	Yes	4	40
	No	6	60
Asset owned - mobile phone	Yes	10	100
	No	0	
Asset owned - rice cooker	Yes	10	10
	No	0	
Asset owned - water boiler	Yes	10	10
	No	0	
Asset owned - foreign bow	Yes	4	40
	No	6	60
Asset owned - alter	Yes	9	90
	No	1	10

Asset type		No	%
Asset owned - bukhari	Yes	8	80
	No	2	20
Asset owned - electric iron	Yes	3	30
	No	7	70
Asset owned - electric fan	Yes	1	10
	No	9	90
Asset owned - rice mill	Yes	2	20
	No	8	80
Asset owned - sewing machine	Yes	1	10
	No	9	90
Asset owned - tractor	Yes	4	40
	No	6	60
Asset owned - machine plow	Yes	1	10
	No	9	90
Asset owned - thresher	Yes	0	
	No	10	100
Asset owned - winnower	Yes	3	30
	No	7	70
Asset owned - insect pump	Yes	1	10
	No	9	90
Asset owned - jewelry	Yes	2	20
	No	8	80

Table 17: No. and percentage of non-affected household respondents' affirmation on possession by asset type

Asset type		No	%
Asset owned - radio	Yes	74	63
	No	43	37
Asset owned - TV	Yes	79	67
	No	38	32
Asset owned - refrigerator	Yes	54	46
	No	63	54
Asset owned - bicycle	Yes	4	3
	No	113	97
Asset owned - motorbike	Yes	3	3
	No	114	97
Asset owned - car	Yes	17	14
	No	100	85
Asset owned - mobile	Yes	111	95

Asset type		No	%
Asset owned - electric iron	Yes	8	7
	No	109	93
Asset owned - electric fan	Yes	6	5
	No	111	95
Asset owned - rice mill	Yes	22	19
	No	95	81
Asset owned - sewing machine	Yes	12	10
	No	105	90
Asset owned - tractor	Yes	23	20
	No	94	80
Asset owned - machine plow	Yes	8	7
	No	109	93
Asset owned - thresher	Yes	3	3

phone	No	6	5
Asset owned - rice cooker	Yes	116	99
	No	1	1
Asset owned - water boiler	Yes	102	87
	No	15	13
Asset owned - foreign bow	Yes	19	16
	No	98	84
Asset owned - alter	Yes	97	83
	No	20	17
Asset owned - bukhari	Yes	73	37
	No	44	73

	No	114	97
Asset owned - winnower	Yes	16	14
	No	101	86
Asset owned - insect pump	Yes	1	1
	No	116	99
Asset owned - jewelry	Yes	34	30
	No	82	70

Data on expenditures shows that overall farmers expenditures on consumption (food, clothing and children education) is much less than non-consumption expenditure (health, service bills, transportation, religious ceremonies, taxes, fuels, house maintenance, labour hire, production inputs). The farmers in the affected category seem to spending slightly higher on an average than the non-affected households. As a percentage share of the total expenditure, non-affected households spend 79% on non-consumption expenditure while affected households spend 73% as opposed to 21% spent on consumption by non-affected households where as affected households spend 27%. The data reveals that the needs of rural households are becoming diversified and there are many expenses to meet besides fulfilling the dietary needs of the household. In such a situation there will be an increasing requirement to meet these needs through augmented income for the households.

Table 18: Statistics on affected respondents' expenditure by type

	Expenditure on consumption	Total non-consumption expenditure	Total expenditure
Mean	21,144	81,800	102,944
Median	13,500	45,500	60,721
Minimum	-	1,550	5,600
Maximum	296,500	1,157,200	1,173,200
Sum	2,473,840	9,570,630	12,044,470
Percentiles	25	8,900	35,585
	50	13,500	60,721
	75	21,900	122,340

Table 19: Statistics on affected respondents expenditure by type

	Expenditure on consumption	Total non-consumption expenditure	Total expenditure
Mean	27,260	75,026	102,286
Median	24,500	55,142	71,632
Minimum	4,800	26,935	33,535
Maximum	65,000	164,100	196,500
Sum	272,600	750,265	1,022,865
Percentiles	25	7,650	38,410
	50	24,500	55,142
	75	42,850	113,140

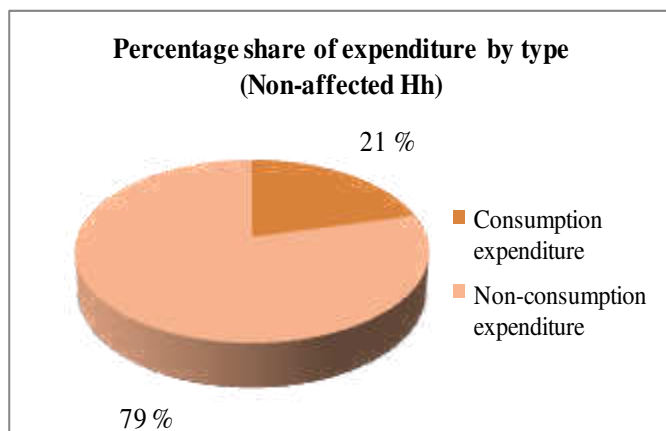


Figure 6: Percentage share of expenditure by type of non-affected Hh by type

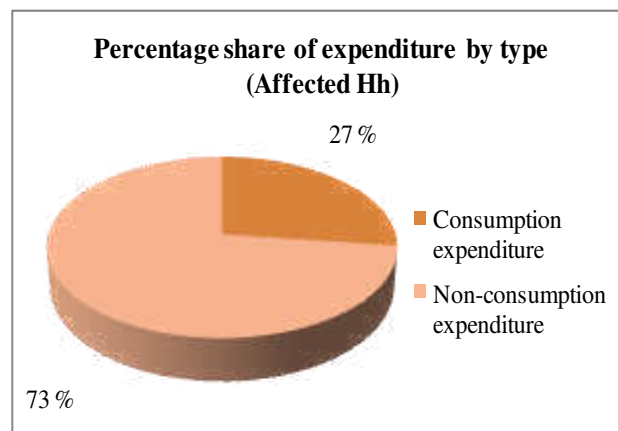


Figure 7: Percentage share of expenditure of affected Hh by type

3.10 Enterprises

A rapid assessment of the type of enterprises operating in the project area reveals that there are in total 8 shops in total in Tashiling and Tsangkha. There are also 2 shops and 1 tourist resort between Chendebji and Tashiling. There are 3 RNR products sales outlets which are basic sheds constructed with government assistance from which farmers at the moment sell dairy produce.

In the periphery of the project area, in Bjizam there is one shop and between Bjizam and Trongsa there is one tourist resort and 1 general shop. Between Tsangkha and Bjizam also there is 1 resort and 1 hotel. Trongsa Dzongkhag, according to data received from the Ministry of Economic Affairs in Trongsa has 465 service category of enterprises, 262 contract businesses, 22 production and manufacturing enterprises, 293 small retail traders and 46 micro-trade enterprises. The commencement of the NHPP, as experienced with the Mangdechhu HPP, is expected to increase the volume of business transactions of businesses in Trongsa. The business communities, with their present experience with servicing clientele from the Mangdechhu HPP anticipate similar opportunities from this project as well.

3.11 Vulnerability

Discussion on vulnerability is important from a social development perspective. Often development projects can aggravate the socio-economy of vulnerable populations through differential impacts of the development. Here, several types of vulnerabilities that could be possibly triggered by shocks, income poverty, land ownership, widowhood, disability, productive capacity are briefly discussed. In this report, the types of vulnerabilities will be quantified among the population but the main analysis of vulnerability and compounding of vulnerabilities will be discussed in the Resettlement Plan document.

Shocks

Villagers' household socio-economy can be adversely affected by shocks triggered by events both natural and anthropogenic. The table below describes the number of respondents who experienced such shocks. The table shows the common shocks experienced to be crop failure, death of livestock and severe illness and injury. The other shocks seem not to be widely prevalent.

Table 20: No. & percentage of respondents' experience of shock by type and affected status

Type of respondent	Type of shock experienced															
	Livestock death		Crop failure		Loss of regular employment		Fire, theft, loss or property		Severe illness, injury		Death of Hh member		Victim of violence, crime		Food shortages	
	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Not affected	87	30	53	64	1	116	2	115	11	106	6	111	0	117	1	116
Affected	7	3	5	5	0	10	1	9	2	8	0	10	0	10	0	10
Total	94	33	58	69	1	126	3	124	13	114	6	121	0	127	1	126

With regard to whether or not people were adversely affected by the shocks, the table below shows that 19% of those affected by crop failure and 12% of those affected by livestock death reported to have faced difficulty since their living conditions was affected by the event. In general, the data shows that households seem to possess good resilience and have coping strategies to abide by the adverse situations instigated by the shocks. Food shortages, crime, fire or theft, violence seems to be quite rare occurrences.

Table 21: No. & percentage of respondents' experience hardship on experiencing shock of shock by type and affected status

If living conditions affected by	Response	Type of Respondent					
		Not affected		Affected		Total	
		No.	%	No.	%	No.	%
Livestock death	No	106	91	10	9	116	100
	Yes	11	100	0	0	11	100
Crop failure	Yes	21	91	2	9	23	100
	No	96	92	8	8	104	100
Loss of regular employment	Yes	2	100	0	0	2	100
	No	115	92	10	8	125	100
Fire, theft, loss or property	Yes	0	0	0	0	0	100
	No	117	92	10	8	127	100
Severe illness, injury	Yes	7	87	1	12	8	100
	No	110	92	9	8	119	100
Death of Hh member	Yes	5	100	0	0	5	100
	No	112	92	10	8	122	100
Victim of violence,	Yes	1	100	0	0	1	100
	No	116	92	10	8	126	100

If living conditions affected by	Response	Type of Respondent					
		Not affected		Affected		Total	
		No.	%	No.	%	No.	%
crime							
Food shortages	Yes	2	100	0	0	2	100
	No	107	92	9	8	116	100

Disability

The data about disability shows a total of 13 persons that reported disability during the household survey. It is notable that 9 out of the total disabled are women. Some of the disabilities prevalent are blindness, deafness, dumbness, lameness and body malformation.

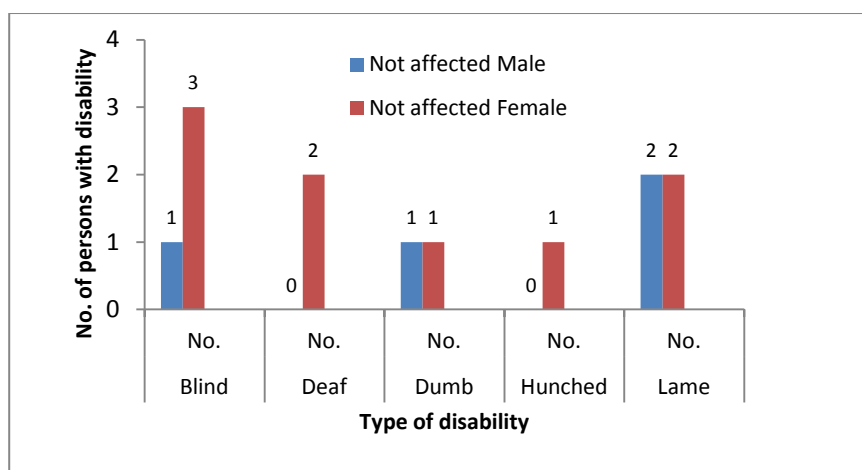


Figure 8: No. persons with disability by type and affected status

Income poverty

The data on income poverty from the survey shows that 7 households from among the non-affected households have incomes that are below the national poverty line of Nu. 1,097 a month or Nu. 13,164 a year. Most of these households are under Drakten geog which is indirectly benefited by the NHPP.

Table 22: No. & percentage of respondents facing poverty

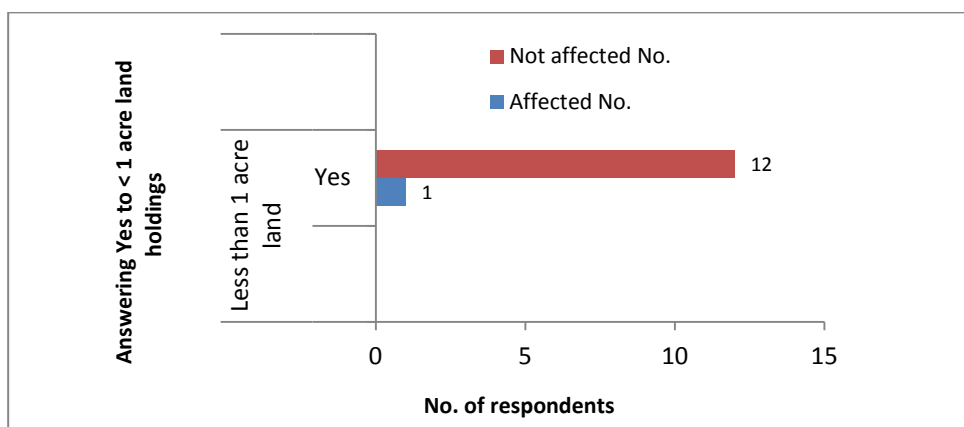
If live below poverty line	Type of Respondent					
	Not affected		Affected		Total	
	No.	%	No.	%	No.	%
No	109	92	10	8	119	100
Yes	7	100	0	0	7	100

Widowhood or divorce can enhance the vulnerability of women. The data shows that there were in total 33 women who were widowed of which only 1 is from the affected households. Similarly only 1 woman among the 20 divorcees is from affected households. The non-affected households hold larger populations of these categories as can be noted from the table below.

Table 23: No. & percentage of respondents facing widowhood

Marital status of members	Respondent type		
	Not affected	Affected	Total
	No.	No.	No.
Widow	32	1	33
Widower	11	0	11
Divorcee	19	1	20

As a productive asset in villages in Bhutan, the acreage of land owned and cultivated has implications not only for food security but also for income especially if livelihoods are land-based. It was found out that among the affected households only 1 household reported owning land less than 1 acre. Whereas, 12 non-affected households hold less than 1 acre of land.

*Figure 9: No. of respondents with marginal landholdings (< 1 acre)*

Chapter 4: Stakeholder Consultations, Participation and Information Dissemination

4.1 Stakeholder Analysis

A stakeholder analysis matrix below maps the stakeholders, the reasons for being involved in the Project, nature of involvement in the preparation and implementation phases of the project, level of influence exerted by each stakeholder vis-à-vis the project and the benefits that each stakeholder expects to achieve.

It is evident that DGPCL, the donor and the GNHC have high influence on how the project will be planned and implemented since most crucial decisions would be taken by these agencies on the project. The dzongkhag and geog administrations at the local level are important in that they would play an important role in facilitating land acquisition before the project can commence. These local government entities also will, owing to their local presence, assist the project authorities in any matters requiring engagement with villagers. The villagers in whose area the project will be implemented are important and they need to be consulted throughout project preparation and implementation as they can oppose the project if they are unhappy with impacts and if they do not get a fair deal for losses of any kind. The business community within Trongsa and beyond will be able to benefit from the many opportunities for supply of goods and services required for the project.

Table 24: Stakeholder matrix for NHPP

Stakeholder/beneficiary	Reason for involvement	Role/Nature of involvement		Influence H – High M – Medium L – Low	Benefits to stakeholders
		Project preparation	Project implementation		
DGPCL	Coordinate studies, identify & recruit construction companies, supervise implementation	Lead agency	Lead executing agency Management and coordination M&E Reporting Develop policy and regulation Technical adviser Implementation	H	Contribute to fulfilling DGPCL mandate
Donor	Funds for the Project	Monitoring	Implementing agency Funds disbursements M&E	H	Contribute to development goals of the country
GNHC	National Aid Coordination GEF OFP	Coordination and monitoring	Facilitate co-financing Approve fund release M&E	H	Contribute to GNH (poverty alleviation)
Dzongkhag	Falls within administrative	Coordination	Coordination of issues impinging	M	Local presence and necessary role for early verification of land and

Admini stration	ve area of jurisdiction. Facilitation of land survey and compensati ons		on villages and geog matters		compensation. Assist in resolving problems as they arise
Geog Admini stration	Falls within administrati ve area of jurisdiction. Facilitation of land survey and compensati ons	Coordination	Coordination of issues impinging on villages and geog matters	M	
Villager s of benefiti ng and impact ed villager s	Project located in the area and land & properties could be affected	Provision of information and facilitation of studies	Derive benefits	H	
Busine sses within and outside Trongs a	Business opportunitie s – goods and services required by the Project.	Supplier of goods and services	Supplier of goods and services	L	

4.2 Consultation Strategy

The approach to be used for consultations has been outlined in the methodology section. The team carried out consultations with various groups of persons. The Geog Tshogde or local administrative functionaries were consulted for their views on the impending NHPP development and their suggestions on how best they could participate in the various stages of development of the NHPP. Similarly, the local village heads were also consulted for similar views. The outcomes of consultations with these groups have been summarized in the next section.

Once the impacted land had been determined, the affected persons, 10 out of 11 who are affected, participated in the consultative meeting. They were informed about land acquisition, the procedures and their views were also received on smooth transition when land is taken over and compensation paid. The minutes of the consultations is appended with the Resettlement Plan document. It is inevitable that the Resettlement Plan will have to be disclosed once complete for which all affected people will be invited to participate in the event and to forward grievances if any within a stipulated date.

4.3 Stakeholder Exchange and Outcomes

The meeting held with the Geog Tshogde was attended by the Mangmi (Deputy Gup/Chairperson) and the Geog Administration. A summary of the discussions with them are bulleted hereunder:-

With regard to the *development potentials* of the geog, some of the developmental activities and infrastructure that the geog still requires are farm roads and irrigation channels. Activities such as prevention of crop predation of crops and animals by wild animals, crop and livestock development, conversion of dry land to wetland and small and medium enterprise development such as food processing units were considered essential.

The tshogpas mention that electricity and soling of the farm road and the need of a meeting hall in centrally located Lorim as well as pasture and potato development seem to be the main needs of the Nyala-Drangla tshogpa. Whereas, for the Tangsibji tshogpa feels that wetland expansion, farm road improvement and renovation of irrigation channels are required in terms of developmental activities.

Their *perceptions* on the NHPP are that the project is beneficial although negative impacts mainly on the environment are foreseen. With the NHPP in place, it is expected that the overall infrastructure in the project area and the geog such as roads, colonies will be enhanced. The school and BHU could also be upgraded as there will be large populations that these facilities will have to service over and above the presently served villagers. They also expect that the area will receive stable electricity.

The *tshogpas* feel that the area will progress a lot and they will be able to derive benefits from the project. They also expect to benefit as they can sell agriculture and livestock products since they will have an assured demand by the customer base created by the project. They also feel that they would be assured a stable and reliable supply of electricity once the project is complete allowing them to use many electrical appliances and small machinery.

Some of the *negative impacts* of the NHPP seen are those on the environment and eco-systems. There also may be damage to community properties such as existing farm roads, drinking water systems and irrigation temporarily. Substantial dust pollution is expected to impact on crop yields and on the health of the locals. Traffic congestion, inadequate water from the current water source for the increased population is expected. There would also be possibilities of an increase in disease transmitted by the foreign worker populations.

Some of the negative impacts as foreseen by *tshogpas* are impacts on land but feel that it is acceptable if they are compensated adequately in land or cash, as desired by the owners. They also noted that those who have small parcels of land could be differentially impacted since they depend on these more than those with large landowners who may not be as adversely affected since they have larger landholdings to fall back on in case of loss. Also, since access to fuel wood resources could be competitive but these issues could be sorted out through proper discussions with the contractors. They also feel that the project will create access of wild animals from across the river to land near their village so crop predation will increase so request adequate measures in the form of fencing to control access.

The Geog Tshogde expects to *participate* in the NHPP by assisting with information provision and with surveys during the planning phase. During the construction, they can mobilize local people and youth for employment. The Tshogde also can assist in the identification of vacant government land for replacement.

They expect that these negative impacts can be well mitigated especially the environmental ones by proper management by the government. The impacts on health can be averted and reduced with good awareness among both resident and foreign worker populations.

With regard to the GT's views on *land affected by the Project*, they feel that most affected land is not prime productive land but a few whose land is affected depend entirely on the affected land and therefore could face hardship. They feel that the procedure allowing people whose land is affected to opt for exchange land or cash is up to people's choice. They feel that where possible the project should try and avoid impacting land of people who depend solely on that land where possible. Also, they request if the productivity of land lost is assessed for compensation since currently compensation does not cover the state of the land taken over.

The *tshogpas* are of the opinion that if people are adequately compensated or can get the desired replacement land for land lost, this should be acceptable. They also advocate the grant of development cost of the land which people will take over as replacement land which are mostly forested land and would require immense cost for making the land cultivable. They also feel that people should receive their registration for the replacement land soon and without hindrance.

In stating their *expectations*, the Geog Tshogde representatives expect to work closely with the project and the people. They also feel that the Project could invest in some facilities such as drinking water source protection (fencing and plantation), construction of market sheds in different areas accessible to both farmers and workers it would be beneficial. They also request for emergency budget that the Project could consider funding the re-construction works of irrigation channels and farm roads which are by *force majeure* washed away especially during summer. They also want to collaborate closely with the NHPP in solving where relevant problems jointly as they emerge.

The *tshogpas* too expect that some development funds are made available by the project so that those activities which the government is not able to fund or for emerging needs are taken up by the Project. They also feel that they should be provided electricity as the present supplies from the micro-hydel are unreliable and unstable. They also feel that blacktopping of the present farm roads and employment opportunities for local people in the project would be useful.

Some *concerns* the Geog Tshogde have are delay in land replacement. They also share the experience that people have expectations on high rates of compensation but the government has standardized rates and this leads to further delay in the acquisition process. They also request caution especially during blasting in certain areas in which local deities reside. Another concern is about health impacts brought on by incoming workers and immigration impacts if there is interaction between locals and workers leading to marriages.

The concerns that *tshogpas* have are that the work may not be implemented as per plan by the contractors and therefore may impact adversely on the environment and farmers' land for which they may not receive the required compensation. A *tshogpa* was also worried about head-hunting of children on commencement of the project as sacrifice.

The minutes of the consultations held with affected people can be found with the Resettlement Plan document. However, in summary, the discourse dealt with impacts on land and other local infrastructure such as roads and the mini-hydel, compensation or land replacement and people's views and concerns on the mode of compensations and rates offered by the government. Grievance redressal was also discussed and the means which affected people had at their disposal was explained.

4.4 Information Dissemination

Information dissemination refers to making available information with regard to the Resettlement Plan in the public domain. Some of the strategies that will be used to ensure that information is disseminated as widely as possible are described below:-

- The executive summary of the Resettlement Plan document to be posted on DGPCL's website and be made available in whatever form is desired by any authority or person sharing an interest in the RP;
- The RP Document to be made available in the DGPCL Office as well as with public libraries for access to the general public or issued on request;
- The RP is to be summarized into a booklet. Entitlements and details of compensation are to be translated into Dzongkha and made available to the Geog Tshogde, Dzongkhag Administration and last but not the least with each affected person.

Chapter 5: Perceptions on Project Benefits and Adverse Impacts

Respondents were asked on their perceptions of benefits from the project. The table below in which some of the benefits expected show that most felt that they would acquire economic gains through the sale of agriculture and livestock products. The worker base would be substantial and fresh local vegetables and dairy products would be demanded. People also expect benefits in employment opportunities as there would be substantial number of jobs created for which locals could take up like transportation and other support services. People also foresee opportunities for business such as groceries, taxis and hotels to cater to the worker population. Access to shops and markets will be enhanced through improved road networks and availability of vehicles. Upgrading of school and health facilities to cater to a larger population also seems inevitable.

Table 25: No. of respondents' mentioning benefit from NHPP by type

Respondents answering	Type of benefit expected from Nikkachhu HPP							
	Access to electricity	Market for agricultural produce	Improved health services	Improved education facilities	Easy access to shops and markets	Employment opportunities	Access to business opportunities	No benefits expected
No. of respondents	10	47	17	15	29	31	21	1

In terms of adverse impacts, the main concern as also found out in the consultations was with land. This concerned differential and more severe impacts on those with smaller landholdings and the need to ensure that they got fair compensation if impacts could not be avoided altogether. The possibility of avoidance was reinforced to save the land of such people. Other impacts mentioned were those affecting the environment and impacts arising out of the migrant population in terms of health, immigration and competition for local resources.

Chapter 6: Conclusions

The NHPP project components namely adits, access roads, muck disposal sites, power house and surge shaft as well as residential colonies will leave an indelible mark in the physical and social landscape of Serpochen, Tangsibji, Tsangkha and Norbuodi settlements under Tangsibji geog. The area will see substantial construction activity which will transform the rural area into a hydropower project town as observed in other areas in Bhutan in the past such as Chukha, Gedu, Rangjung and the Punatsangchu Basin settlements of Hesothangkha, Basochhu and Baychu.

There are a number of stakeholders involved in the Project but the most important besides the project proponent (in this case, DGPCL) are the communities living in the area who will have to approve the project by according a “social clearance” to the Project. In the wake of any opposition to the Project, there will be undue delays, unwarranted media attention and a blemish on DGPCL if a robust SIA and adequate consultations are not carried out. Other key stakeholders are the local government agencies in the dzongkhag and geogs respectively who need be brought on board for their inputs, though periodic and minor, are necessary for the smooth execution of the project. They will therefore have to be consulted always and sufficient relevant information shared for their cooperation and facilitation.

It is possible that the majority of land owners are women, takes active part in family affairs and in decisions and therefore assigned by family members as household heads. This is a matter of pride and not vulnerability in Bhutan and therefore should be mistaken for a vulnerable group without the addition of other social and economic variables which could then provide better explanations of vulnerability.

People reside in semi-extended families which are a source of household labour and internal social safety net for care of the very young and the old. The population characterized by a young population and almost equal proportions of males to females has potential for better economic improvement of the household.

Though farming is the mainstay of the people in the project area, there is scope for diversification of occupations with the huge opportunities presented by the NHPP whether for household production of marketable surpluses or off-farm work in which youth and men can engage in, many of which will require prior training to perform in project-related tasks.

Health and education services and facilities are widely available to the population keeping morbidity rates low and school-going aged children in school. Influx of more people in the project, both national and non-national will necessitate an up gradation of these facilities to cater to a burgeoning population.

Land is not optimally used and factors like household labour availability, damage of wildlife to crops, limited irrigation for paddy transplantation and limited incentive to commercialize agriculture for want of absorbent markets seem responsible. This is however set to change with a huge expatriate population expected which will provide the required market. The mixture of labour, farming skills, investments and effective extension by the RNR sector for better yields can ensure broad-based development of the commercial agriculture sector in the geog.

The present benchmarks of annual income earned seem reasonably good. There are reasons, such as the quality of housing and the presence of most household assets in the houses, to believe that people of the benefiting villages are well-off. With the project, they could only prosper more if the opportunities are prudently taken advantage of to meet the diverse needs of the household as shown by the consumption patterns in the households.

The communities living in the project area though prosperous are not immune to factors that would enhance their vulnerability. Shocks arising out of natural causes (climate, death) or man-made (illness, accidents, crime, food shortages) can make people vulnerable. When these are further aggravated with the socio-economic factors such as marginal land holdings, low income, disability, senility and widowhood could compound vulnerability. Such people could become worse off as a result of the project as they would not be able to cope with and capitalize on the benefits as the more resource-rich households do.

The consultations with stakeholders has ensured buy in to the project because people are expectant that the project should start soon. Land acquisition issues have been discussed and government policies, procedures and practices disseminated and their concerns discussed. However, the process should continue so that people have a smooth transition to receipt of land exchange or cash compensation as desired by them and adequate, relevant and timely dissemination of information is necessary. Peoples' representatives namely the Geog Tshogde and the Tshogpas were allowed to share their views and concerns on imminent NHPP development and these will be carried forward in the design and implementation of the Resettlement Plan.

Projects almost always create expectations from projects of this scale. However, the needs expressed are modest and will only benefit the collective since what they ask for are development needs that the government, with its limited resource to be shared across the country, cannot immediately support. People see huge promise in their collective economic advancement through creation of a market for their goods and services. They can internalize benefits by mobilizing their own resources supported by government sectors and working of the market.

Annex K: List of Officials Consulted

List of People consulted by Project team during survey work and preparation of the EIA

Date and Year	Name	Agency
November 2-24, 2010	Public Consultation	Drakteng geog
November 25-26, 2010	Public Consultation	Tangsibji geog
29 June 2012	Dr. Durga Neopaney	Environment Officer, Mangdechu Hydropower Project
24 July 2012	Mr. Cheku Dorji	Deputy Park Manager Jigme Singye Wangchuck National Park
26 July 2012	Dasho Dawala	Dzongda, Trongsa Dzongkhag Administration
26 July 2012	Ms. Tshering Yangzom	Environment Officer, Trongsa Dzongkhag
27 July, 2012	Mr. Kunzang Chedrup	Asstt. Engineer for Dam, Mangdechu Hydropower Project
30 July 2012	Mr. Tenzing Khorlo	Chief, Environment Assessment Division, National Environment Commission
30 July 2012	Mr. Karma C Nyedrup	Advisor, National Environment Commission
25 July, 2012	Mr. Pasang Dorji	Nyala Tsogpa, Trongsa Dzongkhag
25 July 2012	Mr. Tshering Tashi	Geog Administrative Officer, Trongsa Dzongkhag
25 July, 2012	Mr. Sar Wangchuk	Tsogpa, Tangsibji geog, Trongsa Dzongkhag

List of People consulted by Project team during due diligence

Date and Year	Name	Agency
17 Sep, 2012	Dr. Durga Neopaney*	Environment Officer, Mangdechu Hydropower Project
May 10, 2013	Mr. Bijay Moktan	World Wildlife Fund, Bhutan
May 10, 2013	Mr. Wangda	Head, Watershed Department, DOFPS
September, 2012 24 July 2013	Mr. Kesang Wangchuk	Park Manager Jigme Singye Wangchuck National Park
25 July 2013 29 October, 2013	Mr. Tshering Tashi	Geog Administrative Officer, Trongsa Dzongkhag Administration
September 17, 2013 December 2013	Ms. Rebecca Pradhan	Royal Society for the Protection of Nature
30 October, 2013	Mr. Sar Wangchuk	Tsogpa, Tangsibji geog, Trongsa Dzongkhag
September 2013-	Mr. Tenzing Khorlo	Chief, Environment Assessment Division,

June 2014 (more than twice a month)	Mr. Tshering Dorji	National Environment Commission
April 29, 2014	Mr. Sonam Wangchuk	Head, Wildlife Conservation Division, Department of Forest and Parks
April 29, 2014	Mr. Namgay Tshering	Head, Land Section, Forest Protection and Utilization Division, Department of Forest and Parks
Email communication with stakeholders		
Email discussions with Dzongkhag Forest Officer, Trongsa Dzongkhag		
Email discussions with Environment Officer, Trongsa Dzongkhag		
Email discussions with Park Manager, JSWNP		

Timeline of the Project

Date and Year	Project Activity
June 3, 2010	Social Impact Assessment and Environmental Impact Assessment awarded to 2 Local Consultancy firms by DGPC
July 7, 2010	Formal letter sent to Trongsa Dzongkhag, Nature Conservation Division, Department of Forest, informing them of EIA studies being conducted for Project
July 16, 2010	Meetings to discuss EIA process with 11 AM: Forest Resources and Management Division 2PM: Nature Conservation Division 3PM: National Environmental Commission
September 28, 2010 November 17, 2010	Letter sent by DGPC informing Trongsa Dzongkhag informing about Project and seeking approval to conduct SIA and EIA
November 23-26, 2010	Public consultations and surveys from November 23-25 by local consultants in Drakteng and Tangsijbi gewogs
November 15, 2010	ToR for EIA endorsed by NEC
November 30, 2010	Social Impact Assessment completed
January 28, 2011	Meeting to discuss Project with stakeholders at Conference room, Project Office in Changzamto
March 3, 2011	EIA consultancy awarded for Stand Alone Project
October 25, 2011	Site visit by National Environment Commission
November 21, 2011	DGPC Board decision to change project as Stand Alone Project- decision communicated to NEC to defer environmental clearance process
March 26, 2012	EIA TOR approved by NEC
July, 2012	EIA completed
June, 2012	Additional social and environmental studies initiated and due diligence initiated under ADB Technical Assistance
June, 2012	Application for various clearances (Forest, Dzongkhag, Land etc.) initiated
July 25, 2012	Public Consultation with Local Communities in Geog Tsogdue Hall, Tangsibji
September 18, 2012	EIA presentation to all stakeholders NEC, Department of Forest and Parks, NGOs, Local Representatives
October 1, 2012	EIA report finalized and submitted to DGPC after editing and

Date and Year	Project Activity
	incorporation of comments from EIA presentation
October 10, 2012	Consultant with Project Affected Women in Trashiling
October 29, 2012	EIA revised after due diligence and additional field studies and submitted by DGPC to NEC for approval
October 30, 2012	Discussion of EIA and EMP with local communities in Tsangkha and Tangsibji villages. Distribution of the EMP in dzongkhag to participants and to the geog administrative officer for further distribution
December 4, 2012	Public consultation with affected persons in Tangsibji geog office
12 December, 2013	ESIA presentation to the Dzongkhag and community leaders (Minutes of meeting in Dzongkha)
December 27, 2013	EIA presentation by DGPC to NEC and all Stakeholders/Representatives of various organizations
January 27, 2014	EIA presentation to local communities and public at Tsangkha Middle Secondary School
March 10-15, 2104	Joint field visit by NEC and stakeholdersto project site
April 3, 2014	Formal comments from NEC based on Presentation and Field visit
April 7, 2014	Public consultation with displaced household representative in Tangsibji geog office
April 9, 2014	Public consultation with displaced household representatives in Drakten geog office
May 8, 2014	Revision of EIA based on Comments from NEC after meetings and field visit
July 1, 2014	Environmental clearance awarded by NEC (based on all other clearances received from various stakeholders)

**Annex L: Public consultation
proceedings with the project affected
households**

MINUTES OF THE CONSULTATIONS WITH THE PROJECT AFFECTED HOUSEHOLDS

Venue: Geog Tshogde Hall, Tangsibji
Date of Consultation: 25 July, 2012
Participants: Affected households of Serpochen, Tangsibji, Tsangkha villages, Geog Tshogde Officials, DGPC officials, Facilitators from BHUCORE-Gonefel Consulting Team.

Karma Jimba, Consultant welcomed all participants (affected participants) to the meeting and emphasized the importance of cooperation to achieve good results. He then introduced all persons who came to the meeting from outside the community such as Consultants, DGPC and ADB. He introduced the purpose of the meeting, which is to discuss jointly participants' perception about the project and concerns with regard to land affected by the project. The participants were made oriented through reference to the maps, locations of project components such as Dam, access roads, adits, muck disposal sites, staff colonies, quarries, temporary camps, and power house using the map where all project components were marked on it. They were asked if they understood the entire project footprint. Questions raised regarding the components were clarified.

With regard to impact on land by project components, Mr. Karma Jimba, explained that although the type of land impacted and the owner of the land had been identified, the exact acreage of land affected is yet to be determined. The participants who expressed their concerns are described below:-

- The Mr. Sar Wangchuk Tshogpa of Tangsibji mentioned that damage to the mini hydel's canal will affect irrigation supply to all the wet land owned by Tangsibji farmers.
- He also mentioned that as far as possible minimizing impact on land should be attempted.

Wild Life Conflict

The villagers informed the meeting that the main animals which damage crops are boar and sambar deer which damage crops. They also explained that the degree of damage was similar to other geogs in the Dzongkhag and that the wild animals damage almost 40 – 50 % of the crops. They attributed the cause of wild life damage to the increase in forest areas and good health of the forest, which led to increase in wild life population. They also mentioned that they are carrying out protective fencing. They were informed of wild life predation on livestock and the compensation scheme of the government. Participants informed of a few owners of cattle killed by wolves and owners who reported the incidents to forestry officials. Participants requested Nikachhu Project to help to ease wildlife damages.

Perception of the Project and Compensation

The participants were asked their perceptions about the project. Mr. Tshering Tashi, Geog Administrator Officer (GAO) mentioned that 2 years ago the project was already being discussed and that impact on the land were assessed but issues about land loss, compensation in cash or land replacement had not been discussed. So this meeting is very timely.

Mr. Pelzang, an affected person mentioned that though impact on the land of a few households is inevitable, the benefit to participants exceeded negative impacts. He explained that most affected

participants would lose about 5 % of land but they have kept in mind that figures on the amount of land lost may change. They also informed that they are aware of people affected by Mangdechhu Project not receiving land replacement or cash compensation. The lesson learned was that it is important to sort out all compensation in advance to avert future problems. On the question raised about availability of land for compensation within the geog it was informed that there is adequate land available for replacement within the geog. Mr. Tsewang Norbu another affected person informed that most affected prefer land replacement over any other compensation. It was raised that affected people should be personally asked their preference either for land replacement, cash or any other compensation and it was not right for one person to decide on this for others.

Mr. Karma Jimba explained of other ancillary benefits such as free electricity for 10 years as in Punatsangchhu Project would have to be explored. The GAO mentioned that it is often the case that more land has been taken by the project during construction than originally assessed. This He said is very problematic for villagers. This was increasingly noticed in the Mangdechhu Project. He suggested that all land replacement and cash compensation replacement is to be done before implementation of the project and to clarify all players' responsibilities.

Another affected person Mr. Tashi Phuntsho emphasized the need for the project to consider employment for school dropout of project influenced Households (HH) to which the Karma Jimba mentioned that the household situation of potential employees among the local youth has to be examined to ascertain needs of the household.

Another affected person Mr. Tenzin Duba mentioned that the scheme applied for the Punatsangchu hydro power project should be replicated for Nikachhu wherein affected participants receive free electricity for 10 years. He also mentioned that this meeting has been useful as all participants were explained and understood the procedure for compensation.

An affected person Mr. Tenzin Duba asked what would happen if during construction land of owners other than those affected would be impacted. To this the Mr. Karma Jimba replied that that this is not likely to happen although there would be some changes to the land of affected persons identified already during the planning phase of the project.

Mr. Tenzin Wangchuk another affected person mentioned that the access road would affect land in strips above and below the road. So land affected by the road may be small and therefore not eligible for land replacement or compensation. He also enquired about the impact on houses. Mr. Karma Jimba explained that if more land is affected and only the house is saved it may be more viable for participants to relocate to places where they would have both land and homesteads. Therefore, the option would be to value the house for acquisition and resettle the person in the replaced land. He also mentioned that the team will look at practices followed in other power projects in Bhutan with regard to free electricity for consumption sale by the affected person.

Another affected person Mr. Norbu Wangdi informed that the Drangla people could get 1 to 2 acres along the road (Sherphuchen) and shifted therefore for income generation opportunity through sale at the road site (not clear please rephrase). He went on to request that they are given land replacement in the colony area for establishing small businesses to enhance their livelihoods.

Another affected person Mr. Tenzin Duba also mentioned that there is scope for up-gradation of school for which hostel facilities are required which the project may consider supporting.

On the enquiry about the cultural properties by Mr. Karma Jimba the participants informed about the Tsheringma Drupchu, Babji Dzong (hillock in the shape of dzong) and rock above Tsheringma Drupchu.

They also mentioned that the Zalam chu which receives water draining from the Tseringma Drupchu is important and precious as it provide drinking water to 75% households under Tangsibji. However, none of the Project components would be affecting any of these. Furthermore they explained that area is just called Babji Dzong which has no connection to historical Dzong.

Mr. Sar Wangchuk, Tshogpa of Tangsibji mentioned that if there is an opportunity of expanding the road alignment and muck disposal site to government land; this should be done to lessen the impacts on land. He also emphasized to register replaced land before construction.

Mr. Pasang Dorji, Nyala Tshogpa indicated that the community forest at Nyalateng may be affected by the project. It was clarified that since the community forest is located above the road it will be not be impacted since the access road to the muck disposal site and colonies will have it's off take from the highway but will be aligned below the road towards the planned components.

Conclusion

The Consultant, Mr. Karma Jimba mentioned that the Consultants and the Project would as far as possible take into consideration issues that were discussed in the meeting to ensure that there are less problems with land acquisition.

Since they were no other issues raise the GAO thanked all for their participation in the discussions and for exchanging their views. He mentioned that the meeting has been very useful and informative.

The meeting ended with the signing of the attendance and invitation by Mr. Karma Jimba to all for lunch.

**Annex M: Proceeding minutes of the
draft ESI A presentation to the
stakeholders**

Record Note of Discussion of the Draft ESIA Presentation on Nikachhu Hydropower Plant (NHPP) from 0930 hours to 1330 on September 18, 2012 in Hotel Migmar Conference Room, Thimphu

The lists of participants are attached as Annexure I.

Registration of all the participants from various agencies started by 0900 hours and shortly after the arrival of the Chairperson Dasho Chhewang Rinzin, Managing Director of Druk Green Power Corporation, the presentation commenced.

Dasho in his opening remarks welcomed all the participants from various agencies of Royal Government of Bhutan and Non Governmental Organizations and also other relevant stakeholders. Dasho expressed his gratitude for the presence of diverse stakeholders that was gathered for the ESIA presentation of Nikachhu HPP. Dasho informed the forum that despite being burdened by already ambitious target to achieve 10,000 MW by 2020, Druk Green was still taking up the medium sized projects like NHPP mainly because besides operating and maintaining the existing hydropower plants, its other mandate is to develop and promote new hydropower plants. Therefore in terms of moving forward with capacity building, NHPP serves as a very important project for Druk Green.

Dasho stated that this was a revised ESIA for Nikachhu after the identification of the new scheme whereby the tail water of Nikachhu shall be discharged into the dam of Mangdechhu HPP. He stated that NHPP is fortunate enough to have been able to secure in principle Asian Development Banks (ADB) funding. M/s Price water Coopers (PWC) recruited by ADB has also been associated with the Consultant: M/s Bhutan Consultants and Research (BHUCORE) in carrying out the studies so as to enable for ADB to move forward with the funding.

Dasho reminded the forum that Nikachhu HPP is not a Druk Green's Project but an important National Project and, therefore, everyone present should work together and help each other in enabling the success of Nikachhu HPP.

He also mentioned that the project shall be developed under Clean Development Mechanism (CDM) under UNFCCC like Dagachhu HPP and therefore level of Environmental and Social Safeguards responsibilities and scrutiny is even greater for this project.

As Environmental Clearance (EC) is pre-requisite for any project implementation, the draft ESIA report discussion is very crucial to get feed backs and suggestions for the stakeholders so that the final report can be comprehensive which shall expedite the EC process.

He closed the opening remarks by hoping for an interactive and fruitful discussion.

The Consultant then presented the report and the following discussions and comments were observed:

1. Mr. S.k Jain of PWC, ABD noted that the environment policy of ADB which has been reflected as Environment Policy, 2002 has been revised to 2009 and therefore to be accordingly corrected in the document.
2. Mr. Sangay Dorji, Wildlife Conservation Division, Department of Forest and Park Services expressed the need to take into consideration the time frame that was allotted for the survey that was carried for the baseline data of the endangered animals in the project area and also the need to take into account the seriousness of the information that was provided by the park officials and locals of the presence of the endangered animals. He also suggested to incorporate the studies done by the park and records of presence of endangered species by the locals in the report.
3. Mr. Kesang Wangchuk, Park manager, Jigme Singye Wangchuck National Park (JSWNP) thanked Druk Green for including JSWNP in the consultation meeting. He informed the forum that JSWNP is a fairly new park and as yet no extensive research has been done. Despite that, based on the camera evidence it is established that JSWNP is a known tiger habitat and therefore proper care has to be taken while the project is still in the planning stage.

Dasho on this acknowledged the comment and also re-iterated that NHPP is not individual's project and is of National Interest so information and concerns be shared for incorporation.

4. Mr. Chimmi Dorji, Department of Hydro met Services, raised the concern on sample size that was considered for the socio economic survey as to whether people below the age of 15 and elders above the age of 60 were also consulted. Mr. Karma Jimba, Consultant, BHUCORE, clarified that 127 household which was the total size and that the specific details are reflected in the report.
5. Ms. Rebecca Pradhan from Royal Society of Protection of Nature (RSPN) expressed concerns regarding the influx of huge manpower that will be imported for the project. She stated the need for employing the local contractors and workers for the project rather than importing. She also informed that besides the tree sizes of 10 cm and above that was considered for the sampling size, trees below the 10 cm girth also has to be considered for the sample size as these trees shall grow into future forests.

Dasho assured the forum that if the local contractors had the required expertise and know how, they would definitely be taken in and that special contract works like drilling for geotechnical investigation, ESIA, survey and all had been restricted to only Bhutanese Contractors keeping in mind the need to develop competencies amongst private sector.

6. Mr. Sangay Dorji, Wildlife Conservation Division, Department of Forest and Park Services raised the question of whether the project is being accepted by the people and community within the project area. Mr. Saroj Nepal, Social Consultant with BHUCORE said that it was well included in the survey questionnaire and the people in general welcomed the project. He also mentioned that people welcomed the project wholeheartedly and were looking forward to it.

In addition to this, the Gup of Tangsibji Gewog, Mr. Jigme Chogyel expressed that this project is of national interest and would certainly be beneficial to them. He also mentioned that there were no issues from the people of his Gewog. However, the Gewog were not able to explain technically on why NHPP had to be revised technically and had to tunnel to MHPA. Generally, he expressed his people's support for the project.

Dasho on this also highlighted the development brought and associated with hydro-projects in the region with the experiences from the commissioned Kurichhu, Chukha and Tala Hydropower Plants.

7. Director (Projects), Druk Green raised some concerns on the following issues:
 - a. The need to revisit the figures presented on submergence area and total land acquisition;
 - b. The use of hydraulic breakers for Dam excavation was not technically viable option due to Scope of Work;
 - c. Issues related to logs being carried out and damages done to Dam. He opined that given the relatively smaller catchment of NHPP, this should not be of much concern to us and directed to re-examine in the report;
 - d. The need to discuss further on the proposed allocation of funds for the community so as not to duplicate what the Royal Government is doing and that; while the intentions are good, no undesirable precedence must be created.





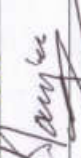
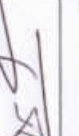




Director (Finance), Druk Green further stated that allocation of separate funds could create conflict of interest over the ownership of the fund.

- e. He pointed out that nature can be more resilient than we expect: for instance, he mentioned that hornbills which are very sensitive to disturbance have been seen to habitat in the construction sites of Dagachhu Project.
- 8. Mr. Chimmi Dorji from Department of Hydro met services expressed the need for detailed study on aquatic ecology and for the environmental release.
- 9. Mr. Sangay Dorji from Wildlife Conservation Division, Department of Forest and Park Services suggested the need for diversification in plantation and to avoid monoculture.
- 10. Miss Rebecca Pradhan, Royal Society for Protection of Nature, pointed out that the budget allocated for plantation was less and hence needs to be properly assessed.
- 11. Dasho Thrompon, Thimphu Thromde pointed out the need to have a sanitary landfill instead of common landfill which could serve both Nikachhu as well as the Trongsa town.
- 12. Mr. Kezang Wangchuk, Park Manager of JSWNP mentioned that the disturbance to wildlife could be huge due to huge influx of construction workers during construction period and therefore needs to be properly mitigated. He also stated the need for support by the project, in addition to resources provided by RGoB, to the Park Management to monitor the increased activities created by the project.

