ENVIRONMENTAL IMPACT ASSESSMENT (EIA) & ENVIRONMENTAL MANAGEMENT PLAN (EMP) STUDY

NAYING HYDRO ELECTRIC PROJECT (1000 MW)

(Sector 1(c); Cat "A")

September, 2025

EXECUTIVE SUMMARY

Prepared for:

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QCI Certificate No.	**NABET/EIA/22-28/RA 0415**
Laboratory	**AGSS Analytical and Research Lab (P) Ltd.** **An ISO-9001: 2015 Accredited Laboratory** **(NABL Accredited Testing Laboratory)**
Baseline Data Monitoring Period	**Post Monsoon (September 2024)** **Winter (December 2024)** **Pre Monsoon (April 2025)**

1. INTRODUCTION

The Environmental Impact Assessment (EIA) for the 1000 MW Naying Hydroelectric Project in Shi Yomi and Siang districts of Arunachal Pradesh has been undertaken to evaluate the project's potential impacts on the physical, biological, and socio-economic environment. The study assesses baseline environmental conditions in and around the project area, predicts likely impacts during construction and operation phases, and recommends appropriate mitigation and management measures. The EIA ensures that environmental considerations are integrated into project planning and decision-making, as required under the EIA Notification of September 2006, which governs the environmental clearance process for such projects.

2. CHRONOLOGY OF PROJECT PROGRESS

Initially allotted to private developers by the Government of Arunachal Pradesh over 15 years ago, Naying HEP saw limited progress. In April 2021, the state government terminated the MoAs of non-performing private developers, and in January 2023, the project was formally handed over to NEEPCO as part of basin-wise reallocation directed by the Ministry of Power, Government of India. A fresh MoA for the development of the project was signed between NEEPCO and the state government on 12 August 2023. Prior to its transfer, the project had undergone detailed investigations including preparation of the DPR, EIA/EMP studies, and a public hearing held on 11 May 2012. The DPR was concurred by the Central Electricity Authority (CEA) on 11 September 2013, with the concurrence later transferred to NEEPCO in October 2023 and made valid up to 30 September 2025. The 66th meeting of the EAC reviewed the project in May 2013, and the Ministry later directed strict adherence to environmental flow requirements and spatial configuration as per the Siang Basin Study. Power Potential Studies revised accordingly were approved by CEA on 29 March 2022.

The project was discussed by the Expert Appraisal Committee (EAC) in the meeting of 27th June 2024 where scoping clearance was recommended. Scoping clearance letter was issued by Ministry of Environment, Forest & Climate Change (MOEF&CC) vide **TOR Identification No.** TO24A0501AR5925513N and **File No.** J-12011/37/2007-IA-I (R) dated 07/08/2024. Naying H.E. Project with 1000 MW power generation capacity, falls under Category A, as listed at item 1(c) of the Schedule to EIA notification

3. PROJECT DESCRIPTION

Naying Hydroelectric Project (1000 MW) is a run-of-the-river scheme proposed on the Siyom River, a tributary of the Siang, in the Shi Yomi and Siang districts of Arunachal Pradesh, near Yapik village. The project comprises a concrete gravity dam (108 m high dam from river bed) with a full reservoir level (FRL) at El 805 m, a 10.6 km long head race tunnel, a 28 m diameter restricted orifice open to sky type surge shaft, four steel-lined pressure shafts, and a 465 m long tail race tunnel. Power will be generated through an underground powerhouse complex housing four vertical axis Francis turbine units of 250 MW each. Other associated structures include intake works, diversion tunnels, coffer dam, transformer cavern, valve chamber, pot head yard, and access roads. **Table 1** gives the salient features and **Figure 1** gives the layout map of Naying H.E. Project.

Table 1: Salient features of Naying H.E. Project

A	**LOCATION**	
	State	Arunachal Pradesh
	Districts	Shi Yomi & Siang
	River	Siyom
	Coordinates	
	Dam Site	28°31'10"N, 94°30'25"E
	Powerhouse	28°31'53.60"N, 94°33'54.30"E
	Nearest Airport, Domestic	Dibrugarh, Assam (301 Km from Project)
	Nearest Airport, International	Guwahati, Assam (715 Km from Project)
	Nearest Rail head (Broad gauge)	Silapathar, Assam (241 Km from Project)
B	**HYDROLOGY**	
	Catchment Area at diversion site	2760 sq km
	Design Flood (PMF)	8270 cumec
	Location of Catchment	Siyom river is a tributary of Siang River in Brahmaputra Basin of Arunachal Pradesh
	Riparian or Ecological flow d/s of Dam	As per Approved Basin Study Report.
C	**CIVIL WORKS**	
	Reservoir	
	Full Reservoir level (MWL/ FRL)	El. 805 m
	Minimum Draw Down Level (MDDL)	El. 800 m
	Live Storage at FRL	52.57 MCM
	Submergence at FRL i.e. EL 805.0m	160 ha
	Diversion Tunnels	
	Number	4 Nos. (2 nos. DT-I & DT-II on left bank and 2 nos. DT-III & DT-IV on right bank)
	Diameter & shape	10.6 m diameter, Circular in shape
	Length	DT-I (1003m), DT-II (1083m), DT-III (761m) & DT-IV (862m)
	Diversion discharge (1 in 25 year)	4793 cumec (Monsoon)
		2500 cumec (non-monsoon)
	Diversion tunnel gates	2 vertical lift gates in each tunnel 4.2m (W) x 10.6 m (H)
	Coffer Dam	
	Type	Concrete face rock fill dam
	Height of u/s Coffer Dam	±29.5 m (Above River Bed)
	Height of d/s Coffer Dam	±8.5 m (Above River Bed)
	Main Dam	
	Type	Concrete gravity
	Dam top m	El 808.0 m
	River bed level at dam site	El 700.0 m
	Max. dam height (above deepest foundation level)	138.0 m
	Length of dam at top	317.0 m
	Dam height (above river bed level)	108.0 m
	Spillway	
	Design flood	8270 cumec
	Crest elevation (Main Spillway -Low Level)	740m
	Crest elevation (Auxiliary Spillway- Upper level)	802 m
	Type:	
	Main Spillway Auxiliary Spillway	Sluice Spillway Chute Spillway
	Number & size of spillway opening	
	a) Lower level (W x H)	4 nos. (8.0 m x 12.8 m)
	b) Upper level (W x H)	1 no. (6.0 m x 3.2 m)
	Energy Dissipater	Trajectory Bucket Type
	Power Intake	

	Numbers	1 no.
	Number of Openings	2 nos.
	Size of opening (W x H)	6.5 m x 7.5 m
	Trash rack sill level	778.0 m
	Intake invert elevation	781.0 m
	Trash rack inclination	780 with horizontal
	Head Race Tunnel	
	Number	1 no.
	Size & Type	10.6 m dia. Circular (finished)
	Maximum Discharge During Monsoon Period	424.5 cumec
	Design Discharge	424.5 cumec
	Length	7080 m
	Surge Shaft	
	Number	1 no.
	Type	Open to Sky
	Size & Type	28m dia. Circular (finished)
	Vertical Shaft Height	89.1 m
	Pressure Shaft	
	Type	Underground
	Number	4 nos. (PS-1, PS-2, PS-3 & PS-4)
	Type	Steel lined
	Diameter	4.5 m (finished)
	Length	PS-1 & PS-4 (390.50m) and PS-2 & PS-3 (369.50m)
	Type of Steel & Thickness	ASTM-537 Grade-II, Thickness varies from 18mm to 32mm
		SAILMA-600HI, Thickness 36mm
	Valve Chamber	
	Type	Underground
	Size (W x H)	10 m x 24.45m
	Length	105.0m
	Penstock Erection Chamber (Top)	
	Type	Underground
	Shape & Size (W x H)	Modified D-shaped, 8.0 m x 10.0m
	Length	105.0m
	Penstock Erection Chamber (Bottom)	
	Type	Underground
	Shape & Size (W x H)	Modified D-shaped, 8.0 m x 10.0m
	Length	97.0m
	Powerhouse	
	Type	Underground
	Number of caverns	1 no.
	Allotted Tail water level to Naying HEP	520.0m
	Normal tail water level (all units running at full load) at collection gallery with invert level at TRT outfall as 520.00m	528.40m
	Minimum tail water level at collection gallery (one machine at 10% load)	520.72m
	Turbine axis elevation	514.0m
	Type of turbine	Francis: Vertical Axis
	Generating units	4 x 250 MW
	Shape & Size (W X H)	Modified D-shaped, 23.0m x 54.22m
	Length	181.0 m
	Design discharge (For Each Unit)	
	a) Monsoon period	106.125 cumec (Each unit)
	b) Non-Monsoon period	104.75 cumec (Each unit)
	Main Inlet Valve	

	Type	Spherical
	Number	4 nos.
	Axis elevation (300 inclined entry of penstock in powerhouse)	514.0m
	Bus Duct	
	Shape	D-shaped
	Size (W x H)	5.0 m x 6.0 m
	Number	4 nos.
	Transformer Cavern & GIS	
	Type	Underground
	Number of caverns	1 no.
	Shape & Size (W x H)	Modified D-Shaped, 16.5 m x 25.50m
	Length	163.60 m
	GIS	Double Bus Bar type, underground, proposed inside the Transformer Hall
	Collection Gallery	
	Type & Shape	Underground, Modified D-Shaped
	Number of Cavern	1 no.
	Width	4.0 m (El 514.0 to El 534.00m)
		16.5m (El 534.0 to El 547.50m)
	Height	33.5m
	Length	120.5 m
	Invert Elevation	514.0m
	Number of draft tube tunnels (extension of draft tube to collection gallery)	4 nos.
	Length of Draft tube tunnels	91.5 m
	Size (W x H)	13.75m x 5.76m
	Tail Race Tunnel	
	Type	Underground
	Number	1 no.
	Shape & size	Modified D-shaped, 11 m wide & varying height
	Length	464.9m
	Pothead Yard	
	Type and Size	Surface Pothead Yard (190m x 61m)
	Control Room & 11KV SY	85m(L) x 20m(W)
D	**HYDRO MECHANICAL EQUIPMENT**	
	Spillway Radial Gates	
	Number of gates	4 nos.
	Size of gates	8.00 m span x 13.025 m high
	Type of Hoist	Twin Hydraulic cylinders
	Operating conditions	Opening and closing under unbalanced head conditions and flowing water.
	Spillway Stoplogs	
	Type of stoplog	Vertical lift slide type
	Number of stoplog	1 no.
	Number of openings	4 nos.
	Size of opening (W x H)	8000 mm x 21320 mm
	Type of Hoist	Gantry crane using a lifting beam
	Operating conditions	Opening & closing under balanced head conditions
	Auxiliary Spillway Gate	
	Type of gate	Vertical lift fixed wheel type
	Number of gates	1 no.
	Number of openings	1 no.
	Size of opening (W x H)	6000 mm x 3200 mm
	Type of Hoist	Common gantry crane operating spillway stoplog units

	Operating conditions	Opening under unbalanced head condition and closing against flowing water and unbalanced head
	Emergency Auxiliary Spillway Gate	
	Type of gate	Vertical lift fixed wheel type
	Number of gates	1 no.
	Number of opening 1 no.	1 no.
	Size of opening (W x H)	6000 mm x 3200 mm
	Type of Hoist	Common gantry crane operating spillway stoplog units
	Operating conditions	Opening under unbalanced head condition and closing against flowing water and unbalanced head condition
	Diversion Tunnel Gates	
	Type of gate	Vertical lift fixed wheel type
	Number of openings	8 nos. (two openings in each tunnel)
	Number of gates	8 nos.
	Size of opening (W x H)	4200 mm x 10600 mm
	Operating condition	Closing against flowing water and unbalanced head condition
	Trash Racks for Power Intake	
	Number of Openings	5 nos.
	Size of opening (W x H)	4.4 m span x 30.00 m vertical
	Sill Level	778.0 m
	Trash rack inclination	78^0 with horizontal
	Intake Gates	
	Type of gate	Vertical lift fixed wheel type
	Number of openings	2 nos.
	Number of gates	2 nos.
	Size of opening (W x H)	6500 mm x 7500 mm
	Type of Hoist	Electrically operated rope drum hoist
	Operating conditions	Opening under balanced head condition created by crack opening and closing under unbalanced head condition and flowing water
	Intake Bulk Head Gate	
	Type of gate	Vertical lift slide type
	Number of openings	2 nos.
	Number of gates	2 nos.
	Size of opening (W x H)	6500 mm x 7500 mm
	Type of Hoist	Electrically operated rope drum hoist.
	Operating conditions	Raising & lowering will be done under balanced head condition
	Draft Tube Gates	
	Type of gate	Vertical lift slide type
	Number of openings	8 nos. (two openings in each draft tube tunnel).
	Number of gates	8 nos.
	Size of opening (W x H)	6000 mm x 5760 mm
	Type of Hoist	Gantry crane of 25T capacity by using lifting beam.
	Operating conditions	Opening and closing under balanced head conditions achieved with a provision of bypass piping
	Adit gates	
	Type of gate	Hinged type
	Number of openings	2 nos.
	Number of gates	2 nos. (Adit-2 & Adit-3)
	Size of opening (W x H)	2200 mm x 2200 mm
	Type of Hoist	Manual operation
	Operating conditions	Opening & closing under empty water condition
E	**ELECTRO MECHANICAL EQUIPMENT**	

	Turbine	
	Type of Turbine	Francis: Vertical Axis
	Number of turbines	4 nos.
	Maximum gross head (One machine running at 10% load)	284.28 m
	Minimum gross head (All machines running at full load)	271.60 m
	Rated net head	261.50 m
	Rated Output	250 MW
	Generator	
	Type of Generator	Semi-Umbrella type
	Rated power	277.78 MVA
	Power factor	0.9
	Generator Voltage	15.75 ± 10% kV
	Number of Phases	3 Phase
	Frequency	50 ± 5% Hz
	Insulation	Class F type
	Type of Cooling	Closed, re-circulating cooling system with surface air cooler
	Transformer	
	Number of Transformer	13 nos. single phase transformers (one stand by)
	Step Up Transformer	Single phase, 102 MVA, 15.75/420√3 kV
	Bus Reactors (Indoor)	1 no., 3 phase, 400kV, 80 MVAR
	EOT Cranes	
	320/32/10 T	2 nos. in Power House
	80/20T	1 no. in valve chamber
	10 T	One in GIS building
F	**POWER EVACUATION**	
	From GIS to outdoor pothead yard through XLPE cable	
	Pot head yard	Surface
	Line Reactors (outdoors	2 nos. three phase, 400kV, 50 MVAR each
G	**COST ESTIMATE**	
	Hard Cost at April 2023 Price Level	Rs. in Crores
	Civil & HM	6409.37
	E & M	1522.2
	IDC	1626.95
	Total (Present Day)	**9558.52**
	Civil & HM	6409.37
	E & M	1522.2
	IDC	1937.39
	Escalation	1966.9
	Total (Completed cost)	**11835.86**
H	**CONSTRUCTION PERIOD**	**6.0 Years (Excluding 1.5 years for preconstruction activities)**
I	**POWER GENERATION**	
	Energy generation in 90% Dependable Year	3809 MU
	Energy generation in 50% Dependable Year	3995 MU
	Free power to home State	12% Additional 1% for local area development fund
J	**TARIFF**	
	1st year tariff	5.05 (Rs./kWh)
	Levelized tariff	4.94 (Rs./kWh)