Dasho in conclusion stressed the importance of this project to nation building so that the revenues from the hydropower sector contribute to support the socio-economic development of the kingdom and therefore such cross-sectoral views must be taken, noted and properly addressed. Dasho also mentioned that Consultant (BHUCORE) to take note of all the comments and incorporate them before finalizing the reports.

Dasho thanked all the representatives for their participation in the presentation meeting and the meeting concluded at 1330 hours.













Registration Sheet for Presentation on Draft Environmental and Social Impact Assessment Report of Nikachhu Hydropower Project,
18th September, 2012 at Hotel Migmar, Olakha; Thimphu

Sl. No	Name	Organization/ Agency	Email ID	Contact No.	Signature
1	Chenwang Lingpa	DGPC			
2	Dorji P. Phuntshok	DGPC			
3	Ugyen Namgyal	DGPC			
3	Dorji T. Phuntshok	DGPC			
4	Lam Dorjee	DGPC			
5	Dechen Wangmo	DGPC	dechen76@gmail.com	17618716	
6	Pema Dorji	DGPC	pema.dorji@gmail.com	17959090	
7	Tandin Dorji	DGPC	tandin87@gmail.com	17202320	
8	Toran Pelden	DGPC	peldoran@gmail.com	17694940	
9	Neki On	DGPC	deki@gmail.com	17621210	



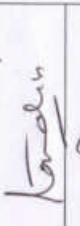

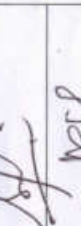







Registration Sheet for Presentation on Draft Environmental and Social Impact Assessment Report of Nibachhu Hydropower Project,
18th September, 2012 at Hotel Migmar, Olakha; Thimphu

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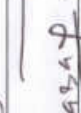



Registration Sheet for Presentation on Draft Environmental and Social Impact Assessment Report of Nikachhu Hydropower Project,
18th September, 2012 at Hotel Migmar, Olakha; Thimphu

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2	Sangay Lingzin	DOHS, THIMPHU	sangayre.dhs@dohs.gov.bt	17420649	
3	Jamyang Namgyal	DHPS/MOEA	jamyang-namgyal@dhps.gov.bt	17275326	
4	Soren Choden	DGPC			
5	Ugyen Wangchen	DGPC			
6	Yeshey Dorji	DGPC	yeshey.dorji@yahoo.com	17164449	
7	Jigme Chet Singh	Gap Kholshe		177465929	
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9	Tashi Uamoo	DGPC	tashilhams047@gmail.com	17664830	
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Registration Sheet for Presentation on Draft Environmental and Social Impact Assessment Report of Nikachhu Hydropower Project,
18th September, 2012 at Hotel Migmar, Olakhaj, Thimphu

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15	Tandin Wangmo	DKE, MoEA	tandin90@gmail.com	17600036	
16	Tashi Choeden	DHPS MoEA	choedentashi@gmail.com	17647484	
17	Sangay Wangmo	NEPA	sangaynorden@gmail.com	17555209	
18	A.C. Ghimig	NEPA	acghim@yahoo.com	17717468	
19	Sonam Dorjap	BEA	Sonam.dorjap@gmail.com	17616220	
20	Sangay Sharpa	BEA	sangay66shen@gmail.com	17760062	
21	B.L. Chanlagai	DGRC, DSM	padamch1@gmail.com	17614767	
22	Kunzang Yonten	Bto PWC	ongdi65@disnet.bt	17110241	
23	S.R. JAEN	PWC	stain@epmsindia.org	99810297612	
24	Deki Yole	PWC	dekiy200@yahoo.co	17110028	

Registration Sheet for Presentation on Draft Environmental and Social Impact Assessment Report of Nikachhu Hydropower Project,
18th September, 2012 at Hotel Migmar, Olakha; Thimphu

Sl. No	Name	Organization/ Agency	Email ID	Contact No.	Signature
25	VK Mishra	MHPA	wishnu.v.2001@yahoo.co.in	17345165	
26	Tsering Phing	Ntze	Tsering. S.1@gmail.com	17786782	
27	Sonam Palden	BPC	sonampalden@bpc.bt	17149969	
	Rbraellen	RSPN	rebecca.praeden@gmail.com	17629881	
28	Passang Dorji	Druk Green	pdorji@gmail.com	17115955	
29	Tshering Lham	Druk Green		77235611	
30	Dhendup Ezeri	Tarayangana	dhezang.yozed@gmail.com	17420151	
31	Pemsa	Tarayangana	Hpema@gmail.com	17653354	
32	Chhimi Dorji	DHMS	clinico@gmail.com	17556306	
33	Karchung K. Dorji	Druk Green	karchungk@gmail.com	17612373	
34	Samsang Dorji	WCD, DIPS	shabsangay@gmail.com	17620886	
35	Keleap Wangchuk	JSUN	kelewangchuk@hotmail.com	17114888	

18th September, 2012 at Hotel Migmar, Olakha; Thimphu

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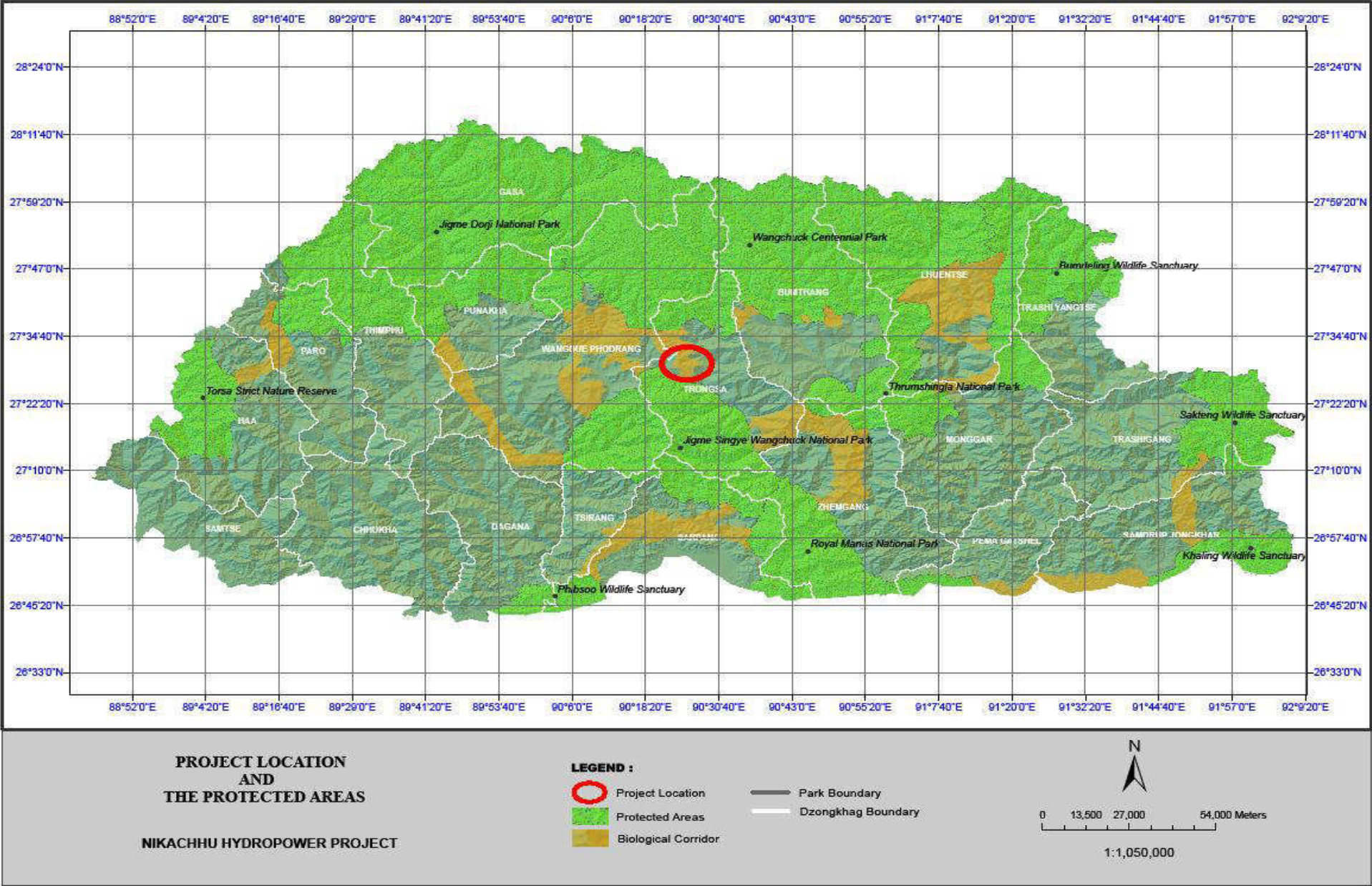
Annex N: Terrestrial survey form

APPENDIX IV: TERRESTRIAL SURVEY FORM

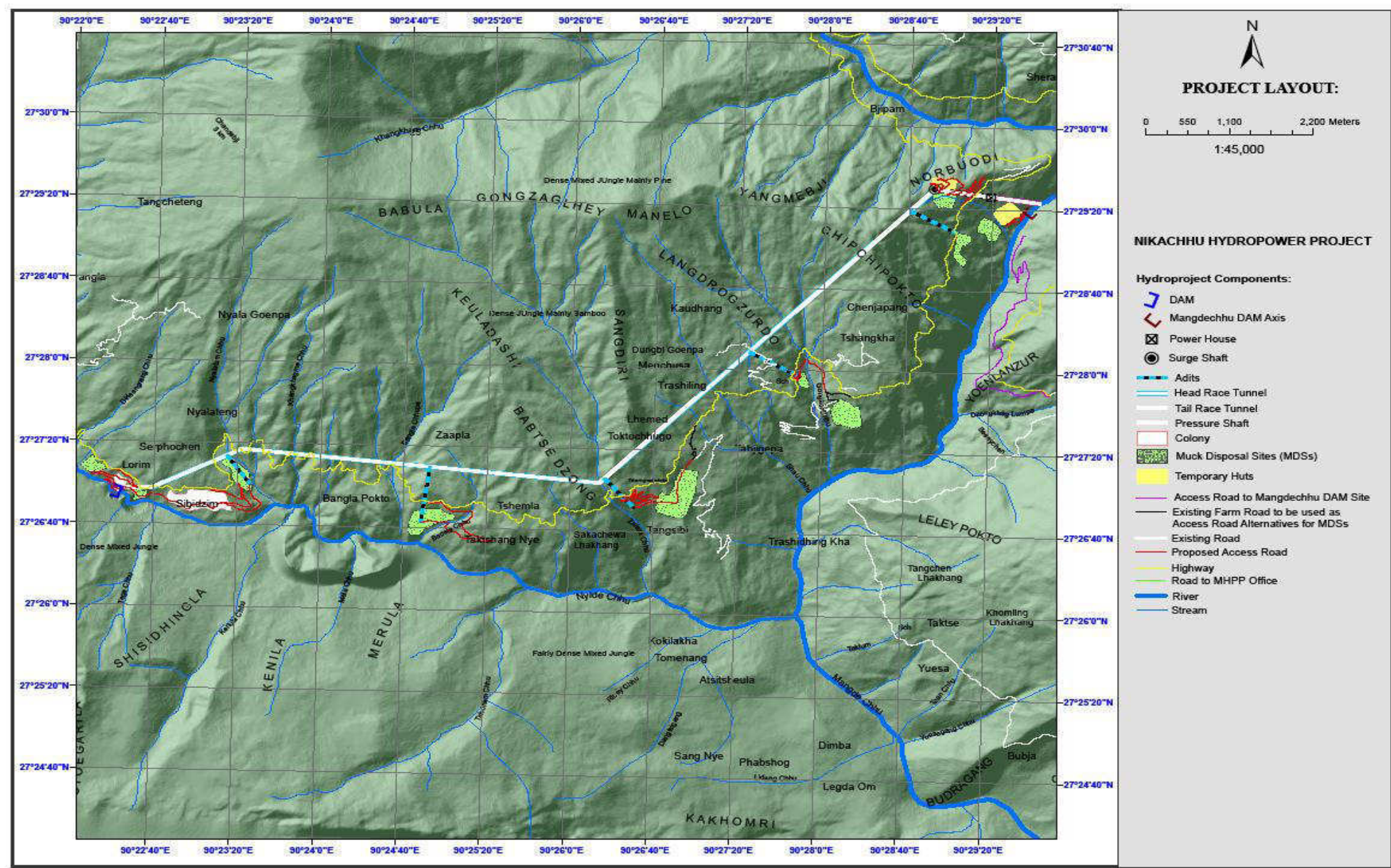
Transect	Location Name	Coordinate (transect)	Coordinates Plot	Bearing	Total transect length (m)	Plot size radius (m)	Girth Class										Orchids	Ground vegetation	Avifauna (name)	Mammalia ns (name)	Reptiles (name)					
							> 200 cm		Between 100 and 200 cm		between 100 and 50 cm		Girth < 50 cm		of Specie	Names of trees										
							# trees	Ht (m)	# trees	Ht (m)	# trees	Ht (m)	# trees	Ht (m)												
01																										

Annex O: List of Maps

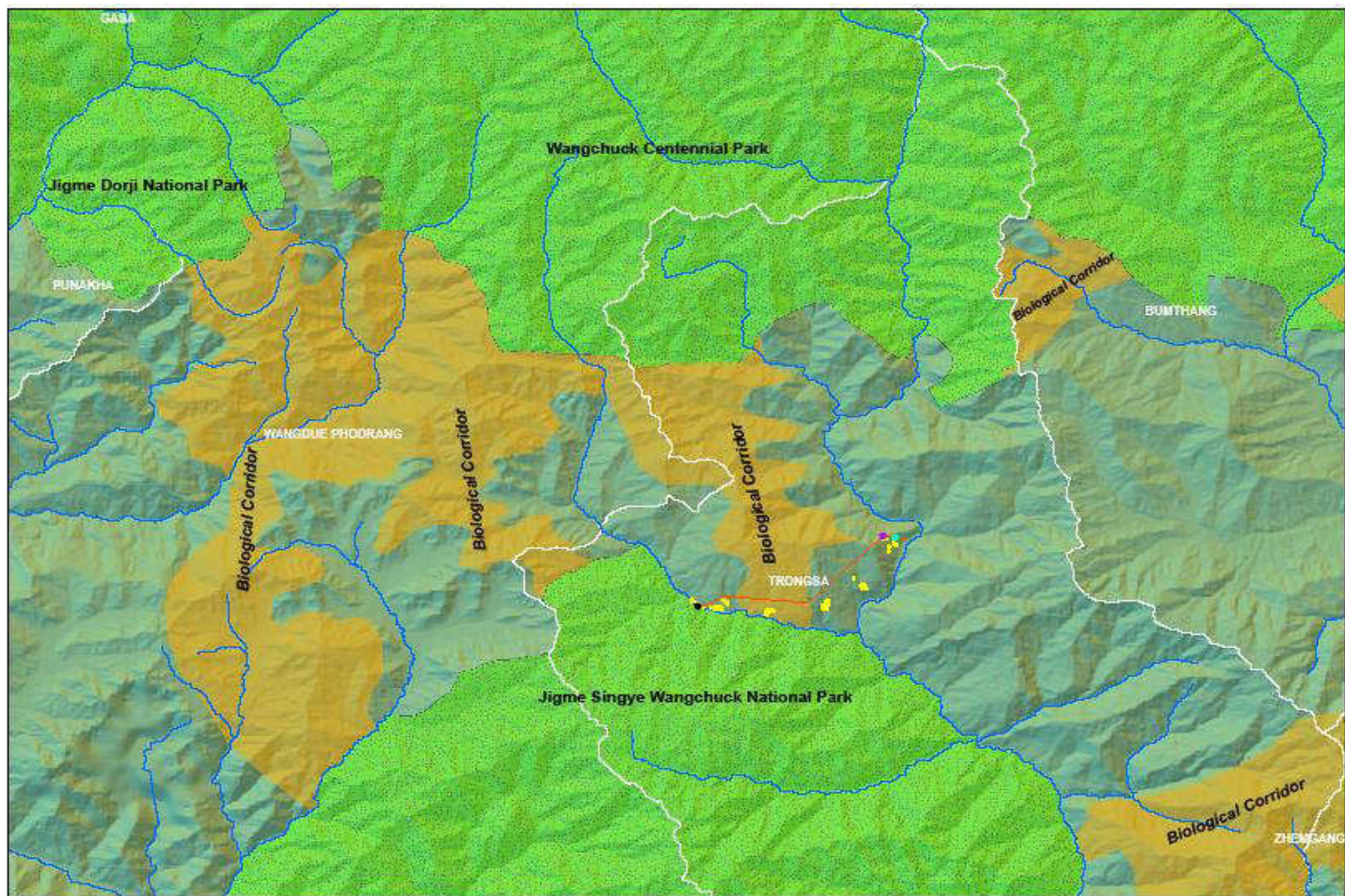
Map 1: Project Location



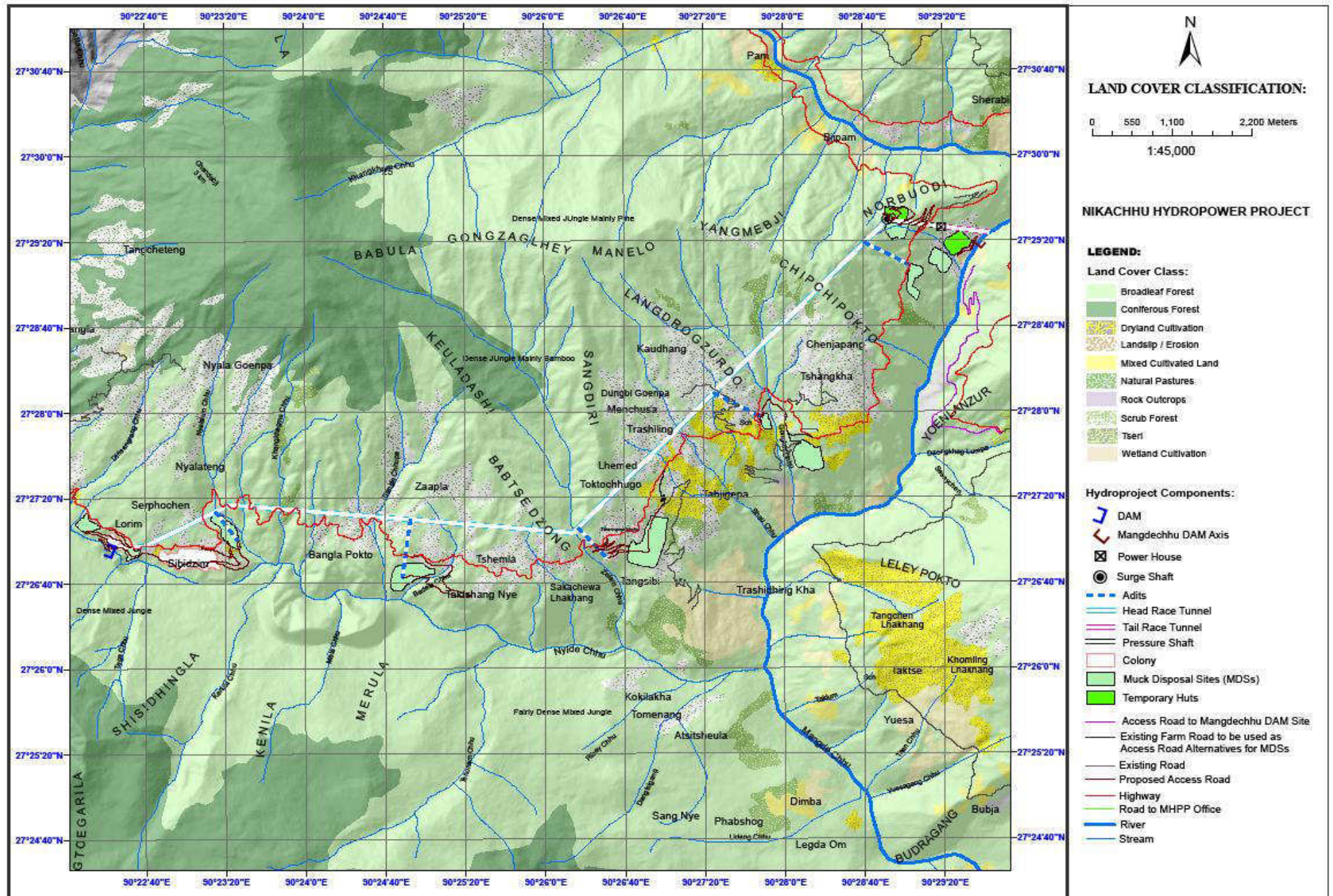
Map 2: Project Layout



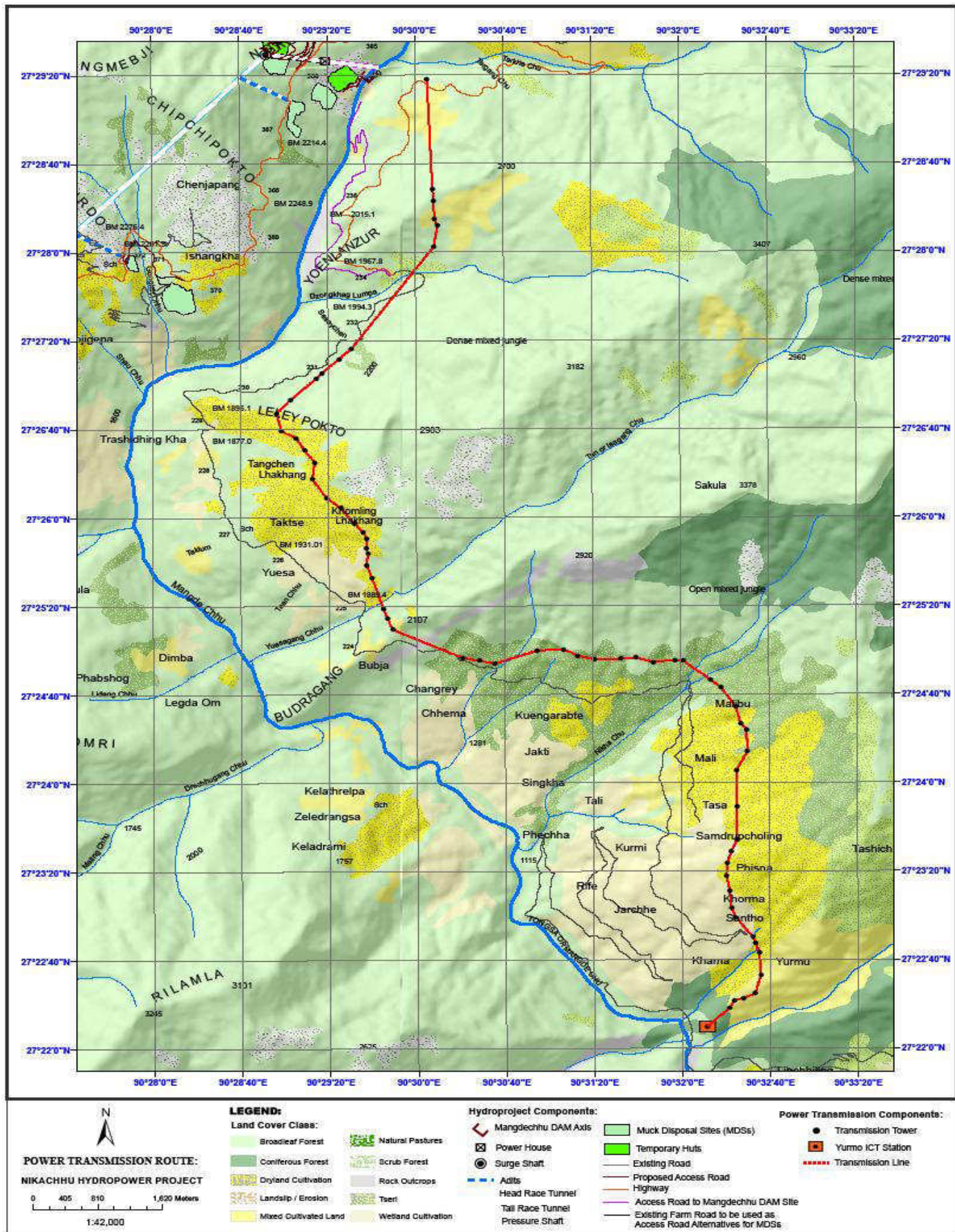
Map 3: Project Components and Protected Areas



Map 4: Land Use



Map 5: Power Transmission Route



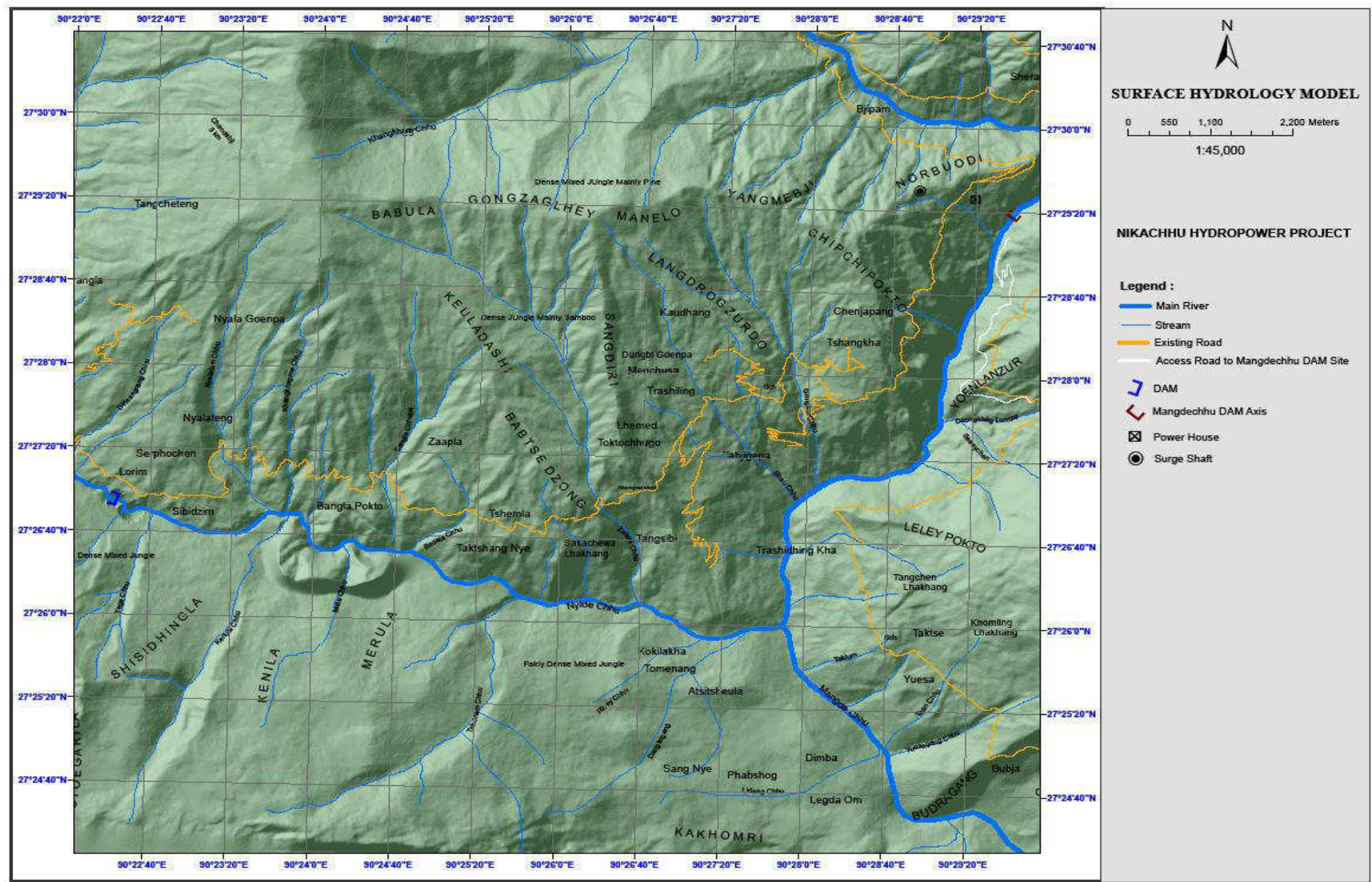
Map 6: Quarry Sites



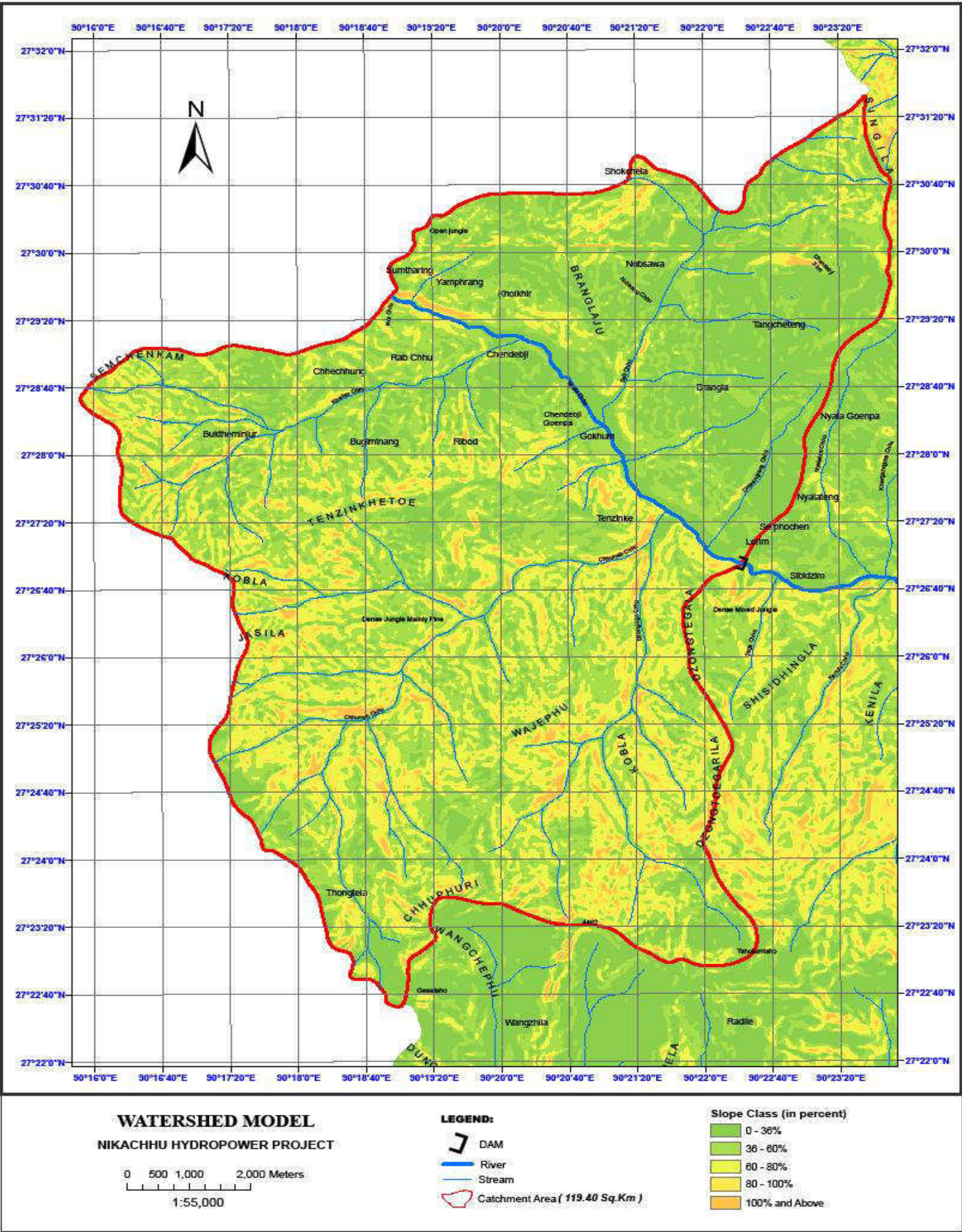
QUARRY SITES
NIKACHHU HYDROPOWER PROJECT

Quarry Site	Location	Coordinates	
1	Gangchudor	27°32'27.90"N	90°13'9.21"E
2	Pelela (on the old Highway)	27°33'8.41"N	90°12'7.55"E
3	Dung Dung Ngesa	27°32'19.00"N	90°10'37.22"E

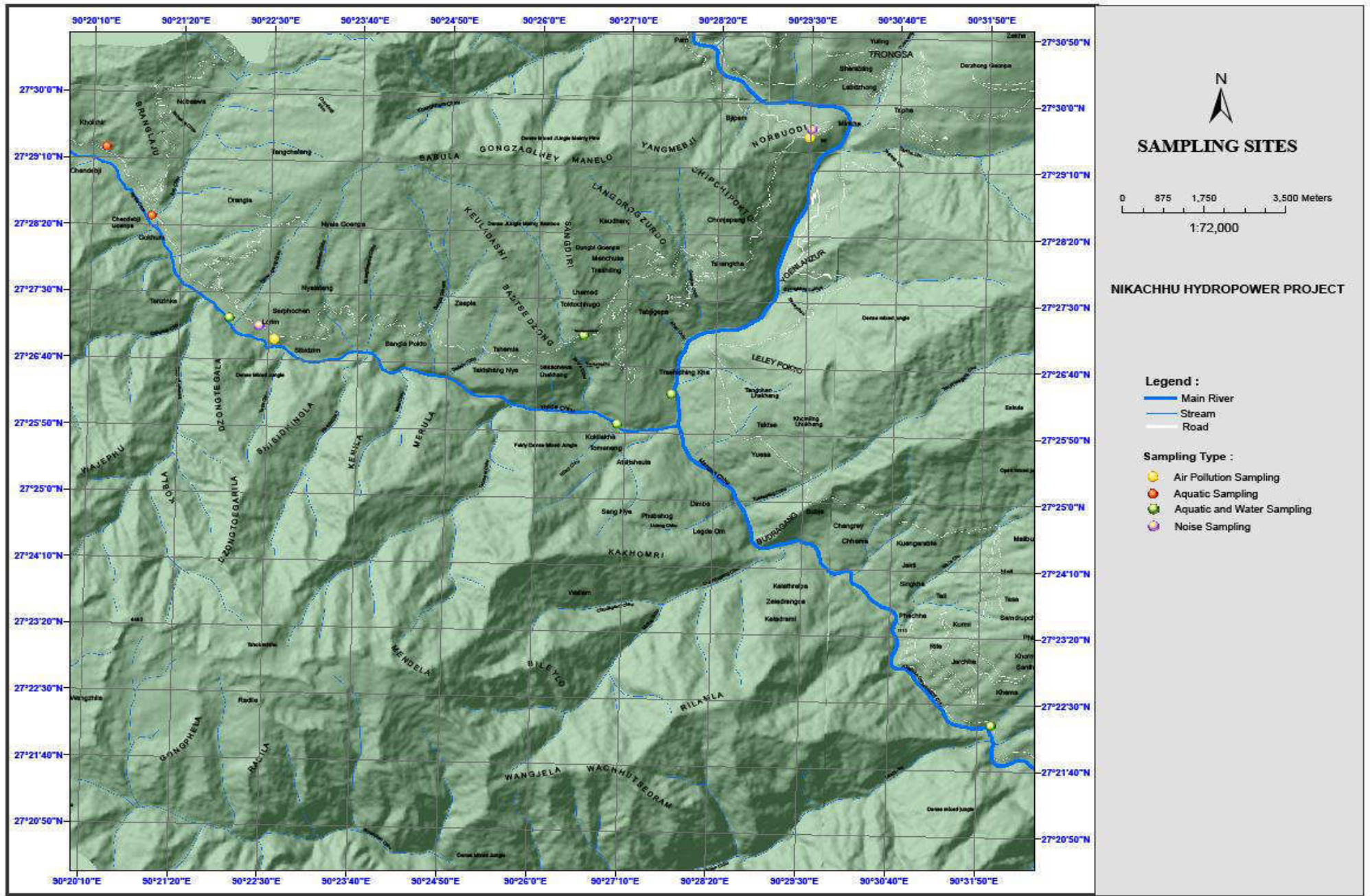
Map 7: Project Area Hydrology



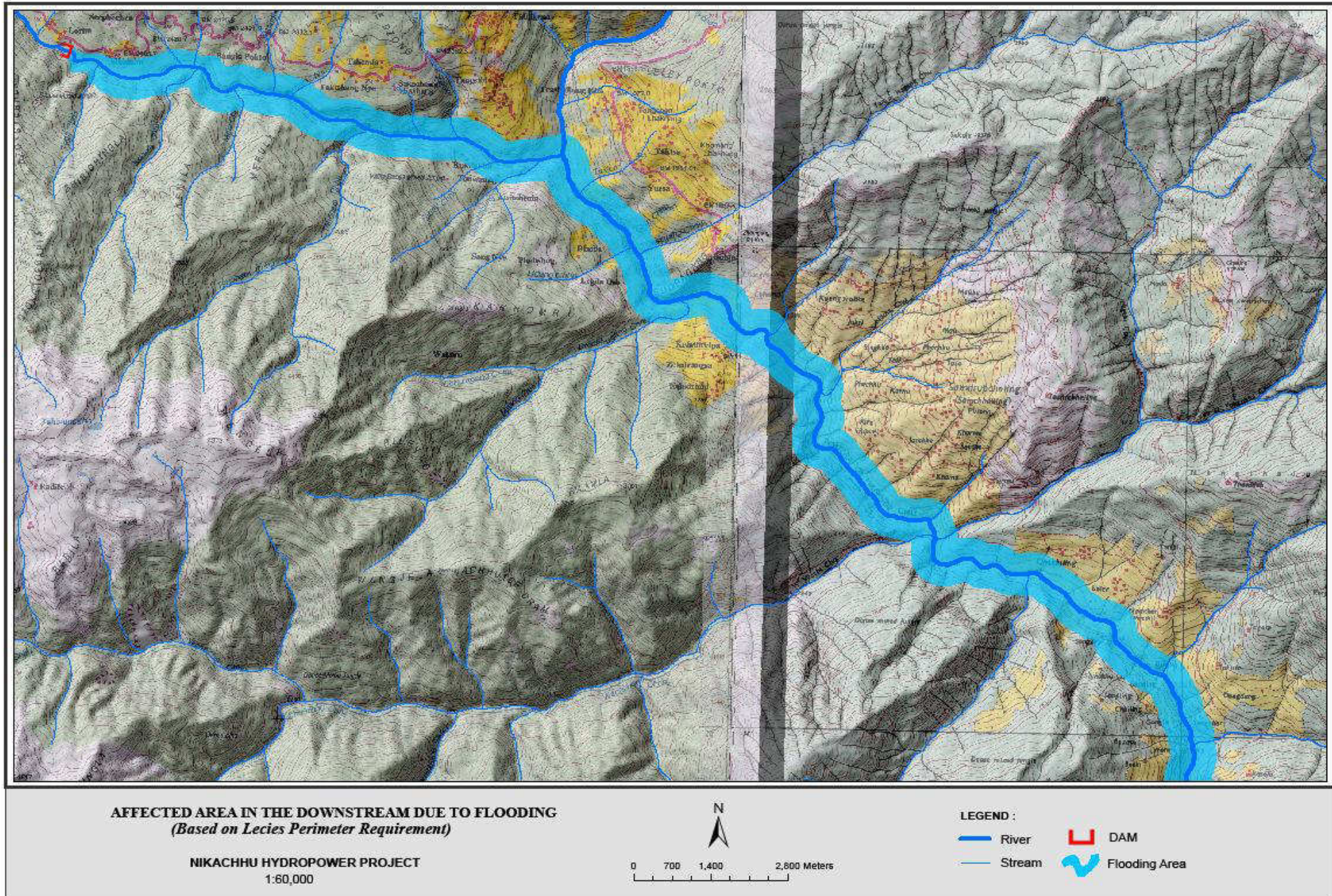
Map 8: Watershed Upstream Dam



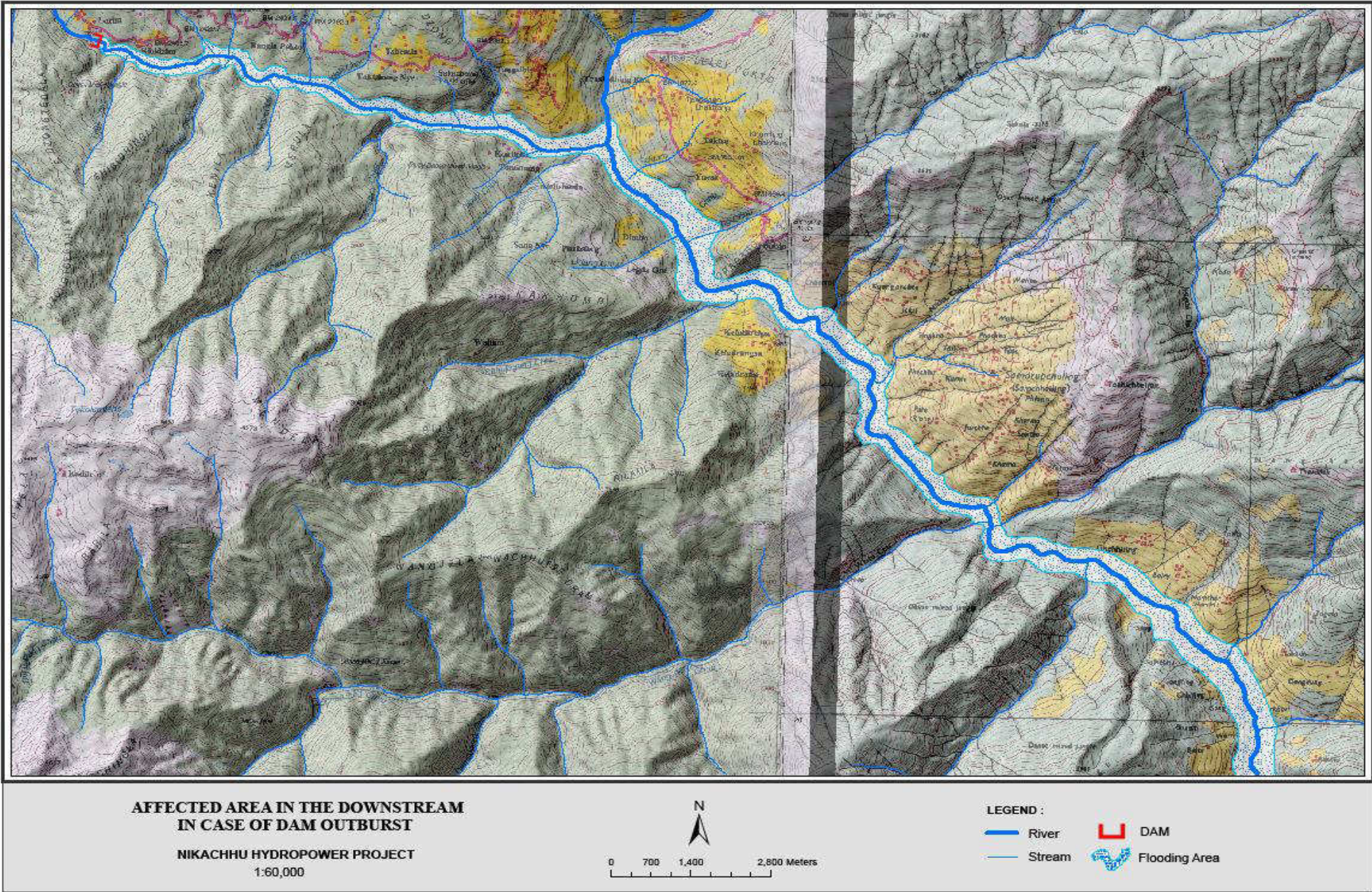
Map 9: Environmental Sampling Sites



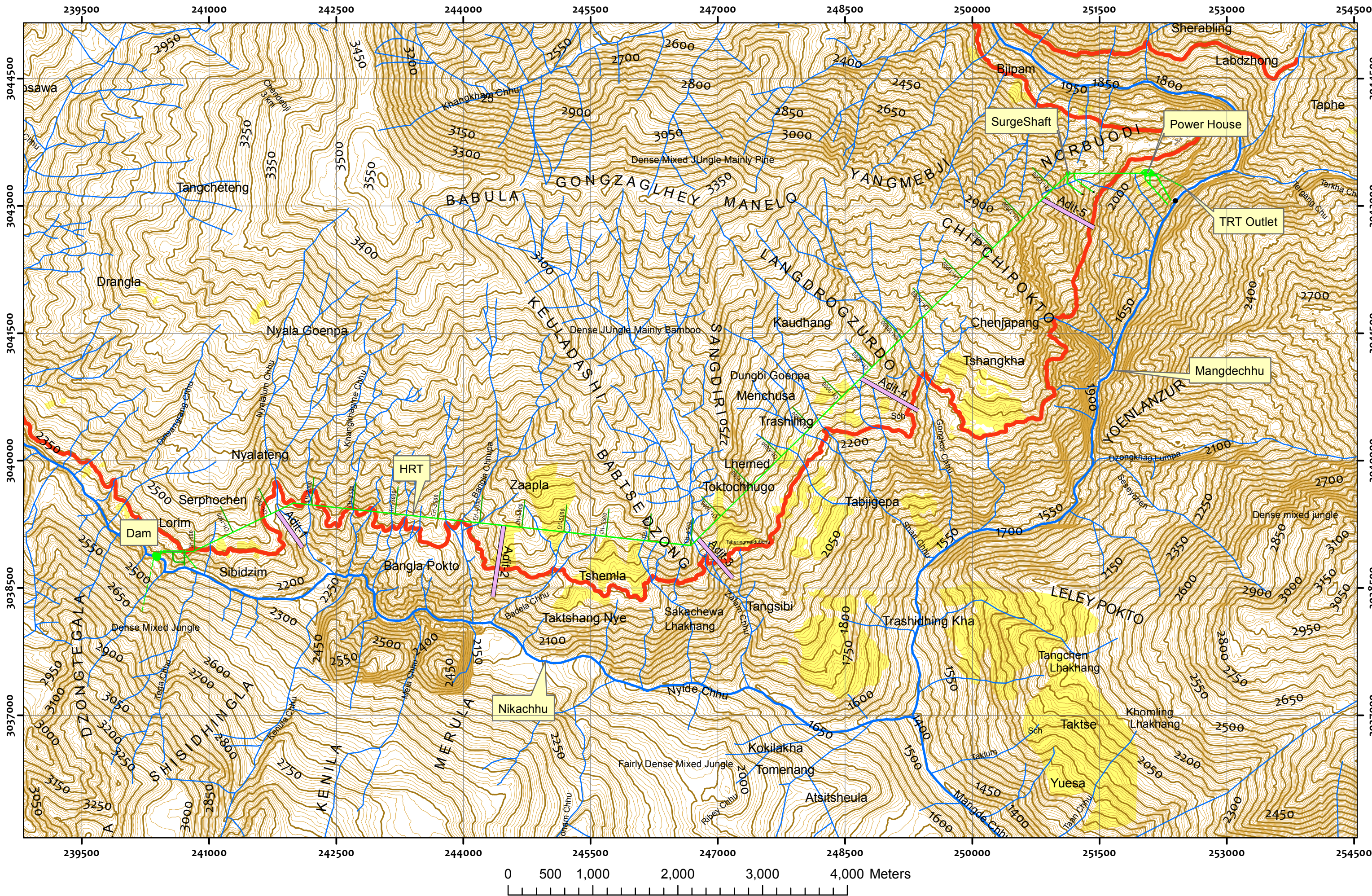
Map 10: Dam burst scenario lacies method



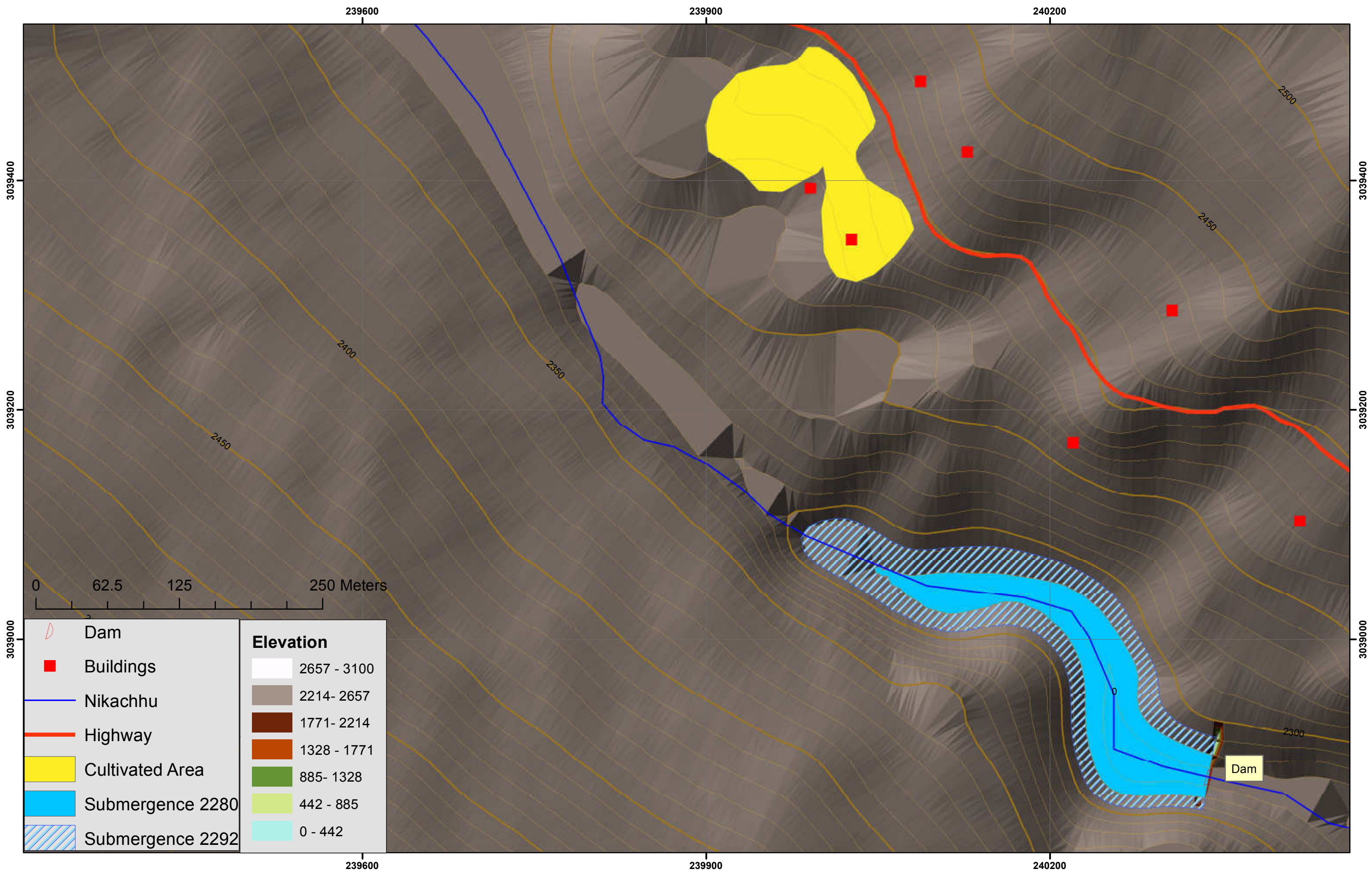
Map 11: Dam burst scenario slope method



Nikachhu HPP Layout showing Adits
Contour Interval 10m,Scale 1:40,000



Nikachhu HPP Layout of Potential Flooded Area
Scale 1:3000



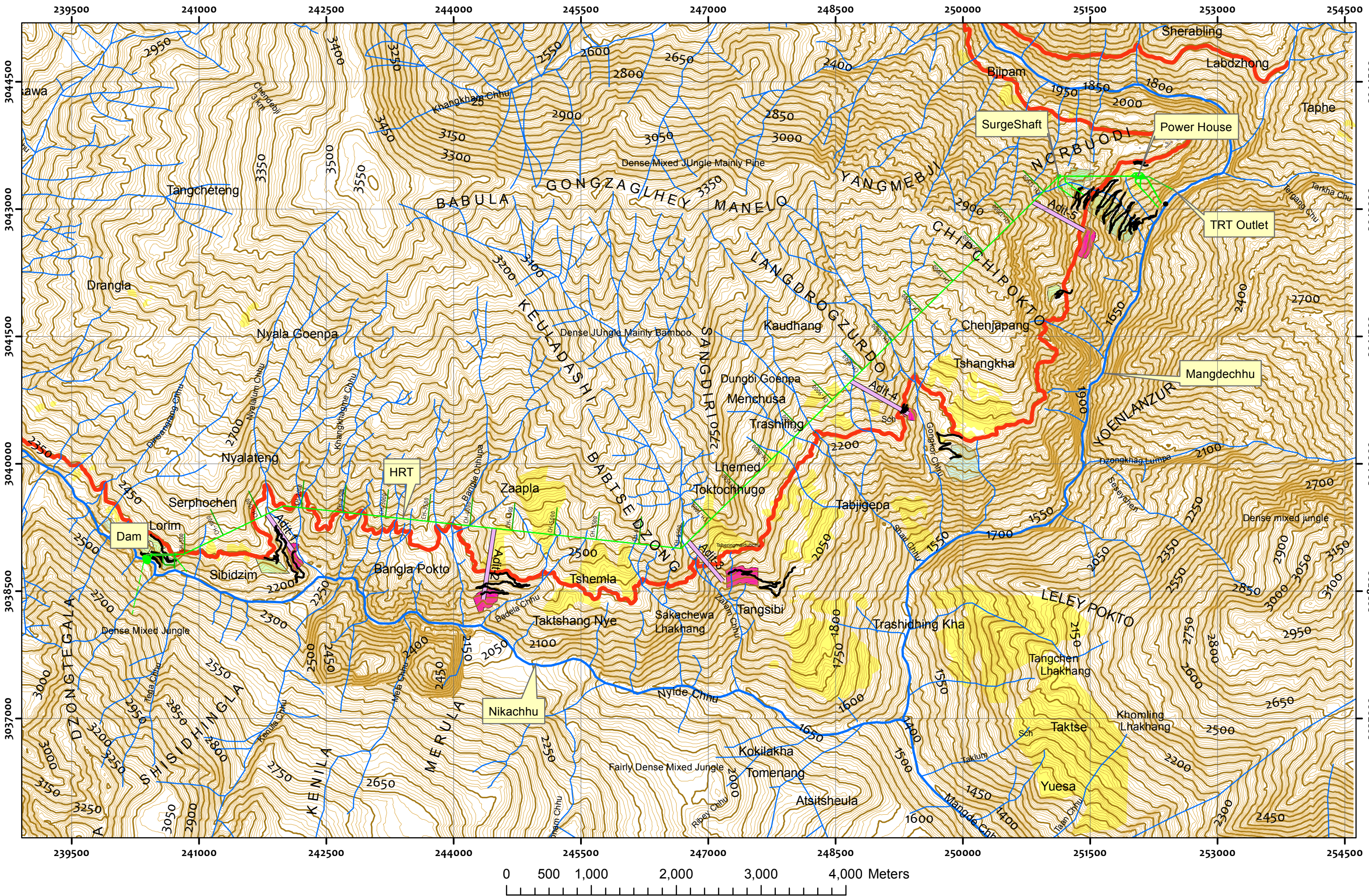
	Dam
	Buildings
	Nikachhu
	Highway
	Cultivated Area
	Submergence 2280
	Submergence 2292

Elevation	
	2657 - 3100
	2214- 2657
	1771- 2214
	1328 - 1771
	885- 1328
	442 - 885
	0 - 442

Nikachhu HPP
Contour Interval 10m, Scale 1:40,000



Nikachhu HPP Layout showing Access Rods
Contour Interval 10m,Scale 1:40,000



Annex P: Terms of Reference



འབྲུག་རྒྱལ་ཁབ་འཕེལ་རྒྱུ་གཞི་གཙོ་སྒྲིལ་ལྷན་ཁག་
 དཔལ་ལྷན་འབྲུག་གཞུང་།
National Environment Commission
 Royal Government of Bhutan



NEC/ESD/DGPC/1837/2012/ 3480

March 26, 2012

To
 The Director(Projects)
 Projects Department
 Druk Green Power Corporation Ltd
 Thimphu

Subject: Endorsed Terms of Reference (TOR)

Sir,

This has reference to your letter no. DGPC/PD/37 (a)/2012/1626 dated March 01, 2012 regarding the Terms of Reference (TOR) for conducting the Environmental Social Impact Assessment (ESIA) study for Nikachhu Hydropower Project for the extended areas under Tongsa Dzongkhag.

In this regard, find attached the endorsed terms of reference. Please ensure that the ESIA study is conducted as per the endorsed ToR and the reports are submitted accordingly.

Thanking you,

Sincerely,

Copy to m(c), P&AD

ff

27/3/12

Pema Dorji,

Thinley Dorji
 (Thinley Dorji)
 Head
 Environment Services Division



Copy to:

1. The Dzongkhag Environment Officer, Dzongkhag Administration, Tongsa for information
2. OC

**Terms of Reference (ToR) for conducting
Environmental and Social Impact Assessment (ESIA)
of Nikachhu Hydropower Project (NHPP)**

March, 2012



1. Background

Nestled in the Himalayas, Bhutan is endowed with an enormous wealth of hydropower potential. The hydropower potential is estimated to be over 30,000 MW and so far only about 5% of that potential has been harnessed.

Druk Green Power Corporation Limited (Druk Green) was formed on January 1, 2008 with the amalgamation of the erstwhile hydropower corporations and it is mandated to look after existing power generating facilities and to accelerate the hydropower development in the country. The company currently operates five power plants with an installed capacity of 1,480 MW and will be taking over power plants for operation and maintenance as and when those being constructed under Special Purpose Vehicles of the Royal Government are commissioned. The company will also be taking up new hydropower projects on its own or under joint ventures.

2. Nikachhu Hydropower Project

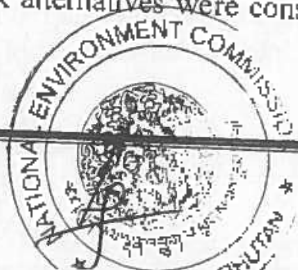
As per the updated Power System Master Plan (PSMP) of Bhutan (2004), the installed capacity of Nikachhu Hydropower Project was envisaged as 208 MW. Dam site was proposed at location named D1 with river bed El. 2,240 m. The height of the concrete dam was 23 m above river bed level.

Department of Energy (DoE), RGoB allocated the Pre- Feasibility Study (PFS) of the Project to DGPC in 2009. The PFS report was submitted to DoE in November 2010. In the PFS report, Dam Site (D1) and the Power House (PH1) location were at the same location as proposed in the PSMP; however, the installed capacity was a little higher at 210 MW. In June 2011, the geotechnical studies at the feasibility level were completed. As per the geotechnical studies; the dam site at D1 was not found to be suitable; thereby, two alternatives dam sites D2 and D3 were identified.

The geological and geotechnical study show that PH1 lies in fair rock conditions with high permeability, consisting almost entirely of Garnetiferous Micaceous Schist and Mica Schist with intrusions of Quartz and Dykes. From the geotechnical studies, it was concluded that the location of PH1 may be feasible; however, the cost of construction may escalate due to presence of high permeability at PH1. Keeping in view the geological conditions, similar to the one being encountered at Dagachhu Hydropower Project which has led to time and cost overrun, an alternative location of Power House PH2 and PH3 were identified. The alternate scheme not only locates the Power House areas in more competent geology but enables the tail water to be released into the reservoir of the 720 MW Mangdechhu Hydroelectric Project for increasing electricity generation.

Based on the merits of combining the Nikachhu Hydropower Project with the Mangdechhu Hydroelectric Project, Druk Green's Board in its 30th Meeting approved the study of the combined scheme.

After the approval, the PFS Report which was prepared in November 2010 was updated in December 2011. In the updated PFS, six alternatives were considered for the study. The six alternatives are as under;



Description	Alt # 1	Alt #2	Alt#3	Alt#4	Alt#5	Alt#6
Dam Location	D2	D3	D2	D3	D2	D3
Power House Location	PH1	PH1	PH2	PH2	PH3	PH3

The locations of the Dam and Power House are as under;

Location of Dam Site and Power House		
Location	Coordinates	
	Latitude	Longitude
D2 at Lorim	27°26'55.41"	90° 22'22.21"
D3 at Banglapokto	27°26'32.49"	90° 24'9.34"
PH1 at Tansibji Village	27°26'29.46"	90° 27'17.90"
PH2 at Norbuodi	27°29'28.36"	90° 29'5.37"
PH3 at Chipchipokto	27°28'39.94"	90° 28'50.19"

* In the updated PFS Report, it was recommended to carry out Feasibility Study for Alternative Alt #3, Alt #4, Alt #5 and Alt#6 keeping in view the following:

- i) -The levelized tariff for Alt#3, Alt#4, Alt#5 and Alt#6 are lower than Alt #1 and Alt #2;
- ii) From the surface geology, the geology of PH2 and PH3 especially in the Surge Shaft, Pressure Shaft, Power House and Tail Race Tunnel is good and far better than at PH1;
- iii) Social and Environment Impacts of developing the Nikachhu Project in combination with Mangdechhu Project are far lower than developing the stand alone Nikachhu Project with PH1.

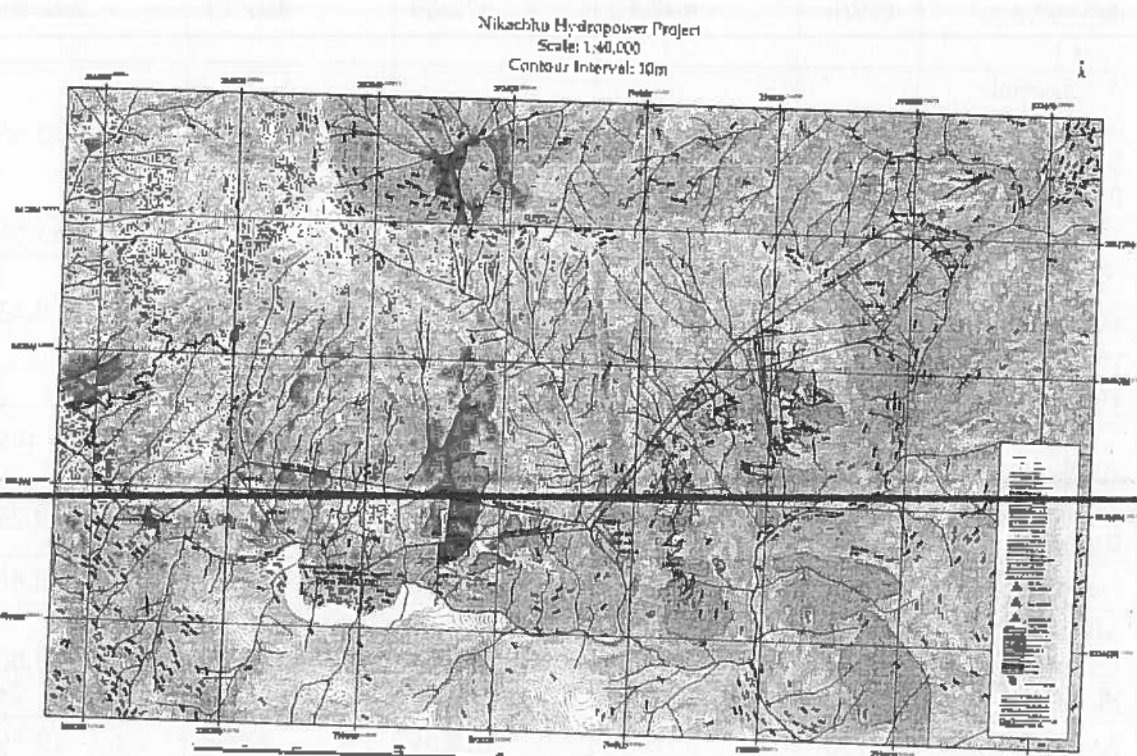
The Tender for Design and Engineering at Feasibility Level has been floated and shall be awarded in March, 2012. The Inception report shall be scheduled to be completed in June 2012. One of the outcomes of Inception Report is the selection of the best project from the above four alternatives (i.e Alt#3, Alt#4, Alt#5 and Alt#6). The location of the selected alternative shall be furnished to the Consultant during the tenure of this Consultancy Services. Thus the ESIA under the Scope of this ToR shall cover only one of the project alternatives. However, for the estimation and understanding of the project, the technical's details of the four alternatives are given below;

2.1. Technical Details of the Project

The Project is found on topographic map Wangdichung, sheet no. 78 I/7 in scale 1:50,000 with counter interval of 40 m published by Department of Survey and Land



Records, 2000, 1st edition, Bhutan. Below is the surveyed map of the project area with tentative location of intakes and Power Houses.



The main East-West highway runs along Nikachhu from Chendebji Chorten past the project intake and the powerhouse area viewed from Chejapang, MHEP Dam access. The diversion site D2 and D3 are located on Nikachhu approximately 3.5 and 8.6 kms respectively, downstream of Chendebji Chorten. The Power House, PH2 is located at Norbuodi (Alt#3 and Alt#4), close to Mangdechhu Dam, and PH3 at Chipchipokto (Alt#5 and Alt#6).

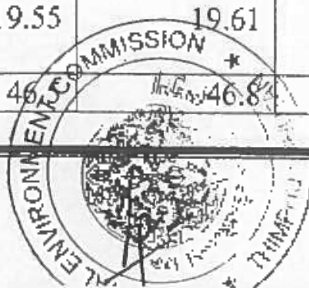
Access road to the intake may take off from the main highway at Lorim (D2) and Bangla Pokto (D3).

The tables below provide the Technical Details of Nikachhu Hydropower Project;

a. Salient Features

Descriptions	Unit	Alt#3	Alt#4	Alt#5	Alt#6
Power Potential					
Design Discharge	m ³ /s	30.74	33.08	30.74	33.08
Net Head	m	504.18	353.19	504.18	353.19
Installed Capacity	MW	130		130	98

Descriptions	Unit	Alt#3	Alt#4	Alt#5	Alt#6
Energy (90% dependable year)	GWh	497.17	372.89	497.17	372.89
Additional Energy from Mangdechhu Power House	GWh	373.34	390.67	373.34	390.67
Total Energy	GWh	870.5	763.56	870.5	763.56
PLF (90% dependable year)		0.44	0.43	0.44	0.43
Hydrology					
Catchment Area	km ²	373	398	373	398
Mean Annual Runoff	l/s/km ²	49.23	49.23	49.23	49.23
Design Flood	m ³ /s	446.53	476.46	446.53	476.46
Minimum Environmental Flow	m ³ /s	0.05	0.05	0.05	0.05
Average flow	m ³ /s	18.36	19.59	18.36	19.59
Maximum flow	m ³ /s	109.58	116.92	109.58	116.92
Minimum Flow	m ³ /s	2.94	3.13	2.94	3.13
Reservoir					
FRL	masl	2,280.05	2,121.11	2,280.05	2,121.11
Gross Storage	mill. M ³	0.0199	0.0125	0.0199	0.0125
Live Storage	mill. M ³	0.0078	0.0037	0.0078	0.0037
Dead Storage	mill. M ³	0.0122	0.0088	0.0122	0.0088
Length of Reservoir	m	464.41	289	464.41	289
Reservoir Area	km ²	0.0213	0.013	0.0213	0.013
Dam					
Type	Concrete Gravity Dam				
Dam top level	masl	2,281.55	2,122.61	2,281.55	2,122.61
River bed elevation	masl	2,262.00	2,103.00	2,262.00	2,103.00
Dam height above river bed	m	19.55	19.61	19.55	19.61
Crest Length	m	46.5	46.8	46.5	46.8



Descriptions	Unit	Alt#3	Alt#4	Alt#5	Alt#6
Headrace Tunnel					
Length	m	13,250	10,310	12,300	9,100
Optimum dia. Of tunnel	m	3.3	3.4	3.3	3.4
Recommended dia. Of tunnel	m	4.5	4.5	4.5	4.5
Design discharge	m ³ /s	33.82	36.39	33.82	36.39
Velocity	m/s	2.13	2.29	2.13	2.29
Surge Shaft					
Number	No	1	1	1	1
Orifice diameter	m	12.36	12.36	12.36	12.36
Height	m	59.24	56.11	56.93	52.6
Top Elevation	masl	2,308.50	2,148.12	2,307.46	2,146.48
Pressure Shaft					
Number	No	1	1	1	1
Type	Steel Lined				
Diameter	m	3.4	3.4	3.4	3.4
Rated Discharge	m ³ /s	33.82	36.39	33.82	36.39
Velocity	m/s	3.72	4.01	3.72	4.01
Length	No	535	375	528	369
Main Access Tunnel					
Diameter	m	6	6	6	6
Length	m	576	576	651.5	651.5
Power House Complex					
Type	Underground				
Size of Power House	m	80X18X39	80X18X39	80X18X39	80X18X39
Size of Transformer cum GIS Cavern	m	47X13.5X20	47X13.5X20	47X13.5X20	47X13.5X20
Number of Units	No	2	2	2	2
Capacity of each Unit	MW	65	49	65	49
Type of Turbine		Vertical Pelton	Vertical Pelton	Vertical Pelton	Vertical Pelton



Descriptions	Unit	Alt#3	Alt#4	Alt#5	Alt#6
Speed of rotation	RPM	375	300	375	300
Type of Generator		Synchronous, 0.9 pf lag	Synchronous, 0.9 pf lag	Synchronous, 0.9 pf lag	Synchronous, 0.9 pf lag
Generator Voltage	kV	11	11	11	11
Transformer and GIS		6 + 1 spare, 30 MVA, 1 ph., 11/132 / $\sqrt{3}$ kV GTs	6 + 1 spare, 30 MVA, 1 ph., 11/132 / $\sqrt{3}$ kV GTs	6 + 1 spare, 30 MVA, 1 ph., 11/132 / $\sqrt{3}$ kV GTs	6 + 1 spare, 30 MVA, 1 ph., 11/132 / $\sqrt{3}$ kV GTs
		220 kV GIS	132 kV GIS	132 kV GIS	132 kV GIS
Maximum Gross Head	m	530.72	371.78	530.72	371.78
Net Head	m	504.18	353.19	504.18	353.19
Tailrace Tunnel					
Length	m	1,140	810	1,970	1,960
Size	m	4.7	4.7	4.7	4.7

b. Land Requirement Estimate for the Project by various Project Ancillaries

Component (s)	Area (Ha)
Permanent Colony	5.83
Total area required for proposed roads	11.5
Transformer and Electric line for Permanent Colony	0.02
Water Tank for Permanent Colony	0.05
Labour Camp, Store & Workshop for Dam site	1.73
Labour Camp, Store & Workshop for Power House, Surge Shaft	2.99
Temporary Site office and Quarters for Power House	0.21
Temporary Site office for Dam site	0.21
Labour Camp area for Dam site	0.66
Aggregate crushing plant near Dam site	1.62
Batching and Mixing plant near Dam site	1.21
Batching and Mixing plant near HRT site	0.81
Batching and Mixing plant near Power House site	0.81

Note: The above land requirement is tentative.

c. Tentative areas required for Muck Disposal

Muck Disposal Area for;	Area (Ha)
Dam site	2.02



HRT , Surge Shaft, ADITs	3.47
Power House	1.36
Magazine Area	0.12

The Consultant shall identify muck disposal areas for Nikachhu Hydropower Project at the vicinity of various Adits and other project components.

d. Tentative Adit Lengths for various Project Alternatives

Alt # 3		Alt # 4		Alt # 5		Alt # 6	
ADIT	Length (m)	ADIT	Length (m)	ADIT	Length (m)	ADIT	Length (m)
ADIT 3-1	911	ADIT 4-1	647	ADIT 5-1	911	ADIT 6-1	647
	940	ADIT 4-2	638	ADIT 5-2	940	ADIT 6-2	638
ADIT 3-2							
ADIT 3-3	535	ADIT 4-3	1,568	ADIT 5-3	535	ADIT 6-3	1,308
ADIT 3-4	1,069	ADIT 4-4	1,083	ADIT 5-4	781	ADIT 6-4	280
ADIT 3-5	1,105			ADIT 5-5	347		
Total Length (m)	4,560.00		3,936.00		3,514.00		2,873.00

The locations of the ADITs for all the alternatives are give in the Project Map in Section 2.1.

e. Total Volume of Muck likely to be generated from various Project Components

Project Component	Unit	Alt#3	Alt#4	Alt#5	Alt#6
Diversion Tunnel	m ³	4,899.38	7,805.66	4,899.38	7,805.66
Dam	m ³	13,639.05	13,639.05	13,639.05	13,639.05
De-silting Chamber	m ³	30,288.75	34,744.50	30,288.75	34,744.50
HRT	m ³	210,732.14	163,973.47	195,623.05	144,729.25
Surge Shaft	m ³	7,107.91	6,732.36	6,830.74	6,311.21
Pressure Shaft	m ³	4,857.37	3,404.70	4,793.82	3,350.23
TRT	m ³	19,778.37	14,053.05	34,178.41	34,004.91
MAT	m ³	16,286.02	16,286.02	18,420.73	18,420.73



ADIT	m ³	79,113.47	68,287.42	60,965.95	49,844.96
Power House	m ³	56,160.00	56,160.00	56,160.00	56,160.00
GIS Cum Transformer Cavern	m ³	12,690.00	12,690.00	12,690.00	12,690.00
Total volume of muck generated	m ³	455,552.46	397,776.22	438,489.87	381,700.49

f. Summary of Access Road (km) Requirements

Description	Alt # 3	Alt # 4	Alt # 5	Alt # 6
Highway to D2	1.34	-	1.34	-
Highway to D3	-	3.77	-	3.77
Access road to Surge Shaft (Alt# 3 and Alt#4)	3.13	0.46		
Access road to Surge Shaft (Alt#5 and Alt# 6)	-	-	1.58	1.13
Access road to Power House (PH2)	0.42	0.42	-	-
Access road to Power House (PH3)	-	-	-	-
Road to ADIT	5.92	11.48	5.79	11.53
Total Road Length (km)	10.81	16.13	8.71	16.43
Bridges (m)	-	-	171.2	171.2

3. Regulation for Environmental Clearance of Projects

Under Section 29 of the Regulations for the Environmental Clearance of Projects, if the National Environment Secretariat or Competent Authority requires the applicant to conduct environmental assessment, the following provisions apply:

29.1 Terms of Reference: The Applicant will draw up the Terms of Reference (ToR) for the environmental assessment.

29.2 Preparation and Submission of the Environmental Assessment Report: The applicant shall prepare the environmental assessment report consistent with the ToR approved by the Secretariat or Competent Authority. The environmental assessment report shall, wherever possible, follow the format described in Annex 3 and the guidelines issued by Secretariat or Competent Authority

29.3 Public Notice of Availability of the Environmental Assessment Report: The applicant will comply with the public notice requirements in Section 31 of this regulation

29.4 Within the time limit specified in Annex 1 regarding receipt of complete environmental assessment report and completion of the public notice procedures, the Secretariat or Competent Authority may issue an environmental clearance based on the environmental assessment report.



4. Objectives

The objectives of this Consultancy Services are to:

- Review of earlier Environmental and Social Impact Assessment Reports and update for the extended areas;
- Ensure that the resulting ESIA Report will be suitable for review and evaluation by NEC, DGPC and other stakeholders including development partners;
- Serve as a standard document against which the subject matter covered by the ESIA report will be evaluated and;
- Provide specific guidelines for:
 - ✓ Identification and description of the issues to be investigated;
 - ✓ Fitting the ESIA studies into the context of existing policies, rules and administrative procedures;
 - ✓ Public consultations and disclosure;
 - ✓ Collection of data;
 - ✓ Examining alternatives;
 - ✓ Assessing impacts and
 - ✓ Developing an Environmental Management Plan (EMP) and Resettlement Plan (RP).

4.1.Scope of Work

The ToR is being prepared for an ESIA at the Detailed Design and Engineering Stage of the project cycle. ESIA for Nikachhu as a standalone project has already been carried out in 2010 (Annex-I). The scope of work under this ToR shall cover ESIA of the extended project areas including environmental assessments of its various project ancillaries. The scope of services to be provided by the Consultant shall be, but not limited to the following:

- ✓ Incorporate findings of the previous Environmental and Social Impact Assessments that covers Power House area PH1 and Dam Alternative D1 (Annex-I);
- ✓ Conduct ESIA of the extended Project Areas of the Combined Scheme;
- ✓ Conduct ESIA of the identified access roads (roads to adits and road connecting various project components): The assessment should comply with the NEC's Sectoral Guideline for EA of Highways and Roads;
- ✓ Preliminary Environmental Assessment of Transmission and distribution lines (describe the structure (pole/tower type, height, average span, right of way width, etc), significant or sensitive features in the corridor, likely impacts of the line and main impact mitigation measures that will be implemented): in compliance with NEC's Sectoral Guideline for Transmission and Distribution lines;
- ✓ Detailed Management Plan for Muck Disposal Sites;
- ✓ Prepare Mitigation Measures, Environmental Management Plan, Auditing plan and Monitoring Programmes;
- ✓ Conduct Social Impact Assessment for the project;
- ✓ Prepare Resettlement Plan (RP) in accordance with the internationally accepted standards and guidelines;



- ✓ Assess the identified sites for colonies, labour camps, batching plant, adits, etc. (tentative locations to be provided by Druk Green)
- ✓ Incorporate any other information that may be determined by the NEC in line with the provision of the Environmental Assessment Act 2000 & its Regulation 2002.

5. The Contents of the Report

The following sections outline the Report for the ESIA of the Nikachhu Hydropower Project.

5.1.Name and Address of the Project Applicant

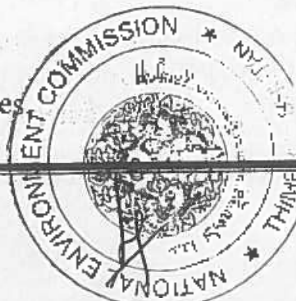
This section of the report should provide a concise description (corporate overview) of the organization that is submitting the report and should include:

- ✓ Name of the project;
- ✓ Name of the Applicant;
- ✓ Present mailing address including telephone number, fax, and email address of the applicant;
- ✓ Name of the environmental focal person of the applicant (as per Section 3 of "Regulation for EC of Projects, 2002");
- ✓ Qualification/designation of the focal person;
- ✓ Telephone number of environmental focal person;
- ✓ The name and contact details of the company that prepared the EA report.

5.2.General Introduction of the Proposal

This section must clearly state the objectives of the project, and its relevance to the Kingdom's socio-economic development. The objectives of the study and the relationship of its results to project planning, design and implementation should also be highlighted in this section. It should highlight critical points in the decision-making process linking Environmental and Social Impact Assessment and project execution. This will require descriptions of the construction and operational phases of the proposed project and should include the project;

- ✓ Location and accessibility;
- ✓ Design and layout;
- ✓ Size and capacity;
- ✓ Land requirements;
- ✓ Access requirements;
- ✓ Transmission lines and distribution networks;
- ✓ Construction materials;
- ✓ Construction activities;
- ✓ Energy and power source for construction;
- ✓ Schedule;
- ✓ Staffing;
- ✓ Support facility services;
- ✓ Labor requirements; and
- ✓ Operation and maintenance activities



- In the Application for Environmental Clearance - Guidelines for Hydropower Development, these are addressed under i) Project Physical Details, ii) Project Biological Environment and iii) Project Social Environment. The Guidelines also include tables and matrixes for presenting the information. However, the information should be more detailed for those parts of the project where significant environmental and social Impacts have been identified.

5.3.Policies, Laws, Rules and Directives

Review of the country's legislative and administrative framework within which the ESIA is to be undertaken to ensure that the project is in compliance with national environmental and social requirements.

A summary should be made of the guidelines, procedural aspects, acts, rules, regulations and policies and sectoral guidelines, hydropower policies, forestry regulations, etc., to be followed in the preparation of the ESIA report for the proposed project. Particular emphasis should be given to the policies and legal framework for sensitive issues such as pollution standards, protected areas, endangered species, criteria for impact evaluation, and the relocation of and compensation for project affected peoples.

5.4.Description of the Existing Environment

The data need to be collected only for additional/extended area.

- The report must present relevant baseline information pertaining to the geo-physical, biological, socio-economic and cultural situation of the area under study, including any changes anticipated prior to project implementation.

5.4.1. Data Collection for the Preparation of ESIA Report and Methodology of Data Collection

The evaluation of the effects of hydropower project on the environment and socio-economy require adequate knowledge of the ecosystems, including the human communities which exist within the area of influence of the project.

This section should summarize what baseline data and information was gathered, describe how they were gathered, and explain how they were used. The study goals must be clearly defined. The methodologies used for data collection should be briefly described. Predictive, quantitative models and standards should be proposed wherever possible to avoid vague and subjective predictions. In addition, public involvement to focus the analysis on locally important concerns and issues, and to ensure peoples' participation, should be employed.

5.4.2. Methodology

Methods used for collecting data should be mentioned. In analysis of air, water and noise, methodology adopted, instruments used etc., should be mentioned. The land-use/land-cover pattern of the area should be determined through interpretation of google

earth images, topographic sheets and ground truthing. Standard methods should be used for characterizing the diversity and other significant features of the biota and details of field survey given.

The baseline studies should be conducted in the following study areas but not limited to;

- i. The whole project area including the Catchment and Submergence Area;
- ii. Mangdechhu Dam site and Tailrace;
- iii. Project Areas to be acquired for various works area (including access roads, transmission lines, muck disposal area, colonies, batching plant areas, etc).

Adverse impact on land stability, catchment soil erosion, reservoir sedimentation and spring flow (if any) due to (a) considerable road construction/widening activity (b) interference of reservoir with the in-flowing streams (c) blasting for commissioning the HRT, TRT and some other structures should be studied. Besides, the following maps should be included in the report.

- ✓ The location map of the proposed project;
- ✓ The project layout, superimposed on a contour map of ground elevation showing main project features (viz. location of dam, head works, main canal, branch canals, quarrying, muck disposal sites, infrastructures etc.);
- ✓ Drainage map of the catchment up to the project site;
- ✓ Soil map of the study area including the Catchment area;
- ✓ Geological and seismo-tectonic map of the study area showing main project features;
- ✓ Interpretation of google earth images, topographic sheets along with ground verification developed for the land use/land cover pattern of study area using overlay mapping techniques viz. Geographic Information Systems (GIS).

5.4.3. Baseline Data

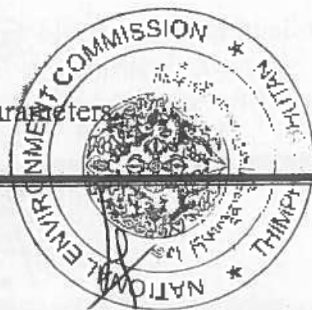
The Consultant shall collect data for the extended areas and areas where data collection is deemed necessary based on the review of the earlier study. Baseline data for the followings shall be collected.

i. Geological and Geophysical Aspects

- ✓ Geography & physiography of the project area;
- ✓ Design discharge & its RI (Recurrence Interval);
- ✓ Regional geology and structure of the catchment;
- ✓ Seismicity, tectonics and history of past earthquakes in the area;
- ✓ Critical review of the geological features around the project area;
- ✓ Impact of project on geological environment;
- ✓ Justification for location & execution of the project in relation to structural components.

ii. Seismo-tectonics

Provide site-specific information on earthquake parameters.



iii. Hydrology of the Basin

The hydrological data shall be made available by Druk Green.

In the report, baseline description of hydrology should be presented. The monthly flow rates and the average annual flow rates of Nikachhu and Mangdechhu rivers should be presented. The baseline description of hydrology on previous report has to be updated and improved. In doing so, the following points should be taken into consideration;

- ✓ Hydro-meteorology, drainage systems;
- ✓ Catastrophic events like cloudbursts and flash floods, if any would be documented;
- ✓ For estimation of sedimentation rate the data shall be provided by Druk Green;;
- ✓ Water availability for the project and the aquatic fauna;
- ✓ Design discharge and its recurrence interval.

iv. Biological Resources

Additional data for the extended areas should be collected with respect to the followings;

• Flora

- ✓ General vegetation pattern and floral diversity viz trees, shrubs, grasses, herbs, significant microflora etc. including lichens and orchids;
- ✓ Forests and forest types;
- ✓ Water body inundating forest area;
- ✓ Vegetation profile, no. of species in the project area, etc;
- ✓ Documentation of economically important plants, medicinal as well as timber, fuel wood etc;
- ✓ Endemic, endangered and threatened species;
- ✓ Impact of impoundment and construction activities on the vegetation;
- ✓ Cropping and Horticulture pattern and practices in the study area;
- ✓ Location of National Park in the vicinity of the project.

• Fauna

- ✓ Inventorisation of terrestrial wildlife and present status;
- ✓ Endemic, threatened and endangered species.

• Avifauna

- ✓ Fauna study should be carried-out;
- ✓ Status Resident/Migratory/Passage migrants;
- ✓ Endemic, threatened and endangered species & fossils;
- ✓ Impact of project on threatened/endangered fauna; if any,
- ✓ Inventorisation of terrestrial wildlife and present status.

• Aquatic Ecology



The study/sampling should at least cover eight sections at various locations as follows;

- i. above Nikachhu intake;
- ii. 2 sections between Nikachhu intake and Nikachhu-Mangdechhu confluence;
- iii. 2 sections between MHEP Dam and Nikachhu-Mangdechhu confluence;
- iv. 3 sections between Nikachhu-Mangdechhu confluence and MHEP Tailrace;

The study should comprise the followings but not limited to;

- ✓ Fish and Fisheries;
- ✓ Fish migrations, if any;
- ✓ Breeding grounds;
- ✓ Impact of dam building on fish migration and habitat degradation;
- ✓ Overall ecological impact up to Mangdechhu tailrace and the impact of untreated and waste water in to the river.

• **National Park areas status of threatened/endangered fauna**

- ✓ Biotic Pressures;
- ✓ Management plan for National Park and threatened/endangered fauna.

v. Water Quality

Collection of data pertaining to water (physico-chemical and biological parameters) and likely impact during construction and post construction periods should be carried out.

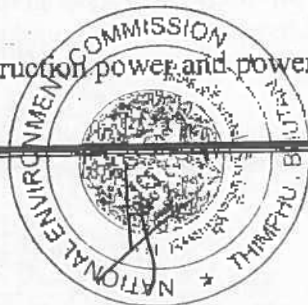
vi. Air Environment

- ✓ Baseline Information on ambient air quality in the project area covering aspects like SPM, RSPM, Sox, NOx;
- ✓ Noise Environment;
- ✓ Traffic density in the project area.

5.4.4. Identification of Environmental Impacts

The ESIA report should contain a list of both the adverse and the beneficial impacts anticipated as consequences of the proposed project at different stages of project cycle (Location, Construction and Decommissioning stages) and the following ancillary activities but not limited to;

- ✓ Permanent colony, labour camps, offices, stores and other temporary structures
- ✓ Proposed road
- ✓ Batching and mixing plants
- ✓ Construction materials extraction (Quarry)
- ✓ Workshops and job facilities
- ✓ Transmission lines (transmission line construction power and power evacuation line)
- ✓ All other Ancillary facilities



It is recommended to refer the various Sectoral Guidelines for Environmental Clearance, NEC, 2004 for detailed assessment of environmental impacts of the project activities and then accordingly submit to NEC as appendices.

The impacts should be predicted and quantified as far as possible in terms of their magnitudes, location and duration contexts. Matrices, networks, checklists and questionnaires used in the process of identifying impacts should be appended in the annexes. Any environmental quality standards or socio-economic measures that were applied in the assessment must be stated. The impacts should be grouped into three basic categories as follows:

i. Physical

• Air

- ✓ Changes in ambient levels and ground level concentrations due to total emissions from point, line and area sources;
- ✓ Effects on soils, material, vegetation, and human health;
- ✓ Impact of emissions DG sets used for construction power if any, on air environment.

✓ Assessment of likely Greenhouse Gas (GHG) emissions from the Project (Dam) and its implication on Carbon Neutral Policy of the country

• Noise

- ✓ Changes in ambient levels due to noise generated from equipment, blasting operations and movement of vehicles;
- ✓ Effect on fauna and human health.

• Water

- ✓ Changes in quality;
- ✓ Sedimentation of reservoir;
- ✓ Impact on fish and other aquatic fauna;
- ✓ Impact on aquatic life in the dewatered stretch of the river;
- ✓ Impact of sewage disposal.

A prediction of the likely changes to water quality along the downstream river section due to the release of the environmental flow and sub-catchment inflows is required.

• Hydrology

Given that Nikachhu Hydropower Project is now likely to involve the inter basin transfer of water into the Mangdechhu river, hydrology has to be described pre- and post-project for the affected sections of each river. The baseline flows and post-project flows should be presented on the Nikachhu and Mangdechhu rivers, clearly showing changes in river flow from the combined effects of the Nikachhu and Mangdechhu HEPs. The four locations that need to be covered are (i) Nikachhu immediately below



the dam; (ii) From the Dam of Nikachhu to the Nikachhu-Mangdechhu confluence; (iii) From the Dam of Mangdechhu to the Nikachhu-Mangdechhu confluence; and (iv) From Nikachhu-Mangdechhu confluence to the Mangdechhu HEP tailrace outlet. This discussion should clearly indicate the flow data and estimation method/s applied, and describe the catchment size and land cover; seasonality of river flows; and elevation, grade and accessibility (for river use) of the river sections where flow is reduced.

Downstream flows along river sections below dam - the estimation of post-project flows down the river sections where reduced flow has to take into account: (i) the proposed minimum constant environmental releases, if required, from the Nikachhu and Mangdechhu HEPs; (ii) average monthly spill flows from each HEP, if any likely during the monsoon; and (iii) intermediate catchment flows estimated to discharge into both rivers below each dam diversion.

Land

- ✓ Changes in land use and drainage pattern;
- ✓ Changes in land quality including effects of waste disposal;
- ✓ Riverbank and their stability;
- ✓ Impact due to submergence.

ii. Biological

- ✓ Deforestation and shrinkage of animal habitat;
- ✓ Impact on fauna and flora (including aquatic species if any) due to decreased flow of water;
- ✓ Impact on rare and endangered species, endemic species, and migratory path/route of animals, if any;
- ✓ Impact on breeding and nesting grounds, if any;
- ✓ Impact on animal distribution, migration routes (if any), habitat fragmentation and destruction due to dam building activity.

iii. Socio-economic Aspects

The details and Scope of Work are given in Section 5.5 of this ToR.

5.4.5. Alternatives for Executing the Proposal

Scoping matrix, likely impacts identified for various aspects of environment (aquatic, terrestrial and socio-economic) during construction and operation phase of the project must be discussed in brief for the selected alternative. This section should outline how the 'No Action Option' will be compared with the option of implementing variations in the design of the proposed project. The proposed methods will be expected to be capable of evaluating the advantages and disadvantages of both options in term of economy and environment. The 'No Action Option' is the existing scenario and describes status quo condition; whereas, under the condition with proposed project implementation, some changes are bound to take place. It is very important to explain here how different stakeholder groups will be incorporated into the consideration of alternatives such as:



- ✓ Design;
- ✓ Project site;
- ✓ Technology and operational methods, schedule, required raw materials;
- ✓ Acceptability or otherwise of the risks likely to emerge while implementing the proposal; and
- ✓ Other relevant points.

Design, site, technology and operational alternatives should be compared systematically in terms of potential environmental impacts, capital and recurring costs, suitability to local conditions, institutional training and monitoring requirements. The environmental costs and benefits may be quantified and economic values for each of the alternatives should be given. The next step is to evaluate the policy under which the proposed project is being considered. Evaluate the existing policy and examine whether implementation of proposed project under the policy bring social benefits, protects the environment and achieves sustainability. However, if these are not attainable, then there is a need for policy intervention in order to identify a policy alternative that is socially acceptable and environmentally sound.

5.4.6. Mitigation Measures, Environmental Management Plan and Auditing

i. Mitigation Measures

The roles and responsibilities of concerned agencies at the central and local levels of administration in the implementation of mitigation measures proposed must also be included.

The ESIA report should propose pragmatic mitigation measures for all the activities likely to have an adverse impact. As mitigation measures cannot be expected to eliminate totally the adverse impacts, it is recommended that compensatory measures be proposed as well. It is essential that the cost effectiveness of mitigation measures be analyzed against viable alternatives. Present the mitigation plan in sufficient detail as far as possible so that it can be incorporated into the criteria for the project design. Explain specific aspects about the mitigation plan to be included in tender documents for the project construction contractor.

Appraise the plan for involuntary resettlement and describe any measures taken to minimize the number of relocations. Examine the success of previous resettlement programs and recommend changes in the current plan accordingly. Evaluate the incremental contribution to the long-term degradation of local natural and social and economic system. In doing so, compare the severity of cumulative impacts with those from other previous development activities.

ii. Environmental Management Plan (EMP) and Environmental Management Office

The ESIA report should provide a comprehensive EMP. It describes activities in support



of the following:

- ✓ project monitoring;
- ✓ project management;
- ✓ the verification of predicted environmental impacts with the impacts actually arising, and;
- ✓ the agencies responsible for these measures, costs and schedule.

The EMP should include but not be limited to the following.