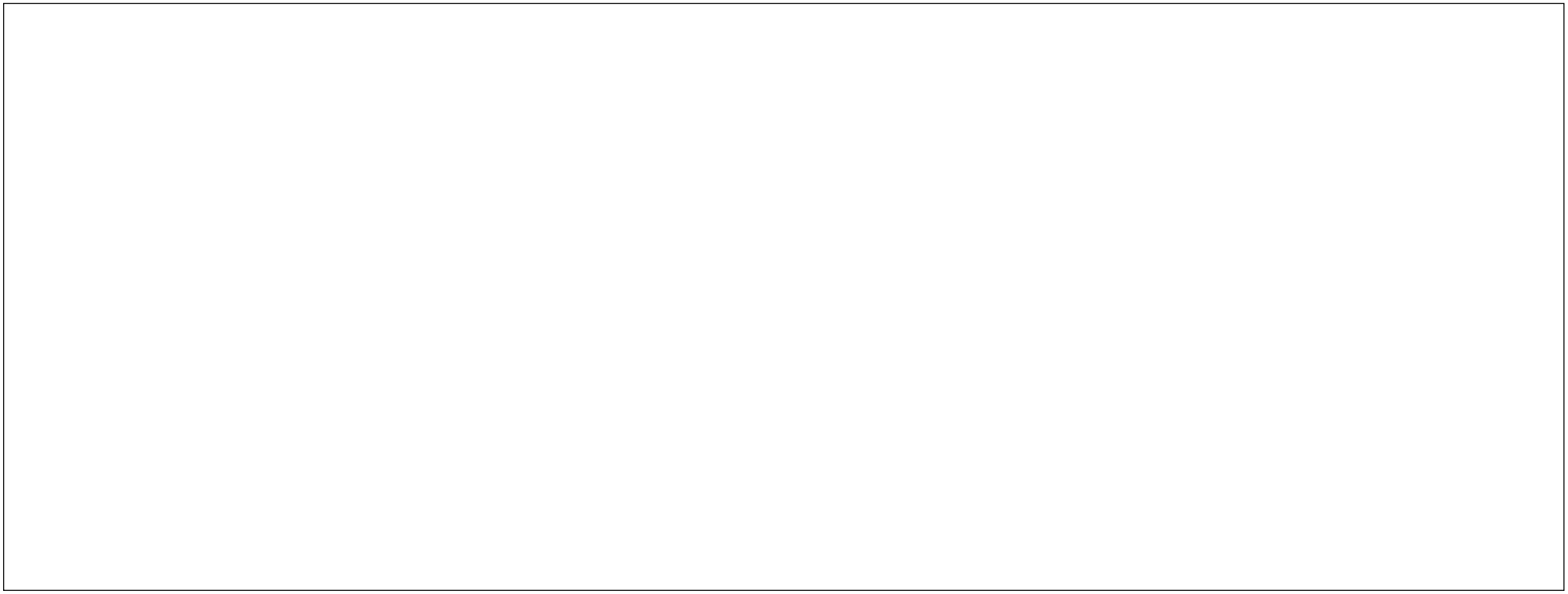

Figure 1: Layout map of Naying H.E. Project

4. LAND REQUIREMENT

The total requirement of land for the project is 470.80 ha. The land will be utilized for setting up of structures like construction of Dam, Powerhouse, Reservoir, office/colony area, quarry area, dumping area, roads, etc. The land required for the proposed components are tabulated below in **Table 2**.

Table 2: Land requirement for the proposed project

S. No.	Components Area (ha)	Area (ha)
1	Reservoir Area (including 40 ha of river bed area)	160.00
2	Main Dam	28.50
3	Dumping Area	37.50
4	Aggregate Stack Piling	1.25
5	Quarry Area	46.90
6	Plants	13.50
7	Conveyor Belt & Diesel Loco Track	7.75
8	Roads	26.00
9	Portal Area	7.80
10	Office Area	5.00
11	Colony Area	0.45
12	Store Area	7.00
13	Explosive Magazine	0.75
14	Working Area	111.15
Total Surface Area		**453.55**
Underground Area		**17.25**
Total Area		**470.80**

Entire land is forest land and application for forest clearance has been submitted and is under process under proposal number: FP/AR/HYD/IRRIG/492810/2024 and stands accepted in PSC-I as on Dec 2024 and is currently pending at DFO/CF/Nodal officer.

5. DESCRIPTION OF THE ENVIRONMENT

Data on the existing environmental parameters in the study area delineated as per the approved Terms of Reference (TOR) for EIA studies by Expert Appraisal Committee (EAC) of the Ministry of Environment, Forests and Climate Change (MoEF&CC) were collected to understand the present setting of the environment at the project site.

The field surveys for the collection of primary data were conducted between September 2024 and April 2025 covering monsoon, post-monsoon (for air monitoring), winter, and pre-monsoon/summer seasons to collect data/ information on terrestrial ecology and physical environment. The base line status is described briefly in the following sections.

5.1 Study Area

The study area for the environmental study has been delineated as the project area or the direct impact area within a 10 km radius of the main project components like proposed Dam, Powerhouse, Head Race Tunnel and 10 km downstream of the Tailwater discharge point of proposed project. The map of the study area prepared based on the above criteria is given in **Figure 2.**

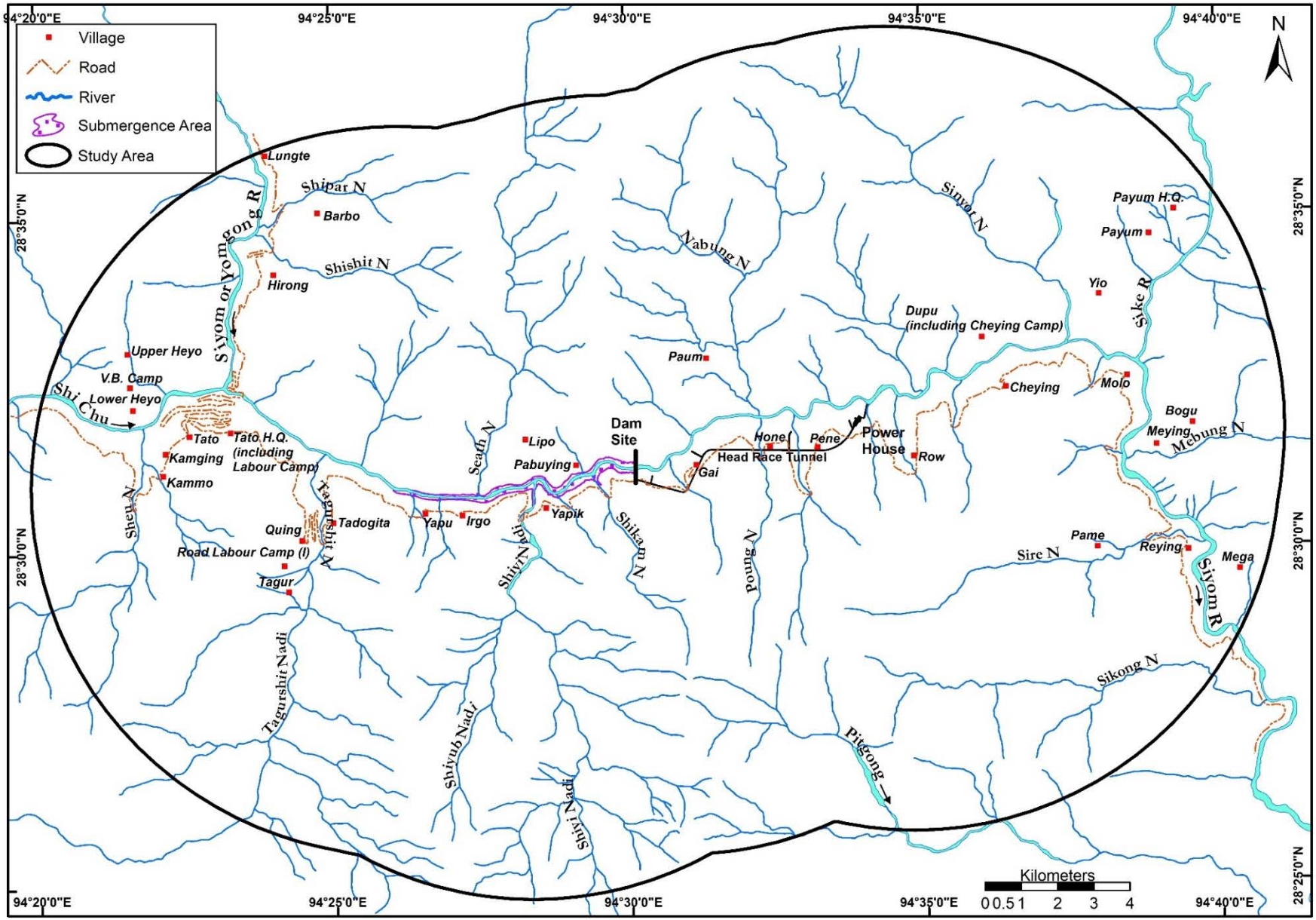

Figure 2: Map showing Study Area of the Proposed Naying HE Project

5.2 Physiography

The study area ranges in elevation from 342 m to 4070 m. Analysis indicates that 48.34% of the project area falls within the 1001 m to 2000 m elevation band, while 31.54% lies in the 2001 m to 3000 m range. The elevation of the components of proposed project lies is between 342-2000 m. A slope map/data of the study area shows that 43.36% of the area is Steep (30-45 degree), followed by Moderately Steep (15-30 degree) which is about 38.31 % of the total study area.

5.3 Land Use/ Land Cover

The land use/ land cover map shows that in the study area of proposed project, Evergreen/Semi-evergreen Forest (92.54 %) comprises of most of the study area, where all the components of the project are falling under this landuse. Other than this, scrub forest is occupying 3.37% of the total area, grazing land 1.99%, waterbody 0.57%, shifting (Jhum) cultivation 0.43% and settlement covers 0.36% of the total study area.

5.4 Geology

Naying Project is located on the Siyom River in a geologically complex and tectonically active region of Arunachal Pradesh, characterized by rugged terrain, steep slopes, and thick overburden; more pronounced on the right bank. The area falls within the Arunachal Himalayas and exposes rocks primarily belonging to the Proterozoic Siang Group and Higher Himalayan Crystalline sequence. The lithology includes schists, quartzites, slates, gneisses, and intrusives, classified under formations such as Sela and Siyom, with evidence of multiple thrust zones including Siyom Thrust and Sike Nala Thrust. The river catchment receives substantial monsoonal rainfall and glacial meltwater, influencing surface processes and slope stability in the project area.

5.5 Seismicity

Seismotectonically, the project is located on the southern margin of Higher Himalaya near the boundary with the Lesser Himalaya. The project area falls in the Zone V as per IS-1893 (Part 1) 2016, Seismic Zoning Map of India and indicating a high-risk zone for seismic activity.

5.6 Hydrology

Naying Project is located on the Siyom River, which originates near Tunokar Ogo in Arunachal Pradesh. The catchment at the dam site comprises the Siyom and Shi-Chu rivers with a combined area of 2,760 km². The total river length from its origin to the dam site is about 77.5 km. The project is designed for an installed capacity of 1000 MW with design discharges of 424.5 cumec (monsoon) and 419.0 cumec (non-monsoon). The annual and lean season load factors are 43.71% and 13.67%, respectively. The 90% dependable year is 1978–79, with corresponding flow data used for design. The Probable Maximum Flood (PMF) has been adopted as 8,270 cumec. Due to the steep Himalayan terrain, sedimentation is significant, with an estimated deposition of 1.85 MCM/year; low-level sluices are included for flushing. Environmental flow (e-flow) provisions based on the basin study are 14.25 cumec in lean season, 41.61 cumec in intermediate periods, and 86.45 cumec in monsoon season, based on 20% of average 10-daily flow in a 90% dependable year. Glacial lake outburst flood (GLOF) has been worked out as 785 cumec at dam site.

5.7 Meteorology

Naying HEP area, located in Shi Yomi and Siang districts of Arunachal Pradesh, exhibits a humid subtropical climate influenced by the southwest monsoon, which brings significant rainfall between June and September—accounting for about 67.6% of the annual average rainfall of 2,952.3 mm. The highest annual rainfall was recorded in 2015 (3440.9 mm), and the lowest in 2021 (1767.1 mm). Temperatures begin to rise in February, peak in June, and gradually decline thereafter. The hottest month is August with an average maximum temperature of 31.3°C, while January is the coldest, averaging 12.8°C. Relative humidity remains moderate to high year-round, reaching up to 90% during the monsoon and dropping to around 55% in March. Wind speeds are generally higher during spring and summer, with the maximum average of 2.35 m/s recorded in April. Predominant wind directions are from the southeast in most months, though shifts to northwest and east-southeast are observed during September and March, respectively. These meteorological parameters influence ambient air quality, erosion potential, and overall site conditions during project implementation.

5.8 Soil

The study area is predominantly covered by loamy to loamy-skeletal soils on moderately to steeply sloping hills with severe erosion and varying stoniness. The major soil taxonomic groups include Lithic Ustorthents and Typic Ustochrepts, with Soil Units 3 and 4 covering nearly 50% of the area. Soils are generally shallow, somewhat excessively drained, and vulnerable to erosion due to the hilly terrain.

Physico-chemical analysis indicates that the soils are mostly sandy loam to loamy sand in texture with medium bulk density (1.48–1.97 g/cc) and moderate porosity (34.8%–42.4%), supporting good aeration and water movement. Water holding capacity is also moderate (36.6%–42.0%). Soil pH is neutral to slightly alkaline, and electrical conductivity values are well within non-saline limits, suggesting good chemical health. Organic carbon content is consistently high, indicating favorable conditions for microbial activity.

In terms of fertility, nitrogen and phosphorus levels fall in the ‘medium’ category, while potassium is consistently in the ‘low’ range across all locations and seasons. Nutrient Index calculations confirm medium fertility status for nitrogen and phosphorus and low for potassium. Overall, the soil quality is good, but potassium deficiency may require management in case of agricultural or afforestation activities.

5.9 Ambient Air Quality

The ambient air quality in the project area is generally clean, with no major pollution sources due to the absence of industries and low traffic density. Monitoring at six locations showed that concentrations of PM2.5, PM10, SO_2, and NO_2 were well within the National Ambient Air Quality Standards (NAAQS, 2009). The highest recorded PM2.5 and PM10 values were 20.1 µg/m³ and 47.2 µg/m³, respectively, both observed at Tato village (AQ1) during winter. SO_2 and NO_2 levels remained low across all seasons, with maximum values of 8.5 µg/m³ and 11.4 µg/m³, respectively. The Air Quality Index (AQI) for all sites and seasons fell in the ‘Good’ category, indicating no significant air quality concerns in the area.

5.10 Noise Quality

Baseline noise monitoring in the study area showed that daytime equivalent noise levels (Leq) at several locations exceeded the CPCB residential limit of 55 dB(A), primarily due to vehicular movement and ongoing road construction activities during the monsoon and early winter seasons. The highest daytime noise levels were recorded at NT8 (Cheying Village) during the monsoon (60.5 dB(A)) and at NT2 (Tato Village) during winter and pre-monsoon (up to 59.0 dB(A)). However, night-time noise levels remained within the permissible limit of 45 dB(A) at all locations across all seasons. With the completion of construction activity in some areas, noise levels showed a declining trend in subsequent monitoring, indicating temporary and localized exceedance linked to external developmental activities.