- ✓ Delineation of micro-watersheds in the river catchment and mapping of critically degraded areas requiring various biological and engineering treatment measures;
- ✓ Identification of area for treatment based upon GIS methodology and Silt Yield Index (SYI) method of AISLUS coupled with ground survey;
- ✓ The prioritization of watershed for treatment based upon SYI. Spatial Information in each micro watershed should be earmarked on maps in the scale of 1:50,000. The CAT plan would be prepared with year-wise Physical and financial details;
- ✓ Creation of Green Belt Plan around the Periphery of the Reservoir and Compensatory Afforestation Scheme in consultation with the Department of Forests;
- ✓ Biodiversity Conservation and Wild life Management Plan for conservation and preservation of endemic, rare and endangered species of flora and fauna (in consultation with the Jigme Singye Wangchuck National Park (JSWNP));
- ✓ Fisheries Development plan for conservation/management of riverine fishes and management plan for aquatic biodiversity in the dewatered stretch of the river.
- ✓ Resettlement & Rehabilitation (R&R) Plan along with social/community development. R&R plan would be framed in consultation with the Project Affected Persons (PAPs), Project Authorities and the local government;
- ✓ Energy Conservation Measures;
- ✓ Dam Break Analysis of the selected alternative & Disaster Management Plan;
- ✓ Restoration and landscaping of all working Areas: reclamation of borrow pits (quarry sites), muck disposal sites and construction areas;
- ✓ Public Health Delivery System including the provisions for drinking water facility for the local community;
- ✓ Management during the construction of Roads and all other Project components;
- ✓ Sanitation & Solid Waste Management Plan for domestic waste from colonies and labour camps, etc;
- ✓ Water and Air Quality & Noise Environment Management during construction and post-construction periods;
- ✓ Forest Protection Plan especially guarding access to JSWNP;
- ✓ Reservoir RIM Treatment Plan;
- ✓ Environmental Monitoring Programme (With physical & financial details covering all the aspects form EMP);
- ✓ Muck Disposal Plan (Suitable sites for dumping of excavated material would be identified in consultation with the DGPC, NEC and JSWNP);
- ✓ Setting up of Air quality monitoring stations, management and reporting schedule to NEC.



Muck disposal is a major issue during project construction due to the large volume of material generated (from dam site preparation, tunneling, power station cavern excavation, road works, etc.) and the limited stable disposal sites available in proximity of the construction sites in the steep-sided valleys where project facilities are proposed. The minimum level of information that should be presented in the report should clearly indicate the plans for muck/spoil disposal proposed disposal sites and predict the impacts associated with it. The management plan should include:

- estimated total volume of spoil to be generated from each site (volume after excavation, assuming spoil will be compacted upon disposal);
- proposed spoil disposal site though tentative locations shall be provided by Druk Green (with the boundary of each site illustrated on scaled maps), and estimated capacity of each site based on site contours and final landform proposed;
- land cover and legal status of each proposed disposal site;
- general management measures to be implemented – i.e. topsoil stripping and stockpiling; final landform/landscaped slopes, retaining structures and drainage; compaction in layers; site revegetation works; and
- final land use of each filled landform.

The volume of spoil/muck discussed in the ESIA should be the volume of spoil after it has been dumped and compacted at disposal sites, as opposed to the excavation volume, otherwise the volume required in disposal sites will be substantially underestimated.

Appropriate spoil disposal sites may include riverside land where disposal will not unduly restrict flood flows, lower slope hillside land where stable disposal can be achieved, or hillside depressions/small valleys where there is limited upslope catchment. Lower value land should be used wherever possible, such as riverside deposits, degraded or barren areas, and grassland. The location of project roads and other ancillary facilities should be planned in conjunction with spoil disposal sites so that: (i) the limited available disposal sites are not compromised by ancillary developments that could be located elsewhere, and (ii) project road length is minimized.

Cost and budget outlay for all the plans (Cost for implementing all the Environmental Management Plans including the cost for implementing Environmental Monitoring Programme, aforesaid compensation, mitigation and management measures, Resettlement and Rehabilitation (Section 5.5), etc.).

The administration of an EMP may require the establishment of an Environmental Management Office to house monitoring staff after the closure of the EIA office. Funding to cover the costs of establishing and operating an appropriate Environmental Management Office to administer the EMP should be guaranteed in the basic project budget.

The EIA report should include a description of the administrative aspects of ensuring that mitigation measures are implemented and their effectiveness monitored after approval of the EIA.

iii. Auditing Plan

The purpose of auditing is to assess the actual environmental impact, the accuracy of prediction, the effectiveness of environmental impact mitigation and enhancement measures, and the functioning of monitoring mechanisms. The ESIA should include the design for auditing and its justification. Provide enough information to serve as a basis for carrying out an environmental audit, with appropriate indicators to be used in the process of the audit study during the operation stage of the project.

iv. Monitoring Plan

This section of the ToR must outline how the monitoring plan of project construction and operation will be elaborated. The report should clearly specify the nature of the monitoring required, stipulating who should undertake these activities, the cost and any other necessary inputs. The time schedule for monitoring should also be specified. Provide a comprehensive plan covering the environmental and social variables to be monitored, and provide the location and timing of sampling and measurement of the variables. Include baseline, compliance and impact monitoring and indicators to be measured for each of them. Name the institutions responsible for monitoring the different variables and show how the management plan is expected to influence the operation of the project. Provide sufficient guidance and prepare a 'training needs assessment' on sampling protocol and analytical standards to ensure the generation of reliable data.

5.4.7. Additional Studies

This section contains a description of other major studies that should be undertaken in support of the preparation of the EIA. If formal studies on environmental valuation and environmental risk assessment have been undertaken as part of the ESIA, these need to be included.

a. Environmental Valuation

Environmental Valuation provides means of assessing the benefits of environmental conservation and its contribution to the national economy. Based on such study, the benefits of the proposed project and environmental conservation can be compared and decisions could be made accordingly. Therefore, this part of the study should assess the economic value of the conservation and protection of environment in the proposed project area and comparison of benefits with the proposed project should be presented.

b. Environmental Risk Assessment

An environmental risk assessment may be a necessary part of the EIA if there is considerable uncertainty about the likelihood or the magnitude of environmental impacts. The data collected during basic EIA studies provides much of the information needed for explicitly dealing with the uncertainties relating to environment impacts. There are two major categories of risk: 1) those to human health, and 2) those to



ecosystem integrity. The primary goal of environmental risk assessment is to evaluate risks, their monetary costs, the costs of emergency response and/or avoidance of risk.

Environmental risk assessment studies require a high degree of scientific and mathematical rigor and may be costly if not properly planned.

5.5. Social Impact Assessment (SIA)

As a part of feasibility study, Social Impact Assessment for Nikachhu Hydropower Project as a standalone project was carried out. The study areas covered villages of Tangsibji and Drakteng Gewogs (Annex-I). Now, since the project area is being extended and access road alignments for the project have been changed, the potential socio-economic impacts of the project need to be updated.

In order to assess the latest potential socio-economic impacts of the project and prepare mitigation measures for adverse social impacts, the following studies shall be carried out as a part of ESIA:

- ✓ **Component 1:** Conduct a SIA of the proposed Nikachhu Hydropower Project; and
- ✓ **Component 2:** Prepare a Resettlement Plan (RP) in accordance with internationally accepted standards and guidelines (ADB or World Bank standards and guidelines will be acceptable).

5.5.1. Component I - Social Impact Assessment

i. Purpose and Objective

The overall purpose of the SIA is to assess, analyze, monitor and manage the social impacts of the proposed project.

The objective of the SIA is to produce an independent and robust Social Impact Assessment Report that will satisfy best practice and applicable national and international requirements.

The SIA process should be built on the following three elements:

- ✓ A detailed assessment of the socio-economic conditions of the people who may be negatively/positively affected;
- ✓ A detailed study of the impacts in terms of the extent of land acquisition, crop and tree loss, displacement, livelihoods and employment impacts, aesthetic impacts, cultural impacts (both tangible and non-tangible), community impacts, demographic impacts, development impacts, economic impacts, gender impacts, health impacts, impacts on vulnerable groups and indigenous peoples, infrastructural impacts, institutional impacts, leisure and tourism impacts, political impacts (good governance, human rights, democratization etc.), poverty impacts, psychological impacts, resource impacts (access and ownership of resources), and impacts on social and human capital;
- ✓ A detailed plan to mitigate the identified impacts and an assessment of the costs of such measures. It is essential to generate key indicators based on the SIA in order

to facilitate monitoring. Most essential of all is that the impact assessments should be transparent, participatory, and verifiable.

ii. Scope of work

The previous SIA has identified all affected people and communities that would be affected by the project. However, the current study should re-assess, update and re-identify all the affected people because of the combined scheme and change in project locations. It should define operationally relevant social issues that may affect project design, delivery, and outcomes, and provide mitigation measures for each adverse impact.

• Tasks

- ✓ Identify stakeholders and people who are directly affected (positively or negatively) and carry out a stakeholders' analysis;
- ✓ Mobilize and train enumerators. Lead and provide overall guidance and supervision to enumerators in data collection. Ensure data quality control. Check and review the outputs submitted by enumerators to ensure accuracy, completeness and consistency of responses, conduct validation checks of a sample of accomplished questionnaires to ensure data reliability and consistency. Data analysis and reporting;
- ✓ Provide specific recommendations to avoid/minimize social risks;
- ✓ Inform, consult, and carry out dialogue with stakeholders on matters regarding project design alternatives, implementation of social mitigation measures, and provide specific recommendations on project areas with high social impacts, including identification of areas, such as presence of significant common property or indigenous communities that may require adjustments in project design or special assistance to mitigate the adverse impacts on them;
- ✓ Facilitate and coordinate the participation of stakeholders in meaningful consultations and discussions;
- ✓ Document and analyze the local historical setting of the project area so as to be able to interpret responses to the proposed project, and to assess cumulative impacts;
- ✓ Collect baseline data (social profiling) to allow evaluation and audit of the impact assessment process and the planned project itself;
- ✓ Describe the relevant human environment/area of influence and baseline conditions of the people living in the proposed project area;
- ✓ Provide a rich picture of the local cultural context, and develop an understanding of local community values, particularly how they relate to the planned project;
- ✓ Conduct a socioeconomic survey of the affected population and provide a socioeconomic profile of the affected population and available infrastructure facilities or services in the project influence area to identify potential positive/negative impacts on poverty reduction and adverse impacts of the project on affected communities;
- ✓ Identify and describe the activities which are likely to cause impacts (scoping) and identify the full range of probable social impacts that will be addressed;
- ✓ Predict (or analyze) likely impacts and how different stakeholders are likely to respond;



- ✓ Assist in the evaluation and selection of site alternatives;
- ✓ Recommend mitigation measures for each adverse impact induced by the project;
- ✓ Participate in the valuation process and provide suggestions about compensation (non-financial as well as financial);
- ✓ Describe potential conflicts between stakeholders and advise on resolution processes;
- ✓ Determine magnitude of adverse social impacts and identify social safeguard instruments as required based on national laws, policies, and regulations;
- ✓ Develop coping strategies for dealing with residual or non-mitigatable impacts;
- ✓ Advise on appropriate institutional and coordination arrangements for all parties;
- ✓ Develop a mitigation plan;
- ✓ Develop monitoring and evaluation plan/mechanism to assess social development outcomes during the implementation of the project and after its completion.

• **Methods and Tools**

- ✓ Conduct a detailed socioeconomic survey of the households and villages affected by the project;
- ✓ For socioeconomic, cultural, and institutional analysis, combine multiple tools and employ a variety of methods for collecting and analyzing data, including both quantitative and qualitative methods (expert and key informant interviews, focus group discussions, beneficiary assessments, rapid and participatory rural appraisal [RRA/ PRA], and gender analysis);
- ✓ Develop interview schedules, field survey questionnaires, and checklist for data collection and discussions;
- ✓ Screen and prioritize social issues through different techniques, such as mapping and ranking;
- ✓ For determining the magnitude of impact and analysis of alternatives, indicate all information on structures, utilities and abutting land use that is likely to be affected within the project impact zone;
- ✓ The selection of SIA methodology should emphasize consultation and participation of project affected persons (PAPs), project implementing and executing agencies at the national, Dzongkhag and Gewog levels. The discussions with relevant government officials and local organizations should be participatory and broad-based, leading to the identification, selection, and agreement on project;
- ✓ Qualitative analysis should be undertaken in order to comprehend the intricacies of the causal chain and to inform and supplement the quantitative analysis. Methods could include PRA techniques, key informant interviews, most significant change approaches etc. The mix of qualitative and quantitative methods should be designed in order to maximize the usefulness of both types of data in the analysis, and to resolve shortcomings in either type of material.

5.5.2. Component II - Resettlement Plan

The proposed Nikachhu Hydropower Project will require private land to be acquired for construction of project infrastructure such as; access roads, power house, dam, surge shaft, offices and residential colonies, etc. Such land acquisition may induce involuntary resettlement, disturb indigenous communities/ethnic minorities, and

impact on cultural properties of significance. Therefore a detailed resettlement plan will have to be prepared.

Cadastral Data required for Resettlement Planning shall be collected by the Consultant.

i. Purpose and Objective

The overall purpose is to improve the living standards, physical security, and productive capacity and income levels of all the people affected or, at the very least, to restore them to former levels or pre-project levels within a reasonable period of time.

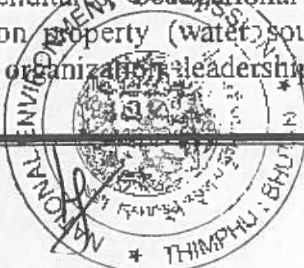
The objective of the study is to prepare a Resettlement Plan in accordance with internationally acceptable standards and guidelines which sets out strategies to mitigate adverse effects induced by the project. The RP, among others, will establish the parameters for the entitlements package for APs, the institutional framework, mechanisms for consultation and grievance resolution, the time frame, and cost estimates.

ii. Scope of Work

The study will cover all affected persons and formulate strategies in order to assist in determining project impacts on the social, economic, cultural, and livelihood activities of affected persons and communities, and provide mitigation measures in the form of fair compensation for losses suffered by APs.

• Tasks

- ✓ Record any measures taken to reduce land acquisition and resettlement impacts through changes in the design of the project.
- ✓ Mobilize and train enumerators. Lead and provide overall guidance and supervision to enumerators in data collection. Ensure data quality control. Check and review the outputs submitted by enumerators to ensure accuracy, completeness and consistency of responses, conduct validation checks of a sample of accomplished questionnaires to ensure data reliability and consistency. Data analysis and reporting.
- ✓ Conduct participatory rapid appraisal (PRA) in the project area. Identify key stakeholders and conduct meaningful consultations with them about the project and resettlement effects.
- ✓ Identify any vulnerable groups who might require special assistance and consult with them.
- ✓ Conduct a census of all the people potentially affected, to determine the scope and magnitude of likely resettlement effects, and to record likely losses. Suggest a cut-off date for entitlements.
- ✓ Conduct a socioeconomic survey of a sample of 30 percent of the people affected. Establish a baseline of incomes and expenditures, occupational and livelihood patterns, use of resources, use of common property (water sources, irrigation channels, tsamdros, sokshings, etc.), social organization, leadership patterns, local



- community organizations, and cultural parameters.
- ✓ Consult with the agencies (central as well as dzongkhag-level) responsible for land acquisition, land replacement, valuation of assets, and compensation rates.
- ✓ Review laws, regulations and directives of the RGOB that apply to land acquisition, resettlement, and compensation. In this review consider the method for valuing assets, the timing and method of paying compensation, the legal and administrative procedures applicable, land titling, and registration procedures.
- ✓ Prepare an entitlement matrix listing all likely effects of permanent as well as temporary land acquisition. Establish criteria for the eligibility of resettlement assistance and benefits of affected households. Prepare standards for compensation and restoration of the social and economic base of the people affected to replace all types of losses.
- ✓ If APs are displaced and need to be relocated, prepare options for relocation and for income restoration which build upon the existing social, economic and cultural parameters both of the people affected and of any host populations. Provide for relocation costs, lost income, and income support during transition.
- ✓ Prepare a framework for participation of APs. All APs should be meaningfully consulted when designing entitlements and the implementation of land acquisition and resettlement. Prepare special measures for consultation with any vulnerable groups. Specify mechanisms for the resolution of grievances and an appeals procedure.
- ✓ Prepare an institutional framework that designates responsibilities to provide compensation, undertake relocation work, take responsibility for income restoration, supervise, manage, and monitor the implementation of land acquisition, land replacement and resettlement activities.
- ✓ Prepare a monitoring and evaluation plan, identifying the responsibilities, time frame, and key indicators. Specify the time frame for monitoring and reporting.
- ✓ Prepare a time-bound implementation schedule for land acquisition and resettlement in conjunction with the agreed implementation schedule for project components, showing how APs will be compensated before actual acquisition of the affected land, or before demolition of any affected structures.
- ✓ Prepare an indicative budget. Prepare indicative land acquisition and resettlement costs. Prepare budgetary allocation and timing. Specify sources of funding and approval process. Prepare an annual budget estimate for resettlement by major category of expenditures.

• Methods and Tools

- ✓ Conduct census, socioeconomic survey, and inventory of assets survey with the help of appropriately designed questionnaires and instruments.
- ✓ Participate in, and validate, the detailed measurement survey of all private land to be acquired by the project in collaboration with the dzongkhag land records officials to ascertain the precise amount, and type, of private land to be acquired and replaced.
- ✓ Conduct focus group discussions (FGDs) to discuss adjustment in designs.
- ✓ Conduct consultations and discussions with APs, dzongkhag and gewog officials, and the DGPC to finalize the implementation mechanism and to promote informed decision making.
- ✓ Develop database for Project Affected Households to enable monitoring.

5.6.Greenhouse Gas Emissions

The Consultant should present emission savings from the generation of renewable energy as this is one of the major project benefits.

Accordingly, the volume of CO₂ emissions that will be avoided per annum by the generation of renewable energy from the project as opposed to the volume of CO₂ that would be emitted by the generation of an equivalent amount of power from the current mix of generation supplying the Indian grid (NEWNE) should be estimated. This can be presented for: (i) the Clean Development Mechanism (CDM) crediting period for the project (e.g. 21 years, consisting of 7 years + 2 x 7 years renewal); and (ii) the minimum expected project life.

This section should give direction to Project's viability and accession as a CDM Project.

5.7.Outputs and Deliverables

The final expected outcome of the Environmental and Social Impact Assessment Report should include, but is not limited to:

- ✓ Incorporation of earlier studies into the current findings and impact assessments;
- ✓ Findings of the Environmental Impact Assessment;
- ✓ Findings of Social Impact Assessment;
- ✓ Findings of analysis and consultations;
- ✓ Outline of social safeguard instruments as required;
- ✓ Recommendation for adjustments in designs during feasibility and detailed design stage;
- ✓ Resettlement Plan (RP), with appropriate action plans and entitlement matrix to provide different types of assistance to all categories of affected people, with monetary values wherever feasible. The plan should include a detailed itemized budget and other resources required to implement the RP.

5.8.Qualification and Experience of Consultants

5.8.1. Environmental Specialist

- ✓ Advanced degree in relevant field (Environmental Science, Natural Resource Management, Forestry, Botany) preferred;
- ✓ Experience in conducting EIAs and writing EIA Reports;
- ✓ Experience in data collection and analysis;
- ✓ Good writing and analytical skills.

5.8.2. Social Expert

- ✓ Advanced degree in social sciences (anthropology, sociology, social work, economics) (preferred);
- ✓ Experience in preparing SIAs (essential) and RPs (preferred);
- ✓ Experience in fieldwork preferably among project-affected person, including rapid

of ESIA study, with their addresses and telephone numbers.

- ✓ Application for environmental clearance for the project components as per the applicable Sectoral Guidelines for Environmental Clearance, NEC, 2004.

NOTE:

- The Environmental Assessment Report is required to be prepared as per the provisions of EA Act 2000, Royal Government of Bhutan
- The Consultant should maintain consistency and accuracy in the report and no subjective statements shall be accepted
- The Consultant shall render technical assistance to project proponent during Public Consultation as per the provisions of section 31 of the Regulation for the Environmental Clearance of Projects 2002.
- ~~The applicant shall be responsible for undertaking any other related study desired by the NEC during the process of environmental clearance~~
- Finally, the EA report should include all other necessary documents such as clearance from respective Dzongkhag Administration, Department of Forest, evidence of public consultation, etc.
- A soft copy of the report including all the annexes, maps including Google earth images/maps of all project components, GIS data, etc. needs to be submitted along with the hard copy of the report.



- ✓ rural appraisal, household census interviews/surveys (preferred);
- ✓ Experience in land acquisition (preferred);
- ✓ Experience in data analysis, both quantitative and qualitative (essential); and
- ✓ Ability to manage and train local survey teams (essential).

5.9.Environmental Clearance of the Project

Environmental Clearance of the Project shall be pursued by DGPC. However, the Consultant shall update and incorporate the Report if there are comments from the stakeholders including NEC. The Consultant should have adequately consulted NEC and other relevant stakeholders for comments and recommendations before finalizing the report.

5.10. Conclusions and recommendations

Based on the findings of the ESIA study, conclusions should be drawn and recommendations should be made regarding project implementation.

5.11. Checklist for No Objection Certificate

In order to obtain an Environmental Clearance for the project, an NOC must be obtained from all relevant parties. Attach these documents to the EIA report. A checklist of agencies from whom NOCs may be required is presented in NEC's Application for Environmental Clearance Guideline for Hydropower, Road and Transmission Lines.

5.12. References

Provide a list of references cited in the text of the main report.

5.13. Appendices

The following should be included in appendices:

- ✓ Maps related to the study;
- ✓ Aerial photographs if possible;
- ✓ Sample questionnaires, checklists, matrices, charts and photographs;
- ✓ Information on the hydrology, meteorology and geology of the project area;
- ✓ Information on vegetation, forest and fauna of the project area;
- ✓ Location and brief description of sensitive sites;
- ✓ Information on water quality, noise intensity and air quality of the project area;
- ✓ Audio-visual records of the area if any;
- ✓ Information pertaining to agriculture, livestock, soil and use of fertilizers in the area;
- ✓ Information on socio-economic and cultural impacts;
- ✓ Name and addresses of personnel and the institution(s) involved in the ESIA study;
- ✓ List of invited and consulted people in the project affected area, their opinions, records of public involvement (e.g. meeting, workshop, consultation);
- ✓ Persons and institutions contacted outside of the project affected area in the process

Minutes of Meetings/Record Note of Discussions and Attendance Sheets

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འཛིན་སྐྱོང་གནང་མར་ འབྲུག་སྐད་འབྲུང་སྒྲིག་མེ་ལས་འཛིན་གྱི་ འཛིན་པ་འཛིན་སྐྱོང་མདོ་ཆེན་མཆོག་ འཕྲོད་གནད་ནི་གི་ ལྷོ་གཟུགས་བཟང་
པོ་དེ་འབད་ཅུང་ དེ་མེས་ གནས་སྐབས་ཅིག་གི་རིང་ དཔུ་ལོག་སྐད་ལྷན་ཚོགས་གྱི་ ལྷོ་འཛིན་གྱི་ ལྷོ་གཟུགས་བཟང་པོ་ བཞེས་པོ་དཔལ་
ལས་བརྟེན་ ལྷོ་གཟུགས་ལྷོ་མ་ལོ་མས་པར་ ལཱ་ལུ་ རྩོད་མཆོག་སེམས་ལེན་གསལ་པའི་ དང་ཞག་ ལྷོ་ཆེས་6-11-2013 ལུ་ འབྲུག་སྐད་
འབྲུང་སྒྲིག་མེ་ལས་འཛིན་གྱི་མངའ་འོག་ ལྷོ་གཟུགས་མེ་འབྲུག་ལང་ འགོ་བྱེད་གནང་བཞིན་མ་ལས་ མི་ལོ་24 འཁོར་པའི་ ལྷོ་སྤྱོད་
ཅིས་ལྷན་ཁུལ་ད་ མི་དབང་མངའ་བདག་རིན་པོ་མཆོག་དང་ རྒྱལ་བཙུན་རྣམ་གཟིམ་གྱི་དུ་གཅོས་པའི་ མི་རྩོད་ཆེན་མཆོག་དང་
རྣམ་ཐག་གི་ རྩོད་པོ་དག་པ་ཅིག་ དེ་ལས་ རྣམ་ཐག་ གི་དུང་ཆེན་ ཆེ་མཐོ་ཅན་གྱི་ འབྲུག་མི་རྣམས་ལུ་ རྩོད་གནད་ལི་ དེ་
བསྐར་ མི་དབང་མངའ་བདག་སེམས་རིན་པོ་ཆེ་གིས་ འཛིན་པ་འཛིན་སྐྱོང་མདོ་ཆེན་ལུ་ རྒྱལ་ཁབ་ལུ་ བན་པའི་རྒྱུ་བརྟེན་སྒྲིག་མེ་ལོ་འགོ་
ཁུངས་ ཁོང་འཕེལ་གཏང་དགོ་པའི་ བཀའ་སློབ་བཟང་པོ་ གནང་པོ་དཔལ་ལས་བརྟེན་ མི་རྩོད་ཆེན་མཆོག་གིས་ལང་ བློ་གཙུག་སྒྲིག་མེ་
ལས་འགུལ་ གསལ་སྤྲོད་དོན་ལུ་ བཀའ་ལྷིག་གནང་བ་ཚུ་ ལྷོ་ལོ་2013 ལུ་ར་ གནང་ནི་འབད་ ཞལ་གྱིས་བཞེད་དེ་པོ་དེ་མེས་ གནས་
ཚུ་ལ་དང་འབྲམ་མེ་ ཚོགས་དམངས་ལུ་ཁྱེད་

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དེལས དཔོན་མཛོད་བདག་མཆོག་གིས་ རི་ཀ་ཚུ་གྲོག་མེལ་ལུ་ལྟེ་ མཐའ་དཔྱད་རྟག་ཞིབ་སྒྲུབ་བྱེད་གསལ་ལུ་ འབད་མར་འོང་མི་
སྤང་མེ་སྤྱི་ཆེད་འོག་གི་ཆབ་དང་ དམངས་པ་ ཆོག་སེལ་ ལུ་བསྐྱེད་ཆེད་འོག་གི་ བདག་སྤྱོད་འགོ་དཔོན་དང་ རྫོང་ཁག་གི་འབྲེལ་ཡོད་
འགོ་དཔོན་དང་ ལས་སྡེ་དང་ལས་འཛིན་ཁག་གི་ འགོ་དཔོན་ཚུ་ འབྲུག་སྤྱི་འབྲུང་གྲོག་མེལ་ལས་འཛིན་ ལས་འགུལ་མདོ་ཆེན་གྱི་
གཙོ་སྐུ་པའི་ འགོ་དཔོན་གཞན་ཚུ་ལུ་ སྤྱུག་བྱུག་ས་བཟང་པོ་ལྷུ་དང་ཅིག་པར་ རི་ཀ་ཚུ་གྲོག་མེལ་ལུ་ལྟེ་ འབྲེལ་བའི་ཡིག་
རིགས་ མང་རྫོག་སེལ་ཅིག་ རྫོང་ཁག་ནང་སྤྱོད་ཡོད་པ་ལས་ ལས་འགུལ་གི་སྒྲིམ་ལས་ གསལ་སྤྱོད་ཅིག་འབད་ཐོག་ལས་ གསུང་གོ་ས་
གནང་ཚུ་གསལ་པའི་ དུག་ཅི་མས་ཟེར་སྤྱབ་བཞིན་དུ་ འབྲུག་སྤྱི་འབྲུང་གྲོག་མེལ་ལས་འཛིན་ཁག་ལུ་ རོས་ལེན་ལེགས་ཤོམ་གནང་
སྟེ་ ད་རེས་ འཛོམས་ཚུ་གསལ་མི་ལུ་ བཞིན་དག་འཛོམས་ཡོད་ལུ་གསལ་གསུང་གནང་ཡི། ལས་འགུལ་མདོ་ཆེན་གྱིས་ལྷུ་བཞིན་དུ་
འཛིན་སྤྱོད་མདོ་ཆེན་ དཔོན་མཛོད་བདག་མཆོག་ ད་རེས་ནངས་པ་ དཔྱད་འོག་ས་སྤྱོད་ཆོག་གི་ ལྷི་འཛིན་གྱི་ ཟུག་འགན་
ཐབས་བཞེད་ཡོད་པ་ལས་བརྟེན་ ད་རེས་ ཞལ་འཛོམས་ནང་སར་ ཐོན་མ་ཚུ་གསལ་ཟེར་ འགུལ་འཛིན་གནང་དེ་ ཁོར་ སྤྱོད་པོ་སྤྱོད་
མ་ཚུ་གསལ་ཅུང་ དེ་སྟེ་ ཟུག་གི་ཚ་གྲུང་ བཞེད་གནང་མི་གིས་ར་ སེམས་དག་འཕེལ་ཟེར་ ཆོག་སེལ་དམངས་ལུ་གསུངས་གནང་ཡི། ལས་
འགུལ་བརྟག་ཞིབ་སྒྲུབ་བྱེད་འབད་ཆར་ལུག་ ཡིན་ཅུང་ མི་སེར་དང་ ཁོས་བསྐྱེད་དང་ སུམ་ལུ་ཞིབ་དཔྱད་ཚུ་ འོག་སྟེར་ རྫོང་
ཁག་གིས་འབད་དགོ་པ་ལས་ ལུ་ བསྐྱར་ཡོག་ འབད་དགོ་པ་འཛོན་མ་ལ་མོག་སེལ་པའི་ བྱ་སྤྱབས་མ་བདེམ་འཛོན་མས་ དེ་ཡང་ མང་སྟེ་
ཚུ་གྲོག་མེལ་ལུ་ལྟེ་ ལུ་གི་ ཉམས་སྤྱོད་ལས་བརྟེན་ཡིན་ མི་སེར་གྱི་ སུམ་གཞུང་བཞེས་འབད་ནི་དང་ སུམ་བདེ་དང་ རྟེན་འབྲུས་
སྤྱོད་དགོ་པ་ འབྲེལ་ཡོད་ནགས་ཚལ་ལས་ཁུངས་དང་ རྒྱལ་ཡོངས་མཐའ་འཁོར་ལྷན་ཆོག་ས་ རྒྱལ་ཡོངས་སུམ་ལྷན་ཆོག་ས་ཚུ་ལས་
ཉོག་ས་མེད་གྱི་གནང་བ་ རྟེན་གོས་པའི་རིགས་ཚུ་ཡང་ ལུ་འགོ་བཙུགས་པའི་སྤྱབས་ལས་རང་ ང་བཅས་གེར་ མཉམ་འབྲེལ་ཐོག་འབད་
བཅིན་ ཆེད་འོག་ཆོག་སེལ་སྟེ་དང་ རྫོང་ཁག་ཆོག་སེལ་འདུ་ཚུ་བརྟུན་དེ་ བྱིམ་ས་མཐུན་ཐོག་ལས་མཛུགས་དཔེན་ ལུ་གི་སྤྱབ་འབྲུས་
མཐོག་ས་དུག་སྟེ་འཛོན་ཚུ་གསལ་པའི་ རོས་འབབ་དང་ ལྷག་པར་དུ་ ལས་འགུལ་ལུ་ལྟེ་ ཐོ་བྱུར་གྱི་ རྫོང་ཁག་ཡར་རྒྱས་ཆོག་ས་
འདུ་ ཆོག་སེལ་དགོ་ཅུང་ དུས་འཕུལ་ལས་ ཞལ་འཛོམས་ཆོག་ས་གནང་ནི་ཟེར་གསུངས་གནང་ཡི། རི་ཀ་ཚུ་གི་ཐད་ ལས་འགུལ་བརྟག་
ཞིབ་གྱི་ལུ་ཚུ་ ང་བཅས་ར་ འབྲུག་སྤྱི་འབྲུང་གྲོག་མེལ་ལས་འཛིན་གྱི་ བཟོ་རིག་མཁས་མཆོག་ཚུ་གིས་ ཐུ་མི་ལུ་ རེ་མ་དགོ་པར་མཛུགས་
གནང་མི་ལུ་ ངལ་རང་ཡོད་ལུ་གསལ་དང་ འོག་ དངོས་སུ་སྟེ་ ལུ་འབད་མ་དུ་ བྱ་སྤྱབས་མ་བདེམ་ མི་འཛོན་འོང་ཟེར་གསུངས་ཡི།
རྫོང་ཁག་དང་ཆེད་འོག་ འབྲེལ་ཡོད་ལས་ཁུངས་ཁག་གི་འགོ་དཔོན་དང་ དམངས་པ་ ཆོག་སེལ་ མི་སེར་གེར་འབད་ཅུང་ རི་ཀ་ཚུ་



ལས་འགུལ་འདི་ལུ་ མཉམ་འབྲེལ་ ལེགས་ཤོམ་གྱི་ཤོག་ལས་ རྒྱལ་སྤྱིར་ཕུལ་ནི་འདི་ཁག་ཆེ་ འདི་བརྒྱུ་མ་མཁོ་ ལས་འགུལ་གཞི་བཙུག་
 འབད་མ་ད་ མཐའ་ལོའི་གནས་སྤངས་དང་མི་སྡེ་ལུ་ གནོད་པ་ལྷུ་མ་དེ་དེ་འོང་ ཡིན་རུང་ མི་གཅིག་དང་གཉིས་གྱི་ བཟོན་དང་
 དཀའ་ངལ་ལུ་ མ་བརྟམ་པར་ རྒྱལ་ཡོངས་གྱི་ ཁེམ་ན་ལུ་དམིགས་ཀྱི་ ར་བཅས་གེར་གེས་ རྒྱལ་སྤྱིར་ཕུལ་ནི་འདི་ ཁག་ཆེ་ཟེར་
 གསུངས་གནད་སྟེ་ ལས་འགུལ་གྱི་མཐའ་དབྱེད་བརྟག་ཞིབ་སྟན་ཐུན་ལེ་གསལ་སྟོན་ རོན་ཚན་ཁག་གཉིས་སྟེ་ཕུལ་ཡི། རོན་ཚན་དང་པའི་
 ནང་ ལས་འགུལ་མདོ་ཆེན་གྱིས་ རི་ཀ་རྒྱ་སྟོག་མེ་ལས་འགུལ་གྱི་འཕུལ་རིག་དང་ བཟོ་རིག་དང་འབྲེལ་བའི་ ཡར་རིམ་དང་བཅས་པ་སྟེ་
 གཤམ་གསལ་གྱི་ རོན་ཚན་ཚུ་ གསལ་སྟོན་ཕུལ་ཡི།

- སྟོག་མེ་ལས་འགུལ་ སྤྱིར་བཏང་གི་ རྒྱལ་ཁྲུངས།
- རྒྱུ་མཐུན་སྟོག་མེ་ལས་ འོང་འབབ།
- འབྲུག་གཞུང་གིས་ ལག་ལེན་འཐབ་ཡོད་པའི་ ལས་འགུལ།
- འབྲུག་སྤྱི་འབྲུག་སྟོག་མེ་ལས་འཛིན་གྱི་ མངའ་འོག་ལུ་ཡོད་མི་ ལས་འགུལ་ཚུ།
- རི་ཀ་རྒྱ་སྟོག་མེ་ལས་འགུལ་གྱི་སྤོར་ལས་ གསལ་བཤད།
- ལས་འགུལ་བཟོ་བསྐྱུན་གྱི་ མ་དབྱེད་དང་ ལས་འགུལ་གྱི་ བདག་དབང་།

གསལ་སྟོན་ཕུལ་བའི་སྐབས་ལུ་ ད་ལྟོ་ འབྲུག་རྒྱལ་ཁབ་ནང་ རྒྱ་མཚོ་དང་ཁང་སྤྱོམ་ཤོས་ དར་ལ་སྟོག་མེ་འཕུལ་ཁང་འདི་ཡིན་ རྒྱ་མཚོ་ད་
 ཁང་དེ་གི་ལྷག་ལས་ བྱུག་ཅོ་བར་ན་ལས་ རོང་ཡུར་སྟེག་སྟེ་ རྒྱ་ཁོལ་གཏོ་གོང་མ་གི་ མཆུག་པས་མར་འོང་མི་ ཕྱི་བཟུག་ལུང་མ་རྒྱ་དེ་
 ཁབ་སྤྱིར་དེ་ དར་ལ་རྒྱ་མཚོ་དང་ནང་བཙུག་ནི་གི་ ལཱ་འབད་བཞིན་དུ་ཡོད་པ་ལས་ རིག་གསར་གྱི་ཐབས་ལམ་ ཉེན་སྲུང་དང་ ལཱ་མ་
 སྟེ་ འབད་ཐབས་ཡོད་པ་ལས་ རི་ཀ་རྒྱ་ལས་འགུལ་གྱིས་ གཞི་བཙུག་ཆེ་བའི་ ར་བཅས་ ཁོང་གསར་ཆོས་ཆེ་རལ་བརྟན་ཅེ་ཆོང་ལུ་
 གནོད་སྦྱོར་མི་འབྱུང་ ཐུགས་ཚུགས་ ལཱ་མཁན་མ་གནང་ཟེར་ ཆོག་སྤངས་པ་ལུ་ གསལ་གནང་ཡི།

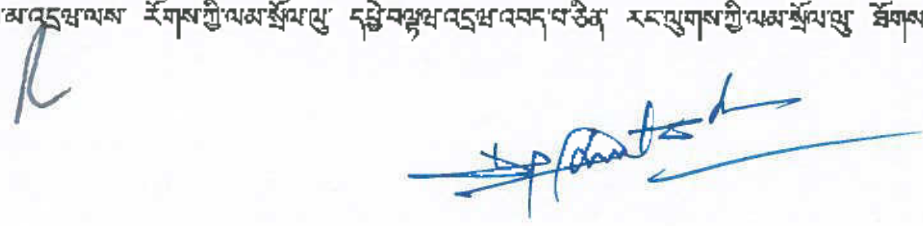
ལས་འགུལ་བཟོ་བསྐྱུན་གྱི་རོན་ལུ་ ར་བཅས་ར་ འབྲུག་རྒྱལ་ཁབ་ནང་ མ་དབྱེད་ལངས་སྟེ་ མེད་པ་ལས་ མ་དབྱེད་ཀྱི་ ཨེ་ཤི་ཡ་གོང་
 འཕེལ་དབྱེད་ལང་གིས་ སྟོག་སར་མ་ཐོག་དང་ བསྐྱེན་འགྲུལ་ ལུ་ཨེ་ཤི་ཡ་ར་ ས་ཡ་ 20 གནང་ནི་སྟེ་ ལས་ལེན་འབད་དེ་ཡོད་ དེ་

ཡང་ ར་བཅས་འབྲུག་སྤར་འབྲུང་སྒྲིག་མེལ་ས་འཛིན་གྱིས་ དར་དཀར་ཚུ་སྒྲིག་མེལ་ས་འགྲུལ་དེ་ རང་བཞིན་གནས་སྤངས་ལུ་ གནོད་
པ་ཉུང་ མི་སྡེའི་འཕྲོད་སྤྱོད་ལེགས་ཤོམ་ བཟོ་རིག་དང་འབྲུལ་རིག་ གཅིག་གི་ཐད་ལས་འབད་ཅུང་ སྤྱུལ་ཚད་དང་ལྡན་མ་སྟེ་ ལྷག་འབྲུལ་
ཚུ་མ་ཐུན་དུ་ འབྲུང་པའི་བསྐྱང་ཡོད་པའི་ བད་མཚན་ལེགས་ཤོམ་ལས་བརྟེན་ཡིན།

ལས་འགྲུལ་འདི་གི་ བདག་དབང་གི་སྒོར་ལས་འབད་བཅིན་ འབྲུག་སྤར་འབྲུང་སྒྲིག་མེལ་ས་འཛིན་ལུ་ བརྒྱ་ཆ་49 དང་ མ་དངུལ་
བོད་ན་མི་ མཉམ་འབྲེལ་གཙུག་ཁྲེལ་ བརྒྱ་ཆ་26 དང་ གློ་འདྲོད་ཡོད་མི་ མི་སེར་ལུ་ བརྒྱ་ཆ་23 གློད་ནི་ཡིན་མ་ལས་ འབྲེལ་ཡོད་
ས་གནས་གི་མི་སེར་ཚུ་གིས་ ལས་འགྲུལ་དོན་ལུ་ མ་དངུལ་བགོ་བཤའ་ བཅུག་འདྲོད་ཡོད་བཅིན་ སྒོ་སྐབས་ཡོད་ཟེར་བྲུལ།

དེ་ལས་ མཐའ་ལེའོར་གནས་སྤངས་འགོ་དཔོན་གྱིས་ གསལ་སྟོན་གྱི་ དོན་ཚན་གཉིས་པ་དེ་ མཐའ་ལེའོར་གནས་སྤངས་དང་ མི་སྡེལུ་
ལས་འགྲུལ་གྱིས་ ཡན་གནོད་ཚུ་དང་ རང་བཞིན་མཐའ་ལེའོར་འཛིན་སྒྲིང་ ཐབས་ཤེས་སྒྲིག་སྟེ་ཡོད་པའི་སྒོར་བྲུལ་མི་དེ།

- ལས་འགྲུལ་དོན་ལུ་ མི་སེར་ ལྷང་པ་72 གྱི་ ས་ཆ་སྐྱམ་ཞིང་ ཨེ་ཀར་26.09 རྒྱ་ཞིང་ཨེ་ཀར་ 0.60 རྒྱ་གས་
ཚལ་ ས་ཆ་ཨེ་ཀར་ 222.46 བཅས་ས་ཆ་ཨེ་ཀར་244.44 དཔོན་ལས་ མི་སེར་གྱི་ ས་ཆ་འི་ས་ཆ་བདེང་ རྒྱ་
འབྲུལ་ དེ་བཟུམ་སྟེ་ འཛིན་གཉིས་ཀྱི་འབྲུལ་ཚུ་ བའི་བཅའ་ཁྲིམས་དང་ གཞུང་གིས་ ཆ་འཛོག་མཛད་མི་ གོང་ཚད་ལྟར་
ཐོབ་ནི་ རྒྱ་ཞིང་ཐད་ ག་དེ་ཉུང་ཉུང་ལེན་ནི་དང་ ཡང་ཅིན་ ཅུག་ཅན་ལས་རང་ རྒྱ་ཞིང་འདི་ ལས་འགྲུལ་ལུ་ མ་ཤོག་པ་སྟེ་
འབད་ནི་གི་འཆར་གཞི་ ཡིན་ཟེར་བྲུལ། རྒྱ་གས་ཚལ་གྱི་ས་ཆ་གྲུལ་ལས་ ས་གནས་སྟོ་རིམ་ཟེར་སར་ རྒྱ་མཛོད་ཁང་དོན་ལུ་
འཛིག་ས་མེད་མེད་པར་ཐུག་ཅི་དགས་སུང་སྒྲིབ་སྒྲིང་གའི་ ས་ཆ་ཨེ་ཀར་6 རྒྱ་དཔ་ལས་ བཟོང་ས་དེ་ཡང་ སྒྲིང་གའི་ ས་
ཁོངས་སུ་ལཱ་རྒྱུ་རྒྱུ་ནང་ རྒྱུ་མས་ཟེར་བྲུལ།
- ལས་འགྲུལ་གྱི་ལཱ་འགོ་བཙུག་འོང་པའི་བསྐྱང་ལས་ ཤིང་གུངས་744,644 དེ་ཅིག་ལུ་ གནོད་སྤྱོད་འབྲུང་ནི་མས་ ཡིན་ཅུང་
ལས་འགྲུལ་གྱིས་ཤིང་ཚལ་ འོ་བཟང་བཙུག་ནི་གི་ འཆར་གཞི་ཡོད་ཟེར་བྲུལ།
- འབྲུག་པའི་ལས་མི་ མ་ལང་མ་ལས་བརྟེན་ རྒྱ་གར་གྱི་ ལས་མི་སྤྱོད་ཐུག་ལས་བཅད་དེ་ བསྐྱ་བསྐྱེས་དེ་ ལཱ་འབད་པའི་སྐབས་
ལམ་སྟོལ་མ་འདྲུལ་ལས་ རྒྱ་གས་གྱི་ལམ་སྟོལ་ལུ་ དཔྱེ་བརྟུལ་འདྲུལ་འབད་བཅིན་ རང་ལུགས་གྱི་ལམ་སྟོལ་ལུ་ ཐོགས་

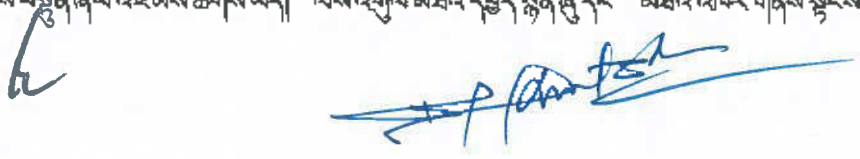


ཕྱགས་ནི་དང་ ལས་མི་གི་སྒོ་སྤྱོད་ཀྱི་ལས་བཞེན་ ཡུག་སྒྲིག་པ་བརྩོག་པའི་རིགས་ འཕྲོད་ནི་གི་ཉེན་ཁག་ཡོད་ཅུང་ དེ་གི་
དཀའ་ངལ་འཛིན་སྒྲོལ་འབད་བཅས་ཀྱི་ ཐབས་ལམ་ཡོད་ལུགས་སྒོར་ཁྱེད།

ལས་འགལ་བཅོ་བསྐྱོན་ལས་བཞེན་ ཁོང་ལུ་ ཁྱོད་བཟུམ་ བྱ་སྒྲུབ་མ་བདེ་ཡོད་ཅུང་ གནོད་པ་ལས་ ཡན་པ་ཆེ་བའི་སྒོར་
པར་རིས་དང་བཅས་པ་སྟེ་ གསལ་སྒྲོན་ཕུལ་ཡོད་པའི་བརྒྱུད་རིན།

- ལཱ་གཤེག་དང་ ཁག་འཕག ལཱ་གི་སྒོ་སྤྱོད་པས།
- ཆོང་འབྲེལ་ ལཱ་གི་སྒོ་སྤྱོད་པས།
- འགྲུལ་འཁོར་ལམ་དང་ གྲུལ་འཁོར་གྱི་ཞབས་ཏོག་ཚུ་ ཡར་ཤུག་བཅོ་ནི།
- གསོ་བ་དང་ ཤེས་རིག་མཐུན་ཀྱིན་ ཁོང་འཕེལ།
- རྒྱལ་ཁབ་ཀྱི་ འོ་བསྐྱར་ འོང་འབབ་ ཐེར་འབུམ་, ༢༠ བཅོ་ནི་དང་ དེ་ཡང་ མང་ཤོས་ རྒྱགར་གྱི་དབུལ་ཕུ་ཕྱི་སྒོག་ལས་
ཐོབ་ཚུགས་ དེ་མ་ཆད་ རྒྱང་གསལ་གོང་འཕེལ་གཏང་ནི།
- གྲོག་ཤུགས་ ལུ་ནི་གི་སྐུ་ཡ་, ༢༩ གིས་ བརྩོག་རྒྱུང་(ཀར་ཐོན་ཏུ་འཕྱོགས་ཀྱི) གོན་, ༢༥, ༢༩, ༢༠ དེ་ཅིག་ མར་
ལབ་གཏང་ཚུགས།
- ཉམས་འགྲུལ་མེད་པའི་ རྒྱ་ཡི་གྲོག་མེ་གོང་འཕེལ་སྤྱི་ལཱ་སྒྲིལ་, ༢༠༠༤ ཅན་མའི་དགོངས་དོན་ལྱུར་ ལས་འགལ་གྱིས་
བཞེས་མི་ མཆའི་ཆད་གཞི་དང་བསྐྱུན་ མཆའ་ཐོབ་ནི་ཡིན་མ་མཆད་ མཆའ་ཁེ་ཀར་རེ་ལུ་ འོ་ལྷར་བཞིན་ཏུ་ གྲོག་མེ་རིན་
མེད་སྒྲོང་པ་ ལུ་ནི་གྲ་, ༡, ༠༠༠ རེ་དང་ ཡང་ན་ དེ་འི་འབྲུམ་དབུལ་རྒྱང་ཐོག།
- སྤྱི་ལཱ་ ལས་འགལ་ལུ་ཚུད་དེ་ གནས་སྤོད་གོ་བ་འཕྱོར་དེ་ གནོད་སྐྱོན་བརྒྱ་ཆེས་སྟེ་ ཕྱགས་པའི་ ཉམས་ལྷན་པ་ བཟའ་
ཆང་གི་གྲུལ་ལས་ མི་རིམ་གཅིག་ལུ་ རང་མེད་ཤེས་ཆད་དང་ ལག་རྩལ་གྱི་ཕྱོགས་འགྲུབ་དང་བསྐྱུན་པའི་ ལས་འགལ་བཅོ་
བསྐྱོན་འབད་བའི་བསྐྱང་ལུ་ ལཱ་གཤེག་གི་སྒོ་སྤྱོད་པས་ཐོབ་ནི་ ཡིན་པའི་སྒོར་གསལ་ཁུ་འབད་ཡི།

ལས་འགལ་འདི་གི་བརྒྱག་ཞིབ་སྐབས་ འབྲེལ་ཡོད་ལས་སྡེ་དང་བརྒྱུག་སྡེ་ཚུ་དང་ གྲོས་བསྐྱུན་ཞལ་འཛིན་མས་ཆོག་པ་ཡོད་པ་མཆད་ མི་
མེར་དམངས་ཚུ་དང་ཡང་ གྲོས་བསྐྱུན་ཞལ་འཛིན་མས་ཆོག་པ་ཡོད། ལས་འགལ་མཐའ་དཔྱད་སྒྲུབ་ཁུ་ཅུ་དང་ མཐའ་འཁོར་གནས་སྤྱངས་དང་



མེས་ཤིང་པལ་འཕྱོར་ལུ་ སུན་གཞོན་དང་ ཉེན་ལུང་ཐབས་པམ་ཚུ་གི་སྒྲོར་ འབྲེལ་ཡོད་པམ་ཤེད་དང་ གཞུག་སྡེ་ (རྒྱལ་ཡོངས་མཐའ་
འཁོར་ལྷན་ཚོགས་ འབྲུག་གློག་ཤུགས་དབང་འཛིན་ ལཱ་པ་ཤེན་རྒྱལ་ཤུགས་པམ་ཁུངས་ འགས་ཚལ་པམ་ཁུངས་ རྒྱུ་ཁག་བདག་
སྒྲོར) ཚུ་ལུ་ བཀའ་སྡེལ་འབད་ཡོད།

ལས་འགུལ་ལུ་ སུ་མཆོད་མི་ ཉམས་སྤྱད་པ་ སུ་ཁོང་བདག་པོ་མཆོད་ལས་ ཉམས་སྤྱད་མེད་པའི་ ཡི་གུ་མེད་པོ་དང་དང་ འཛིག་སུ་མེད་
མེད་དཔལ་ལྷན་གྱི་དགུ་མཁུ་སྤྱོད་པ་མཁུ་ལཱ་ལཱ་ སུ་མཆོད་མི་ཁྱེད་ རྒྱ་ལུ་ ཉམས་སྤྱད་ཡི་གུ་མེད་པོ་དང་པའི་ཁྱེད་ དང་དུང་ མེད་མི་ཁྱེད་
མི་རྒྱ་ལུ་ཡང་ ལྷ་ཡི་གུ་མཁུ་སྤྱོད་པོ་དང་མེད་ལྷ་ཡི་

གསལ་སྒྲིལ་ལྟར་ རང་པོའི་གནས་སྐབས་འཛིན་སྒྲིལ་དང་ གཞི་ཆ་གསལ་འཆར་གཞི་དང་ འབྲེལ་པའི་ ཟད་འབྲེལ་སྒྲིལ་
ཆོག་པ་དཔལ་ལྷན་ ལྷན་འབྲེལ་འགན་ལུ་ཁྱེད་ཀྱི་ རང་སྐོའི་བསམ་འཆར་དང་ འབྲེལ་གོ་དཔེ་ བཞེ་སྒྲིལ་འབད་ཡོད་པའི་དོན་ཆ་ཆ་གསལ་
གསལ་ལྟར་།

१) རྩོམ་ཁག་ནགས་ཚལ་འགོད་པོན་གྱིས་ སྒྲིབ་སའི་ནང་ ཤིང་བརྒྱན་སྟེ་ཡོད་པའི་ས་ཆ་ གྲོག་མེལ་ས་འགྲུལ་བཙོ་བསྐྱུན་ ས་
 ཁོངས་ལུ་ རྒྱུད་པ་ཅིན་ དེ་གི་ རྒྱུད་འབྲུག་སྟོན་ཐོབ་ཁུངས་ཚུ་ གསལ་སྟོན་ནང་ ཁག་སལ་ཅིག་མ་རྒྱུད་པ་ལས་ རྒྱུད་འབྲུག་གི་
 མ་སྐྱེན་གྱི་ཚུ་ཐོབ་ཁུངས་གཏན་གཏན་ཅིག་ བཙོ་གནང་དགོ་པའི་བྱ་བ་ལུ་ཡོད་པའི་ཁར་ ལས་འགྲུལ་བཙོ་བསྐྱུན་དོན་ལུ་ ཁ་
 འབག་དང་འབྲེལ་བའི་ ལཱ་དོན་ མང་རབ་ཅིག་འོང་ནི་མི་ནུམ་ལས་ ཁ་འབག་པ་དང་ ལཱ་འབད་མི་དོན་ལུ་ གནས་སྐབས་གི་
 རྒྱུད་སྒྲིབ་ མ་གནས་གསལ་ལྟེ་དང་ གསལ་ལུ་རང་ གནི་ཆ་གསལ་འབད་ནི་གི་ འཆར་གནི་ཡོད་པའི་ ས་ཁོངས་གཏན་འཁེལ་དོམ་
 འཛིན་གནང་སྟེ་འབད་བཅིན་ མ་འོངས་པ་ལུ་ ས་ཆ་ལས་བརྟེན་པའི་ རྟོགས་འཛིན་ མི་འཐོན་ནི་གི་ ལན་ཐབས་འོང་ནི་དང་
 དེ་ལས་ རྩོམ་གྱི་འབྲུལ་ཁང་དང་ ཅུམ་སྒྲིབ་འབྲུལ་ཁང་ཚུ་ ས་ཁོངས་གསལ་ལུ་ གནི་བརྒྱུགས་འབད་ནི་ཚུ་གི་སྒྲིབ་ ད་ལྟོ་
 གོ་དང་གོ་ལས་རང་ གཏན་འཁེལ་བཙོ་གནང་བཅིན་ བཟུལ་ལས་ རྟུམ་མ་མ་བདེ་མུ་ མི་འཐོན་ཅེར་བའི་ བསམ་འཆར་
 ལུ་ཡོད།

སྒྲིག་མག་འོག་ལུ་སྒྲུང་པ་ལི་ མི་མེར་ཉམས་མཁུང་པ་སྒྲུང་ལུ་སྒྲིག་པ་ལི་སྒོ་བ་ལ་མཆུ་ཡང་ འགས་ལ་བཟོ་གནང་དགོས་འདུག་ མེར་སྒྲུལ་དང་ བྱི་གཟུ་སྒྲིག་མེ་ལས་འགལ་པ་ལྟེ་ རུ་མཆོད་ཁང་གསར་སྒྲུང་འབད་མར་ ཡུའི་གསར་རྒྱལ་པ་སྒྲུ་ཆོག་སའོ་དཔ་ལས་

[Handwritten signature]

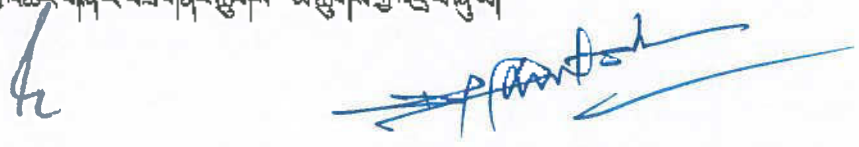
བུ་རིགས་འབྱམས་སྤོང་དང་ བལྟ་སའི་ སམྐོ་ལེགས་བཅོས་འབད་དེ་གནང་ཚུགས་པ་ཅིན་ བུ་རིགས་ཉེན་སྲུང་དང་ལྷན་འོང་ནི་
ཡིན་མཁའ་ཚད་ བལྟ་བཤམ་པ་དོན་ལུ་ཡང་ ཡན་ཐོགས་འབྱུང་ནི་ཡིན་པའི་བསམ་འཆར་བྱུ་ཡི།

དེ་གི་ལན་ལུ་ ལས་འགུལ་མདོ་ཆེན་གྱིས་ རྒྱལ་ཚབ་འགོ་དཔོན་གྱིས་ཁྱེད་ལཱ་བཞིན་དུ་ བུ་རིགས་བལྟ་སའི་ སམྐོ་རེ་ངོས་
འཛིན་འབད་དེ་ བཅོ་ཚུགས་པ་ཅིན་ མཐའ་འཁོར་གནས་སྤངས་དང་ རྒྱལ་ཁབ་མཐའ་དོན་དང་ ལྷག་པར་ རྩིང་ལག་དང་
ས་གནས་གྱི་ མི་མེར་ཚུ་ལུ་ བལྟ་བཤམ་ལས་བརྟེན་ ཁེ་ལན་འོང་ནི་གི་ བསམ་འཆར་བྱུ་མི་ལུ་ འབྲུག་སྤྱི་འབྲུང་གྲོག་མེ
ལས་འཛིན་ཁ་བྱུག་ལས་ཡང་ དེ་བབྱམ་མ་བྱུན་ཉེན་བཅོམ་ནི་གི་ རྒྱལ་སྤྱི་རྩིས་བྱུ་ཡོད་ཅེར་གསལ་ཡི། དེ་ལས་ རྩི་བོན་སའི་
སའོངས་ སྤྱི་འབྲུང་དང་ རྒྱ་སེར་བྱུ་ཚུ་ལུ་ རོས་འཛིན་འབད་དེ་ཡོད་པའི་གནས་ཚུ་བྱུ་ཡི།

ཉེ་མ་ལས་ གྲོག་མེ་ལས་འགུལ་གཞི་ཆགས་དང་ ད་ལྟོ་ གྲོག་མེ་ལས་འགུལ་ གསར་སྤྱོད་འབད་བའི་བསྐྱར་ཡོད་པའི་
སྤྱབས་བདེལ་དང་ མ་བདེལ་ཚུ་འཛོན་ཏེ་ཡོད་པའི་ དཀའ་ཉེ་གས་དང་ཉམས་སྤྱོད་ཚུ་གི་སྒོར་ རྩི་གས་དམང་ཚུ་གི་ཁ་བྱུག་ལས་
སྤྱགས་མེད་པར་ གསལ་བཤད་དང་ གྲོས་བསྐྱར་གནང་མི་ཚུ་ ཡན་ཐོགས་ཅན་གྱི་གསལ་བཤད་ཅིག་ཡིན་མཁའ་ཚད་དུ་
འབྲུག་སྤྱི་འབྲུང་གྲོག་མེ་ལས་འཛིན་ཁ་བྱུག་ལས་ འོག་ དཔྱེ་ཞིབ་འབད་འོང་ཅེར་གསལ་བཤད་ལུ་ཡོད།

༢༽ དཔྱོད་སྤྱི་འབྲུང་བདག་མཆོག་གིས་ གྲོག་མེ་ལས་འགུལ་གཞི་ཆགས་དོན་ལུ་ རྩི་བལྟ་མ་འབྲུག་ཡང་དང་ རྩི་བོན་སའི་སའོངས་ཚུ་
དང་པར་ རོས་འཛིན་འབད་དེ་ གནན་འཁེལ་བཅོམ་གནང་དགོང་ཡོད་ ས་དང་རྩི་རིགས་བཀོག་སའི་སམྐོ་ཚུ་ཡང་ ལྷགོར་
ལས་ རོས་འཛིན་འབད་དགོ་པའི་སྒོ་རྒྱུ་ གསུང་གནང་མཁའ་ཚད་ ལས་འགུལ་མཐའ་དམུད་བརྟེན་ཞིབ་སྒྲུབ་ཞུ་ཡིན་ དེ་གི་
དོན་ཚན་ཚུ་ ཁགས་ལ་བཅོམ་གནང་པ་ཅིན་ ལེགས་ཤོམ་འོང་ནི་གི་ རྒྱལ་སའོངས་བཀོད་གནང་ཡི།

༣༽ དཔྱོད་སྤྱི་འབྲུང་རབ་གྱིས་ ས་དང་རྩི་རིགས་ལེ་ག་རང་ རྩི་བོན་སའི་བཀོག་དགོས་ རོས་བདེན་ཡིན་མཁའ་ཚད་ མཐའ་འཁོར་གནས་
སྤངས་ལུ་ཡན་ཐབས་དང་ ཡང་ན་ སྤྱི་བགྲུ་ལག་མོ་མོ་དང་ མཐའ་འཁོར་ལེགས་ཤོམ་བཅོམ་དོན་ལུ་ ས་དོད་གོ་མི་རེ་འཛོན་པ་
ཅིན་ ལས་འགུལ་ཁ་བྱུག་ལས་ དེ་ལུ་ བསྐྱེལ་འབྱེད་གྱི་ཞབས་ཏོག་གནང་ཐབས་གྱི་ འོས་བབས་ ཡོད་མེད་གྱི་ བསམ་
འཆར་བྱུ་ཡོད། རྩི་རུང་ འཁོར་ལམ་ལྷག་འོག་ལུ་ མི་དམངས་ལན་པའི་སམྐོ་དང་ སམྐོ་ཡོད་སམྐོ་ལུ་ བཀོག་གནང་སྟེ་
མི་དམངས་འབྱམས་མཁའ་ཚད་ ཅེད་ཐང་བབྱམ་ཅིག་ སའོག་སའོར་རིགས་གྱིས་ བཀའ་སྟེ་ ལེགས་བཅོས་གྱི་ཐབས་ལམ་དང་
རྩི་ལན་གྱི་འཆར་གཞི་རེ་བཅོམ་གནང་ཚུགས་ མི་ཚུགས་གྱི་འདྲི་བཞུ་ཡི།



[illegible][illegible]

6 ~~Signature~~

མེས་སྒྲིག་གནང་དགོས་དང་ དེ་ཡང་ མ་ཁམ་དབྱེ་བ་བསྐྱར་བཅོས་འབད་ནི་ལུ་ ཉུག་ལུན་ འགོ་རམ་ལས་བརྟེན་ཡིན་པའི་
ཁར་ ཁ་འབག་པའི་ལཱ་གཤམ་ཁྱེད་ཀྱི་སྤྱད་སྒྲུར་ཆགས་ནི་གི་ ས་སྤྱོད་མ་མཆོམས་གཏན་འཁེལ་ རིས་འཛིན་འབད་དགོ་པའི་ཁྱེད་
དང་ སྒྲེར་གྱི་ས་ཆ་ཡིན་ཅུང་ རྫོང་ཁག་བདག་སྤྱོད་དང་ མཉམ་འབྲེལ་གནང་སྟེ་མཛད་དགོ་པ་ཚུ་ ལས་འགུལ་གྱིས་ མཁྱེན་
དགོ་པའི་བསམ་འཆར་ལྟོ་ཡོད།

དགོས་ཚུངས་བདག་མཆོག་གིས་ མི་མེར་གྱི་ས་ཆ་ རྒྱ་ཞིང་གུངས་ལུ་ ཁྲོམ་ར་བཀོད་དེ་ཡོད་པ་ཅིན་ སྐམ་ཞིང་ལུ་ སྤྱིར་བཅོས་
མ་འབད་ཚུན་ ལས་འགུལ་གྱི་མིང་ཐོག་ ཁྲམ་མིང་སྤྱོད་མེར་འབད་ཐབས་མེད་པ་ལས་ ས་ཆ་འདི་དབྱེ་ཁྲམ་སྤྱིར་བཅོས་འབད་དགོ་
པའི་བྱ་སྤྱོད་ཚུ་ རྫོང་ཁག་སོན་མ་འགོ་དཔོན་གྱིས་ འགོ་འདྲེན་འཐབ་སྟེ་འབད་དགོ་པ་དང་ རྒྱལ་ཡོངས་ས་ཆ་ལྟན་ཚུགས་གྱི་
རྒྱལ་ཡོངས་ ས་ཆ་བསྐྱར་འཇལ་གྱི་ ལས་རིམ་དང་འབྲེལ་ཏེ་ ས་ཆ་བསྐྱར་འཇལ་གནང་ཚར་ཡོད་པ་བཞིན་དུ་ མི་དབང་
མངའ་བདག་རིན་པོ་ཆེ་མཆོག་གི་ཞབས་ལས་ཡང་ ས་ཆ་བསྐྱར་འཇལ་གྱི་ལག་ཁྲམ་ཚུ་ ཁྲོང་གསར་རྫོང་ཁག་གི་མེད་འོག་སོ་སོ་
ལུ་ གནང་ཚར་ཡོད་པ་ལས་ ས་ཆ་དང་ ས་ཆ་བའ་བཟུལ་པའི་ ཉེགས་འཛིང་སྤྱོད་ འཛོན་དགོ་པ་ཅིག་མེད་ཅུང་ ད་ལྟོ་ ལས་
འགུལ་གྱིས་ གསལ་སྤྱོད་འབད་མི་ནང་ཚུན་མི་ས་ཆ་ཚུ་ ཁྲམ་གསར་རྫོང་གནས་སྤངས་ ཅོག་ཐང་པ་ཡོད་མེད་ མེད་འོག་ཡིག་
ཚང་དང་ཅིག་གའར་ འབྲེལ་བ་འཐབ་བཞིན་མ་ལས་ ཞིབ་དཔྱད་མ་ཐེལ་ཕྱིན་ འབད་དགོ་པའི་བཀའ་སྤྱོད་གནང་ཡི།

ཨེ་ཤི་ཡ་གོང་འཕེལ་དངུལ་ཁང་གི་གྲོས་སྤྱོད་པ་གིས་ ས་ཆ་བའི་ས་ཆ་བསྐྱར་བཅོས་དོན་ལུ་ ས་ཆ་ཨེ་ཀར་རེ་ལུ་ དངུལ་ཁྲམ་
100,000/-རེ་བཞག་སྟེ་ཡོད་ཟེར་ལྟ་ཡི།

༡༽ སྤྱང་མི་བེ་ཚོགས་པ་ནས་ ལས་འགུལ་གྱི་ མ་རོགས་དང་ རོ་རོགས་བཀོག་སའི་ས་སྤོ་འདི་ གྲོག་མེ་འཕུལ་ཁང་ཚུང་བ་གི་
འོག་ལུ་ཡིན་མས་ མི་མེར་ཚུ་ འཛོ་བ་གཅོ་པོ་སོན་མ་དང་ རྒྱ་ཞིང་ལུ་བརྟེན་ཏེ་ སྤྱད་མི་ཅིག་ཡིན་མ་ལས་ སོན་མ་ཞིང་ལམ་
དང་ རྒྱལ་ཡོངས་ལུ་ གནོད་སྐྱོན་རེ་ མི་འབྱུང་ག་ ཟེར་བའི་དོགས་པ་དང་ འོ་སོག་གི་རྒྱུ་འབྱས་ཚུ་ ཉེ་མའི་རིན་གོང་གི་
ཚད་གཞི་ཡིན་མ་ལས་ རྒྱལ་ཁབ་གྱི་དཔལ་འཕྱོར་གོང་འཕེལ་དང་འབྲེལ་ཏེ་ རྒྱུ་འབྱས་ཐོབ་ལམ་ཚུ་ཡང་ ཡར་མེད་དང་
སྤྱིར་བཅོས་རེ་ མཛད་དེ་གནང་པ་ཅིན་ ཇི་མཆོམས་གྱི་བསམ་འཆར་དང་ མི་མེར་ རང་སྤོའི་སྒྲེར་གྱི་ས་ཆ་གི་སྐམ་ཞིང་ནང་
ན་སོན་བཏབ་སྟེ་ཡོད་པའི་ རྒྱུ་འབྱས་ཐོབ་ལམ་ གཤེ་འབད་རང་ཡོད་པ་ཡིན་ན་ གསལ་ཏོག་ཏོ་འབད་བཅོ་གནང་དགོ་པ་
འདུག་ཟེར་ལྟོ་ཡོད། ཅན་མ་འོངས་གོང་ལས་རིམ་འགོ་དང་ རྒྱ་མ་འོང་གོང་ལས་ལུར་བཟེར་དོ་བབྱམ་ ད་ལྟོ་ ལྷ་གོང་ལས་
རང་ གསལ་གྲོས་སྒྲུགས་ལུ་བཅུག་སྟེ་ ལྷ་བས་བདེ་ཏོག་ཏོ་ བཅོ་གནང་དགོ་པའི་རྒྱུ་ཚུངས་ལྟོ་ཡོད་ ལས་འགུལ་གྱི་

འགོད་པོ་མཆོད་ཅིག་ལས་ ཞལ་འཛོམས་ཆོག་མཁན་པོ་དང་ སུམ་པོ་དང་ ལྷ་ལྷ་མ་ ཉེ་མར་ སྤྱོད་ལེན་འབད་དེ་མ་
 གོ་གས་ སུམ་པོ་དང་མཆོད་ཅི་མེད་ཅེར་གསུང་ས་ཡི། དེ་ལས་ སུམ་པོ་སྤྱོད་པ་དོན་ལུ་ ཞལ་འབག་པ་གི་སྤྱི་ལས་
 ལེན་བཞིན་མ་ལས་ ཕྱི་མ་བསྐྱབ་ཡོད་མི་ཚུ་ རོག་ ལཱ་མཉུག་བསྐྱུལ་ད་ ལྷག་ས་ཤོག་ཚུ་ཡང་ ཞིང་ཚོ་ལུ་ རིན་མེད་སྤྱོད་པར་
 འབྱེན་པོར་ཅེར་གསུང་ས་མི་དེ་ དེས་བདེན་ཡིན་ན་ཅེར་དོག་ས་གསལ་ཞུ་ཡི། ལས་འགུལ་གྱིས་ མོང་ལུ་ཞུ་མི་ ས་རོགས་ཚོ་
 རོགས་བཀོག་སར་ འགོ་འགུལ་འབད་སའི་འཁོར་ལམ་དེ་ དུ་ལྟེའི་ རོན་མཁའི་ལམ་དེ་གིས་རང་ བདུ་བམི་བདུ་བད་དང་ དེ་
 མིན་ འཁོར་ལམ་ བརྒྱ་བསྐྱེད་པེ་འབད་དེ་ མི་མེར་གྱིས་ཆ་ཚུད་པ་ཅིན་ དེ་གི་ ལྷ་ལྷ་མ་དང་ སུམ་པོ་བཞིན་བསྐྱོར་
 ཞུ་ཡི།

དཔོན་ཚོང་བདག་གིས་ ལས་འགུལ་གཞི་ཆ་གསལ་ལས་བཞེན་ ས་གནས་ཀྱི་ མི་མེར་དམངས་གིས་ཞིང་དང་ མཐའ་འཁོར་
 གནས་སྤངས་ལུ་ སུམ་པོ་གསུང་དང་ གཞོད་ཉེན་གདེའབད་རང་ཡོད་པ་ཡིན་ན་ མི་མེར་ཚུ་གིས་ མཆོད་དགོས་ལག་ཆེ་བས་
 འདི་དང་ཅོག་ཐད་ས་ སྤྱི་མཁའི་ནང་ ལུ་མཆོད་པ་སྤྱོད་པ་ ལྷ་ལྷ་མ་ཐོབ་ལམ་ཡོད་པ་སྤྱོད་ འབད་དགོས་པོར་ དེ་མེས་ཡོད་
 པའི་སོ་ནམ་ཞིང་ལམ་ བརྒྱ་བསྐྱེད་པེ་འབད་དགོ་རུང་ དེ་བསྐྱེད་ཀྱི་ ལྷ་ལྷ་མ་ཚུ་ཐོབ་ནི་དང་ འཁོར་ལམ་ དེ་གིས་རང་
 བདུ་བམི་ཅིན་ ལེགས་བཅོས་ཀྱི་ལུ་ཚུ་ ལས་འགུལ་གིས་གནང་པོར་ སྤྱོག་མེ་འཕུལ་ཁང་ཚུང་བའི་ཚུ་ལམ་དང་ ཚུ་ཞིང་གི་
 མཆོད་ཚུ་ཡོད་མི་ཚུ་ ལས་འགུལ་གིས་བཅོས་པེ་འོང་ནི་མ་གོ་གས་ མེད་པ་འབྱེད་ནི་ཉེན་ལག་ནི་ཡང་མེད་པ་ལས་ མི་མེར་
 ཚུ་ ལྷག་ས་ཀྱི་ཆ་ཚུང་མཆོད་དགོས་ གནི་ཡང་མེད་ཅེར་གསུང་གནང་ཡོད། དེ་ལུ་ ལས་འགུལ་མཆོད་ཆེན་གྱིས་ཡང་ ལས་
 འགུལ་གསུང་སྤྱོད་འབད་མ་དང་ སྤྱོག་མེ་འཕུལ་ཁང་ཚུང་བའི་ ཚུ་ལུ་དང་ ཚུ་ཞིང་གི་ཚུ་ལུ་ སྤྱོད་ཚུ་ལམ་ཚུ་
 བཀག་གཞོད་གནི་མེད་པར་ ལ་འབག་གི་ལུ་དོན་སྤྱོད་པ་དང་ འགན་ལེགས་ལས་བཅོས་པེ་ འབད་ནི་ཡིན་ཅེར་ འབྲུག་སྤྱི་
 འབྲུང་སྤྱོག་མེ་ལས་འཛིན་ནས་ལས་སྤྱོད་ཞུ་ཡི། དཔོན་ཚོང་བདག་མཆོག་གིས་ ཞལ་འབག་གི་སྤྱོད་པར་གྱི་ལྷག་ས་ཤོག་
 རོག་ བཅུ་ལམ་ ལཱ་མཉུག་བསྐྱུལ་ཚར་བཞིན་མ་ལས་ སྤྱོད་མི་སྤྱོད་ཀྱི་ དབང་ཆ་ ཞལ་འབག་པ་སོ་མའི་སྤྱོད་པ་དང་འཕྲིལ་
 རིམ་གོ་གས་ རྒྱུ་ལག་བདག་སྤྱོད་དང་ འབྲུག་སྤྱི་འབྲུང་སྤྱོག་མེ་ལས་འཛིན་གལ་ཡང་ འདི་བརྒྱུ་མེད་པར་ཆད་མེད་ཅེར་
 གསལ་གནང་ཡི།

༤། རྒྱུ་ལག་སོན་མ་འགོད་པོ་མཆོད་ཀྱིས་ གནས་སྤྱོད་པ་དོན་ལུ་ སྤྱི་ལས་ལེན་པའི་སུམ་པོ་ཚུ་ ལས་འགུལ་གྱི་ལུ་དང་ སུམ་པོ་ལས་
 ལེན་པའི་ ལུ་ལུ་མཆོད་པེ་ལེན་པ་ལས་ སུམ་ རོག་ ཉེ་མར་ བརྒྱུ་སྤྱོད་ བཅོ་གནང་དགོས་དང་

དེམིན་ ལོ་ཐོག་གི་ ལྷན་འབྲེལ་པའི་ གནད་འབད་ཡོད་ཀྱི་ དཔེར་ན་ དབང་འདུལ་ ཟམ་བརྒྱུ་བས་སྐབས་ སུ་ཆ་ལེན་
སྤྱོད་ཡོད་མི་ཚུ་ ད་ལྟོ་ བར་ན་ཡང་ བཟུལ་སྤྱོད་ འབད་མ་བརྟུབ་པར་ ཡོད་ཟེར་ཁྱུ་ལཱ་།

ལས་འགུལ་མདོ་ཆེན་གྱིས་ ལས་འགུལ་གྱི་ ལཱ་འགོ་བཙུག་དོན་ལཱ་ ལག་འབག་ཚུ་ལཱ་ ལཱ་དོན་སྤྱོད་ལེན་ མ་འབད་བའི་ཉེ་
མར་ སྤྱོད་གར་གྱི་སེལ་ཁོངས་ཚུ་ སྤར་ག་ཡིན་མ་ འཕྲོ་མཐུད་ བཟུལ་སྤྱོད་འབད་བརྟུབ་བཟོ་དགོ་པའི་ ཡིག་ཐོག་ ལག་སྐུལ་
བཀོད་དེ་སྤྱོད་ནི་དང་ མཐའ་འཁོར་གནས་སྤངས་དང་ གསོ་བའི་འཕྲོད་བསྟེན་ མི་སྡེ་ལཱ་ སུ་ཆ་བཟུལ་དང་ ལེགས་བཅོས་
འབབ་ལམ་ཚུ་གི་སྒོར་ འགན་ཡིག་ནང་ ལག་སྐུལ་བཀོད་དེ་འབད་བཅིན་ དྲུག་ནི་མས་ དར་དཀར་ཚུ་སྒོག་མེ་ལས་འགུལ་
དང་ ཅོག་ཐད་པ་གི་འཆར་གཞི་བཟོ་སྟེ་ འབད་ཡོད་ཟེར་ཁྱུ་ཡོད།

༩༽ རྫོང་ལག་གསོ་བའི་འགོ་དཔོན་གྱིས་ གསོ་བའི་ གནད་དོན་ལས་བརྟེན་པའི་ ཉེན་སྲུང་བཟུལ་ལམ་ མི་སྡེ་བས་གྱི་མི་འཁོར་དང་
འབྲེལ་ཏེ་ གསོ་བའི་འཕྲོད་བསྟེན་ལེགས་བཅོས་དང་ བརྒྱ་བསྐྱེད་ གནད་ཚུགས་པའི་འོས་བབས་དང་ འཆར་གཞི་ཚུ་ གནད་
འབད་རང་ཡོད་ཀྱི་ ཟེར་བའི་འདྲི་བཀོད་དང་ ལས་འགུལ་བཟོ་བསྐྱུན་ལཱ་དོན་ འགོ་བཙུགས་པའི་དང་ཅིག་ལཱ་ གསོ་བའི་
འཕྲོད་བསྟེན་བརྒྱ་རྒྱུགས་པའི་མི་ངོམ་ལེ་ ལོགས་སུ་ བསྐོ་བཞག་མཛད་དེ་ རྫོང་ལག་གསོ་བའི་སྡེ་ཆེན་དང་མཉམ་འབྲེལ་འབད་
དགོས་ལག་ཆེ་བས་ཟེར་ཁྱུ་ཡོད།

དེ་ལཱ་ ལས་འགུལ་མདོ་ཆེན་གྱིས་ རི་ཀ་ཚུ་སྒོག་མེ་ལས་འགུལ་འདི་ ལས་འགུལ་ཚུང་ཀྱ་གཅིག་ཡིན་མ་ལས་ སྤྱན་ལང་དང་
སློབ་གྲྭ་གསར་པ་བརྒྱུ་པ་མི་ཚུ་གས་ ཡིན་རུང་ ལས་འགུལ་གྱི་མི་སྡེ་བས་དང་ དགོས་མཁོ་དང་བསྐྱུན་ ལཱ་བསྐྱེད་ལེ་ འབད་
དགོས་ཡོད་ནི་དང་ ལཱ་འབག་མང་ཤོས་རང་ གསོ་བའི་འཕྲོད་བསྟེན་ཚུང་ཀྱ་ལེ་ གཞི་བཙུགས་འབད་བཙུག་ནི་གི་འཆར་གཞི་
ཡང་ ཡོད་ཟེར་ཁྱུ་ཡོད།

དགོས་རྫོང་བདག་མཆོག་གིས་ ལས་འགུལ་གི་དོངས་ལས་ གསོ་བའི་འཕྲོད་བསྟེན་བརྒྱ་རྒྱུགས་པ་ དགོས་ལག་ཆེ་བས་ དེ་ཡང་
མང་སྡེ་ཚུ་ལས་འགུལ་ འགོ་བཙུགས་བཞིན་མ་ལས་ རྫོང་ལག་ནང་ ལུས་འབྲེལ་ལས་བརྟེན་པའི་ རྟན་གཞི་ཐོབ་མི་ ༡༢༥
ཙམ་ རང་སོས་ལས་སྤངས་ཐོག་ལས་ ཟླ་གི་བརྒྱ་གཞི་ལཱ་འབད་ལཱ་ད་ བད་འ་འཛིན་ཡོད་པ་དང་ ལག་འབག་ལས་མེད་ སྤྱོད་
སྤྱར་ལས་རང་ མི་གངས་ ༤ དེ་ཅིག་ ཡིན་པའི་མི་ རྟན་གཞི་ཐོབ་ཡོད་པའི་ངོས་འཛིན་ བྱུང་མ་ལས་བརྟེན་ཏེ་ཡིན་ རི་

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ཀུན་གྱིས་ དཔེགས་རལ་ཅིག་བརྟོན་ཐོག་ལས་ གྱི་མི་ ལྷ་གཤོག་པ་ལེན་མ་དེ་རང་ ལུན་ཚོགས་གླིང་ལས་ བརྟག་ཞིབ་འབད་
ཚུགས་པ་ཅིན་ དྲག་ནི་མས་ཟེར་བའི་ བསམ་འཆར་བཀོད་གནང་ཡི།

༡༠། ཉེ་ལ་བྱང་ལའི་དམང་མི་གིས་ ལས་འགུལ་གཞི་ཆགས་ལས་བརྟེན་ མི་མེར་གྱི་ གཞི་ཁྱིམ་སྤོ་བཤུད་འབད་དེ་ འབྱོར་གོ་པ་རེ་
ཡོད་ན་ ལྷ་གོང་ལས་ མི་ངོ་མ་ལུ་ གོ་བདམ་མཐིལ་ཅིན་ སྤོད་གནང་དགོ་པའི་ཁྱབ་ཕུལ་ཡོད་ དེ་ལུ་ གཞི་ཁྱིམ་སྤོ་བཤུད་འབད་
དེ་ འབྱོར་གོ་པའི་ མི་མེར་གྱང་པ་གཅིག་ཡང་ མེད་ཟེར་གསལ་ཡི།

ལས་འགུལ་མདོ་ཆེན་གྱིས་ མི་མེར་གྱི་ཁྱིམ་དང་ གླམ་ཁྱིམ་ མཆའི་དབྱེ་རིམ་གཅི་ལེན་དགོ་ཅུང་ ལས་འགུལ་ལུ་ དགོ་པ་
རེས་བདེན་དང་ ག་དེ་ཉུང་ཉུང་མ་དེ་རང་ ལེན་ནི་གི་ཐབས་ཤེས་སྤྱི་གཉེ་ འབད་ནི་ཟེར་བའི་བསམ་འཆར་ཁྱུ་ཡི།

ལྷ་གཤོག་དང་ ཆོང་ལུ་ ཁའབག་ལ་སོགས་པའི་སྤོ་སྒྲུབ་ས་ ཡོད་པའི་ གསལ་སྟོན་ ལས་རིམ་སོག་ལས་ གསལ་བཤད་དང་
མཛུངས་པར་ སྤོ་སྒྲུབ་འདི་དང་ འདི་བབྱམ་ ཐོབ་ཁུངས་ དེས་བདེན་ཡོད་པའི་ དོན་ཚན་ གསལ་རི་རི་གཅིག་ འཁོད་
གནང་དགོ་པའི་ བསམ་འཆར་བཀོད་མི་ ལེ་ག་འཐོན་ཡོད་པའི་ལན་ལུ་ དྲགོས་ཁྱིམ་འཛིན་དང་ ལས་འགུལ་མདོ་ཆེན་
གཉིས་གྱིས་ སྤོ་སྒྲུབ་ས་ ཐོབ་ལམ་ཡོད་དེ་འབད་ཅུང་ མི་ངོ་མ་འདི་དང་འདི་ལུ་ འདི་བབྱམ་གྱི་ ཐོབ་ཁུངས་ཡོད་ཟེར་བའི་
དབྱེ་བཀོགས་སུ་ཕྱེ་ཕྱེ་མེད་ཅུང་ གློག་མེ་ལས་འགུལ་ གཞི་ཆགས་ལས་བརྟེན་ཏེ་ གཞི་ཁྱིམ་ སྤོ་དགོ་པ་བྱུང་མི་ བརྒྱ་ཆེ་མ་སྟེ་
ཉམས་ཀྱང་སོགས་མི་ ཁྱིམ་གྲང་རེ་གི་ མི་ངོ་རེ་ལུ་ རང་མེད་ཤེས་ཚད་དང་ ལག་རྩལ་གྱི་ རྩོགས་འགྲུབ་དང་བསྟན་པའི་
ལས་འགུལ་བཅོ་སྟན་འབད་བའི་སྒྲུབ་ས་ལུ་ ལྷ་གཤོག་གི་ སྤོ་སྒྲུབ་ས་ཡོད་ཟེར་ ཁགས་པ་ཚུ་དེ་ཡོད་པ་མཆོད་ ལས་འགུལ་
དོན་ལུ་ མི་མེར་གྱི་ས་ཆ་ ཐབས་མེད་གཞུང་བཞེས་འབད་དགོ་པ་ཅིན་ མི་མེར་གྱི་ས་ བཀའ་ཁུགས་རེ་ལུ་ རོ་ལྟར་བཞིན་ཏེ་
གློག་མེ་རིན་མེད་སྟོང་པར་ ལུ་ནི་གི་ ༡༠,༠༠༠ རེ་ ཐོབ་ཁུངས་ཡོད་ལུགས་དང་ ཁའབག་དང་ ཆོང་འབྲེལ་གྱི་ལྷ་གི་སྤོ་
སྒྲུབ་ས་ཚུ་ཡང་ མི་ངོ་ རང་མེད་ལྷོགས་འགྲུབ་དང་བསྟན་ཏེ་ ཐོབ་ཁོང་ཟེར་གསུངས་ཡི།

དྲགོས་རྫོང་བདག་གིས་ རྫོང་ཁག་བདག་གློང་ཁམས་ལས་ བཀའ་ལས་བརྟེན་པའི་ཉོགས་བཤད་དང་ བཀའ་བསྟོན་ལེན་གྱི་
ཚོགས་པ་ གཞི་བརྩམས་འབད་བཞིན་མ་ལས་ དཀའ་ངལ་གཞི་ཡང་མེད་པར་ རྩལ་ས་བདེ་ཉོག་ཏེ་ བཅོ་གནང་དགོ་པ་དང་
མི་མེར་གྱི་ བཀའ་བཟའ་སྟོན་ འབད་འཕྱོ་ཡོད་མི་ཚུ་ ལས་འགུལ་ཁོངས་སུ་ མཆུན་པའི་ཉེ་མར་ བཀའ་བཅོས་འཛིན་འབད་

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དེ་སའཁབ་སྒྲིབ་ལེན་འབད་དགོ་པའི་ལས་ཤིང་མ་བཟོ་གནང་ནི་དང་གཡུ་སྒྲིབ་ ཅུས་འབྲུལ་ལས་སའཁབ་སྒྲིབ་ལེན་འབད་མ་
ཚུགས་ཚུན་ཚེད་ མེར་དབང་གི་སའཁབ་ གྲུ་ཁར་ལེན་ཏེ་ འབད་དགོ་པའི་བསམ་འཆར་བཀོད་གནང་ཡོད།

༡༡༽ གྲིང་ཀ་འཛིན་སྒྲིབ་པ་གིས་ གསལ་སྒྲོན་ནང་བལྟ་མ་ད་ རི་དྭགས་སྤང་སྒྲིབ་སྤང་ ཉེན་སྲུང་ ཤིང་རིགས་བཟུགས་སྒྲིབ་ མི་
སྡེའི་རྒྱུ་འབྲས་དང་ རྒྱུ་སྒྲིབ་ལ་མོགས་པའི་ ཐབས་ལམ་གྱི་ འཆར་ཅིས་བཀོད་ཡོད་མི་དེ་ ཉུང་རང་ཉུང་མ་ལས་ འཆར་
ཅིས་ཚུ་ གཤེ་འབད་བཀོད་ཡིག་ཟེར་ བསམ་འཆར་བཀོད་ཡི།

དཔྱོད་ཚུང་བདག་གིས་ རི་དྭགས་སེམས་ཚན་ ཉེན་སྲུང་གི་དོན་ལས་འབད་ཅུང་འབྲ་ མཐའ་འཁོར་གནས་སྤངས་དང་ མི་
སྡེའི་དོན་ལུ་འབད་ཅུང་ ལས་འགུལ་གསར་སྤྱད་ མ་དེལ་ཡོངས་བསྡོམས་ཐོག་ལས་ བརྒྱ་ཆ་ཕྱེ་ཀ་གཅིག་མིན་པར་ མང་
སྡེ་ཚུ་ལས་འགུལ་བཟུམ་སྡེ་ བརྒྱ་ཆ་གཅིག་གི་ཅིས་ བཞག་ཐབས་ཡོད་པ་ཅིན་ གཤེ་འབད་མཚམས་གཟེར་པའི་ རྒྱགས་
འཆར་བཀོད་གནང་ཡི།

༡༢༽ རྫོང་ཁག་ནགས་ཚལ་འགོ་དཔོན་གྱིས་ མི་སྡེ་ནགས་ཚལ་ཁག་ ༤ གྲོག་མེ་ལས་འགུལ་གྱི་ སའཁབ་སྤང་ ཚུང་ནི་ཡིན་མ་
ལས་ རྒྱུ་འབྲས་ཐོབ་ལམ་ཚུ་ ཁག་སལ་ བཀོད་གནང་དགོ་པའི་ བསམ་འཆར་དང་ ལས་འགུལ་ལས་ ཤིང་སྤྲུམ་བཟུགས་
ནི་དང་ སའཁབ་ ལེགས་བཅོས་གྱི་ འཆར་གཞི་བཟོ་གནང་མ་ད་ རྫོང་ཁག་དང་གཅིག་ཁར་ གྲོག་བསྐྱུན་འབད་དེ་ གནང་པ་
ཅིན་ མི་སེར་དང་ རྫོང་ཁག་ ལས་འགུལ་ཚུ་གི་བར་ན་ ལྷབས་བདེ་ཏོག་ཏོ་འོང་ནིའི་ བསམ་འཆར་ཚུ་ལྟ་ཡི།

༡༣༽ དཔྱོད་ཚུང་རབ་གྱིས་ འདས་པའི་ཉམས་སྒྲིབ་ཐོག་ལས་འབད་པ་ཅིན་ སའཁབ་དང་འབྲེལ་པའི་རྒྱུ་འབྲས་ཐོབ་ལམ་ སའཁབ་
བཅས་པའི་ གནད་དོན་གནང་དང་གནན་ གཅིག་ཐད་ལས་འབད་ཅུང་ ལས་འགུལ་རྒྱང་མ་ཅིག་གིས་མིན་པར་ ད་ལྟོ་ གོ་
དང་གོ་ལས་རང་ མི་སེར་དམངས་དང་ རྫོང་ཁག་བདག་སྒྲིབ་བཅས་འཛོམས་ཐོག་ གསུང་གྲོག་ཞིབ་ཞིབ་གནང་སྡེ་ གཅིག་
བསྐྱེལ་ཐོག་ལས་ རྒྱགས་ཐག་ཚེད་གནང་པ་ཅིན་ མ་འོངས་པ་ལུ་ ལྷབས་མ་བདེམ་ཚུ་ མི་འཐོན་མ་འོང་ཟེར་པའི་བསམ་
འཆར་ལྟ་ཡོད།

༡༤༽ དཔྱོད་ཚུང་བདག་མཆོག་གིས་ ཞི་ཀ་ཚུ་གྲོག་མེ་ལས་འགུལ་ལྟ་དོན་ལུ་ རང་བཞིན་མཐའ་འཁོར་གནས་སྤངས་དང་ མི་སྡེ་
དཔལ་འབྱོར་ སའཁབ་རྒྱུ་འབྲས་ སའཁབ་དང་འབྲེལ་པའི་ གནད་དོན་གཅིག་ཐད་ལས་འབད་ཅུང་ རྫོང་ཁག་བདག་སྒྲིབ་

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བརྒྱད་དེ་ ཕྱག་ལུ་མཛད་གནང་པ་ཅིན་ འབྲུལ་ཕྱག་ལུ་གཉིས་ལུ་ ཡན་ཚེས་དང་ འབྲུལ་འབྲུལ་ཅན་ཅིག་ལུ་ འཁྱུར་ཚུགས་
ནི་ཡིན་མ་མཚན་ ལཱ་དང་ བྱ་བ་ག་ཅི་འབད་རུང་ ཁྱིམ་དང་མཐུན་མ་སྟེ་ ཡིག་ཚོག་ འགན་ཡིག་ཁག་ལཱ་ལ་བཞོན་དེ་ བཟོ་
གནང་པ་ཅིན་ མི་མེར་དང་ཚོང་ཁག་ ལས་འགྲུལ་གསུམ་གྱི་བར་ན་ ལྷ་བས་མ་བདེ་མཆོ་ ཅུ་ལས་རང་འཛོན་དགོས་ མེད་
ཟེར་བའི་དྲན་གསལ་གསུང་གནང་ཡོད།


༡༥། དུགས་ཚོང་བདག་མཆོག་གིས་ བེ་ཀ་ཚུ་སྒྲིག་མེལ་ལཱ་འགྲུལ་གཞི་ཆགས་དང་བསྟུན་ སྒྲིག་ཐག་གསལ་པ་འཕྲེན་ནི་གི་ལམ་དང་
ཀ་ཆེན་ཚུ་ ས་གནས་གསེལ་ལཱ་དང་ བཟོ་དགོས་ཡིན་ན་དང་ སྒྲིག་ཐག་བརྒྱད་ལམ་དེ་ལས་བཞེན་ གཞུང་དང་ སློང་ས་ གསེ་
དང་ གཞུང་ཚོགས་ནི་ཡིན་པའི་ ལྷ་མ་ལྷ་ཁག་ལཱ་བཟོ་སྟེ་ ཚོང་ཁག་བདག་སྒྲོང་ལུ་ ཕུལ་དགོས་སྟེ་གསུངས་གནང་ཡི།