5.11 Water Quality

The water quality in the project study area; both surface and groundwater, is generally very good, primarily due to low population density and the absence of industrial activity. Surface water samples from eight locations across three seasons met CPCB Class 'A' standards, with favorable levels of pH, DO, BOD, and coliforms, and no toxic contaminants detected. The NSF Water Quality Index rated surface water as 'Good' across all sites and seasons. Groundwater samples from five locations also complied with BIS (IS 10500:2012) norms, with all key physicochemical and biological parameters within permissible limits. The Drinking Water Quality Index rated groundwater as 'Excellent', confirming its suitability for drinking without treatment.

5.12 Floristic Diversity

Forest Types

The forests in Naying Project area encompass a wide variety of vegetation types, reflecting the ecological richness of the Eastern Himalayas. As per Champion and Seth's (1968) classification, the area includes forest types ranging from tropical to alpine zones. These include Tropical Wet Evergreen and Semi-Evergreen Forests, Moist Deciduous Forests, Subtropical Pine Forests, Montane Wet Temperate and Moist Temperate Forests, and Moist Alpine Scrub. Lower elevations are dominated by semi-evergreen forests and bamboo brakes, while mid-elevations feature subtropical wet hill and pine forests. Higher altitudes host temperate forests, which give way to alpine scrubs and pastures at the uppermost reaches. This vertical forest stratification enhances regional biodiversity and ecological resilience.

Floristic

The floristic survey of the Project area indicates high plant biodiversity across key project components, with 388 species documented, including angiosperms, gymnosperms, pteridophytes, bryophytes, and lichens. The submergence zone hosts tropical evergreen forests, including *Canarium strictum* (EN), a medicinal species. The dam site features species like *Alnus nepalensis* and the valuable medicinal plant *Coptis teeta* (EN, WPA Schedule III). At the powerhouse site, rare and threatened species such as *Amentotaxus assamica* (EN) and *Paphiopedilum fairrieanum* (CR) were recorded. The downstream stretch supports diverse riparian flora, including *Quercus lamellosa* (NT) and potential populations of *Gleditsia assamica* (VU). In total, 16 rare, endangered, and threatened (RET) species were observed, though no endemic species were reported. Economically important plants like timber, bamboo, and medicinal herbs are widely present, alongside 31 species used as wild edibles

by local communities, reflecting rich ethnobotanical traditions. Conservation measures are essential to safeguard the sensitive species and habitats identified.

5.13 Faunal Diversity

The fauna of the Project area includes a diverse range of species with significant conservation value. Field surveys and local inputs confirmed 26 mammal species, including endangered species like Alpine Musk Deer, Bengal Slow Loris, and Dhole, and vulnerable species such as Leopard, Asiatic Black Bear, and Sambar. Seventeen mammals are listed under Schedule I of the Wildlife Protection Act (2022). Avifaunal diversity includes 49 bird species, with two vulnerable and five Schedule I species, such as the Kalij Pheasant and Oriental Pied Hornbill. Sixteen herpetofauna species, all classified as Least Concern, were found mainly in riparian and forest edge habitats. Butterfly diversity is represented by 34 species, primarily Nymphalids, with no Schedule I species but several under Schedule II. The presence of multiple rare, endangered, and threatened (RET) species across taxa highlights the ecological sensitivity of the area and necessitates targeted conservation measures during project development.

Fish fauna

The Siyom River and its tributaries support a modest but ecologically significant fish community comprising 20 species, including Snow Trout (*Schizothorax richardsonii*) and Gotyla Sucker Head (*Garra gotyla*), with occasional reports of the endangered Golden Mahseer (*Tor putitora*). While there is no commercial fishery, subsistence fishing is common among local villagers. Most species are adapted to cold, fast-flowing hill streams and exhibit local migratory patterns. Several rare, endangered, and threatened (RET) species—such as *Tor putitora*, *Tor tor*, *Amblyceps mangois*, and *Glyptothorax cavia*—are present, along with vulnerable species like *Bagarius bagarius* and near-threatened taxa like *Neolissochilus hexagonolepis*. These findings emphasize the ecological sensitivity of the river system and the need for maintaining environmental flows and incorporating fish-friendly design features in the project.

5.14 Proximity to Protected Area

No project component falls in any notified protected area. Nearest Protected Area to the Project Components is Yorde Rabe Supse Wildlife Sanctuary (WLS) which is at a distance of around 10.10 km from proposed quarry area and Mouling WLS which is at a distance of around 11.74 km from the project component.

5.15 Social Environment

5.15.1 Study area villages

The Project area spans 37 villages in Arunachal Pradesh's Siang and Shi Yomi districts, with a population of 7,579 predominantly Scheduled Tribes (95.46%). The region has a sex ratio of 1,051 and a low literacy rate of 49.85%, with a significant gender gap. Around 42.56% of the population are workers, mainly engaged in cultivation and other subsistence activities like animal husbandry and forest produce collection. Infrastructure is limited: education and healthcare facilities are sparse, with only one high school and a few PHCs. While road connectivity exists, internal roads and public transport are poor. Electricity and tap water

reach only a few villages, and access to markets, telecom, and banking remains inadequate, reflecting overall underdevelopment.

5.15.2 Socio-Economic Profile of Project-Affected Villages

A total of 12 villages will be affected by land acquisition for the project, including 10 villages in Tato Circle of Shi Yomi district and 2 villages in Payum Circle of Siang district. Goyi hamlet lies entirely within the proposed reservoir area, while Charu villagers, though shifted earlier, still retain properties there.

The affected area comprises 377 households with a population of 1,627 (49.7% male, 50.2% female), with a sex ratio of 1008 females per 1000 males. About 47% of the total population are workers, of which nearly 69% are main workers. Farming and allied activities remain the predominant occupation, particularly subsistence-based shifting cultivation and terrace farming with crops such as millet, maize, paddy, and root vegetables. Some villages, such as Row and Dupu, show high dependence on cultivation, while others like Gai, Tado-gitu, Hone, and Pene reflect a stronger shift towards non-agricultural employment.

Secondary livelihoods include animal husbandry, fishing, forest produce collection, and bamboo/cane crafts. A small proportion of the population is engaged in government service, defence forces, Border Roads Organisation, and other wage labour or small businesses. Overall, economic opportunities remain limited, and dependence on natural resources and subsistence agriculture is high.

5.15.3 Ethnographic Profile

The Naying Project area is inhabited by Adi (Bokar) and Tagin tribes, who maintain strong cultural traditions, including Donyi-Poloism, shamanistic rituals, and festivals like Solung and Mopin. While Christianity is growing among youth, traditional beliefs remain influential. Livelihoods are largely subsistence-based, focused on farming, livestock, forest produce, and bamboo crafts. Settlements are clan-based with stilted bamboo houses and are governed by customary councils. Infrastructure is limited, though improving under government schemes. Proximity to the international border brings a strong security presence. Migration and development pressures pose risks to cultural preservation.

5.15.4 Historical, Religious and Scenic Attractions in the Study Area

The project region is rich in cultural and spiritual heritage, home to landmarks like Samten Yongcha Monastery in Mechuka; one of the oldest Mahayana Buddhist monasteries—and Neh Pemashubu, a revered meditation site of Guru Padmasambhava. In Aalo, the Donyi Polo Gangi Along serves as a major spiritual center for tribes following indigenous faiths. The area also features natural attractions such as the scenic Mechuka Valley, Siko Dido Waterfall, Tato Hot Spring, Pari Mountain, and Kaying Village, offering trekking, panoramic views, and insights into local tribal culture.

6. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 Ambient Air Quality

During the construction phase of the project, air quality may be impacted by increased vehicular traffic, use of machinery, operation of crushers and batch plants, and dust from

unpaved roads and material handling. Emissions from fuel combustion and possible burning of waste or firewood by workers could further affect air quality and require control measures. However, the current air environment is clean and within permissible limits. In contrast, the operation phase of the hydropower project is not expected to cause any significant air pollution, as activities are limited to closed water conveyance with no major emission sources.