དུགས་ཚོང་བདག་མཆོག་གིས་ འདི་བརྒྱམ་གྱི་ཁྱོས་བསྟུན་ ཞལ་འཛོམས་ཆོག་ལས་གནང་དགོས་ཁག་ཆེ་བས་ དེ་ལས་ མཐའ་
འཁོར་གནས་སྤངས་དང་འབྲེལ་བའི་ ཉུག་མེད་གྱི་གནང་བ་ལུ་ནི་དང་ ལཱ་དོན་གཞན་ཚུ་ གང་མཆོག་ལས་ འབད་ཐབས་ལུ་
ཡིན་ཟེར་གསུངས་ཏེ་ གྱི་ཆེས་ ༢༢/༡/༢༠༡༥ ལུ་ ས་གནས་ ལྷང་མི་བཟུང་ཞེད་འོག་ཡིག་ཆ་དང་ འབྲེལ་ཡོད་ལས་ཁུངས་
ཁག་གི་འགོ་དཔོན་དང་ ལས་འགྲུལ་ལུ་ ས་ཆ་ཚུད་དེ་ཡོད་པའི་ཁྱིམ་གུར་/ས་ཆའི་བདག་པོ་ ཅུ་པ་ ༡ སྟེ་ མི་དམངས་སྒྲོས་
བསྟུན་ཞལ་འཛོམས་གནང་སར་ དེས་པར་དུ་ འཕྲོན་གནང་དགོས་མཚན་ འབྲེལ་ཡོད་ ཞེད་འོག་གི་ཁབ་དང་ གཞུལ་སྒྲིའི་
དམངས་མི་ ཆོག་ལས་ ལྷང་མི་བཟུང་ཞེད་འོག་གི་ ཁྱིམ་གུར་རེ་ལས་ མི་ངོ་རེ་ ཆད་ལུས་མེད་པར་ ཞལ་འཛོམས་གནང་སར་
འཛོམས་དགོས་དང་ དེ་གི་ ཁོ་བ་བདེ་སྒྲོང་ཚུ་ གཤམ་དང་དམངས་མི་ ཆོག་ལས་པ་ཚུ་གིས་ འབད་དགོས་པའི་བཀའ་བརྒྱ་གནང་ཡོད།
བེ་ཀ་ཚུ་ སྒྲིག་མེལ་ལཱ་འགྲུལ་བཟོ་སྟུན་དོན་ལུ་ ས་ཆ་དང་ མཐའ་འཁོར་གནས་སྤངས་དང་འབྲེལ་བའི་ ལཱ་དོན་ བྱ་སྟེའི་
ལས་རིམ་ཚུ་ ཀྲིང་གསལ་ཚོང་ཁག་བདག་སྒྲོང་ཁག་གི་ ཕྱག་སྒྲིག་ལཱ་འབད་དེ་ འབད་དགོས་པའི་ འབྲེལ་ཡོད་ལྷན་ཁག་
ལས་ ཡིག་ཚོག་གི་ བཀའ་བརྒྱ་ལོགས་སུ་གནང་དགོས་པའི་བཀའ་བསྒྲིབ་གནང་ཡོད་ (letter of intent) དེ་ལུ་ ལས་
འགྲུལ་མདོ་ཆེན་གྱིས་ འབྲེལ་ཡོད་ལྷན་ཁག་ལུ་ འབྲུལ་རང་ ལྷན་འབྲུལ་ལུ་བཞིན་མ་ལས་ ཕུལ་ནི་ཟེར་ཞུ་ཡི།

ལས་འགྲུལ་མདོ་ཆེན་གྱིས་ དུགས་ཚོང་བདག་མཆོག་གི་དབུ་གཙོས་པའི་ དུགས་ཚོང་རབ་ སྟེ་ཆོན་ཁག་གི་འགོ་དཔོན་ འབྲེལ་ཡོད་ལས་
ཁུངས་ཁག་གི་འགོ་དཔོན་དང་ ལྷང་མི་བཟུང་ཞེད་དང་ དམངས་མི་ ཆོག་ལས་པ་ཚུ་ ད་རེས་གྱི་ཞལ་འཛོམས་ནང་ལུ་ བྱོན་གནང་མི་ལུ་
བཀྲིན་དག་འཆོར་ཡོད་ཟེར་ཞུ་ཡོད་པ་མཚན་ ལྷན་པར་ ཞལ་འཛོམས་འདི་གིས་ ཆོག་ལས་དམངས་ཀེར་ལུ་ དེག་པ་དང་ ཉམས་སྦྱོངས་



ཡོན་ཏན་གསར་པ་ལེ་གྲུ་ར་ རོབ་ཡོད་པ་ལེ་ཁར་ མང་ཕྱེ་རྒྱ་ལས་འགུལ་ལུ་ བྱ་སྤྲུལ་མ་བདེ་བའི་ ཉམས་སྦྱང་རྒྱ་ལས་བརྟེན་ རི་ཀ་རྒྱ་
 རྒྱུ་ག་མེ་ལས་འགུལ་འདི་ བྱ་སྤྲུལ་བདེ་ཏོག་ཏོག་རྒྱུ་ལས་ མཐར་འཁྱོལ་དང་ ལྷག་འབྲས་ཅན་ཅིག་འབྱུང་རྒྱུ་གསལ་འཛིན་གསལ་སྤྲོད་དང་
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 (ཆེད་བའ་རིན་འཛིན་) 14/11/2014
 དཔྱོད་ཆེད་བའ་གདངས་ཀྱི་འཛིན།
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 (རྟོ་རྟེ་དཔལ་འབྱོར་ལྷན་ཚོགས་) 22/9/2014
 ལས་འགུལ་མདུ་ཆེན།
 འབྲུག་རྒྱུར་འབྱུང་རྒྱུ་ག་མེ་ལས་འཛིན་ཆེན།

Q & A session minutes for Technical and ESIA presentation of 118 MW Nikachu Hydroelectric Project

Venue: Raven Hotel

Date: December 12, 2013

Sl. No	Agenda/Issue	Discussion	Recommendation/Resolution	Action to be followed
1	Land compensation	Need for initial assessment & study on private land	Initial assessment & study to be carried out before the onset of project works to compensate accordingly at later stage	Focal person from Nikachu project & Dzongkhag Land Lease committee
2	Location for Batching plant and stone quarry	Need for initial assessment and study to be carried out	Initial assessment & study to be carried out for appropriate location. The batching plant to be same as mentioned in DPR and not based on contingency.	Focal person from Nikachu & Dzongkhag Environment committee
3	Transmission Line	Need for study	Study & assess the transmission line corridor and incorporate in the project report	Nikachu Project
4	Eco-tourism	The need to explore & fund tourism site especially bird watching along project area	Eco-tourism to be explored and incorporated into project plan	Nikachu Project
5	Muck disposal, waste management & water	<ul style="list-style-type: none"> - The need to identify and plan muck disposal site before the onset of project works - The need to plan waste & sewerage before the onset of project works for people living in camps - The need to check and treat water before consumption 	<ul style="list-style-type: none"> - To refer Water & Waste management Act - To get necessary clearance for all environment and culture related works before the onset of project works - To conduct open space planning to find adequate space to muck disposal, recreational site filling etc. 	Nikachu Project & Dzongkhag Environment Officer

			<ul style="list-style-type: none"> - To treat water as separate entity and the need to produce clearance 	
6	Identification, measurement & estimation of infrastructure	<ul style="list-style-type: none"> - The need to identify & work out estimate & measurement of all those infrastructure alongside project area before the onset of project 	<ul style="list-style-type: none"> - To identify & conduct measurement, and estimation in order to reduce receiving harassment from public and to cut down cost at later stage 	Nikachu Project
7	Royal Tsamdro	<ul style="list-style-type: none"> - The need to identify royal tsamdro along project area 	<ul style="list-style-type: none"> - To identify royal tsamdro & seek the royal assent 	Tangsibji Gup, Mangmi & Tshogpas & Dzongkhag
8	4 Acres Wetland	<ul style="list-style-type: none"> - The need to avoid 4 acres wetland, if possible, in view of tedious conversion procedure 	<ul style="list-style-type: none"> - To avoid wetland in view of the hassle laden conversion rules 	Nikachu Project
9	Private land	<ul style="list-style-type: none"> - The need to authenticate private land with Dzongkhag Land Record office before land transaction 	<ul style="list-style-type: none"> - To authenticate record with Dzongkhag Land record office 	Nikachu Project
10	Mini-hydel channel at Tangsibji	<ul style="list-style-type: none"> - The need to keep the continuity of water flow from the channel without disturbance from the project 	<ul style="list-style-type: none"> - DGPC shall fulfill the mandate on paper and instruct the companies working on the site 	DGPC
11	Tangsibji farm road & crop compensation	<ul style="list-style-type: none"> - Tangsibji farm road falling under project area - Crop compensation to affected farmers 	<ul style="list-style-type: none"> - Tangsibji farm road to receive upgradation if project uses it - Crop compensation to be paid after investigation 	Nikachu Project

12	Health facilities in the Gewog	<ul style="list-style-type: none"> - Not in the plan to construct health and school facilities 	<ul style="list-style-type: none"> - Companies to look into strengthening existing health facilities - Nikachu to identify health focal person from the project 	Nikachu Project
13	Park Services	<ul style="list-style-type: none"> - The budget for conserving park services to be less & was not consulted with Park office 	<ul style="list-style-type: none"> - To depute a team to work out proper estimate, if time permit 	Nikachu Project
14	<ul style="list-style-type: none"> - Land acquisition - Local Utility 	<ul style="list-style-type: none"> - Nikachu project to proceed land acquisition before the start of the project as informed by Project - To use the local service as much as informed by the project 	<ul style="list-style-type: none"> - Land acquisition shall take time owing to the difficulty in finding proper land substitution - Project to use local service to the best and private land to be recuperated and handed over to leasers toward the end of project 	Nikachu Project
15	<ul style="list-style-type: none"> - Arable wetland - Letter of Intent - Right of Way - Public consultation 	<ul style="list-style-type: none"> - The need to recover wetland into arable land after project activity - The need to issue letter of intent from the govt. agency - To study 'right of way' for private land - The need to fixed a date for public consultation 	<ul style="list-style-type: none"> - Explicitly mentioned in Project ESIA - To issue 'letter of intent' from the govt. agency - To look in 'right of way' before encroaching private land - Public consultation on January 27, 2014 at Tangsibji Gewog Center 	Nikachu Project

**Members from Dzongkhag Administration
Gewog**

Dasho Dzongda
Dasho Dzongrab
Dzongkhag Principal Officer
Dzongkhag RNR Sector Heads
Chairperson
Dzongkhag Health Officer
Dzongkhag Planning Officer
Dzongkhag Environment Officer
Dzongkhag Accounts Officer
Dzongkhag Land Record Officer
Park Manager, JSWNP, Tshangkha
Territorial Ranger, Trongsa
Territorial Ranger, Chendebji

Members from DGPC












Director, Projects Department, DGPC
Chief Designer (electrical division)
Survey Engineer
Environment Officer

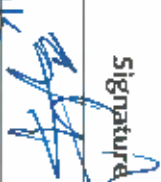

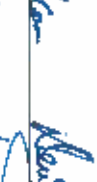



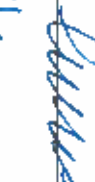





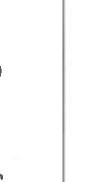
Administrative Officers
ADB Consultant










Members from

Gup
Mangmi
5 Tshogpas
Representative of DT

Attendance sheet for the DPR presentation meeting regarding 18 MW Nkachingu Hydropower Project at Trongsa
Venue: Raven Resort, Trongsa Viewpoint
December 12, 2013

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25					

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Minutes of Detailed Project Report (DPR) Presentation for 118MW Nikachhu Hydropower Project (NHPP) to National Environment Commission (NEC) and other stakeholders.

Venue: Conference Room, National Environment Commission, Thimphu

Date: December 27, 2013

Participating Agencies:

1. National Environment Commission Secretariat;
2. Druk Green Power Corporation Ltd;
3. PwC Consultants;
4. Department of Road, MoWHS;
5. Bhutan Tourism Council;
6. National Biodiversity Center, MoAF;
7. Jigme Singye Wangchuck National Park, DoFPS, MoAF;
8. Department of Forest and Park Services, MoAF;
9. National Land Commission;
10. Gross National Happiness Commission;
11. Bhutan Electricity Authority;
12. Department of Culture, MoHCA;
13. Department of Geology and Mines, MoEA;
14. Mangdechhu Hydroelectric Project Authority;
15. Department of Hydropower and Power System, MoEA;
16. Bhutan Power Corporation;

The list of participants is enclosed as ***Annexure I***.

Director (Projects), Druk Green welcomed all the participants to the DPR presentation and conveyed Dasho MD's apology for not being able to attend the presentation as he has become even busier due to his appointment as the Chairman of the 2nd Pay Commission. Director (Projects) made presentation on the existing hydropower plants, projects under investigations and revenue contributions from DGPC. Other works being undertaken by Druk Green, such as subsidiary companies like Bhutan Hydropower Service Limited (BHSL) and Dagachhu Hydro Power Corporation, other projects like Tsibjalumchhu Diversion Scheme (TDS) which will add annually 93 GWh of energy production from the Tala Hydropower Plant; starting of a hydropower construction company; establishment of Research and Development Center by amalgamation of the existing Centers of Excellences, obtaining of a Consultancy License to market the expertise of Druk Green were presented. He also informed that Druk Green is fully able to manage operation and maintenance of hydropower plants with Bhutanese and that substantial competency have now been developed to investigate, design and construct hydropower projects. He remarked that all Bhutanese must take justifiable pride in the Bhutanese capacity of management of hydropower assets from water to wire and thanked all agencies for their continued support and cooperation in the success of this important sector.

Following the welcome address, Mr. Tenzin Khorlo, Chief Environment Officer (Environment Service Division), NEC as the Chairman of the meeting gave the opening remarks. He thanked Director (Projects) for his presentation on the status and progress of hydropower sector in the Kingdom. He then briefed on the standard procedure of carrying out an Environment Impact Assessment (EIA), mentioning the need for carrying out EIA or Initial Environment Examination (IEE) based on the type of project and its magnitude of impact. He also mentioned that for projects requiring EIA, a Terms of Reference (ToR) needs to be prepared by the project developer and endorsed by NEC. The EIA to-be-prepared should be in line with the approved ToR.

Mr. Karma Tshering, Project Manager, Nikachhu Hydropower Project (NHPP) made detailed presentation on the technical aspects of the project. A copy of the salient features of the project and Executive Summary of the DPR were distributed to all the participants. The following were highlighted:

- Project background;
- Project layout and project salient features;
- Hydrology and power potential studies;
- Civil structures;
- Electro-mechanical equipment;
- Transmission line & construction power;
- Infrastructures & construction facilities;
- Construction schedule;
- Cost estimates;
- Financial analysis;
- Ownership structure and financing structure.

The presentation also highlighted on the financing and ownership structure of the project. The project shall be developed on 70:30 loan equity ratios. It was informed that ADB has already committed USD 120 million for the project: USD 80 million as loan to the project, and USD 40 million as grant/loan to provide the equity of Druk Green. Out of the 30% equity, 51% of the share shall be owned by Druk Green, 23-25% issued as Initial Public Offering to the public of Bhutan as equity shares, and 26% to a strategic partner.

On this, the following comments and discussions were made:

- Mr. Tenzin Khorlo, Chief (ESD) enquired on the process of floating shares and suggested if the preference could be given to the Project Affected People and those in the project area.

In response, Director (Projects) clarified that the allocation of shares has not yet been decided and this aspect could be examined before the issuance of IPO.

- Mr. Tashi Penjor, Dy. Chief Environment Officer, NEC also inquired on the need for strategic partner if Bhutanese could also subscribe to the 26% share which is proposed to be allocated to a strategic partner.

Director (Projects) clarified that seeking a strategic partner is for strategic reasons such as being able to bring in new technology or processes, ability to raise capital, influence in the targeted market for sale of electricity, etc.

- Mr. Ugyen Wangda, HoD, GSB, DGM raised concern on the impact of blasting as was in the case of Trongsa Dzong due to MHEP.

On this, Director (Projects) cited the example of the Tsibjalumchhu Diversion Scheme (TDS) in which a construction adit tunnel has been blasted right from the top of Tala Dam without having any impact on the THP Dam. He informed that there are controlled blasting techniques to limit impact on even attached structures and the Druk Green has the experience not to have any damage on Trongsa Dzong or other structures near the project components.

Mr. Pema Dorji (Environment Officer), Druk Green presented the Environmental and Social Impact Assessment (ESIA) of NHPP as contained in the DPR. He informed that ESIA was prepared in line with the ToR approved by NEC vide letter NEC/ESD/DGPC/1837/2012/3480 dated 26th March, 2012.

The following points were discussed during the presentation:

- Mr. Tenzin Khorlo, CEO, NEC reminded that while opting for alternatives, besides technical aspects, it is also important to take into account environment and social aspects. Mr. Ugyen Wangda, DGM also supplemented on the importance of geological stability, citing the example of Punatsangchhu-I HEP which has encountered geological problems at its Dam site. Director (Projects) informed that NHPP was initially planned as standalone 210 MW project with its Power House originally located at the confluence of Mangdechhu and Nikachhu, under Tangsibji village. However, due to poorer geology, greater environmental and social impacts, less electricity production despite higher capacity, the present scheme, with the tail water being discharged into the Mangdechhu reservoir to provide additional energy generation, was selected as the best alternative. Even for the present scheme, he informed that two sites for Power House and three sites for Dam were examined.
- Mr. Tenzin Khorlo, NEC stated that baseline data should be ideally for four seasons. However, he said that at least two seasons baseline data must be provided. Druk Green agreed to provide baseline data for at least two seasons.
- Mr. Letro, Forest Officer from JSWNP, informed that JSWNP area has actually 37 species of mammal species as per updated data instead of 22 as presented, and also that buffer zone is to be considered as 1.5 to 2 km outside the park boundary.

Mr. Tenzin Khorlo, NEC supplemented that the raw data should be, as far as possible, be obtained from primary source.

Mr. Tashi Penjor, Dy. CEO also enquired whether surveys were carried out in the submergence area since NHPP shall submerge 6 acres of park, to which Ms. Deki Yonten,

Local PwC Consultant recruited by ADB, clarified that surveys, as per standard practice, were done all over the project area and that the submergence area was also covered.

- Mr. Pema Dorji also informed that the Adit-2 of the project falls in one of the Biological Corridors connecting JSWNP and Wangchuk Centennial Park (WCP). Several flora and fauna species are present in the project area and none of which are endangered in the IUCN list.

To this the CEO, NEC suggested that reference be made to the Schedule-I of Forest and Natural Conservation Act of Bhutan.

- With regard to E-flow, Mr. Tenzin Khorlo, NEC informed that a study on environmental flow for all hydropower projects was carried out with Nu. 2 million contributed by Druk Green, which recommended 60% of the minimum flow as E-flow. However, he mentioned that the figure shall be site specific and studies shall be continued to decide on a specific figures. He expects to establish the figure of environmental flow within a year or two and the project developer should keep some provision to incorporate the changes, if required.

Director (Projects), DGPC informed that even with 10% of the minimum flow proposed as E-flow for Nikachhu Project, the tariff for electricity required from this project is quite high. He said that a sensitivity analysis would need to be conducted to examine if higher E-flows made the project financially un-viable.

Ms. Tashi Pem, DHPS recommended that the Department of Hydropower & power Systems which is the nodal RGOB agency for development of hydropower also be consulted/involved in the determination of E-flow for different projects. Mr. Tenzin Khorlo agreed to this.

- Mr. Ugyen Wangda, DGM raised concerns on impacts of reservoirs like RIM instability and reservoir-induced seismicity. He cited the example of Kurichhu Hydropower Plant (KHP) which has its reservoir RIM undergoing erosion. Therefore, studies could be carried out on reservoir stability and reservoir induced seismicity for Nikachhu.

Director (Projects) informed that reservoir RIM instability study is part of the DPR studies and that in view of the small submergence and geology of the area, reservoir rim instability is not a problem with this project. As for the reservoir-induced seismic activity, he informed that this problem is anticipated only from reservoirs with huge volume of water storage. However, based on the recommendations of the participants, he agreed that Druk Green could examine this later.

Mr. Tashi Penjor, Dy. CEO, also cited example of Amochhu HEP having reservoir rim treatment plan. To this, Ms. Pratigya Pradhan, Head, P&DD, Druk Green clarified that the right bank has good rock and for the left bank, reservoir stability plan has been included in the DPR.

- Mr. Tenzin Khorlo, NEC pointed out that an EMP should have technical details including controlled blasting and listing vulnerable animals. He also mentioned to put the monitoring

details including schedule of monitoring and institutions responsible for it. Besides the environmental parameters, he recommended to monitor blasting to eliminate adverse impact on Trongsa Dzong.

Director (Projects) informed that Druk Green has a team of experts (Center of Excellence for Vibration and Thermographic Analysis) who have the experience and knowledge to monitor vibrations from blastings. For monitoring, he also submitted that Druk Green has gained valuable experience from Dagachhu Project. He, therefore, assured that required monitoring shall be put in place.

- Mr. Tashi Penjor, NEC also enquired whether the quarry will be outsourced or operated by project developer. He recommended if this be outsourced to the Bhutanese contractors, since it is one of the activities whereby local contractors can be involved.

Director (Projects) clarified that it has been proposed to have the quarry operated by the main civil contractor but the proposal shall be examined.

- Mr. Tashi Penjor also enquired whether the impact on downstream users due to river diversion has been studied.

Mr. Pema Dorji, EO, Druk Green informed that no direct downstream users are present, and moreover, 11 perennial streams downstream of the Dam provide a minimum combined flow of 0.72 cumecs.

- Since 31.01 acres of private land shall be acquired affecting 12 households, Mr. Shankar Sharma from National Land Commission mentioned that the new land *Tharms* have been issued and therefore, project should use these to identify and quantify land requirements. He also suggested compensating all the Project Affected People at one go to eliminate compensation issues later since PAVA Rates are revised once every three years.

Director (Projects) informed that total EMP cost of Nu. 55 million shall be revised, if required, after comments from stakeholders during the DPR Presentation to Trongsa Dzongkhag on December 12, 2013. Latest PAVA Rates shall be considered while making the revision.

- Ms. Tashi Pem, DHPS, enquired whether the cost for land development has been taken into account while working out compensation amounts. Mr. Kuenzang Yonten, Local PwC Consultant of ADB, clarified that the land development cost has been covered.
- Mr. Choki Gyeltshen, NBC inquired on how the sampling for epiphytes on trees like orchids and fungal species were carried out.

Ms. Deki Yonten, Local Consultant responded that no specific survey methodology has been adopted for epiphyte. The number of only those epiphyte found on the trees falling in the plot were counted.

In response, Mr. Tenzin Khorlo, NEC said whether the Biodiversity Impact Assessment was necessary or not in the first place. Since the project area is near JSWNP, information could be collected from the park office.

Mr. Tashi Penjor, NEC suggested if the methodology for biodiversity inventory could be done in collaboration with DoFPS or with the method approved by the Department for future projects.

- Mr. Shankar Sharma, NLC suggested that the muck dump sites after reclamation could be given to the people as compensation. He also mentioned if the project could look into health issues due to workers influx, job opportunities to Bhutanese, possibility of taking local infrastructures like housing and aligning project roads with existing farm roads.

Director (Projects) responded that the muck dump site can be given back to interested/relevant people according to laws since the muck dump sites shall be acquired only temporarily during the construction period. Regarding the health facilities, it was informed that the major EPC contractor shall be required to have their own basic health facilities for their workers as at Dagachhu HPP.

On the job opportunities, he said one job per family can be given, during the construction period, to those affected adversely as per Sustainable Hydropower Development Policy 2008, depending on their skills. The project can rent local houses, if suitable. As for the alignment of projects road with existing roads, it was informed that the possibilities have been taken advantage of by aligning the road to Adit III with existing Tansgibji farm road to the extent possible, road to Adit V with the existing quarry road and road to muck disposal site at Tsangkha with existing Power Tiller Track.

- Mr. Leki Dorji, DoR, raised concern on whether separate budget has been allocated for maintenance of existing highways.

Ms. Pratigya Pradhan, Druk Green clarified that no budget has been allocated for existing road maintenance except for the maintenance of project internal roads.

Mr. Tenzin Khorlo, NEC added that maintenance of highway can be carried out once the project construction gets completed, however, proper traffic management must be done during construction phase to minimize impact on road condition.

- Ms. Tashi Pem, DHPS enquired whether the free 10,000 unit of electricity per acre of land acquired for the project annually to affected households have been considered to which Director (Projects) clarified that this has been taken into consideration as per the Sustainable Hydropower Development Policy, 2008.

- Mr. Choening Dorji, DoC, commented if the report could cover impact on cultural sites and if extensive studies can be done in the field. Director (Projects) assured that the impact of project on cultural sites has been covered in the project and that the Department of Culture has already provided NOC for the project.

Mr. Tenzin Khorlo also supplemented that this is one of the issues NEC should look into to include in future EIAs.

- Mr. Gorab Dorji, BPC enquired whether the Environment Impact Assessment (EIA) for transmission line for power evacuation has been carried out to which Mr. Pema Dorji, Druk Green responded that a walk-on route survey was done by BPC and detailed EIA Report is under preparation.

Mr. Tenzin Khorlo, NEC also added that EIA for transmission line is a huge exercise, but at least mention about the preliminary details need to be given in the report to inform the stakeholders.

- Mr. Letro, JSWNP also requested if the project developer could get the revised biodiversity data from the park office and also to look into secondary information on presence of Red Panda, one of the endangered species, at the dam site.

Ms. Deki Younten, PwC Local Consultant assured to work with DoFPS for secondary information.

- Ms. Namgay Bidha, DoFPS, commented that instead of capturing the wild animals, they may be allowed to pass since capturing may result to death of animal due to stress. She also enquired on the presence of muck disposal site in biological corridor, and if downstream users like animals, has been considered. On the 2:1 compensatory afforestation monitoring, she cautioned about the survival of plantation.

Director (Projects) clarified that the muck disposals of ADIT-2 falls in the Biological Corridor for which clearance have been applied to Territorial Division and that required management shall be ensured. He also assured that plantation for compensatory afforestation shall be done in consultation with DoFPS. Mr. Tenzin Khorlo, NEC, also added that for the movement of animals downstream it is mandatory for all structures, except for dam, to keep a buffer of the required 100 feet from the water body.

- Mr. Tshering Dorji, NEC, commended on incredible primary baseline data that has been provided. He, however, said that data is confined to project area and data within the periphery of 5 km may be provided. He said that technical details of landfill, bioengineering and compensatory afforestation needed to be provided. Further, he added, if species rescue plan, like MHEP, can be incorporated such as use of eco-duct, eco-structure and habitat enrichment activities where applicable.

Ms. Deki Yonten, clarified that the Risk Assessment and Environment Valuation which was in the previous ESIA report has been dropped while updating since the information was found inadequate and weak: this would be updated and provided upon getting comments from NEC.

- Mr. Tshering Dhendup, NEC enquired on the decommissioning aspects of roads to ADITs, labor camps, recreational plans, and on the version of SPSS used for Social Data Analysis.

Director (Projects) informed that no specific decommissioning of access roads required for construction has been considered. Mr. Tenzin Khorlo also mentioned that the decommissioning plan is one important part of EMP which needs to be included.














The program concluded with the vote of thanks by Director (Projects). He said that Nikachhu Project is the first project that Druk Green is implementing from the basic investigation and ongoing consultations with stakeholders as with the present one has provided a lot of valuable education and feedback to Druk Green so that it can manage such future projects much better. He thanked all the stakeholders for continuing to support Druk Green in its continuing quest for sustainable development of hydropower for the common welfare of all Bhutanese. He also assured that all issues raised shall be appropriately managed by Druk Green.

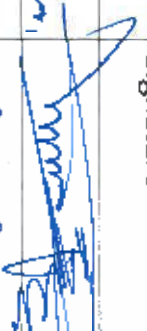













The meeting ended with a vote of thanks to the Chair.



DPR Presentation for 118 MW Nkatchu Hydropower Project
Venue: National Environment Commission Conference Room

Date: 27th December, 2013

Thimphu

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॥ श्रीगणेशाय नमः ॥

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॥ श्रीगणेशाय नमः ॥

॥ श्रीगणेशाय नमः ॥

॥ अथ विष्णुसहस्रनामोक्तम् ॥

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ॐ नमो भगवते वासुदेवाय ॥ १ ॥
 ॐ नमो भगवते वासुदेवाय ॥ २ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ३ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ४ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ५ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ६ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ७ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ८ ॥
 ॐ नमो भगवते वासुदेवाय ॥ ९ ॥
 ॐ नमो भगवते वासुदेवाय ॥ १० ॥

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* विष्णुसहस्रनामस्तोत्रम् ॥ श्रीगणेशाय नमः ॥

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ಇದರಲ್ಲಿ ಉಲ್ಲೇಖಿಸಿರುವಂತಹ ಎಲ್ಲಾ ವಿಷಯಗಳನ್ನು ಸಂಬಂಧಿಸಿದ ಇಲಾಖೆಗಳು ತಿಳಿಸಿರುವಂತಹ ಮಾಹಿತಿಗಳನ್ನು ಆಧರಿಸಿ, ಈ ಕೆಳಕಂಡಂತಿರುವಂತೆ ನಿರ್ಧರಿಸಲಾಗಿದೆ.

ಇದರಲ್ಲಿ ಉಲ್ಲೇಖಿಸಿರುವಂತಹ ಎಲ್ಲಾ ವಿಷಯಗಳನ್ನು ಸಂಬಂಧಿಸಿದ ಇಲಾಖೆಗಳು ತಿಳಿಸಿರುವಂತಹ ಮಾಹಿತಿಗಳನ್ನು ಆಧರಿಸಿ, ಈ ಕೆಳಕಂಡಂತಿರುವಂತೆ ನಿರ್ಧರಿಸಲಾಗಿದೆ.

1	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
2	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
3	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
4	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
5	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
6	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
7	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ
8	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ	ಅಧ್ಯಯನ ಮತ್ತು ಅಭಿವೃದ್ಧಿ

ಇದರಲ್ಲಿ ಉಲ್ಲೇಖಿಸಿರುವಂತಹ ಎಲ್ಲಾ ವಿಷಯಗಳನ್ನು ಸಂಬಂಧಿಸಿದ ಇಲಾಖೆಗಳು ತಿಳಿಸಿರುವಂತಹ ಮಾಹಿತಿಗಳನ್ನು ಆಧರಿಸಿ, ಈ ಕೆಳಕಂಡಂತಿರುವಂತೆ ನಿರ್ಧರಿಸಲಾಗಿದೆ.

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१. यहाँ ११ वहाँ ११ ॐ नमो भगवते वासुदेवाय ॥ १ ॥

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ප්‍රධාන,

1. මානව සම්පත් සංරක්ෂණය සහ සංවර්ධනය කිරීමේ කමිටුවේ සාමාජිකයෙක් ලෙස මාගේ නම සඳහන් කර ඇත.

2. මාගේ නම සඳහන් කර ඇති ස්ථානවලදී මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි. මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි.

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3. මාගේ නම සඳහන් කර ඇති ස්ථානවලදී මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි. මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි.

4. මාගේ නම සඳහන් කර ඇති ස්ථානවලදී මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි. මාගේ සේවය කිරීමට මා සූදානම් වෙමිනි.

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මෙම පිටුවේ අවසානයේ ඇති සියලුම තොරතුරු සහ අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත. (BPC) මෙම පිටුවේ අවසානයේ ඇති සියලුම තොරතුරු සහ අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත.

අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත. (BPC) මෙම පිටුවේ අවසානයේ ඇති සියලුම තොරතුරු සහ අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත.

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අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත. (BPC) මෙම පිටුවේ අවසානයේ ඇති සියලුම තොරතුරු සහ අනෙකුත් සතුන්ගේ පෝෂණය සඳහා වන සේවයේ අරමුණ අනුමත කර ඇත.

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ॐ नमो भगवते वासुदेवाय ॥ ॐ नमो भगवते वासुदेवाय ॥ ॐ नमो भगवते वासुदेवाय ॥ ॐ नमो भगवते वासुदेवाय ॥ ॐ नमो भगवते वासुदेवाय ॥

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॥ श्रीगणेशाय नमः ॥

॥ श्रीगणेशाय नमः ॥

تجدد

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॥ श्री गणेशाय नमः ॥

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श्रीमान् कृष्णचन्द्रगिरिशास्त्रिनः कान्हादत्तचरणैः प्रणीतम्

१. संस्कृत २. संस्कृत ३. संस्कृत ४. संस्कृत ५. संस्कृत ६. संस्कृत ७. संस्कृत ८. संस्कृत ९. संस्कृत १०. संस्कृत

ॐ नमो भगवते वासुदेवाय ।
 श्रीकृष्णार्चनं ।
 श्रीकृष्णाय नमः ।

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5. 2014年12月31日，公司应收账款账面余额为1,000,000.00元，坏账准备余额为100,000.00元。

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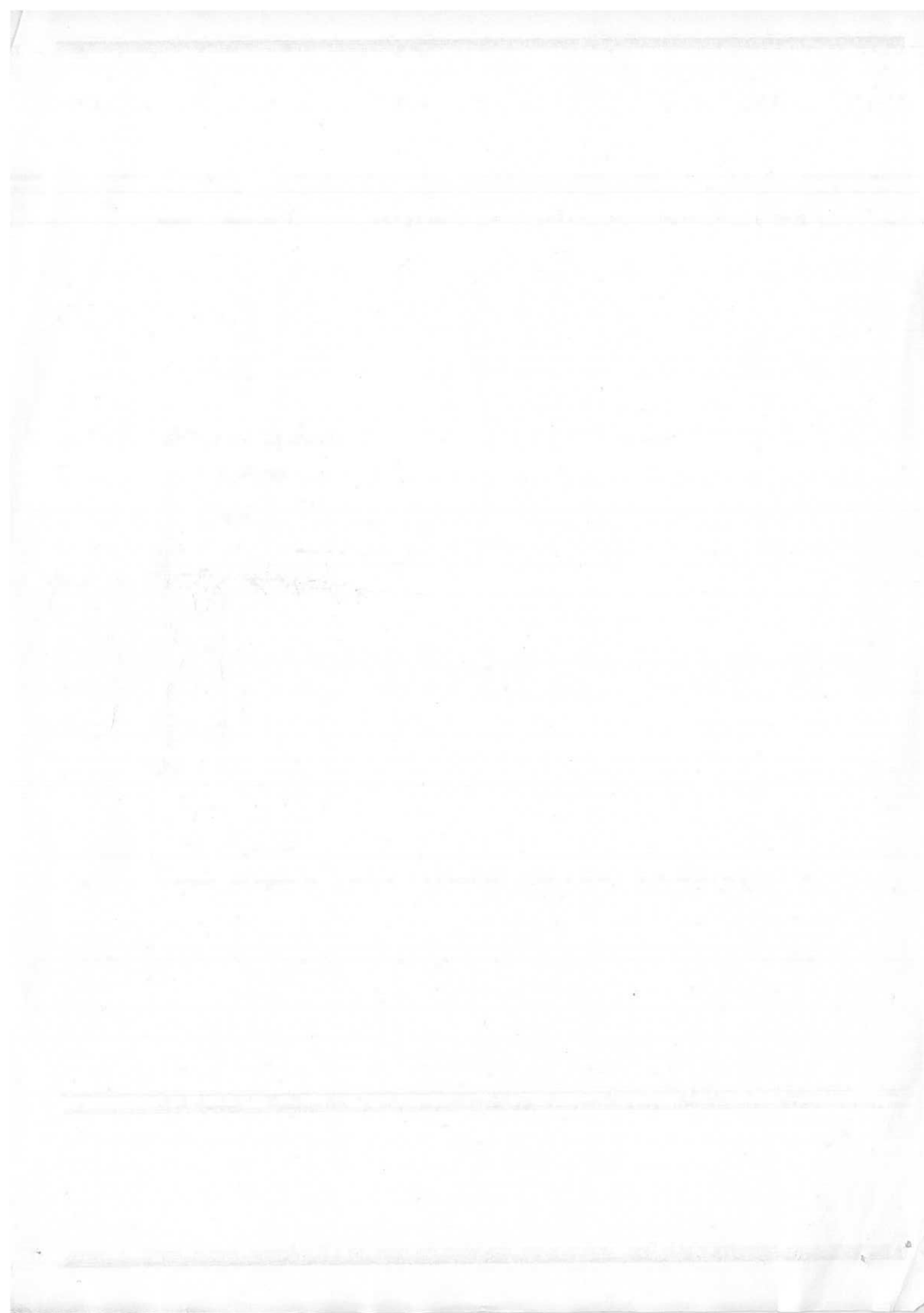
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Minutes of Public Consultation Meeting with Tangsibji Gewog for Nikachhu Hydropower Project at Trongsa (Translated)

Venue : Multi Purpose Hall, Tshangkha Lower Secondary School, Tangsibji.
Date : January 27, 2014
Chairman : Dasho Dzongda Tshewang Rinzin, Trongsa Dzongkhag
Participants: Dorji P. Phuntshok, Director (Projects), Druk Green Power Corporation Limited (Druk Green); officials from various sectors of Trongsa Dzongkhag, representatives from National Land Commission and Department of Forest & Park Services (DoFPS), Gup, Mangmi, Tshogpa and public of Tangsibji Gewog.

Opening Speech

Director (Projects) welcomed Trongsa Dzongkhag's Dasho Dzongda, Dzongrab, officials of various agencies, Gup, Mangmi, Tshogpa and people of Tangsibji Gewog, and representatives from National Land Commission and DoFPS to the Public Consultation Meeting for Nikachhu HPP. He also apologized on behalf of Dasho Chhewang Rinzin, Managing Director of Druk Green for not making to the meeting as he was occupied with his additional responsibility as the chairperson of the pay commission, and conveyed his assurance to conduct the meeting successfully. He also acknowledged and thanked Dzongkhag and Gewog Administrations and the people of Tangsibji for their kind support and cooperation, and requested Administration for cooperation and assistance hereafter.

The Chairperson of the meeting, Dasho Dzongda expressed his appreciation for the concern shown by Managing Director of Druk Green for the meeting despite his absence as he is tasked with numerous works. He also extended appreciation to Director (Projects) and other officers from Druk Green for the preparedness to provide a detailed explanation about the Project to the people. He extended his pride over the planning & investigation of the Project, conducted by expert officials of Druk Green and which is now at stage to get implemented. He also mentioned that Nikachhu HPP's first consultation meeting was held on December 12, 2013 at Raven Resort at Trongsa with Trongsa Dzongkhag Administration, Gewog Administration and officials from other relevant agencies. He also stated that the second round of meeting is conducted with the aim to involve people of Tangsibji, in decisions on land substitution and compensations, and committee to be formed with members from the Dzongkhag Administration. He expressed his

confidence and hope, that Nikachhu HPP will not cause any inconveniences like Mangdechhu Hydroelectric Project Authority (MHPA).

He mentioned that the meeting is not time bound and it shall continue until people are pleased with the information. He stated the reason behind importance of hydropower and its contribution towards solving the rupee crunch. He also informed that except for electricity, other products are not abundantly available and therefore, have to import everything from India. He informed that it was monarch and government's plan to invest in hydropower to generate revenue for the common welfare of Bhutanese. He clarified that people are as important as the Project, so it is the appropriate time for holding such meetings to clarify doubts, sort out any issues or discrepancies, raise concerns at the beginning for harmonized future. He also reminded people that they are aware of situations in their Gewog, and after conclusion of meeting and recording the minutes, people shall not complain about the Project; therefore people are required to fully participate in the meeting.

He also requested people to cooperate with Project in case of land acquisition for the Project and informed that the land will be acquired in line with the existing Rules and Regulations, and compensations paid would be paid accordingly. He also informed that, the affected person in terms of land acquisition shall have the option to choose land for land or cash compensation.

He encouraged people to express their views or concerns without hesitation so that problems in future can be avoided. He mentioned that few problems might arise to one or two people which should be dealt as per the existing norms or procedures and expected appropriate comments and suggestion. He also mentioned that, although Managing Director, Druk Green is not present at the meeting, he informed that Director (Projects) has been authorized to provide justifications and expected Director (Projects) and officials from Druk Green to make decisions.

Director (Projects) from Druk Green informed that under visionary leadership of our kings, Bhutan has now developed the much needed technical capacity in health, education, agriculture and has also come a long way in the field of technological advancement. Till now, Bhutan had been dependent on external human resources to carry out the studies for hydropower development. However, he informed that in case of Nikachhu Hydropower Project, investigations have been carried out by the in house experts and Druk Green has the capacity to carry out works in the field of science and engineering.

The technical specifications of the Project were then presented to the public: Presentation covered the following aspects:

- Project background;
- Revenues from hydropower sector;
- Projects under implementation by Royal Government of Bhutan (RGoB);
- Projects under Druk Green;
- Details of the Project;
- Project financing and ownership.

Director also informed the public regarding the ownership of the Project. He said that unlike Mangdechhu HPP and Punatshangchhu which are being constructed under grant from Government of India , the ownership of Nikachhu HPP is proposed to be shared between Druk Green (51%), Joint Venture partnership (26%) and public (23-25%). Since Nikachhu HPP is located in Tangsibji Gewog under Trongsa Dzongkhag, and if the people of Tangsibji are interested to own shares, It shall be proposed to the RGoB. To supplement this Dasho Dzongdag reiterated that the shares have to be bought by paying certain sum of money and cited example of purchasing shares from banks. He also clarified that this has not been finalized and has to propose to the government for the final decision with regard to floating of shares for the Project to Public.

Mrs. Thinley, Environmental Officer of Druk Green presented the environmental and social aspects of the Project.

The presentation focused on both the positive and negative impacts of the Project and on mitigating the negative impacts from the Project. The social issues of the Project pertaining to the land holdings and on land acquisition were also presented. She informed the public since it is a public consultation meeting with the Project affected families; the focus shall be to resolve the social issues arising from the Project through mutual discussion and deliberation. The Project shall affect 24 families and shall acquire 10 acres of dry land and SRF land of 243.69 acres. The Project shall require a total land of 253.69 acres and therefore private land acquisition, land substitution, cash compensation and likewise crop compensations shall be made in accordance with the Land Act of Bhutan, 2007 and current Property Assessment and Valuation Agency (PAVA) rates of the Ministry of Finance. Project shall avert acquisition of wet land or acquire as less as possible. .

Since the construction of Project will require cutting down of 158,688 numbers of trees Project will carry out plantation at the ratio of 2:1 that is plant two trees to compensate the loss of one tree. She also mentioned that during the construction phase, due to shortage of Bhutanese workers, labors from India will be brought by the Contractors. With the influx of workers, there might be impact like on cultural conflicts and dilution in the locality, risk of communicable diseases and generation of wastes. She mentioned that mitigations measures have been formulated to address these issues.

Some of Project induced benefits that outweigh the negative impacts are:

- Employment and contract work opportunity;
- Business opportunity;
- Improved road and transportation services;
- Development in education and health services;
- Earn revenue mostly in rupee amounting to Nu. 1.7 billion annually and also bring rural development;
- 815.29 million units of energy will sequesterate 75, 8219.70 CO₂e ton of carbon dioxide.
- As per the Bhutan Sustainable Hydropower Development Policy 2008, for every acre of land acquired by the Project, 10,000 units of electricity or monetary compensation in lieu of electricity will be given to affected family.
- For the Project Affected Family having to resettle, one member from the family will be provided employment as per his/her qualification and skill.

The Environmental Management Plan and implementing agency were also presented:

Sl. No.	Environmental Management Plan	Responsibilities
1	Noise Pollution Management	Project Authority/ Contractors
2	Waste Management	Project Authority/ Contractors
3	Muck Disposal Site Improvement	Project Authority/ Contractors
4	Plantation	Project Authority, Gewog, Dzongkhag Administration & Department of Forest.
5	Laborers Colony Management	Project Authority/ Contractors
6	Land acquisition, land substitution and	Project authority, Gewog and Dzongkhag

	compensation	Administrations
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Regarding the availability of employment opportunities, contract works, and business opportunities, Director (Projects) emphasized that it will depend on individual's capability, ideas, dedications and enthusiasm to make use of such opportunities.

The Chairperson informed people that opportunity is available for them to inquire about the locations of Power House, Dam, Access Road, muck disposal sites, Project Affected Persons with respect to land acquisition, and impacts of the Project, He also invited views and suggestions from officials representing various sectors of Dzongkhag, in line with their respective sector plans. With that, the floor was opened for discussion.

Details of question & answer session with public

- 1) Mr. Pema Dorji from Naladangla village requested Project Authority for up gradation of the existing Grade 2 Basic Health Unit (BHU) and donation of an ambulance.

In response to his request, Director (Projects) explained that, the construction of the Project will be awarded to two major contactors and they will have both health facility and ambulance, which will also benefit the local people around the Project area. Regarding up-gradation of the existing BHU, he stated that it is important people should know that unlike Punatshangchhu Hydroelectric Project and Mangdechhu Hydroelectric Project which is financed through 40% grant and 60 % debt, Dagachhu and Nikachhu HPPs are small Projects, totally financed through debt. Therefore, the Project may not be able to provide such facilities like other mega Projects and requested people to be aware of this difference.

- 2) Mr. Pema Wangdi from Naladangla expressed that the Project will have both positive and negative impacts. Since Tangsibji Gewog will be affected by the development of Project, he requested the Project proponent to explore possibility of allocating the shares to the people of Tangsibji.

- 3) Further, Tangsibji Gup requested to ensure availability of public shares to the Mangdue region and exclusively for Tangsibji Gewog. He also wanted to know the percent of share likely to be allocated to them.

Responding to this, Dasho Dzongdag reminded that shares are not free, and prospective buyers have to purchase it to avail profit, one should be well versed with price of share, duration of investment and dividends but informed that if the Project runs into loss, their investments will not be refunded.

Director (Projects) thanked the Chairperson for clarifying on public shares and, further assured that this would be subjected to governments' approval and to decide on percentage of allocation (23-25%) for the public. He also said that the value of share shall be determined and communicated. He also mentioned that the Project is to be handed over to the government after 30 years of its commissioning, so the shares and profits likely to be generated within 30 years needs to be determined. He also explained that profit from hydropower Projects is due to huge investment, for instance, in 2013, Druk Green generated 7,700 million units of electricity amounting to Nu. 12 billion but the net profit was only 11 % so it is essential to calculate at the beginning.

Director (Projects) stated that for construction of the Project, list of people losing land to the Project, along with details of land type, size of land with signed copy of the list is circulated for information and might be already aware of it. He also informed that the exact land requirement will be known with the start of construction works and there might be differences in the size of land which shall be further discussed with the people.

The Chairperson reminded people of having full authority to purchase shares depending on availability of capital, but cautioned them about the risks associated with such investments. However, majority of the people confirmed keen interest to invest in shares of the upcoming hydropower Project.

Supplementing the Chairperson's remarks on shares, Director (Projects) informed the floor that opportunity to invest in share might have to be given to every Bhutanese and if many investors turn up, then it may not be possible to provide huge percent of shares.

Pertaining to Directors information, Dasho Dzungda requested , the preference of share allocation to be in the order of first Tangsibji, being the Project affected Gewog, followed by Mangde Tshozhi and then to other Bhutanese.

- 4) In response to the request made by Mr. Pema Dorji of Tangsibji Gewog, for one surgeon Doctor at Tangsibji BHU, Dasho Dzungda explained that since Trongsa General Hospital is already there, it will be not feasible to have these facilities at Tangsibji BHU. However, Dzongkhag Medical Officer should propose for such requirements, if found necessary and it is better to be in line with the health policies.
- 5) Tangsibji Tshogpa, shared that the location of Tangsibji Village within two rivers (Nikachhu and Mangdechhu) protect village and their crops from wild animals, and was worried that development of hydropower on these rivers might make their village and crops accessible to the wild animals. He also recalled the presentation made in December 12, 2013 in which a muck disposal site was mentioned to be located above the existing Tangsibji Micro Hydel, which provides water for irrigation purpose. Since people are dependent on agriculture (mostly wetland) for their income and livelihood, he showed his concern over the anticipated impacts on the farm road and irrigation channel by construction activities. In addition to these, he requested for construction of agricultural produce sale outlets. He also expressed his gratitude to Project developer for the assurance to implement mitigation measures to avoid adverse impacts on the house and land due to movement of heavy vehicles in the area and added that his concern is due to the problems he heard of caused by development of projects in other places.

In response to Tangsibji Tshogpa, Director (Projects) reassured that micro hydel and irrigation channel will not be affected, but since the Project will be constructed by other group of people, there might be certain inconveniences. However, he assured that these issues shall be clearly mentioned during the award of work to the contractors. Regarding his concern over easy access for wild animals to villages, he said that Nikachhu already got low flow in winter months and in monsoon, hydropower plant will not be able to utilize all the water, and moreover, during investigations, no issues pertaining to wild animal problems in and around the area has been recorded. Moreover, the financier of

the Project, Asian Development Bank (ADB) have strict social and environmental safeguard policies in place and will ensure harmony.

Dasho Dzungda also added that Project must be having mitigation plans to avoid damages to farm road and irrigation channel, and even if it not in place, the Dzongkhag Administration will propose for such plan.

- 6) Tangsibji Gup explained that since the existing farm road in the Tangsibji village which caters to 60 households will also be used by the Project he requested that if Project developer would consider black topping the farm road.

In response to Tangsibji Gup, Dasho Dzungda replied that Project may black top the road till school as they will also use the farm road till school, black top of entire road might be possible. To the proposal by Dasho Dzungda to at least black top the farm road till car parking below the school (1-2 km away), Director (Projects) responded that they will appraise it later. Dasho also added that construction of agricultural product outlet shed shall be constructed accordingly with general rules and shall be constructed 50 feet away from the edge of the road.

- 7) Nyala-dangla Tshogpa, requested for preference of employment (office assistant, security guard, laborers etc) in Project to the youth and people of Naladangla and Tangsibji village, as per their capacity and education background.

In response to Nyala-dangla tshogpa, Dasho Dzungda, explained that the employment distribution should be as per government's new employment policy, for example if all the jobs are offered to the people at the Project locality, what will happen to the places like Gasa where there is no Project at all, so there will be problem in the country and to the people. He also added that as presented earlier the Projects affected families will be given at least one employment opportunities for each family as per their education and capacity during the construction of the Project and also informed that opportunity will be as per to the availability of the vacancies in the announcement and there will be selection procedures. He also informed that as per the employment report from MHPA it shows that many people from Mangde region are involved in the Project, ranging from petty contractors, office assistant to laborers etc. The

people from Tangsibji gewog were also involved in the Project, so informed that the Project has greatly benefited the people in and around.

- 8) Mr. Passang Dorji, Nala tshogpa, explained that they have two different temples and two different monastic institutions at Nala and Dangla respectively and still they don't have proper electricity. He also informed that though there is farm road till village there is no road connection till temple, so during performing ceremonies and festivals it is great problem without the road connectivity. So he requested for additional road connectivity till temple and electricity.
- 9) To complement Nala tshogpa, Tangsibji Gup also added that for the construction of Nikachhu hydropower Project, the construction distribution line are being carried out, so he requested aside construction if the electricity are also provided to the village. He also stated that Naladangla has around 30 household and requested for renovation of the existing farm road.

In response to the above queries, Director (Projects), explained that Druk Green is not an authorized electricity distributor, but for construction of Nikachhu Project transmission line are being carried out by Bhutan Power Corporation, and if the people wish to avail electricity they may have to apply and request to BPC and Druk Green is ready to give you no objection certificate.

Dasho dzongda also added that even if Project developer is willing to give NOC, only BPC is authorized to give and distribute electricity, and moreover electricity distribution equipments like transformers needs to check whether it can also take load or not. Pertaining to electricity distribution, the Project is not yet started, so when Project gets started, contractors might help us with electrification. With regarding farm road Director (Projects) already mentioned that they cannot do anything and moreover he stated that farm road construction may be or may be included in current five year plan and Gup might have the knowledge and he also warned that if it is included in current five year plan then it is better not to jumble with Project.

- 10) Mr. Pema Wangdi, Nala said that the people in their village depends on agricultural and livestock products, so when the Project starts at Lorim, the noise and dust pollution might affect them, therefore it might be better to stay at Goenpa. However as already said by tshogpa, there is no road connectivity, so he requested for farm road, and he

also stated that, as there is no community school in the village and children has to walk long way to Chendebji to study. There by heavy vehicles from MHPA plying the road pose danger to the young children. Even if we want to drop them to school, we cannot afford it, so he requested if Project can help them to provide with one bus to ferry child children or if they can get lump sum fuel allowance.

In response to above queries, Dasho Dzungda questioned that, if bus is donated by Project, who will operate, maintain and bear the running cost? So it will be not viable. For that reason it is better to discuss with the Director (Projects) and request for construction of small dormitory for the students about 15 and more. If they build dormitory for the students, parents of the students might have to give care and cook for students on rotation basis. He also informed that if after construction of the dormitory, parents should not let the dormitory used less and the parents have to sign and accept the terms. This shall be done with consultation between dzongkhag education officials and Project officials.

- 11) Mrs. Rinzin from Tshangkha, explained that her land fall in the Project location for temporary use for materials storage and temporary houses for workers. So she request that instead of acquiring and compensating her land, to lease her land till the commissioning of the Project and she also requested to construct for her with agricultural products outlet shelter.

To this dasho dzongda, said that if the land will be acquired for temporary purposes, then as per the government rules it will be leased and regarding the agricultural product outlet shelter shall be decided for its viability as said earlier.

- 12) Mrs. Pema Seldon from Tshangkha, said that her land will be affected by access road to one of the muck disposal site, so she requested to divert the road, if not at least lease the land. She also requested to investigate and study the dumping of the muck in the big opening near the land which might help both the people and the Project.

To her response, dasho dzongda said that land used for road cannot be lease since it is for use and regarding the dumping of muck at that big opening, Project has to study whether it is feasible or not.

- 13) Mr. Pema Dorji, said that crop compensation of Nu. 12000 for acre of land are very less, so he requested to increase the amount of crop compensation. He also requested to make the useable agricultural land leased for Project to convert back to its original condition, and he also expressed his concern over that blasting that might affect the house and how it will be mitigated.

Dasho Dzungda, said that if the crops are cultivated then compensation will be compensated accordingly with PAVA rules and if not it is ineligible. Regarding damage to the house by activities from Project, engineer shall inspect the house and as per the calculation, the owner will be compensated. He also explained that Dzongkhag Administration will support if owner and Project developer have clearly stated in agreement to convert the leased land, back to its original condition when they handover the land back to owner, if it was not in the agreement and owner complains about the lands condition at later, he cleared that Dzongkhag Administration might not be able to do anything.

- 14) Mr. Tashi Phuntsho inquired about what size of the land affected by the Project will be compensated with free electricity of 10,000 units every year.

To his queries, Director (Projects) explained that as per the Bhutan Sustainable Hydropower Policy, 2008 section 13.2, for every acre of land affected by the hydropower Project, 10,000 units of electricity shall be given yearly and the compensated will also be calculated as per the size of the land affected. If they feel that they cannot consume the entire units in a year due to 100 units free electricity provided by government to the rural every month, they can also opt for monetary compensation. The monetary compensation for 10,000 units will be calculated based on rates as per the rates of electricity exported to India. For example, if the rate per unit of Nu. 4.5 for exported energy, the affected family will get compensation between Nu. 40,000 to Nu. 50,000 in a year.

- 15) Mr. Pema Dorji, Nyala tshogpa, inquired about the compensation rates for the cypress tree that are currently growing in the affected land and he also raised concern over the dust pollution during the construction.

To his queries dasho dzongda responded that whatever are growing on the affected land shall be compensated according to rules and regulation. With regarding the pollution by dust, there is no other ways then to will be deployed vehicles to sprinkle the water and suppress the dust. He also said that the people working in the Project are also working in the dust, and if the dust pollution affects the health of the nearby people living, then the Project authority should look into it.

- 16) Tangsibji tshogpa, inquired about the land substitution and compensation agreement document and who will take responsibility to take care, he also requested to Dzongkhag Administration help to select suitable land for substitution, since if he select the land by himself it might create chaos with other villagers.

Dasho Dzongda said that for land substitution and compensation shall be done through Dzongkhag Administration and there is no requirement for any extra agreement, as the outcome from this meeting among, Project developer, Dzongkhag Administration and gewog shall be presented to the National Land Commission. He also explained that the reason for giving to owner to choose the land substitute is to give him/her the opportunity to choose good land for agricultural purposes. He also said that as suggested by tshogpa, to choose land for them from the map by the Dzongkhag Administration, which will not be feasible, as we may not know the actual land condition and may not be suitable for agriculture. For his suggestion for land substitution to given owner the responsibility for selection of land was agreed by the people in the meeting.

- 17) Gup also added that finding suitable land for land substitution is the responsibility of the owner not the Dzongkhag and the owner shall be assisted by gewog Administration to choose the land. To this Dasho Dzongda responded that for land substitution, Dzongkhag Administration also has full support for finding the suitable land for substitute. He also said that unlike before, as assessed as per the current land survey map and *tharm* details there will be no discrepancy at all with the other party.

- 18) Tangsibji Gup, expressed his gratitude for successful deliberation of comprehensive and detailed consultation meeting and he also expressed his opinion:

- ✓ What they will do if the land substituted are located where there is no connectivity to drinking water and electricity.

- ✓ He also expressed his concern that during the construction of Project will increase the local population and lead to solid waste issues, so he requested for waste dumping site and waste transportation vehicle.
- ✓ He also requested to provide support to community forest and conservation of the environment.

To Gup's opinion, Dasho Dzongda explained that as a best means the land substitute will be given to the choice of the owner and as per the ADB rules and guidelines the affected families shall be granted Nu. 100,000 per acres of wet land for development and reclamation and for dry land Nu. 80,000 will be granted. With consultation with people, if they choose the lands substitute from government land, the land will be good and it will be convenient. He also recommended that waste dumping site is also very important, and the site shall be identified through the Dzongkhag Tshogde and for waste transportation he supposed Project to donate one.

Director (Projects) also said that gup's opinion on waste and community forest was good suggestion and he also mentioned that grave concern for Druk Green power Corporation is also the waste generated at Paro and Thimphu, which ultimately get washed away by river and end up in power plant thereby causing problem to the machine, so to solve the problem of solid waste he assures that Druk Green shall identify the list of waste dumpsites and provide the vehicle for waste collection and transportation. Regarding community forest he said that they have plan to plant the double the number of tree's affected and it shall be done with consultation with people, Gewog and Dzongkhag.

- 19) Director (Projects) also informed that till date the name of the Project had always been kept the name of river, so he asked for people opinion whether to keep the name of Project as Nikachhu HEP or if people have any suggestion of name for the Project. He also mentioned that to suggest new name the people have to suggest and give opinion and this advice shall be consulted with relevant government and stakeholders and other relevant authority for approval.

Tangsibji Tshogpa, expressed pleasure on behalf of people for giving opportunity suggest the name for the Project and he suggested that the Project to be called as Tangsibji Hydroelectric Project since the Project is located Tangsibji. In response to his suggestion as Tangsibji Hydroelectric Project, majority of the people agreed with name

suggested and they all came to agreement to proposed name for the Project as suggested by the people.

- **The main outcome of this public consultation meeting were, commissioning of Nikachhu HEP would also help to generate revenue and it will play important role in economic growth of the country. Moreover it is the Project that will benefit the people of Bhutan and likewise when comprehensive consultation meeting and discussion were conducted on negative and positive impact of the Project, safeguard approach, benefits to the people and land substitution and compensation, no one opposed for the construction of the Project.**

Conclusion Speech

To the end of the meeting, Chairman Dasho Dzungda, reminded people that before start of the Project, it is responsibility of each people to make plan to invest in business and it is also important for those people who have livestock and agricultural land to take opportunity to do business.

Then he also expressed his appreciation to Director (Projects), Officials, representative from National Land Commission, Officer from DoFPS, and people of Mangde tshozhi for successful and fruitful completion of the meeting. He also expressed his well wishes for successful commissioning of Nikachhu HPP and he reminded that for successful commissioning of the Project it is very important to have support and cooperation from the people.

He thanked all the people who attended the meeting and participated in the discussion and , also reminded that if again such meetings are conducted in future, He expects such active participation from people.

(Singed)

(Dorji P. Phuntshok)

Director (Projects)

Projects Department

Druk Green Power Corporation


(Singed)

(Tshewang Rinzin)

Chairman

Dzungda

Trongsa Dzongkhag


Tshogpa
Tangsibi Chewog
Tangsibi Geog

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૩	બસ, વગેરે -	— ૧ —	૨૫
૪	જુનારુ -	— ૧ —	૨૫
૫	વસીય, કુરુચરુદ -	— ૨ —	૨૫
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List of NOCs/Clearances and Approvals



Approvals and Clearances for 118 MW Nikachhu HPP, Trongsa

July 2014

NOCs/Clearances from:

- i. Environmental Clearance
- ii. Cabinet Approval;
- iii. Department of Hydropower and Power Systems (DHPS): Government Directives;
- iv. Bhutan Power Corporation Limited;
- v. Department of Culture, Ministry of Home and Cultural Affairs;
- vi. Department of Roads (DoR);



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 དཔལ་ལྷན་འབྲུག་གཞུང་།
National Environment Commission
 Royal Government of Bhutan



NECS/ESD/DGPCL/1837/2014/ 8446

July 1, 2014

ENVIRONMENTAL CLEARANCE

The National Environment Commission Secretariat (NECS) is pleased to issue environmental clearance in respect of Druk Green Power Corporation Ltd., Thimphu as per the decision of the Environmental Assessment Technical Committee during its meeting on June 17, 2014 for the construction and operation of 118 MW Nikachhu Hydropower Project at Tangsibji Gewog under Trongsa Dzongkhag with following terms and conditions:

1. As per the Section 28.3 of the Regulation for the Environmental Clearance of Projects, 2002, any modification of proposal/application shall take place only with prior approval from NECS;
2. The holder shall ensure that the implementation of the proposed project is in line with the National Environment Protection Act 2007, Environmental Assessment Act 2000 and its Regulation 2002, Waste Prevention & Management Act of Bhutan 2009 and its Regulation 2012 and The Water Act of Bhutan 2011;
3. The holder shall ensure that this environmental clearance is valid only for the project components/activities listed below;

A. DAM PACKAGE

- i. Construction of Diversion Tunnel (DT)
- ii. Construction of Downstream and Upstream Cofferdams
- iii. Construction of Dam including Plunge pool and Spillways
- iv. Construction of Desilting Chamber including Gate Operating Chambers (GOC) and its Adit
- v. Construction of Intake tunnel
- vi. Construction of Silt Flushing Tunnel including GOCs and its Adit
- vii. Construction of contractor colonies including site offices, labour camps, internal roads, job facilities and workshops
- viii. Construction of infrastructures for Dam site including offices and residential complex

B. HEAD RACE TUNNEL PACKAGE

- i. Construction of Head Race Tunnel (HRT) including Adits
- ii. Construction of Contractor's colony including site offices and labour camps, internal roads, contractor construction/job facilities, workshops and explosive magazines for Adits

C. POWER HOUSE PACKAGE

- i. Construction of Butterfly Valve Chamber
- ii. Construction of Surge Shaft



- iii. Construction of Pressure Shaft
- iv. Construction of Pothead yard, Gantry and Dead end towers
- v. Construction of Transformer Cavern
- vi. Construction of Penstock and Intermediate Adits to pressure shaft
- vii. Construction of Main Access Tunnel
- viii. Construction of Cable Tunnel
- ix. Construction of Ventilation Tunnel
- x. Construction of Power House Cavern
- xi. Construction of Generation Transformer (GT) & Gas Insulated Switch Yard Cavern
- xii. Construction of Power House Infrastructures including internal roads, site offices and residential units
- xiii. Construction of Tail Race Tunnel (TRT)
- xiv. Construction of Grid Supply Poles and substation
- xv. Installation of Diesel Generator set
- xvi. Construction of contractor's site facilities including roads, site offices, labour camps, workshops and other job facilities

D. CONSTRUCTION POWER

- i. Construction of 33 kV tie line of 5 Kilometers (Kms) with Right of Way of 12 metres from Banglapokto to Dam, Adit I and Adit II

E. APPROACH ROADS

- i. Construction of 2.1 Kms approach road to dam complex from National Highway (NH)
- ii. Construction of 2.28 Kms approach road to Adit I from NH
- iii. Construction of 1.9 Kms approach road to Adit II from NH
- iv. Construction of approach road to 1.94 Kms Adit III from existing Tangsibji farm road and widening of Tangsibji farm road
- v. Construction of 0.56 Kms approach road to Adit IV from NH
- vi. Construction of 0.42 Kms approach road to Adit V from NH
- vii. Construction of 1.5 Kms approach road to Adit to BVC and Surge Shaft Top from NH
- viii. Construction of 5.7 Kms approach road to Power House Complex from NH

F. UTILIZATION AND MANAGEMENT OF MUCK DISPOSAL SITES

- i. Muck Disposal Site-I at upstream of Dam
- ii. Muck Disposal Site-II at downstream of Dam
- iii. Muck Disposal Site-III near Silt Flushing Tunnel
- iv. Muck Disposal Site-IV for Adit I, Site-V for Adit-II, Site-VI for Adit III, Site-VII for Adit IV and Site-IX for Adit V
- v. Muck Disposal Sites-X, XI and XII at Surge Shaft, Pressure Shaft and Power House areas respectively

The holder shall ensure that separate environmental clearances are obtained for activities not covered in this environmental clearance as per the provisions of the Environmental Assessment Act 2000 and its Regulation 2002;



5. The holder shall ensure that the implementation of the proposed project comply with the Environmental Standards 2010;
6. The holder shall ensure strict compliance to the Undertaking submitted to NECS;
7. The holder shall ensure that the implementation of the proposed project is carried out as per the Environmental and Social Impact Assessment (ESIA) report submitted for environmental clearance;
8. The holder shall ensure compliance to all the terms and conditions of stakeholder clearances at all times;
9. The holder shall ensure that the implementation of the proposed project is strictly confined within the allocated area;
10. The holder shall be solely responsible for any dispute arising due to the implementation of the proposed project;
11. The holder shall ensure that polychlorinated biphenyl is never used as transformer and capacitor oil;
12. The holder shall ensure that use of ozone depleting substances are restricted in line with the revised Regulation on Control of Ozone Depleting Substances, 2008;
13. The holder shall ensure that import and use of secondhand equipment and machineries are strictly prohibited;
14. The holder shall ensure that NECS and any other relevant authorities are informed of any unanticipated or unforeseen chance-find of any precious metals or minerals or articles, that have economic, cultural, religious or ecological importance;
15. The holder shall ensure that local residents, households, communities, public, private parties and any religious, cultural, historic and ecologically important sites are not adversely affected by the construction of proposed activity;
16. The holder shall ensure structural integrity of project infrastructures considering every site specific geological conditions to avoid undesirable incidences during operation;
17. The holder shall ensure that minimum environmental flow is maintained between the Dam and Mangdechu-Nikachu confluence for the sustenance of aquatic life as per relevant existing and future legislations;
18. The holder shall ensure that the implementation of the proposed project, except the construction of Dam, does not lead to blockage, storage or diversion of river, stream, irrigation channel, waterfall, underground water source or any other water resource or water course;
19. The holder shall ensure that a buffer of at-least hundred feet (100 feet) is maintained between the boundary of the project activities, other than Dam, Intake Tunnel, DT and TRT, and streams as per the application submitted for environmental clearance;
20. The holder shall ensure that impact on terrestrial and aquatic fauna in the project area is minimized at all times;
21. The holder shall ensure that Biodiversity Management Plan and Compensatory Afforestation Program are implemented in coordination with the Department of Forest and Park Services to minimize biodiversity impacts;
22. The holder shall ensure that the construction activities at Adit II including the first 100 metres Adit length is not carried out from 10 pm to 6 am;
23. The holder shall ensure that after completion of the initial 100 metres of Adit II length, work is continued even during night but limiting its activities inside the tunnel;
24. The holder shall ensure that felling of trees if required are done only upon obtaining approval from the Department of Forest and Park Services and strictly as per the conditions of the approval;
25. The holder shall ensure that clear felling of trees is carried out only at those stretches where it is required to obtain minimum ground clearance;



26. The holder shall ensure that illegal hunting and poaching are avoided at all times;
27. The holder shall ensure that all construction activities are carried out in an environment friendly manner in order to minimize the adverse environmental impacts;
28. The holder shall ensure that Environmentally Friendly Road Construction (EFRC) techniques are adopted for the construction of approach roads to minimize adverse environmental impacts;
29. The holder shall ensure that bioengineering practices are adopted on all road side slopes to minimize soil erosion and improve visual impacts;
30. The holder shall ensure construction of side drains, cross drains, causeways, and other supporting structures (retaining/breast walls) as required to prevent soil erosion, improve usability and sustainability of the road infrastructure within the project area;
31. The holder shall ensure that liquid wastes/effluents from the project activities including workshops and residential colonies are adequately treated prior to their discharge into the surrounding environment;
32. The holder shall ensure that air quality stations are established for sampling and monitoring of ambient air quality in the project and adjacent areas and regular results are submitted to the NECS for daily national air quality reporting;
33. The holder shall ensure that all project activity sites/facilities especially those located besides the highway are adequately screened/enclosed to minimize adverse visual impact and improve safety;
34. The holder shall ensure that all construction sites and muck disposal sites are adequately barricaded and cordoned off for safety and minimizing visual impacts;
35. The holder shall ensure that highways, roads and other public utilities are safeguarded from being damaged by Project activities and any damages to these public utilities are restored in the least possible time;
36. The holder shall ensure that no raw materials of any kind, machineries, plants, equipments and excavated materials are stacked along the highway at all times;
37. The holder shall ensure safe and smooth flow of traffic along the Wangdue – Trongsa Highway at all times;
38. The holder shall ensure that vehicles passing along the project area travel at or below recommended speed limits in coordination with relevant local authorities to minimize dust generations and avoid mishaps;
39. The holder shall obtain prior approval from the relevant government authorities for road closure and opening times and should be announced in the media;
40. The holder shall ensure that dusts generated due to the project activities are adequately suppressed at all times;
41. The holder shall ensure that the stretch of highway within the project area is well maintained and free of debris and other obstructions at all times;
42. The holder shall ensure that blasting activities are done by certified blasters as per the guidelines issued by the Ministry of Home and Cultural Affairs by adopting controlled blasting techniques at all times;
43. The holder shall ensure that blasting times are publicly announced in the media, displayed on signboards at appropriate locations at the worksite and adequate sentries posted at strategic locations to avoid mishaps during blasting;
44. The holder shall ensure that spillage and roll over of excavated materials are avoided at all times;
45. The holder shall ensure that excavated materials/mucks are dumped strictly at the pre-identified/approved dump sites adopting load, haul and dump technique and never pushed downhill;




46. The holder shall ensure that dump sites are stabilized with appropriate protection measures/check dams of adequate strength prior to dumping of any materials to prevent spillage of mucks into downstream environment and water bodies;
47. The holder shall ensure that comprehensive reclamation and restoration plan is prepared for all muck disposal sites with proper landscape designs in consultation with local authorities, Dzongkhag and other relevant authorities;
48. The holder shall ensure that dump sites are vegetated with local plant species to prevent potential soil erosion and restore vegetation in the affected areas;
49. The holder shall ensure that dust generations from muck disposal sites are adequately suppressed;
50. The holder shall ensure that disposed mucks are compacted on a regular basis;
51. The holder shall ensure that all vehicles transporting construction materials are properly covered to avoid spillage on the highway;
52. The holder shall ensure that wastes generated from the labour camps, worksite and offices are managed as required under the Waste Prevention & Management Act of Bhutan 2009 and its Regulation 2012;
53. The holder shall ensure that littering is strictly prohibited;
54. The holder shall ensure that 3R (Reduce, Reuse, Recycle) technique is adopted for waste management at all project activity sites;
55. The holder shall ensure that no wastes with potential risks of leaching are dumped into the muck disposal site at any point of time;
56. The holder shall ensure that adequate sanitation facility is provided for the workers and employees;
57. The holder shall ensure that adequate fire fighting facilities are installed at the proposed activity and expiry dates of such facilities are checked and kept valid at all times;
58. The holder shall ensure that safety signs are posted at the strategic locations, including signboards indicating area where specific safety gadgets are required;
59. The holder shall ensure that adequate safety gadgets and outfits such as safety helmets, eye goggles, breathing masks, ear muffs, safety boots, etc. are provided to all workers and any other person entering the worksite;
60. The holder shall ensure that underage workers are not employed;
61. The holder shall ensure that first-aid kit is available at the worksite;
62. The holder shall ensure that proper health check up facilities are provided to all the employees and health records are maintained accordingly;
63. The holder shall ensure safety of every person working underground;
64. The holder shall ensure that any raw materials/fuels containing hazardous chemical contents are imported only upon obtaining prior approval from the relevant agencies and the handling, storage, transport and disposal of the same are in accordance with relevant national laws;
65. The holder shall ensure that proper and adequate drains are provided for drainage of tunneling water;
66. The holder shall ensure that signboard is erected at the starting point of the project area and worksite indicating the name of the Project, Proponent and contact address of the proponent;
67. The holder shall ensure that separate budget is maintained for environmental activities;
68. The holder shall ensure that a copy of ESIA document are available at site at all times;
69. The holder shall ensure that a copy of this environmental clearance is available at the worksite at all times;



70. The holder shall develop contingency plan to deal with unforeseen environmental risks, hazards & accidents and submitted to NECS within three (03) months from the date of issue of this environmental clearance;
71. The holder shall develop Detail Implementation Plan focusing on the terms and conditions of this environmental clearance and submitted to NECS within three months (03) from the date of issue of this environmental clearance;
72. The holder shall ensure that renewal of this environmental clearance is processed at least one month prior to its expiry along with a copy of environmental clearance and a report on the implementation of its terms and conditions;
73. The holder shall ensure that all main package contractors have their own environmental units or focal persons with clear terms of reference for strict implementation of the terms and conditions of this environmental clearance; and
74. The holder shall ensure that the environmental unit asserts strict implementation of these environmental terms and conditions at all times.

Failure to comply with any of the above terms and conditions shall constitute an offence under the Environmental Assessment Act 2000, its Regulations 2002, the National Environment Protection Act 2007 and any other relevant laws. Penalties for such offences shall include but not limited to suspension and/or revocation of environmental clearance in part or whole without any liability on the part of the Royal Government.

This environmental clearance is valid up to June 30, 2016 and is subject to review and changes.


(Ugyen Tshewang)
Secretary

To,
The Managing Director,
Druk Green Power Corporation Limited,
Post Box no. 1351
Thimphu

Copy to:

1. Hon'ble Minister for Ministry of Agriculture and Forests, Vice Chair of National Environment Commission, Thimphu for kind information.
2. Director General, Department of Hydropower and Power Systems, Ministry of Economic Affairs, Thimphu for kind information.
3. Dasho Dzongdag, Chairman, Dzongkhag Environment Committee, Trongsa Dzongkhag for kind information.
4. Director General, Department of Forest and Park Services, Ministry of Agriculture and Forests, Thimphu for kind information.

5. Chief Forestry Officer, Zhemgang Forest Division, Department of Forest and Park Services, Zhemgang for kind information.
6. Chief Forestry Officer, Jigme Singye Wangchuck National Park, Head Office: Tshangkha, Trongsa for kind information.
7. Chief Environment Officer, CMD, NECS for necessary action.
8. Dzongkhag Environment Officer, Trongsa Dzongkhag for necessary action.
9. Guard File (DGPC) ESD, NECS for a record.





46/DGPC/NIKA/MD/2014/141

1st July 2014

**Undertaking to the Royal Government of Bhutan
(National Environment Commission Secretariat)**

Druk Green Power Corporation Limited (hereafter referred to as the Promoter) submits this undertaking for the **construction and operation of 118 MW Nikachhu Hydropower Project at Tangsibji Gewog, Trongsa Dzongkhag** to the National Environment Commission Secretariat (NECS), Royal Government of Bhutan.

WHEREAS the Promoter recognizes the importance and need to protect and conserve the environment;

WHEREAS the Promoter understands the adverse impact of the proposed activity on the natural environment; and

WHEREAS the Promoter understands that meeting every environmental standards set by the NECS is the precondition to continue the proposed activity:

THE PROMOTER HEREBY UNDERTAKES TO:

1. Comply with all terms and conditions of the environmental clearance;
2. Carry out the proposed activity strictly as per the Project Document submitted for environmental clearance and minimize adverse impact on the environment;
3. Be solely responsible for compensation, restoration and rehabilitation of the local residents, households, public, private parties, and any religious, cultural and historic sites are adversely affected by the proposed activity;
4. Manage all wastes generated from the proposed activity;
5. Unconditionally take full responsibility of any hazards of pollution to the environment, plants, animals and human health resulting from the proposed activity and to respect the laws and policies of the Royal Government;
6. Unconditionally take full responsibility to increase and maintain the minimum environmental flow for the dewatered stage between Dam and Mangdechhu-Nikachhu confluence if the proposed 10% minimum environmental flow during lean season is determined inadequate for the sustenance of aquatic life;

**OFFICE OF MANAGING DIRECTOR
DRUK GREEN POWER CORPORATION LIMITED**

CORPORATE OFFICE: Post Box 1351, Thimphu, Kingdom of Bhutan. Tel +975-2-336413/336341 Fax +975-2-336342
www.drukgreen.bt

7. Implement the Biodiversity Management Plan in close coordination with the Department of Forest and Park Services to minimize biodiversity impacts;
8. Ensure that surface construction activities at Adit II and first 100 meter Adit II length are not carried out from 10 pm to 6 am to minimize biodiversity impacts;
9. Be solely responsible to resolve any disputes that arise due to the proposed activity; and
10. Fulfill every condition set by the NECS for the overall environmental management relevant to the proposed activity.

NOW THEREFORE, THE PROMOTER HEREBY AGREES:

1. To unconditionally adhere and comply to the terms and conditions of the environmental clearance falling which the construction and operation of 118 MW Nikachhu Hydropower Project shall be stopped without claiming any compensation from the Royal Government;
2. That the NECS shall have the authority to stop the proposed activity for any breach of this undertaking or laws & regulations in force without any compensation; and
3. That in the event of failure to comply with the terms and conditions of this undertaking, the Promoter shall be liable as per the National Environment Protection Act 2007, the Environmental Assessment Act 2000 & its Regulations 2002 and any other applicable laws.

The Promoter hereby submits this undertaking on 1st July 2014 with full understanding of the implications of signing it.



Managing Director
Druk Green Power Corporation Limited
Chhewang Rinzin
Managing Director
Druk Green Power Corporation Ltd.



CABINET SECRETARY

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ROYAL GOVERNMENT OF BHUTAN

Cabinet Secretariat
Gyalyong Tshogkhang
Thimphu : Bhutan

C-3/28/328

20 March 2014

Secretary,
Ministry of Economic Affairs,
Thimphu.

Sub: Approval of detailed project report (DPR) of Nikachu Hydropower Project

Dear Dasho,

The Government has been pleased to approve the proposal on detailed project report (DPR) of Nikachu Hydropower Project as proposed by the DGPC and endorsed by the MoEA. With regard to three options submitted on financial analysis & tariff, the Government agreed to case (a) as first option and case (c) as second preferred option to pursue in terms of financing model.

The Government, however, directed the MoEA on the following:

- i) The blasting is to be controlled from the very beginning like done under PHPA projects. Furthermore, the machine to detect the effect of blasting is to be installed beforehand wherever necessary.
- ii) Comprehensive Corporate Social Responsibility (CSR) is to be included in the DPR and the book of accounts is to be maintained properly. Likewise, the stakeholders are to be consulted and also made aware of the availability of such fund.
- iii) The damage to the roads by hydropower projects is enormous and thus requiring frequent maintenance of roads by DoR (MoWHS). Therefore, it is crucial to work out cost-sharing mechanism for maintenance of roads during the planning phase of such projects.
- iv) The quarry site is a problem as it is either located along the National Highway or the site identified contained mineral deposit like the one in Chuserbu with Dolomite. Therefore, the Mineral Development Policy which is in the final stage will help to streamline in identifying the quarry site.

Copy to
1) Head, P&ID
2) Head, Comptroller

26/3/14

copy to
1) Head, P&ID
2) Head, Comptroller
CS
26/3/14

76
26/3/14

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དངལ་ལྷན་འབྲུག་གཞུང་།
ལྷན་གྲུས་གཞུང་ཚོགས་ཡིག་ཚང་།

ROYAL GOVERNMENT OF BHUTAN

Cabinet Secretariat
Gyaljong Tshogkhang
Thimphu : Bhutan

This letter has reference to the 28th Lhengye Zhungtshog held on March 4, 2014.

With kind regards,

Yours sincerely,

(Penden Wangchuk)

Copy for necessary action to:

1. Managing Director, DGPC, Thimphu

Copy for kind information to:

1. Hon'ble Minister, All Ministries, Thimphu
2. PS to PM, Gyaljong Tshogkhang, Thimphu



ལྷན་སྐྱོང་གྲོག་ལུགས་ལས་ཁུངས། བསྐྱར་རྒྱས་ལྷན་ཁག།
DEPARTMENT OF HYDROPOWER & POWER SYSTEMS
MINISTRY OF ECONOMIC AFFAIRS
THIMPHU: BHUTAN



106/DHPS/2013-14/126

8th April, 2014

✓ The Managing Director
Druk Green Power Corporation Ltd
Thimphu

Subject: Directives of the Government on implementation of Nikachhu HEP

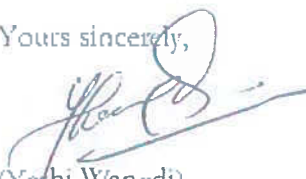
Dear Dasho,

As per the directives of the 28th Lhengye Zhungtshog held on 4th March, 2014, the Ministry of Economic Affairs has been directed by the Government to adhere to certain requirements to be complied and adhered to during the construction of Nikachhu HEP such as controlled blasting, Corporate Social Responsibility etc. The details are provided in the letter received from the Cabinet Secretariat vide Letter No. C-3/28/328 dated 20th March, 2014, a copy of which has also been addressed to Dasho.

In this respect, we request Druk Green to ensure that the directives from the Government are adequately addressed and implemented during construction stages.

Thanking you,

Yours sincerely,


(Yeshe Wangdi)
Director General

Copy to
1. Head, PWD
21 Head, CMX
9/4/14
D(P) Mr. 9.
Nikachhu HEP
15
9/4

Cc:

1. The Hon'ble Secretary, MoEA, Thimphu for kind information.

(15.20)
102
9/4/14

qc

issued



Bhutan Power Corporation Limited
Office of the Managing Director
Thimphu :Bhutan



54/BPC/DGPC/MD/2013/ 2.7.3

November 26, 2013

The Director (Projects)
Projects Department
Druk Green Power Corporation Limited
Thimphu: Bhutan

Subject: Issuance of No Objection Certificate for 118 MW Nikachhu Hydropower Project

Dear Sir,

This has reference to your letter DGPC/PD/P&DD/20(f)/785 dated November 5, 2013 enclosing the DPR for Power Evacuation Arrangements of Nikachhu HEP and seeking No Objection Certificate (NOC) of BPC.

BPC has noted the provisions of the DPR in respect of proposal for power evacuation through one 132kV D/C overhead transmission line from Nikachhu to Mangdechhu and has no objection to the proposed 132kV D/C line. It is noted that this stretch considers only circuit outage contingency, being short-line, and not tower outage contingency, as considered in the case of ATS of other HEPs.

It is also noted that the proposed arrangement is with ACSR Kundah conductor for the overhead transmission line, while the standardised conductor for 132 kV system as per present system and NTGMP is ACSR Panther. While this could be due to the requirement of single-circuit outage consideration, BPC prefers use of ACSR Zebra to cater to this requirement. This is to ensure that standard towers available with BPC could be used for this short stretch of line rather than redesigning the towers as well as avoiding use of non-standardised conductor size in BPC system for this short stretch. This would ensure that in addition to saving in time for redesigns and testing, the inventory issues can also be reduced.

Accordingly, we are conveying our NOC for the DPR in principle and the above may be taken care of during implementation.

While on the subject, this Chapter of the DPR may require corrections in respect of coherence of various information / data with the referred documents, existing network and other minor aspects, which have no impact on the final recommendations and the same can be taken care of in the final report. Other aspects like procurement process through ICB may please be taken care of by you, with due consideration to the volume of work for the transmission line component and other associated issues.

Thanking you,

Yours sincerely,

(Bharat Tamang)
Managing Director

689
2/12/13

འབྲུག་རྒྱལ་ཁབ་མཆོད་སྐྱོད་ལྷན་ཁག་གི་

མཆོད་སྐྱོད་ལྷན་ཁག་གི་

DEPARTMENT OF CULTURE
MINISTRY OF HOME AND CULTURAL AFFAIRS
Royal Government of Bhutan



DCHS-DoCA-1/2013-14/689 286

November 14, 2013

The Director
Druk Green Power Corporation Ltd

Subject: Clearance for the 118 MW Nikachhu Hydropower Project at Trongsa

Sir,

This has reference to your letter no.DGPC/PD/P&DD/20(1)/784 dated November 5, 2013 regarding clearance of the Department of Culture (DOC) for the 118 MW Nikachhu Hydropower Project at Trongsa. DGPC has affirmed in the letter that the project does not have impact on any historical monuments, temples, *chorten* and *nyes* based on the detailed Environmental and Social Impact Assessment conducted by the ADB for the project.

Therefore, the Department of Culture issues the clearance for the 118 MW Nikachhu Hydropower Project. However, if the project discovers significant heritage sites in the affected area or it results to unanticipated effect on heritage sites in the vicinity in the course of implementing the activities of the project, we would like to request the project to take the responsibility to plan and implement appropriate mitigation measures.

Yours sincerely,

(Dorjee Tshering)
Director General

Head, P&DD

2/12/13

- Hon'ble Secretary, Ministry of Home & Cultural Affairs for kind information
- Managing Director, DGPC, Thimphu for kind information
- Dasho Dzongdag, Trongsa Dzongkhag Administration for kind information
- Head, Division for Conservation of Heritage Sites, Dept. of Culture, MoHCA for kind information



**Royal Government of Bhutan
Ministry of Works & Human Settlement
Department of Roads
Regional Office : Trongsa**

Ref. No.RO/DoR(TRONGSA)/2013-2014/PL-10/ 643

Date 19th March, 2014.

The Executive Engineer,

Sub-Division,

DoR : Trongsa.

**Sub: DoR Clearance for construction of Approach roads for 118 MW Nikachhu Hydropower Project
from Trongsa – Chuserbu PNH.**

With reference to your recommendation letter No.FSDT/DoR/2013-2014/W-09/266 dated 17.03.2014 for the issuance of DoR clearance for construction of 8 (eight) numbers Approach roads at 326.80 km, 327.50 km, 327.70 km, 329.10 km, 333.40 km, 341.15 km, 347.65 km and 329.20 km leading towards various components of Nikachhu Hydropower Project from Trongsa – Chuserbu Primary National highway is hereby approved with the terms and conditions attached for strict compliance during the time of execution.

Please Submit the Signed Contract Agreement comprising witness signature for our record.

Encl: Terms & Conditions


(Executive Engineer)

Regional Office,

DoR: Trongsa.

CC:

1. The Chief Engineer, Maintenance Division, DoR: Thimphu along with a copy of the clearance for kind information.
2. Office copy PL-10

DGP
Lay.

Dzongkhag and Gewog Clearances



དཔལ་ལྷན་འབྲུག་གཞི་རིམ་
 འབྲུག་མི་འཇུག་ཆོས་འཁོར་རབ་བརྟན་ཆེ། རྫོང་ཁག་བདག་སྐྱོང་།
ROYAL GOVERNMENT OF BHUTAN
DISTRICT ADMINISTRATION
Chhoetse-dzong: Trongsa

DAT/DEC-17/ 2014/ 5743

May 8, 2014

DZONGKHAG ADMINISTRATIVE APPROVAL

In exercise of the powers delegated under the National Environment Protection Act 2007, of the National Environment Commission Secretariat, Section 47, which mandates the Dzongkhag Environment Committee (DEC) as one of the Competent Authorities in Making recommendations to the concerned Ministries, Local Governments, and /or to the Secretariat concerning any measures that need to be taken to protect the quality of the Environment. Also, Dzongkhag Administration is mandated to issue the Dzongkhag Administrative Approval as per the Section 3.10 of Application for Environmental Clearance Guideline; the Dzongkhag Administrative Approval is hereby accorded in favor of Tangsibji Hydro Energy Limited, Druk Green Power Cooperation as per the decision of 7th Dzongkhag Environment Committee meeting held on May 8, 2014 with following terms and conditions:

1. The Dzongkhag Administrative Approval is issued based on the No Objections from the EIA and EMP presentations held on December 12, 2013 to the Gewog Administration (Gup, Mangmi and Tshogpas) of Tangsibji Gewog, DLLC and DEC members from the Dzongkhag Administration at View Point Resort and the following Public Consultation meeting held on January 27, 2014 with affected households of Tangsibji Gewog, General Public, DGPC and Dzongkhag Administration at Tshangkha Lower Secondary School.
2. The Applicant to execute the work as per The Land Act 2007.
3. The Applicant to execute the work as per The Waste Prevention and Management Regulation 2012.
4. The Applicant to execute the work as per The Water Act 2011.
5. The Administrative Approval is accorded only for obtaining Environmental Clearance and does not include Social Clearance, Forestry Clearance, if required thereof.

Further, this Dzongkhag Administrative Approval will stand valid till obtaining the Environment Clearance from the Competent Authority.

Chairman

Dzongkhag Environment Committee

Copy to:

1. The Director (Projects), Druk Green, Thimphu for kind information and necessary action.
2. The Project Manager, Druk Green, Thimphu for kind information.
3. The Chief Environment Officer, ESD, NECS, Thimphu for kind information.
4. The Range Officer, Range Office, Trongsa for kind information.
5. The Gup, Tangsibji gewog Administration for kind information.
6. Office Copy.

Tshogpa
Tangsi Chuwog
Tangsi Geog

૩ મુખ્યમંત્રીશ્રીના નામ ઉપર સરકારી કાર્યાલયમાંથી મોકલવામાં આવેલ છે

ક્રમ	વિષયનુસાર	મુદત / મર્યાદા
૧	ઉચ્ચ શિક્ષણ -	૩૫૫ - ૨૬૪
૨	વિદ્યાર્થી -	— ૧૫ —
૩	વિદ્યાર્થીના મુદત -	— ૧૧ —
૪	મુદત -	— ૧૧ —
૫	વિદ્યાર્થીના મુદત -	— ૧૧ —
૬	વિદ્યાર્થીના મુદત -	— ૧૧ —
૭	વિદ્યાર્થીના મુદત -	— ૧૧ —



ક્રમ. ઉપનામ. રૂપા. હાથપાત્રી જેવ. નોંધ. નિહાવની નમુ. રૂપ

ક્રમ	ઉપનામ	રૂપા	નોંધ
૧-	કોઈ જાણીતો	કોઈની જેમ	૧
૨-	કોઈ જાણીતો	=	૨
૩-	૧૮૫૧ નામના રૂપા	=	૩
૪-	કોઈ જાણીતો	=	૪
૫-	કોઈ જાણીતો	=	૫
૬-	કોઈ જાણીતો	=	૬
૭-	કોઈ જાણીતો	=	૭
૮-	કોઈ જાણીતો	=	૮
૯-	કોઈ જાણીતો	=	૯
૧૦-	કોઈ જાણીતો	=	૧૦
૧૧-	કોઈ જાણીતો	=	૧૧
૧૨-	કોઈ જાણીતો	=	૧૨
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૧૯-	કોઈ જાણીતો	=	૧૯
૨૦-	કોઈ જાણીતો	=	૨૦

	સી. ગુપ્ત	ગુપ્ત	મુદ્રા
૧-	જેનિયો. સ્વેચ્છા	જેનિયો. સ્વેચ્છા	૨૧
૧૨-	પ્રજા. નેત્રા. પોદ્ધ	=	૨૨
૧૩-	પ્રજા. નેત્રા. સ્વેચ્છા	=	૨૩
૧૪-	સેવ. સેવ. પોદ્ધ	=	૨૪
૧૫-	પ્રજા. સ્વેચ્છા	=	૨૫
૧૬-	સેવ. નેત્રા. સ્વેચ્છા	=	૨૬
૧૭-	સેવ. પોદ્ધ. પ્રજા	=	૨૭
૧૮-	સેવ. ગુપ્ત. સેવ. સ્વેચ્છા	=	૨૮
૧૯-	પ્રજા. પ્રજા. સ્વેચ્છા	=	૨૯
૨૦-	સેવ. પોદ્ધ	=	૩૦
૨૧-	ગુપ્ત. ગુપ્ત. સ્વેચ્છા	=	૩૧
૨૨-	સેવ. પ્રજા. સેવ.	=	૩૨
૨૩-	પ્રજા. નેત્રા. પોદ્ધ	=	૩૩
૨૪-	પ્રજા. નેત્રા. સ્વેચ્છા	=	૩૪
૨૫-	સેવ. પ્રજા. સ્વેચ્છા	=	૩૫
૨૬-	સેવ. ગુપ્ત. ગુપ્ત. સ્વેચ્છા	=	૩૬
૨૭-	પ્રજા. સેવ.	=	૩૭
૨૮-	પ્રજા. સ્વેચ્છા. પોદ્ધ	=	૩૮
૨૯-	સેવ. સેવ. પ્રજા	=	૩૯
૩૦-	પ્રજા. પ્રજા. સ્વેચ્છા	=	૪૦

	બી. યુનિ.	યુનિ.	મુ. રા.
૨-	ઉર્ધ્વ ટ્રાયેંગલ	જુલાની રૂપ	૬૧
૬૨-	મિનિ. ટ્રાયેંગલ	=	૬૨
૬૩-	સુ. ટ્રાયે.	=	૬૩
૬૪-	ઉર્ધ્વ ટ્રાયે. મ.	=	૬૪
૬૫-	જુ. રૂ.	=	૬૫
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Tshogpa
Tangsibi Chewog
Tangsibi Geog

Boys' Life

Chendije
Tangsibi

Tshogpa
Tshangkha Chewog
Tangsihi Geog

Tshogpa
Ngyela Dangle Chewog
Tangsibi Geog

**NOC from Project Affected People (Main Package and
Transmission Line)**

**AGREEMENT BETWEEN AFFECTED PERSONS AND THE DRUK GREEN POWER
CORPORATION LIMITED (No Objection Certification from affected persons)
07.04.2014**

INTRODUCTION

The Royal Government of Bhutan (RGOB) is preparing the feasibility studies for the Nikachhu Hydropower Project in Trongsa Dzongkhag. With the mandate to manage existing power generating facilities as well as to accelerate hydro-power development in the country, the DGPCL, in order to fulfill its mandate, will develop the 118 MW Nikachhu Hydro-power Project in Trongsa dzongkhag.