6.2 Noise Environment

During the construction phase, noise from vehicular traffic, machinery, and blasting activities may disturb nearby wildlife, though impacts will largely be confined to the construction zone. Noise levels are expected to rise temporarily but remain localized. In the operation phase, no significant noise impacts are anticipated.

6.3 Water Environment

During the construction phase, water quality may be impacted by wastewater containing suspended solids, oil, and grease from construction activities and equipment washing. Improper disposal of muck and waste could increase turbidity in nearby water bodies, though this risk is minimized as all muck is planned to be utilized/accomodated. Domestic wastewater from worker colonies, if not treated, could significantly affect water quality and must be managed properly. In the operation phase, minimal impact is expected as the small resident staff will be housed in a colony with proper sewage treatment, with treated water reused for gardening and greenbelt development.

6.4 Land Environment

During the construction phase, key impacts on the land environment include permanent land-use changes due to land acquisition, resulting in the loss of agricultural land and displacement of families—impacts that require adequate compensation to restore and improve livelihoods. The project will generate approximately 4.23 million cum of muck, posing risks of erosion, slope instability, and sedimentation if unmanaged, highlighting the need for a comprehensive muck disposal and dust control plan. Additional impacts include various types of waste generation; municipal, construction debris, biomedical, hazardous, and e-waste; all of which require proper handling and disposal to minimize environmental risks.

6.5 Flora and Fauna

During the construction phase, increased human activity may negatively impact terrestrial flora through tree cutting for fuelwood and construction, requiring alternative fuel provisions and strict monitoring. Terrestrial fauna may be disturbed by machinery, worker presence, and noise from equipment and blasting, potentially causing temporary displacement of wildlife. Mitigation through controlled blasting and surveillance is essential. In the operation phase, impacts are expected to be positive due to restoration of construction sites, green belt development, and implementation of biodiversity and wildlife conservation plans. The reservoir may enhance moisture levels, benefiting local flora and avifauna.

6.6 Fish Fauna

Though commercial fishing is absent, locals occasionally fish using traditional nets. Surveys recorded 20 fish species, including Snow Trout and Garra gotyla, with rare sightings of mahseer. Dam construction and reservoir formation will alter fish habitats and disrupt breeding, a major impact that cannot be fully mitigated. To compensate, reservoir fisheries are proposed, as a fish ladder is unfeasible due to the 108 m dam height. Additionally, 20% environmental flow based on a 90% dependable year has been incorporated to maintain downstream ecology.

6.7 Socio-Economic Environment

Naying Project is expected to bring several socio-economic benefits, including job opportunities during construction, improved infrastructure (education, healthcare, roads), and local area development through increased investment. It will also contribute to clean energy and national renewable energy goals. However, negative impacts include the loss of private and forest land, displacement of families, and potential socio-cultural issues due to the influx of outside workers, such as petty crimes, gender-based violence, and disease outbreaks. These challenges will require proactive social management measures.

7. Mitigation Measures for Air, Water and Noise Pollution

The proposed project, spanning six years, involves major construction activities with potential pollution impacts. However, these can be effectively mitigated through targeted measures. To control air pollution, contractors must follow CPCB guidelines, ensure vehicles have valid PUCs, and maintain metalled roads. Noise pollution will be managed using acoustic enclosures for DG sets, regular machine maintenance, sound barriers, and quieter equipment, with periodic noise monitoring. Water pollution control includes septic tanks, STP for sewage, oil interceptors, and sedimentation traps. A budget of **Rs. 200.0 lakh** has been allocated for implementing these pollution control measures during construction.

8. ENVIRONMENTAL MONITORING PROGRAMME

Environmental Monitoring shall be performed during all stages of the project (namely: construction and operation) to ensure that the impacts are no greater than predicted, and to verify the impact predictions.

Environment monitoring is proposed for a period of 6 years commensurate with the construction period of the project. If the construction period is extended, the monitoring period will also be extended accordingly and additional budget provided. The monitoring program for the proposed project will be undertaken to meet the following objectives:

To monitor the environmental conditions of nearby area;

- To check on whether mitigation and management measures have been adopted, and are proving effective in practice.

A total of **Rs. 330.92 lakh** have been allocated to implement various activities envisaged under Environmental Monitoring Programme.

9. ADDITIONAL STUDIES

9.1 Resettlement & Rehabilitation Plan

The tentative total land requirement of the project is 470.80 ha. The land will be utilized for setting up of structures like Dam, Powerhouse, office/colony area, roads, etc. and also for quarry area, dumping area, and submergence area. Entire land is considered forest land; therefore, application for diversion of 470.80 ha of forest land has been filed on PARIVESH portal vide proposal No. FP/AR/HYD/IRRIG/492810/2024 dated 02/12/2024. In the absence of revenue records, locals claim entire land as private land and therefore R&R plan is prepared to compensate for the acquisition of private land.

12 villages have been identified as Project Affected Villages i.e. villages from where land will be acquired for the project. 10 villages are from Shi Yomi district and 2 villages are from Siang district. SIA study has identified 408 Project Affected Families (PAFs) as owners of 470.80 ha of private land. The PAFs likely to lose both housing and land are estimated as 72 PAFs. The remaining 336 PAFs will not lose homesteads but only land. Therefore, 72 PAFs have been considered for resettlement and compensation thereof. In the absence of detailed data, all 72 PAFs are considered for compensation for cattle sheds, as well.

Complete R&R package for Project Affected Families have been prepared keeping in view the provisions of RFCT_LARR Act, 2013, State R&R Policy, 2008 and as per the guidelines provided in manual for Land Acquisition in Arunachal Pradesh covering housing, annuity/employment, subsistence, transport, cattle shed/shop assistance, artisan/trader support, fishing rights, resettlement allowance, and stamp duty/registration fee. A total of 72 displaced families are eligible for housing and allied assistance, while 408 families qualify for annuity or a one-time grant. Land compensation will be paid as per the Collector's guidelines, including solatium, and is not budgeted here as it is already covered in the DPR. In addition, compensation has been worked out for loss of tribal rights over forest land at prescribed rates, along with a provision of 25% of NPV for community rights. The total R&R cost has been estimated at about Rs. 55.00 crore, inclusive of infrastructure not captured separately.

For families opting relocation, a resettlement colony with essential infrastructure such as roads, drainage, drinking water, electricity (preferably solar), anganwadi, school, and community facilities will be developed at a cost of Rs. 15.00 crore. The plan includes strong institutional arrangements as per RFCT_LARR, including appointment of Administrator, R&R Commissioner, and a District R&R Committee. Monitoring and evaluation will be carried out by an independent agency with an allocation of Rs. 2.00 crore. The total estimated budget for implementation of the R&R Plan and Economic Development Package stands at **Rs. 72.00 crore.**

9.2 Local Area Development Fund

Based on the local consultations in project affected villages, the focus areas covering many important components of the sustainable development such as social, economic, livelihoods and environment are identified and set of development activities proposed under each focus area for the benefit of the local people under the Project.

The provisional budget allocated for implementing the various local area development acitivities and programs envisaged under above focus areas under LADP in affected area around the project is **Rs. 20.00 Crore**. Specific requirement will be finalized after public consultation process.

9.3 Public Consultation

On completion of the draft EIA report and its executive summaries in both English and the vernacular language, the report will be submitted to the Arunachal Pradesh State Pollution Control Board (APSPCB) to initiate the process of public consultation in the two project-affected districts: Shi Yomi and Siang. The key concerns and issues raised during the public consultation, along with detailed responses and mitigation measures, will be documented and presented in a dedicated sub-section of Chapter 7 after the consultation process is completed.

9.4 PROJECT BENEFITS

The 1000 MW Naying Hydroelectric Project will generate 3809 MU of clean energy annually, strengthening grid stability and advancing India's renewable energy goals. Arunachal Pradesh will receive 12% free power, with potential equity participation offering long-term revenue benefits.

The project will create jobs, support local skill development, and enhance access through new roads. Tribal communities will benefit from culturally sensitive Corporate Environmental Responsibility (CER) measures/Local Area Development Plan (LADP @1%) funding for critical amenities like water, roads, and healthcare.

10. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Pollution generation mainly during construction phase will be in the form of air, water and noise pollution, which will be mitigated by adopting various mitigation measures and implementation of environment management plans.

NEEPCO is the project proponent/implementing agency for the entire scheme. The overall responsibility for design and execution of the work including its operation post commissioning Institutional arrangement for planning and implementing various mitigation and management measures along with carrying out environment monitoring rests with the NEEPCO through the contractor.

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10.1 Catchment Area Treatment Plan

The Catchment Area Treatment (CAT) plan highlights the management techniques to control erosion in the catchment area of a water resource project. The life span of a reservoir is greatly reduced due to erosion in the catchment area. Adequate preventive measures are thus needed for the treatment of catchment for its stabilization against future erosion.

In the present study, since two upstream projects; Tato II HEP on the Siyom River and Tagurshit HEP on the Tagurshit Nadi are already proposed, the study area for the Naying HEP has been defined as its free-draining catchment. This catchment refers to the area between the dam sites of the upstream Tato II and Tagurshit HEPs and the dam site of the proposed Naying HEP. The delineated free-draining catchment area has been calculated as 166.28 sq.

km (16,627.69 ha).

The catchment area treatment involves:

- Understanding of the erosion characteristics of the terrain and,
- Suggesting remedial measures to reduce the erosion rate.

The estimated cost of implementation of CAT plan including monitoring and evaluation is **Rs. 888.03 lakh**. CAT Plan has been submitted to state forest department for vetting and approval.

10.2 Compensatory Afforestation Plan

The Compensatory Afforestation Plan for Naying Project addresses diversion of 470.80 ha of forest land under Aalo Forest Division. As per the proposal submitted for forest clearance, compensatory afforestation will be undertaken on 942 ha of degraded forest land in Doimukh Reserve Forest under Doimukh Forest Division, with an estimated cost of Rs. 4,566.45 lakh.

The project site falls under Eco Class I (Tropical Semi-Evergreen Dense Forest), where the applicable Net Present Value (NPV) is Rs 14,36,670 per ha. For underground land, the rate has been taken as 50% of the above-ground value, i.e., Rs 7,18,335 per ha. Based on 433.55 ha of above-ground area and 37.25 ha of underground area, the total NPV for the diverted forest land is estimated at approximately Rs 6496.26 lakh.

Additionally, 1,95,326 trees along with poles and NTFPs will be felled, incurring a valuation of Rs. 2,225.66 lakh. The combined cost of compensatory afforestation, NPV, and tree felling amounts to **Rs. 13,555.95 lakh**.

10.3 Biodiversity Conservation & Wildlife Management Plan

The Biodiversity and Wildlife Conservation and Management Plan for the Naying HEP aims to mitigate ecological impacts arising from habitat degradation, land use change, and human-wildlife conflict. The project area, rich in tropical and temperate forest types under the Aalo Forest Division, supports 317 angiosperm species, various non-flowering plants, and diverse fauna, including avifauna, butterflies, and orchids.

Conservation strategies include habitat enrichment plantations over 20 ha, nursery development, avifaunal conservation through food, shelter, and water provisioning (e.g., bird feeders and artificial nesting), and dedicated efforts for Great Hornbill habitat protection. Establishment of a butterfly park (2.0 ha) and orchidarium is proposed to enhance ecological and aesthetic value. Sustainable practices for NTFP collection (e.g., bamboo, cane, medicinal plants) will reduce pressure on wild resources and support livelihoods.

Awareness and capacity-building programmes will address issues such as shifting cultivation, wildlife poaching, and forest fires. Measures include distribution of artificial trophies, community trainings, and nature education in schools. Human-wildlife conflict mitigation includes veterinary care, rescue centres, mobile response vans, and spring rejuvenation to support wildlife.

The Plan also provides for monitoring by a Biodiversity Management Committee, forest

department infrastructure strengthening (e.g., watch towers, equipment), and contingencies. A total budget of **Rs. 325.0** lakh will be transferred to the Arunachal Pradesh Forest Department for implementation.

10.4 Fisheries Development Plan

The Naying Hydro Electric Project incorporates a comprehensive Fisheries Development and Conservation Plan to mitigate ecological impacts on aquatic life caused by river regulation and habitat fragmentation. While traditional fishing in the Siyom River is minimal and non-commercial, it supports 20 identified species, including vulnerable and endangered varieties like Golden Mahseer and Snow Trout. These species depend on migratory routes and habitat connectivity, necessitating conservation action.

Key components of the proposed plan include establishing a hatchery near the reservoir to conserve indigenous fish and support livelihood-level fisheries. Stocking of fingerlings (48,000 - 64,000 annually) will be managed based on reservoir health. Fishing rights in consultation with the Fisheries Department will be allotted to local communities with training provided for sustainable practices.

Habitat restoration downstream will involve construction of check dams and artificial riffles/pools to maintain spawning grounds and water retention. A dedicated Advisory Committee and implementation team led by the Fisheries Department will oversee execution. Monitoring and reporting mechanisms are built into the plan to ensure transparency.

The total estimated cost is **Rs. 272.0 lakh**, including Rs. 220.0 lakh for capital infrastructure and Rs. 52.0 lakh for recurring expenses over six years. Additionally, environmental flow releases aligned with national guidelines will maintain riverine ecology across seasons.

10.5 Muck Management Plan

Naying Project is expected to generate approximately 4.23 million cubic meters of muck during excavation from areas such as the dam site, powerhouse, and tunnels. Out of this, 30% (1.25 million cum) will be used for aggregate production and 72,326 cum for coffer dam construction. The remaining muck will be disposed at seven identified sites covering 37.5 ha.

These disposal sites have been selected based on geotechnical stability, distance from the river, and location above maximum water levels to avoid environmental hazards. The muck will be dumped in layers, compacted, and stabilized using retaining walls (stone masonry, RCC base), gabions, and catchwater drains to prevent erosion and waterlogging. Slopes will be maintained at an angle of 36°, allowing for vegetative stabilization and future land use.

The plan includes biological measures such as planting of native trees, shrubs, grasses, and herbs over the disposal sites to promote long-term slope stability and ecological restoration. The revegetation strategy covers the entire 37.5 ha with a cost of Rs. 193 lakh.

Post-rehabilitation, portions of the muck sites may be developed into a children’s park or parking facility, supported through the Local Area Development Fund. The total financial outlay for engineering and biological measures amounts to **Rs. 3873.38 lakh**, ensuring safe, sustainable, and aesthetically integrated muck management.

10.6 Landscaping, Restoration of Construction Sites and Greenbelt development

Naying Project will impact approximately 154.65 ha of land due to construction activities including roads, colonies, work sites, and quarries. These will cause vegetation loss, soil erosion, and habitat disturbance, necessitating effective landscaping and restoration.

Restoration Measures: Disturbed areas will be stabilized using retaining structures, drainage systems, and re-vegetated with native species, including medicinal and nitrogen-fixing plants. Quarries will be backfilled and treated with topsoil and bio-fertilizers to encourage natural regeneration.

Green Belt Development: A green belt will be developed around the reservoir, dam, powerhouse, access roads, and colonies. Indigenous, soil-binding, and bird-friendly species will be planted. Landscaping in residential areas will include ornamental and fruit trees, parks, and play areas.

Implementation & Cost: To be executed with support from horticulture and forest departments, the plan carries a total estimated cost of **Rs. 605.0 lakh**, including Rs. 405.0 lakh for engineering works and Rs. 200.0 lakh for biological and green belt measures.