Some private land will have to be acquired for the construction of project facilities such as; adits, musk disposal sites and batching plants, approach roads, Intake Colonies and Office/Temporary Sheds, Temporary Camps, Surge Shaft Colony, Transmission towers, and other project infrastructure.

Although most of the land that falls within the project area belongs to the government, feasibility studies have revealed that some of the land that falls within the project area belongs to private individuals. In order to facilitate the construction of the components mentioned above the RGOB will have to acquire some land that belongs to private individuals.

NEED FOR THIS AGREEMENT (NOC)

This agreement (NOC) is required because 18 households will be losing some portion of their land to the project. The total amount of land to be acquired from the 18 households amounts to 3.817 acres, all 3.817 acres consists of dry land (Kamzhing).

A No objection certification (NOC) from the affected households losing land to the project is a prerequisite for the NHPP to obtain environmental and forestry clearances in order to proceed with the project.

Moreover, this agreement (NOC), as per RGOB's Land Act and ADB's guidelines, guarantees that all compensation for private land acquired will be made and delivered to the Affected Persons before the commencement of any Project construction activity.

CONTENTS OF THE AGREEMENT

This agreement states the following:

1. The Affected Persons are willing and agree, without coercion or force, to their land being acquired by the Project.
2. The Affected Persons will be guaranteed replacement land for any land lost by them to the Project.
3. The replacement land will be identified and delivered to the Affected Persons prior to the commencement of any infrastructure/construction works on the affected lands.

4. If cash compensation is desired by the Affected Persons, the cash compensation will be paid to the Affected Persons prior to the commencement of any infrastructure/construction works on the affected lands.
5. Any other allowable compensation will be made to the Affected Persons prior to the commencement of any infrastructure/construction works on the affected lands.
6. The Affected Persons have no objections to their land being acquired by the NHPP.






In essence this agreement declares that the Affected Persons have no objections to their land being acquired for the Project and that replacement land (or cash compensation, if desired by the APs) will be provided to the Affected Persons prior to any project construction works on their private lands.







We, the Affected Persons, have willingly, and with full knowledge, signed on this agreement on 07.04.2014 without any coercion or force in the presence of our Gup (village headman) who will countersign on this agreement as witness along with the Gewog Administrative Officer, and the Domestic Consultant on behalf of DGPCL.


Attached (annexure 1) is the list of Affected Persons with their signatures that proves that they have no objection to their private lands being acquired for NHPP.

**NO OBJECTION CERTIFICATION SIGNED BY AFFECTED PERSONS ALONG
WITH DETAILS OF PRIVATE LAND TO BE ACQUIRED BY THE NIKACHHU
HYDROPOWER PROJECT (MAIN PROJECT).**

07.04.2014

	Name of owner	Thram No.	Land Type	Thram Area (Acres)	Amount of Land to be acquired (Acres)	Signature of Affected Person
1	Ugyen Zangmo	58	Kamzhing	0.880	0.107	
2	Dorji	56	Kamzhing	2.150	0.480	
3	Namgay Chholing CPS	527	Institutional Land	2.819	0.423	
4	Sonam Wangchen	255	Kamzhing	1.746	0.342	
5	Dorji Zangmo	270	Kamzhing	1.200	0.183	

6	Phub Zangmo	257	Kamzhing	0.563	0.241	
7	Ugyen Tshomo	262	Kamzhing	1.120	0.280	
8	Sonam Pelmo	240	Kamzhing	0.765	0.142	
9	Tshering Lhamo	272	Kamzhing	1.588	0.469	
10	Dorji Dema	258	Kamzhing	1.332	0.393	
11	Tshang Tshang Dotji	269	Kamzhing	1.053	0.352	

12	Kunzang Wangmo	181	Kamzhing	0.370	0.165	



Mr. Jigme Namgyel

Officer in Charge
Tangsi Gewog
Trongsa

OFFICIATING GUP
TANGSI GEWOG
TRONGSA








Mr. Tshering Tashi
GAO Ugyen Phunko
Tangsi Gewog
Trongsa




Mr. Kunzang Yonten
Consultant
ADB/DGPCL

**NO OBJECTION CERTIFICATION SIGNED BY AFFECTED PERSONS ALONG
WITH DETAILS OF PRIVATE LAND TO BE ACQUIRED BY THE NIKACHHU
HYDROPOWER PROJECT (TRANSMISSIONLINE COMPONENT).**

09.04.2014


No.	Name of Owner	Thram No.	Land Type	Thram Area (Acres)	Amount of Land to be Acquired (Acres)	Signature of Affected Person
1	Tashi Wangmo		Kamzhing		0.04	
2	Yeshi Choden		Kamzhing		0.04	
3	Sangay Wangdi		Kamzhing		0.04	
4	Tshering Dema		Kamzhing		0.04	
5	Phurpamo		Kamzhing		0.04	


6	Lemo		Kamzhing		0.04			
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Mr. Gelay Chhophel
Gup
Drakten Gewog
Trongsa

Mr. Kunzang Dorji
Mangmi
Drakten Gewog
Trongsa

Mr.
GAO
Drakten Gewog
Trongsa


Mr. Kunzang Yonten
Consultant
ADB/DGPCI


Mr. Tempa Rabgay
CID no # 11509002761


Mr. Deewan Thapa
CID no # 11805002243

Park and Forest Clearances



Royal Government of Bhutan
Ministry of Agriculture & Forests
Department of Forests & Park Service
Jigme Singye Wangchuck National Park
Head Office: Tshangkha
Trongsa
"Managing Bhutan's Natural Heritage"



JSWNP/Tech-A (15)/2012-2013/ 0299

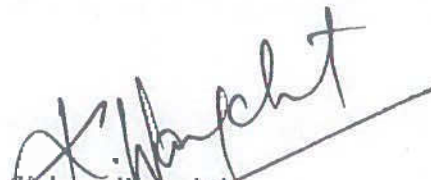
21st January, 2013.

In Charge
Dy. Park Range Office
Chendebji, Trongsa

Sub: Forestry Clearance for the construction of Dam and Diversion tunnel.

The Hon'ble Director General, Department of Forests and Park Services has approved for issue of Forestry Clearance for the construction of Dam and Diversion tunnel measuring 2 acres at Serphuchen Lorim, Chendebji, Tangsibji geog for Nikachu Hydro Power Project, Druk Green Power Corporation, Thimphu vide letter no. DoFPS/Ka-3-2/2013/1636 dated 11th January, 2013.

Therefore, you are asked to mark the trees and the poles within the proposed construction area after receiving the clearance from other stakeholders and handover the timber extraction to NRDCL as per the Forest and Nature Conservation Rule.


(Kelzang Wangchuk)
Chief Forestry Officer

1. The Chief, Environment and CDM Unit, Projects Department, Druk Green Power Corporation, Thimphu.

Andon, Sonam, Daki & Noley

for information

18/02/2013

Jigme Singye Wangchuck National Park HQ, Tshangkha, Trongsa: Bhutan
Tel: 975-3-527005/+527006, Fax - 975-3-527049, Email- jsw.nationalpark@gmail.com

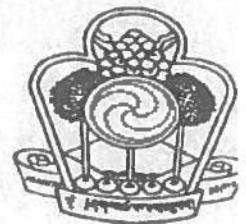


འབྲུག་རྒྱལ་ཁབ་ཀྱི་རྒྱལ་པོ་གཞི་རྒྱུ་གཞི་རྒྱུ་

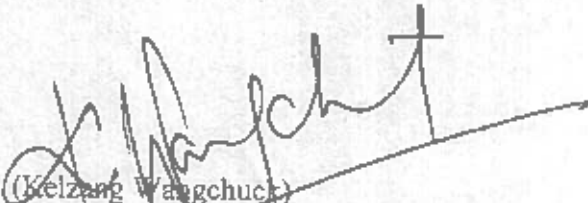
Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Jigme Singye Wangchuck National Park
Head Office: Tshangkha

Trongsa: Bhutan

"managing bhutan's natural heritage"

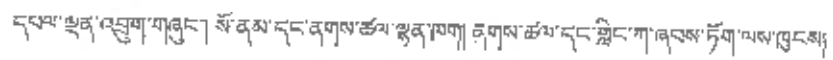


10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. GRF land shall be released only after the proper handing taking note signed by both parties;
12. This clearance shall not restrict easement;
13. This clearance shall be revoked without any liability on part of Government if the holder of this clearance violates any of the above terms and conditions;
14. This clearance is valid up to one year from the date of issue.


(Kelzang Wangchuck)
Chief Forestry Officer

CC to:

1. The Hon'ble Director General, Department of Forests and Park Services, Thimphu for kind information.
2. The DASHO DZONGDAG, Dzongkhag Administration, Trongsa Dzongkhag for kind information.
- ✓ 3. The Project Director, Project Department, DGPCL, Thimphu for kind information.
4. The In Charge, Dy. Park Range office, Chendebji for kind information and necessary action. The trees and poles should be handed over to NRDCL for extraction and disposal as per the FNCR, 2008.



May 5, 2014

Sub: Approval for issuance of Forestry Clearance

In this regard, the Department has reviewed the detail field report, accordingly accorded the approval as per the annexure 18(d),(6) for proposed submergence area measuring 4 acres adjacent to the Dam for Nikachu Hydro Power Project in favour of Project Department, DGPCL, Thimphu.

Therefore, you are asked to issue the forest clearance for above activity from your end as per the existing guidelines. The trees and poles within the area which required for felling should be handed over to NRDCL for extraction & disposal as per the F&NCAR, 2008.

(Chencho Norbu)
Director General

Copy to:

1. The Project Director, Project Department, DGPCIL Thimphu for kind information.
2. ~~The CFO~~, WCD information.



མངའ་སྡེ་ནུབ་ལྷན་ཁྲུང་པོ་

གཞུང་པོ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/03/2012-13/1611

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikaichhu Hydropower Project, Trongsa (DGPC, Thimphu) for construction of access road to dam through GRF land, taking off from Lorim to Subidzim measuring 3.9 km length and 10 m width.

This is issued in accordance to letter no. DoFOS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by Unit Incharge, Chendebji FMU vide no. CFMU/Do/70/2012-13/141 dated 18/12/2012.

The trees and firewood generated from the above land should be handed over to NRDC for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)
Offg. Chief Forestry Officer

Mr. Pema Dorji, Asst. Manager
For info. & n.a.
4/25/04/13

total
= 8 clearance

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) CUP, Tamsibji Gewog Administration, Trongsa for kind information
- 4) Unit Incharge, CFMU for information and necessary action



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གཞུང་མཁུངས་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/03/2012-13/1609

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikaichhu Hydropower Project, Trongsa (DGPC, Thimphu) for construction of access road to Adit IV through GRF land, taking off from Gongkorchhu to Tshangkha measuring 0.990 km length and 10 m width.

This is issued in accordance to letter no. DoFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/293 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDC for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Gup. Tangsibji Gewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁ་ཚང་།

གནམ་མཁམས་ཁྲིའུ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/03/2012-13/1610

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikaichhu Hydropower Project, Trongsa (DGPC, Thimphu) for construction of access road to Surge Shaft through GRP land, taking off from Trongsa-Thimphu Highway to Surge Shaft at Norbuodi measuring 3.6 km length and 8.5 m width.

This is issued in accordance to letter no. DoFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/293 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDC for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information.
- 3) Cmp. Tangsibiji Jewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་ནགས་ཚལ་ཡི་གཙུག་ཁག་

གཞུང་མ་གྲུ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TEC/11/03/2012-13/1615

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikachhu Hydropower Project, Trongsa (DGPC, Thimphu) for lease of 0.910 acres (3682.60 m²) of GRF land located below Surge Shaft (Norbundi) for use as muck disposal site.

This is issued in accordance to letter no.DOFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/295 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDCL for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.



(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Gup, Tangsibiji Gewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་ནུ་གསལ་ཚབ་ཡིག་ཆ་དང་།

གསལ་མ་སྒྲུབ་པ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGIANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFDM/REC/H/03/2012-13/1608

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikachhu Hydropower Project, Trongsa (DGPC, Thimphu) for construction of road to PH and Colonies through GRF land of Adit V, Chipchipokto measuring 0.2 km length and 6.5 m width

This is issued in accordance to letter no.DaPPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2013-2013/293 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDC for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Gap, Tangsibiji Gewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action

(5)



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གསལ་མ་སྒྲུང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/03/2012-13/1612

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of **Nikachhu Hydropower Project, Trongsa (DGPC, Thimphu)** for lease of **11.602 acres (46950 m²)** of GRF land located at **Gongkorchhu-Tsangkhā** for use as **muck disposal site, Adit IV**.

This is issued in accordance to letter no. DoFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/295 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDCI for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasha Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Cdp. Tangsibiji Gewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་རྒྱལ་ཁའ་ལོ་སྒྲུབ་པའི་འཛིན་པ་ལྷན་ཁག་
གཞུང་ལུགས་ལྷན་ཁག་



OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES

ZFD/TECH/03/2012-13/1613

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikachhu Hydropower Project, Trongsa (DGPC, Thimphu) for lease of 14.583 acres (59015 m²) of GRF land located at Surge Shaft for use as muck disposal site.

This is issued in accordance to letter no. DoFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/295 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDC for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)
Offitg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Cmp. Tengesibji Gewog Administration, Trongsa form kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་ནགས་ཚལ་ཡི་གཙུག་ཁག་

གཞུང་པོ་མ་སྒྲུང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECU/03/2012-13/1614

Dated: 24.04.2013

FORESTRY CLEARANCE

In exercise of the powers delegated under the amended Forest and Nature Conservation Rules 2008 conveyed vide No. DF/Ka-3/2008/702 of the Department of Forests and Park Services, Ministry of Agriculture and Forests, the Forestry Clearance is hereby accorded in favor of Nikachhu Hydropower Project, Trongsa (DGPC, Thimphu) for lease of 61.023 acres (246950 m²) of GRF land located below Tsheringma drupchhu for use as muck dumping and batching plant sites at Adit III.

This is issued in accordance to letter no. DoFPS/Ka-3-1/2013/2131 dated 09/04/2013 of the Department and as per the field inspection report submitted by the Range Officer, Trongsa Range vide no. TR/ADM/2-4(b)/2012-2013/295 dated 07/02/2013.

The trees and firewood generated from the above land should be handed over to NRDCL for extraction and disposal as per rules.

This clearance will be valid subject to clearance issued by other concerned agencies as per rules.

(Dawa Zangpo)

Offg. Chief Forestry Officer

CC to:

- 1) Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information
- 2) Managing Director, DGPC, Thimphu for kind information
- 3) Cnp. Yangsibiji Gewog Administration, Trongsa for kind information
- 4) Range Officer, Trongsa Range for information and necessary action



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

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OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/22-2/2013-14/1003

Date: 25/02/2014

FOREST CLEARANCE

The Zhemgang Division, Department of Forest and Park Services, Ministry of Agriculture & Forest is pleased to issue Forest Clearance for construction of permanent & temporary Colonies at Damsite measuring $11,210m^2$, establishment of Batching plant measuring $12,141m^2$, Crushing plant measuring $16,187m^2$, development of Muck disposal area measuring $138,630m^2$, at Lorim and access road construction to Adit I measuring $2600m \times 8.5m$ in SF land, in favor of Nikachhu Hydro Power Project with the following terms and conditions:

The clearance is issued as per the approval from the Department vide No.DoFPS/Ka-6/2014/1220 dated 31/08/2013.

1. This clearance is limited to forestry perspective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought prior to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time activity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. The trees and poles generated should be handed over to NRDC for extraction and disposal as per the F&NCR, 2008;
15. This clearance shall be valid till **one year** from the date of issue and subjected to the periodic review and changes.



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གཞུང་མཁུར་པོ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;

The clearance is issued as per the field report submitted by Unit In-Charge, Chendebji BMU vide Ref.No.CFMU/DoF/22/2013-2014/38 dated 25/12/2013.


(Ugyen Tenzin)
Chief Forestry Officer

Copy to:

1. The Dasho Dzongda, Trongsa Dzongkhag Administration for kind information
2. The Project Manager, Nikachhu Hydropower Project, Trongsa for information.
3. The Unit In- Charge, Chendenbji Forest Management unit for information
4. Office copy

Copy to
1) DOR (P)
2) Head.
31/3/14

February 12, 2014

2600
22-10-14
26/02/14

You may therefore, take further necessary action from your end accordingly and the trees and poles should be handed over to NRDC for extraction & disposal as per the F&NCR, 2008.

Copy to:

PA to Director General, DoFPS for record.

13/2/14

DoFPS for record.

Subhas *Tehang*
Hayang

Wt 26/2



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གཞུང་མསྒྲུང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/22-2/2013-2014/C/L

Dated: 04/02/2014

To:

The Hon'ble Director General,

Department of Forest and Park Services,

Thimphu

Sub: Seeking approval for issuance of forestry clearance in favor of NHPP, Trongsa.

Dashed:

This division would like to forward the application in favor of Nikaehm Hydro Power Project for issuance of Forestry Clearance for the following works at different places.

Sl.no	Activities to be carried out	Area (m ²) & name of place	Remarks
1	Construction of permanent & temporary colony at Dam site	11,210m ² at Lorin	880 nos of trees need to be removed
2	Establishment of Batching Plant at Dam site	1,234m ² at Lorin	230 nos of trees need to be removed
3	Establishment of Crushing Plant at Dam site	16,187m ² at Lorin below national highway	250 nos of trees need to be removed
4	Development of Muck disposal area 1X at Dam site	45,270m ² at Lorin	390 nos of trees need to be removed
5	Development of Muck disposal area 2X at Dam site	90,360m ²	600 nos of trees need to be removed
6	Construction of access road to Adit 1	2000m X 8.5 m	1200 nos of trees need to be removed



མངའ་སྡེ་ནུབ་མཁའ་ཆེན་པོ་གྲུབ་པའི་ལྷན་ཁང་།

གཞུང་ལམ་སྤྲོད་པ།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



Therefore, this is being submitted for your honor's approval and further directives please.

Enclosed: Detail field report & sketch map for your honor's ready reference.

Yours Faithfully,

(Ugyen Tenzin)

Chief Forestry Officer

Copy to:

1. The Projects Department, Planning and Design Division, Druk Green Power Corporation, Thimphu for kind information.
2. The Unit In charge, CFMU for information and necessary action.
3. Office copy.



མངའ་སྡེ་རྒྱལ་ཁུངས་ལྷན་ཁག་

གཞུང་མཁའ་རྒྱུ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



At 10:11 AM 22-2/2013-14/1005

Date: 26/02/2013

FOREST CLEARANCE

The Zhemgang Division, Department of Forest and Park Services, Ministry of Agriculture & Forest is pleased to issue Forest Clearance for the construction of following activities in favor of Nikaclu Hydro Power Project with the following terms and conditions:

Sl.no	Particular	Corridors(Name of place)	Area in meters		Remarks
1	Batching plants in Surge shaft	Norboudi	6070m ²		The acquisition shall be temporary
2	Columns at power house	(Norboudi), above MHPA Dam axis(Right bank)	10643m ²		-do-
3	Batching plant at power house	(Norboudi),downstream of MHPA dam axis(Right bank)	16,187m ²		-do-
4	Muck dumping site-VII	(Norboudi),downstream of MHPA dam axis Right bank	71,000m ²		-do-
5	Muck dumping site-VI at Adin V	Chipechippokto	62,030m ²		-do-
6	Batching plant for Adin IV	Gongkhorechhu	6070m ²		-do-
	Batching plant at power house site	(Norboudi),downstream of MHPA dam axis(Right bank)	12141m ²		-do-
8	Common Muck dumping house site	Plybo Gyedem(Tshangkha)	73,116m ²		-do-
9	Access road to	Agay chocho(Tshangkha)	Length	Breadth	The access road to



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གཞུང་མ་སྤང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



Common Muck dumping site		1.750m	7.5m	common muck disposal site has been along Tshangkha Power tiller track
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The clearance is issued as per the approval from the Department vide no.DofPS/Ka-6/2014/1162 dated 03/02/2014.

1. This clearance is limited to forestry perspective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought prior to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time activity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the Waste Prevention and Management Regulation, 2012;
9. The existing Forest produce shall be disposed/removed only after land registration in them and demarcation as per the existing rules and regulation;
10. This clearance shall not restrict easement;
11. The GRF land shall be released only after proper hand in taking note signed by the parties
12. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
13. The trees and poles generated should be handed over to the NRDCI, for extraction and disposal as per the F&NCA, 2008;
14. This clearance shall valid till one year from the date of issue and subject to the periodic changes and review.



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གཞི་རྒྱུ་མཐུས་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;

This is issued as per field inspection report submitted Range Officer, Trongsa Range vide letter no. TR/ADM/2-4 (b)/2013-14/319 dated 06/01/2014.

(Ugyen Tenzin)

CHIEF FORESTRY OFFICER

Copy to:

- 1) The Dasho Dzongda, Dzongkhag Administration, Trongsa for kind information.
- 2) The Gup, Tashiteng Gewog Administration, Trongsa for information.
- 3) The Range Officer, Trongsa Range for information and necessary action.
- 4) The Project Manager, NHPP for information.



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁྲུང་།

གསལ་མ་སྤྲོད་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/FE(11/22-2/2013-2014/761)

Dated: 08/01/2014

To:
The Hon'ble Director General,
Department of Forest and Park Services,
Thimphu,

Sub: Approval for issuance of Forestry clearance in favor of Nikachu Hydro Power Project.

Dasho,

This division would like to forward an application for issuing forestry clearance in favor of Nikachu Hydro Power Project in the following places

Sl.no	Particular	Corridors(Name of place)	Area in meters	Remarks
1	Batching plants at Surge shaft	Norboudi	6070m ²	The proposed area falls inside GRF land
2	Colonies at power house	(Norboudi), above MHPA Dam axis(Right bank)	10643m ²	-do-
3	Crushing plant at power house	(Norboudi),downstream of MHPA dam axis(Right bank)	16,187m ²	-do-
4	Muck dumping site-VII	(Norboudi),downstream of MHPA dam axis(Right bank)	71,000m ²	-do-
5	Muck dumping site-VI at Adit V	Chipchippokro	62,030m ²	-do-
6	Batching plant for Adit IV	Göngkhorelhu	6070m ²	-do-
7	Batching plant at powerhouse site	(Norboudi),downstream of MHPA dam axis(Right bank)	12141m ²	-do-

Zhemgang, Post Box 594; Tele No. 091 975 - 03 - 7411205 - 741323 Fax No. 741221; e-mail dfozhem@moaf.gov.bj



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གཞུང་མ་སྤྱང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



8	Common Muck dumping house site	Phyho Gyoen(Tshangkha)	73,116m ²	-do-
9	Access road to Common Muck dumping site	Agay chocho(Tshangkha)	Length 1,750m	Breadth 7.5m
				The take off point & middle road falls inside pvt land of Tshangkha

Therefore, this is submitted for Dasho's kind approval please.

Yours Faithfully,

(Ugyen Tenzin)
Chief Forestry Officer

Copy to:

1. The Project Manager, DGPC, Trongsa for information.
2. The Range Officer, Trongsa Range for information and necessary action.
3. Office copy.



མངའ་སྡེ་རྒྱུ་ལེན་པ་ལྟོས་པ་

གཞུང་ལས་ཁུངས་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/22-2/2013-14/1004

Date: 25/02/2014

FOREST CLEARANCE

The Zhemgang Division, Department of Forest and Park Services, Ministry of Agriculture & Forest is pleased to issue Forest Clearance of drift work (underground) measuring length of 350m and 30m in favor of **Nikachhu Hydropower Project** with the following terms and conditions:

The clearance is issued as per the approval from the Department vide No.DoFPS/Ka-3-2/2013/594 dated 31/08/2013

1. This clearance is limited to forestry perpestive as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought piror to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time acitivity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. The trees and poles generated should be handed over to NRDCL for extraction and disposal as per the F&NCAR, 2008;
15. This clearance shall be veiled till **one year** from the date of issue and subjected to the periodic review and changes.



མངའ་སྡེ་ནགས་ཚལ་ཡི་གཙུག་ལག་ཁང་།

གཞུང་མཁན་པོ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;

The clearance is issued as per the field report submitted by Unit In-Charge, Chendebji FMU vide Ref.No.CFMU/DoF/22/2013-2014/25 dated 22/10/2013.

(Ugyen Tenzin)
Chief Forestry Officer

Copy to:

1. The Dasho Dzongda, Trongsa Dzongkhag Administration for kind information
2. The Project Manager, Nikachhu Hydropower Project, Trongsa for information.
3. The Unit In- Charge, Chendenbji Forest Management unit for information
4. Office copy

Copy to
1) Div (P)
2) Head, ~~Conservation~~
31/3/14



དབལ་ཕན་འབྲུག་གཞི་རིག་པ་དང་ནུབ་ཚལ་ལྷན་ཁག། རྒྱལ་ཚལ་དང་གླིང་ཀྱི་ཞབས་ཏོག་ལས་ཁུངས།

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
THIMPHU



No. DoFPS/Ka-3-2/2013/ 594

October 31, 2013

The Chief Forest Officer
Zhemgang Forest Division.

Sub: Approval for issuance of Forestry Clearance

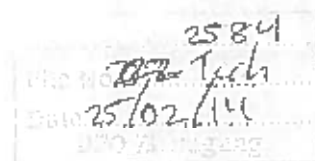
As recommended by your Office letter No. 453 dtd 28/10/2013, approval is hereby accorded as per the annexure 18(d),(6) for proposed clearance of drift work (underground) measuring 350 metres length and 30metres in favour of NHPP, DGPCCL.

Therefore, you are asked to issue the forest clearance for above activity from your end as per the existing guidelines. The trees and poles within the transmission alignment should be handed over to NRDCL for extraction & disposal as per the F&NCAR, 2008.

(Chencho Norbu)
Director General

Copy to:

1. The CFO, FRMD information.
2. PA to Director General, DoFPS for record.



Tenzin / Tshering
25/10

PAVED

4/11/12



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གཞུང་མཁུ་སྤྱོད་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



RFD/TECI/22/2013-14/453

Date: 28/10/2013

To
The Hon'ble Director General
Department of Forest and Park Services
Thimphu, Bhutan.

Subject: Forwarding Clearance in favor of NHPP, DGPCCL

Dasho,

We have an honor to forward an application in favor of Nikachhu Hydropower Project under Tungsibji Gewog, Trongsa Dzongkhag. The applicant has proposed for clearance to carry out drift work measuring length of 350m and 30 m. As per the information, the work shall be carried out exclusively underground. The field report shows that no massive damage is foreseen in future regarding the drift work.

Therefore, necessary approval may be accorded in favour of the applicant.

Enclosed: Field report

Yours Faithfully,

(Dgyen Tenzin)
Chief Forest Officer

cc:

1. Project Manager, Nikachhu Hydropower Project, Tungsibji Gewog, for kind information
2. The Unit Incharge, Chendebjee for information and necessary action.

OIC



མངའ་སྡེ་ནགས་ཚལ་ཡི་གཙུག་ཁག་

གཞུང་ལམ་སྒྲུབ་ཁག་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



No.2FD/Tech/03/2013-2014/1001

26th February 2014

FOREST CLEARANCE FOR DEVELOPMENTAL ACTIVITY

In exercise of authority granted by the Forest and Nature Conservation Amended Rules 2008, the Zhemgang Forest Division is please to issue Forestry Clearance for submergence of Nikachu at Dam site covering 22,800sq.m in favour of Nikachu Hydropower Project under Trongsa Dzongkhag. This has been issued with following terms and conditions.

1. This clearance is limited to forestry perpestive as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought piror to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time acitivity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the Waste Prevention and Management Regulation, 2012;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. This clearance is valid upto one year from the date of issue and subject to the periodic changes.

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government.



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁ་ཚང་།

གསལ་མཛུགས་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



This is issued based on field report submitted the Unit Incharge, Chendepji vide letter no. CFMU/DoF/22/2013-14/52 dated 31st January 2014

(Ugyen Tenzin)
Chief Forestry Officer

CC to:

1. The Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information.
2. The Gup, Tangsbi Gewog Administration for information.
3. The Unit Incharge, FMU-Chendepji for information and necessary action.
4. The Project Manager, Nikachu Hydropower project for information.
5. Office copy.

Copy to
11 Dir (P)
21 Head, Forest
31/3/14



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁའ་

གཞུང་མ་རྒྱུ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



No.ZFD/Tech/03/2013-2014/1002

26th February 2014

FOREST CLEARANCE FOR DEVELOPMENTAL ACTIVITY

In exercise of authority granted by the Forest and Nature Conservation Amended Rules 2008, the Zhemgang Forest Division is please to issue Forestry Clearance for Muck Disposal site covering 24,600sq.m in favour of Nikachu Hydropower Project under Trongsa Dzongkhag. This has been issued with following terms and conditions.

1. This clearance is limited to forestry perspective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought prior to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time activity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly disposed as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRP land shall be released only after proper hand in taking note signed by the parties;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. This clearance is valid upto one year from the date of issue and subject to the periodic changes.

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government.



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁ་ཚད།

གསལ་མཛུགས།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



This is issued based on field report submitted the Unit Incharge, Chendepji vide letter no. CFMU/DoF/22/2013-14/52 dated 31st January 2014


(Ugyen Penzin)
Chief Forestry Officer

CC to:

1. The Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information.
2. The Gup, Tangsbi Gewog Administration for information.
3. The Unit Incharge, FMU-Chendepji for information and necessary action.
4. The Project Manager, Nikachu Hydropower project for information.
5. Office copy.

Copied to
1) Div (P)
2) Head. (P)
3/3/14



1
**OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES**



ZFD/TECH/03/2013-14/1626

Date: 30/06/2014

FOREST CLEARENCE (Developmental Activity)

The Zhemgang Division, Department of Forest and Park Services, Ministry of Agriculture & Forest is pleased to issue Forest Clearance for proposed access road construction in following areas of Nikachu Hydropower Project in favor of Director(Project), Druk Green Power Corporation, Thimphu.

Sl.no	Purpose	Location	Length	Remarks
1	Access road to Adit-V	Near Thumendra	500X8.5 metres	Take off point from Thimphu-Trongsa High Way
2	Access road to Power House	Norboudi	3900X8.5metres	Only alignment passess through GRF Land
3	Access road to Adit III	Namgeycholing School along Tangsibji farm road	2500x8.5 metres	Through GRF land

The clearance is issued as per the approval of the Department vide approval No.DoFPS/Ka-3-1/2014/2047 dated June 19,2014 on following terms and conditions:

1. This clearance is limited to forestry perpestive as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought piror to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time acitivity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;

10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. This clearance is valid upto one year from the date of issue and subject to the periodic changes.

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;

This is issued as per field inspection report submitted by Range Officer, Panbang Range vide no.PBR/3-1/2013-2014/148 dated 21/04/2014.


(Ugyen Tenzin)
Chief Forestry Officer

CC to:

1. The Dasho Dzongdag, Trongsa for kind information.
2. The Project Manager, Nikachu Hydro Power Project for information.
3. The Gup, Gewog Administration, Tangsibji for information.
4. The Range Officer, Trongsa Range for information and necessary action.
5. Office copy.



འབྲུག་རྒྱལ་ཁབ་ཀྱི་རྒྱལ་པོ་ལྷན་ཁྲིམས་ཀྱི་འཕྲུལ་འཁྲུག་ལྷན་ཁྲིམས་

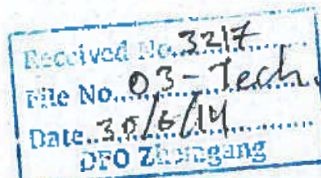
Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
THIMPHU



No. DoFPS/Ka-3-1/2014/ 2047

June 19, 2014

The Chief Forestry Officer,
Zhemgang Forest Division.



Sub: Approval for issuance of Forestry Clearance

On the strength of field report submitted by your office, vide letter No. 1540 on dated 06/06/2014, the approval is hereby accorded as per the annexure 37 for issuance of Forest Clearance for proposed access road construction in the following areas of Nikachu Hydropower Project in favour of Director (Projects), Druk Green Power Corporation, Thimphu.

SLNo.	Purpose	Location	Length	Remarks
01	Access road to Adit-V	Near Thumendra	500x8.5meter	Take off point, from Thimphu-Tromsa high way.
02	Access road to power house	Norboudi	3900x8.5meter	Only alignment passes through GRF land.
03	Access road to Adit III	Namgeychoing school along Tangbji farm road.	2500x8.5meter	Through GRF land.

Therefore, you are instructed to issue the forest clearance for above activity from your end as per the existing guidelines. The trees and poles within the proposed road alignment should be handed over to NRDCL for extraction & disposal as per the F&NCAR, 2008.

(Chencho Norbu)
Director General

Copy to:

The PA to Director General, DoFPS for record.

Subimal
for *wa*
3076



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གཞུང་མ་སྐྱུང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



No.ZFD/Tech/03/2013-2014/1064

5th March, 2014

FOREST CLEARANCE FOR DEVELOPMENTAL ACTIVITY

The Department of Forest and Park Services has kindly accorded Forest Clearance Approval for Development of Muck Disposal area near Badelachu and access road construction to Adit II in favor of Nikachu Hydro Power Project, Trongsa Dzongkhag. This has been issued with following terms and conditions.

1. This clearance is limited to forestry perspective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought prior to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time activity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
14. This clearance is valid upto one year from the date of issue and subject to the periodic changes.

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government.

9/6



མངའ་སྡེ་ནགས་ཚལ་ཡིག་ཚང་།

གཞུང་མཚན་པ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



This has approval vide no.DoFPS/Ka-6/2014/1353 dated 4th March 2014 of the Offtg.Director General, Department of Forests and Park Services, Thimphu.


(Ugyen Tenzin)
Chief Forestry Officer

CC to:

1. The Dasho Dzongdag, Dzongkhag Administration, Trongsa for kind information.
2. The Gup, Tangsibi Geog for information.
3. The Unit Incharge, Chendepji for necessary action.
4. Office copy.
5. *Nikachu Hydro Power Project*



Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
THIMPHU



No. DoFPS/Ka-6/2014/ 1353

March 4, 2014

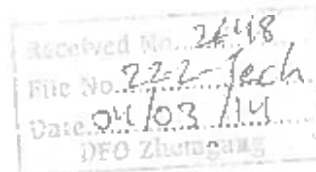
The Chief Forest Officer
Zhemgang Division

Sub: Approval for issuance of Forestry Clearance

As recommended by your letter no.1045 dated 27/02/2014, approval is hereby accorded for proposed development of Muck disposal area measuring 72,996m², at Badelachu and access road construction to Adit II measuring 1,716mX8.5m in SF land, in favour of Nikachu Hydro Power Project, Trongsa Dzongkhag.

You may therefore; take further necessary action from your end accordingly and the trees and poles should be handed over to NRDCL for extraction & disposal as per the F&N CAR, 2008.

(Shacha Dorji)
Offg. Director General

**Copy to:**

PA to Director General, DoFPS for record.



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁྲུང་།

གཞུང་མཐོ་རྒྱུ་

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



ZFD/TECH/03/2013-14/1521

Date: 5/06/2014

FOREST CLEARENCE (Developmental Activity)

The Zhemgang Forest Division, Department of Forest and Park Services, Ministry of Agriculture & Forest is pleased to issue Forestry Clearance for construction of transmission line from NHPC till Yurmo, under Langthel Gewog

The clearance is issued as per the approval of the ministry/ Department/ as per FNCR, 2006 rule no. Chapter XIII, section 9(3) on following terms and conditions:

1. This clearance is limited to forestry perpective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall subject to obtaining other relevant clearance;
4. Additional clearance should be sought prior to any deviation of the activity/area;
5. This clearance shall not be liable for any dispute arising during the implementation of activity;
6. This clearance is limited within the proposed area for specific time acitivity;
7. Any damage cause to Public/Private property shall be borne by holder of this clearance;
8. Any waste generated from the activity should be properly dispose as per the **Waste Prevention and Management Regulation, 2012**;
9. The existing Forest produce shall be disposed as per the existing rules and regulation;
10. The legal status of the land shall remain unchanged and on any occasion the land shall not be converted to private ownership;
11. The GRF land shall be released only after proper hand in taking note signed by the parties ;
12. This clearance shall not restrict easement;
13. No trees should be felled in the area.
14. This clearance shall be revoke without any liability on any part of Government if the holder of the clearance violates any of the above terms and conditions;
15. This clearance is valid upto one year from the date of issue and subject to the periodic changes.

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;



མངའ་སྡེ་ནགས་ཚལ་ཡི་ཁྲུང་།

གཞུང་མཁའ་ཁྲུང་།

OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES



This is issued as per field inspection report submitted by Range Officer, Trongsa Range vide no. TR/ADM/2-4(a)/2013-2014/474 dated 03/06/2014.


(Sonam Rinchen)

Offt. Chief Forestry Officer

CC to:

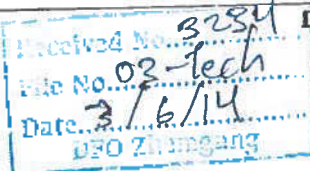
1. Nikkachhu Hydro Power Authority for information.
2. The Gup, Langthel Gewog Administration for information.
3. The Range Officer, Trongsa Range for information and necessary action.
4. Office copy.



འབྲུག་རྒྱལ་ཁབ་གསུམ་གྱི་རྒྱལ་ཁབ་ཆུང་གི་འཛིན་སྐྱོང་པའི་འཕྲིན་ལྷན་ཁང་།
 Office of the Forest Range Officer
 Trongsa Forest Range
 Zhemgang Forest Division



No. TR/ADM/2-4(a)/2013-2014/ 474



Date: 03/06/2012

To,
 The Chief Forest Officer,
 Divisional Forest Office,
 Zhemgang.

Subject: Forestry Clearance for Transmision line of Nlkkachhu Project from NHPC till Yurmo, Langthel.

Sir,
 As the DGPC is carrying out the study on Transmission line from NHPC Power House till Yurmo, Langthel. They are approaching for clearances to study and for loan from Asian Development Bank (ADB).

In this regard you may kindly issue the clearances as they have no tree to fall.

Therefore, necessary Forest Clearance may kindly be issued from your good office for the above stated purpose.

Thanking you,
 Yours Faithfully,

(Pema Wangchen)
 Range Officer
 Forest Range Officer
 Trongsa Range

Copy to:-

1. The Gup, Nubi, Drektang and Langthel, Beat Office for information.
2. The Beat In-Charge, Nubi, Drektang and Langthel, Beat Office for information & necessary monitoring.
3. Office Copy.

**Clearances for Construction Power (33 kV, 5 km from
Banglapokto to Intake)**



དཔལ་ལྷན་འབྲུག་གཞུང་།
 འབྲུག་མི་འགུར་རྩོམ་འཁོར་རབ་བརྟན་ཅེ། རྫོང་ཁག་བདག་སྐྱོང་།
ROYAL GOVERNMENT OF BHUTAN
DISTRICT ADMINISTRATION
Chhoetse-dzong: Trongsa

DAT/DEC-17/2014/ 3543 .


January 24, 2014

DZONGKHAG ADMINISTRATIVE APPROVAL

In exercise of the powers delegated under the National Environment Protection Act 2007, of the National Environment Commission Secretariat, Section 47, which mandates the Dzongkhag Environment Committee (DEC) as one of the Competent Authorities in Making recommendations to the concerned Ministries, Local Governments, and /or to the Secretariat concerning any measures that need to be taken to protect the quality of the Environment. Also, Dzongkhag Administration is mandated to issue the Dzongkhag Administrative Approval as per the Section 3.10 of Application for Environmental Clearance Guideline; the **Dzongkhag Administrative Approval is hereby accorded in favor of Nikachhu Hydropower Project as per the 5th Dzongkhag Environment Committee meeting held on January 23, 2014 for Construction of 5 km, 33kV Transmission line for 118MW Nikachhu Hydropower Project with following terms and conditions:**

1. Applicant to execute the work as per The Land Act 2007.
2. Applicant to execute the work as per Waste Prevention and Management Regulation 2012.
3. Applicant to carry out the transmission line construction along the National Highway RoW, along the edges of the Royal Tsamdro as recommended by the DEC during the field visit.
4. The Applicant to maintain the Zhunglam (Footpath) and maintain 5meters RoW for the Existing Zhunglam (footpath) for the construction of the transmission line.
5. Applicant to ensure that restoration works are carried out after the completion of the construction.
6. The said transmission line construction to benefit the community of Sephuchen (Ngala and Dangla)
7. The Dzongkhag Administrative Approval is accorded only for obtaining Environmental Clearance and does not include Social Clearance, Forestry Clearance, if required thereof;
8. The Dzongkhag Administrative Approval for the said activity is within the jurisdiction of Trongsa Dzongkhag.

Further, this Dzongkhag Administrative Approval will stand valid till obtaining the Environment Clearance from the Competent Authority.


 (Tshewang Rinzin)
 Chairman

Dzongkhag Environment Committee

Copy to:

1. The Director (Projects), Druk Green Power Corporation Limited, Thimphu for kind perusal.
2. The Chief Environment Officer, ESD, NECS, Thimphu for kind information.
3. The Range Officer, Range Office, Tshangkha for kind information.
4. The Gup, Tangsibji gewog Administration for kind information.
5. The Environment Officer, Nikachhu Hydropower Project, Trongsa for kind information and necessary action please.
6. Office Copy.

A handwritten signature in blue ink, appearing to be 'U. M. ...', is written over the printed name 'U. M. ...'. The signature is stylized and somewhat illegible.

3. ຊຸມນາມຂັ້ນນີ້ເປັນສະໄໝຂອງການປ່ຽນແປງໃນການເຮັດ
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Tshogpa
 Tshangkha Chewog
 Tangsibi Geog

Tshogpa
 Chendi Jee Chewog
 Tangsibi Geog

Tshogpa
 Ngyala Dangla Chewog
 Tangsibi Geog

Tshogpa
 Tangsibi Chewog
 Tangsibi Geog

3. જુનાગઢ જિલ્લાના રૂ. ૧૦૦.૦૦ ના બેંકના પાસાના પાસા

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૨	પાસા -	— ૧૫ —	૨૫
૩	પાસા પાસા -	— ૧૧ —	૨૫
૪	કુલ -	— ૧૧ —	—
૫	વર્તમાન -	— ૨૫ —	—
૬	કુલ -	— ૧૧ —	—
૭	કુલ -	— ૧૧ —	—



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འབྲུག་གཞི་རྒྱུ་ཁྲིམས་ལུགས་

གཞན་པོ་མཁུ་སྤྱོད་



OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES

ZFD/TECH/22-2/2013-14/006

Date: 04/02/2014

FORESTRY CLEARANCE

The Zhemgang Division, Department of Forests & Park services, Ministry of Agriculture & Forests is pleased to issue Forest Clearance for **Construction of Transmission Line measuring 5km length and 12m wide from Banglapokto to Dam site of NHPP** via biological corridor of JSWNP & JSWNP in favor of Nikachu Hydro Power Project, Trongsa

This clearance is issued as per the approval from the Department vide letter no.DoFPS/ka-3-2/2014/1038 dated 9th January 2014.

This clearance is limited to forestry perspective as per the detail field report;

1. This clearance is not transferable;
2. The validation of this clearance shall be subject to obtaining other clearances;
3. Additional clearances should be sought prior to any deviation of the activity area;
4. This clearance shall not be liable for any dispute arising during the implementation of activity;
5. This clearance is limited within the proposed area for specific one time activity;
6. Any damage caused to public /Private property shall be borne by the holder of this clearance;
7. Any waste generated from the activity should be properly disposed as per the Waste Prevention and Management regulation, 2012;
8. The existing Forest produce shall be disposed as per the existing rules and regulation;
9. Upon approval of GRF land on lease, the proponent and concerned authority should execute lease agreement for the intended activity. A copy of lease agreement should be forwarded to concerned Forest Division;
10. The legal status of the land on lease shall remain unchanged and shall not be converted to private ownership/mortgaged/sub lease /sold;
11. This clearance shall not restrict easement;
12. Upon expiry/annulment of the GRF land on lease, the GRF land should be restored to original and handed over to DoFPS as per F&NCR;
13. The renewal of the clearance is subject to performance of the activity;
14. The GRF land shall be released only after the proper handing taking note signed by the both the parties.
15. This clearance shall be revoked without any liability on part of Government if the holder of this clearance violates any of the above terms & conditions;
16. This shall be valid till **one year** from the date of issue and subject to the periodic review and changes.



ཨ་ལཱ་ཁྲུང་གི་འཕགས་པ་ལྷན་ཁག་

གཞུང་ལྷན་



OFFICE OF THE CHIEF FORESTRY OFFICER
ZHEMGANG FOREST DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES

Non-compliance of any of the above mentioned conditions is a violation of the Forest and Nature Conservation Act 1995 and its Rules 2006 and amended Rules 2008 and any other relevant laws. This shall result in revocation/suspension of the Forestry Clearance, in part or in whole and the penalties enforced as per the Act without any liability on the part of the government;

This is issued as per field inspection report submitted by Unit In charge, CFMU vide no.CFMU/DoF/22/ 2013-14/37 dated 25/12/2013.

(Ugyen Tenzin)
Chief Forestry Officer

Copy to:

1. The Dasho Dzongdhag, Dzongkhag Administration, Trongsa for kind information.
2. The Gup, Geog Administration, Tangsibgi Gewog for kind information.
3. The Project Manager, NHPP, Trongsa for information.
4. The Unit In charge, CFMU for information.
5. Office copy.



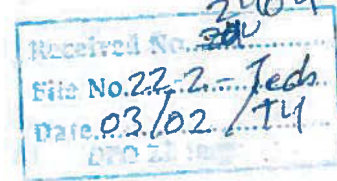
Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
THIMPHU



No. DoFPS/Ka-3-2/2014/ 1038

January 9, 2014

The Chief Forest Officer
Zhemgang Forests Division.



Sub: Approval for issuance of Forestry Clearance

As recommended by your office letter no. 727 dated 31/12/2013, the approval is hereby accorded as per the annexure 18(d),(6) for issuance of Forest Clearance for proposed re-alignment of 33kv transmission line passing through the SRF land measuring 5km length & 12metres wide, from Banglapokto to Damsite of NHPP via biological corridor of JSWNP & JDWNP in favour of NHPP, Trongsa.

Therefore, you are asked to issue the forest clearance for above activity from your end as per the existing guidelines. The trees and poles within the transmission alignment should be handed over to NRDCL for extraction & disposal as per the F&NCAR, 2008.


(Chencho Norbu)
Director General

Copy to:

1. The CFO, WCD information.
2. PA to Director General, DoFPS for record.

Subimal
for na
Wk 3/2