10.7 Reservoir Rim Treatment

Naying Project in Arunachal Pradesh involves a 108 m high dam on the Siyom River, forming a reservoir that will submerge approximately 160 ha over 7.7 km. The transformation from a flowing river to a still-water reservoir may destabilize nearby slopes due to increased saturation and hydrostatic pressure. Geotechnical assessments have identified five landslide-prone zones; four on the right bank and one on the left.

To address this, a Reservoir Rim Treatment Plan has been formulated, combining engineering and biological measures. Engineering interventions include constructing retaining and gabion walls, slope re-contouring, and installing wire mesh to prevent rockfalls. Biological treatments such as grass and shrub planting will stabilize slopes above the waterline.

Additionally, steep-gradient tributaries entering the reservoir will be protected with RCC and gabion walls, and check dams will be built to control erosion and sediment inflow. The total estimated cost of these measures is **Rs. 500.0 lakh**, ensuring long-term slope stability and reservoir safety.

10.8 Sanitation and Solid Waste Management

Solid waste generated from temporary and permanent colonies in construction as well as operation phase requires special management for disposal. The project authorities will ensure sewage generated from labour colonies and site office is treated and disposed as per the SPCB guidelines. It is proposed to provide adequate septic tanks with soak pits for treatment and disposal of sewage. Various aspects of solid waste management include:

- Reuse/Recycling
- Storage/Segregation
- Collection and Transportation
- Disposal

The waste generated from the project area will be collected, segregated and disposed off in line with the provisions laid down in Solid Waste Management Rules, 2016.

A lump sum budget of **Rs. 200.00 lakh** has been kept for capital expenditure towards procurement of bins, carts, mobile toilets, etc. and **Rs. 50.00 lakh** per annum for recurring cost covering replaced items and manpower cost for 6 years of construction phase.

10.9 Public Health Delivery System

The development of the Naying Project in a remote area is expected to place significant pressure on existing healthcare services due to the influx of workers and increased local demands. To address this, a comprehensive **Public Health Delivery System (PHDS)** has been proposed with the aim of strengthening healthcare infrastructure, improving access to emergency care, and promoting disease prevention.

Key components of the PHDS include:

- **Upgradation of Tato Sub-Centre** with enhanced infrastructure, staff quarters, lab equipment, and beds to serve as the main health hub.
- **Two fully equipped ambulances** for emergency transport across the project area.
- **First aid posts** at key construction and labour sites, offering immediate care.
- **Regular health awareness and vaccination camps** focused on maternal health, immunization, and hygiene.
- **Disease control initiatives** targeting communicable and vector-borne illnesses through spraying, sanitation, and surveillance.
- **Institutional framework** involving coordination with the State Health Department, with a designated medical officer and trained paramedics overseeing implementation.
- **Monitoring mechanisms** including health reporting, inspections, and feedback from local communities.

The total estimated cost for PHDS implementation is **Rs. 425.0 lakh**, covering both capital and recurring expenses over the construction period. The initiative aims to safeguard the health of both workers and local residents, ensuring sustainable healthcare support during and beyond the project timeline.

10.10 Energy Conservation Measures

The existing facilities will become insufficient for supply of kitchen fuel for the migrant population during the construction of the project. Therefore, the project authorities would make adequate arrangements such as Community kitchen, Supply of Kitchen fuel, efficient cooking facilities and solar lantern either directly by developer or through contractor to reduce the pressure on natural resources in the project area and minimize impacts on this count. A total budget of **Rs. 430.00 lakh** have been proposed under Energy Conservation Plan.

10.11 Labour Management Plan for their Health and Safety

Construction work has many associated risks and health impacts for the workers who are directly exposed to such health and safety risks. Therefore, there is a need to prepare complete health and safety documents for workers either by project proponent/contractor and proponent shall ensure its implementation. A detailed plan will be prepared covering the above activities before start of construction work. A tentative budget of **Rs. 101.00 lakh**

for labour management have been proposed under EMP.

10.12 Disaster Management Plan

In order to visualize the worst-case scenario, Dam Break Modeling exercise through hydrodynamic simulation on MIKE 11 was carried out by impinging Design flood (PMF) with Dam break with initial reservoir level at FRL of the dam and an inundation map was prepared using simulation output for downstream reach for a length of about 97.5 km downstream of the dam site up to confluence of Siyom River with Siang River. Based upon this, a Disaster Management Plan has been formulated. This plan presents warning and notification procedures to be followed in case of failure or potential failure of the dam. In addition, provision has been kept to formulate a detailed DMP. The purpose is to provide timely warning to the population likely to be affected and alert key people who have to take respective actions in case of an emergency.

The estimated total cost of execution of disaster management plan including the equipment would be **Rs. 400.00 lakh.**

11. SUMMARY OF COST

The capital and recurring costs for the implementation of the Environmental Management Plan for the project amount to **Rs. 18150.33 lakh**. The costs for Compensatory Afforestation Plan, NPV and cost of trees to be felled, have been estimated at **Rs. 13288.37 lakh**, as summarized in **Table 3.**

Table 3: Cost for Implementing Environmental Management Plan

S. No.	Component	Capital Cost (Rs. In lakh)	Recurring Cost (Rs. In lakh)						Total Cost (Rs. In Lakh)
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
A	**EMP Components**								
1	Catchment Area Treatment Plan	888.03	0.00	0.00	0.00	0.00	0.00	0.00	888.03
2	Biodiversity Conservation & Wildlife Management Plan	325.00	0.00	0.00	0.00	0.00	0.00	0.00	325.00
3	Fisheries Conservation and Management Plan	272.00	0.00	0.00	0.00	0.00	0.00	0.00	272.00
4	Muck Dumping and Management Plan	300.00	550.50	575.25	655.25	625.15	617.23	550.00	3873.38
5	Landscaping, Restoration of Quarry, and Construction Sites	0.00	30.00	50.00	125.00	150.00	125.00	125.00	605.00
6	Green Belt Development Plan	10.00	15.00	20.00	25.00	10.00	10.00	10.00	100.00
7	Reservoir Rim Treatment Plan	0.00	0.00	0.00	0.00	200.00	150.00	150.00	500.00
8	Sanitation and Solid Waste Management Plan	200.00	50.00	50.00	50.00	50.00	50.00	50.00	500.00
9	Public Health Delivery System	275.00	25.00	25.00	25.00	25.00	25.00	25.00	425.00
10	Energy Conservation Measures	70.00	60.00	60.00	60.00	60.00	60.00	60.00	430.00
11	Labour Management Plan	21.00	10.00	15.00	15.00	15.00	15.00	10.00	101.00
12	Disaster Management Plan	275.00	25.00	25.00	25.00	20.00	15.00	15.00	400.00
13	Control of Air, Noise and Water Pollution	20.00	30.00	30.00	30.00	30.00	30.00	30.00	200.00
14	Environmental Monitoring Programme	0.00	55.17	55.15	55.15	55.15	55.15	55.15	330.92
15	Rehabilitation and Resettlement Plan**	7200.00	0.00	0.00	0.00	0.00	0.00	0.00	7200.00
16	Corporate Environmental Responsibility (CER) / Local Area Development Plan	2000.00	0.00	0.00	0.00	0.00	0.00	0.00	2000.00
	Sub Total (A)	**11856.03**	**850.67**	**905.4**	**1065.4**	**1240.3**	**1152.38**	**1080.15**	**18150.33**

**Cost of private land procurement will be part of DPR cost.

B	Other Components	Total Cost (Rs. In Lakh)
1	Compensatory Afforestation	4566.45
2	Net Present Value (NPV)	6496.26
3	Tree to be Felled	2225.66
	Total	**13288.37**

*Cost of CA and NPV shall be finalized as part of diversion proposal.