MONJO KHOLA MINI-HYDRO SUBPROJECT (942 kW)

Terms of Reference (ToR)

For

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY

Submitted To

Alternative Energy Promotion Centre
Nepal: Private Sector-Led Mini Grid Energy Access Project (MGEAP)
Mid Baneshwor, Kathmandu
Nepal

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ABBREVIATIONS

AC	Alternate Current
ACSR	Steel Reinforced Aluminum Conductor
AEPC	Alternative Energy Promotion Centre
amsl	Above Mean Sea Level
B	Breath
BA	Basal Area
BOD	Biological Oxygen Demand
BS	Bikram Sambat
BZ	Buffer Zone
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CDO	Chief District Officer
CFUG	Community Forest User Groups
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
cm	Centimeter
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
CTs	Current Transformers
D/ha	Density per hectare
dB	Decibel
dBH	Diameter at Breast Height
DCC	District Coordination Committee
DHM	Department of Hydrology and Meteorology
DIA	Direct Impact Area
dia.	diameter
DNPWC	Department of National Park and Wildlife Conservation
DO	Dissolved Oxygen
DoED	Department of Electricity Development
E	East
E&S	Environmental and Social
EA	Environmental Assessment
EIA	Environmental Impact Assessment
El	Elevation
EMAP	Environmental Management Action Plan
EMP	Environmental Management Plan
EMIMAP	Environmental Management Implementation Management Action Plan
EPA	Environment Protection Act
EPR	Environment Protection Rule
ESCOs	Energy Service Companies
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
GIS	Geographical Information System
GLOF	Glacier Lake Outburst Flood

GoN	Government of Nepal
GRM	Grievance Redress Mechanism
GWh	Giga Watt hour
Ha	Hectare
HHs	Households
Hz	Hertz
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IIA	Indirect Impact Area
INGO	International Non-Government Organization
INPS	Integrated Nepal Power System
IUCN	International Union for Conservation of Natural
IVI	Important Value Index
KII	Key Informant Interview
Km	Kilometer
kV	Kilovolt
kVA	Kilovolt Ampere
kW	Kilo Watt
L	Length
L/C	Letter of Credit
lps	liter per second
m	Meter
MAPs	Medicinal and Aromatic Plants
MGEAP	Mini Grid Energy Access Project
MKMH	Monjo Khola Mini Hydro
MKMHSP	Monjo Khola Mini Hydro Project
mm	millimeter
MoEWRI	Ministry of Energy, Water Resources and Irrigation
MoFE	Ministry of Forest and Environment
MoST	Ministry of Science and Technology
mVA	Milli Volt Ampere
MW	Mega Watt
N	North
NGO	Non Governmental Organization
No.	Number
NRs	Nepalese Rupees
NTFPs	Non-Timber Forest Products
ONAN	Oil Natural Air Natural
OPs	Operation Plans
pH	Potential of Hydrogen
PID	Proportional Integrative Derivative
KPLRM	Khumbu PasangLhamu Rural Municipality
ppm	Parts per Million
PTs	Potential Transformers
RCC	Reinforced Cement Concrete
RD	Relative Density
RF	Relative Frequency
RM	Rural Municipality
RoR	Run of River

RPM	Revolutions per Minute
s	Second
SNP	Sagarmatha National Park
TDS	Total Dissolved Solids
ToR	Terms of Reference
TV	Television
VCBs	Vacuum Circuit Breakers
WB	World Bank
WECS	Water and Energy Commission Secretariat

CHAPTER 1: INTRODUCTION

1.1 BACKROUND OF THE SUBPROJECT

The proposed subproject, Monjo Khola Mini Hydro Subproject (942 kW) is being developed under Mini Grid Energy Access Project (MGEAP)program of Alternative Energy Promotion Centre (AEPC), a Government institution established on 3 November 1996 under the Ministry of Science and Technology (MoST) with the objective of developing and promoting renewable/alternative energy technologies to meet the energy needs in Nepal. At present, it is under the Ministry of Energy, Water Resources and Irrigation (MoEWRI).

AEPC has been implementing the Private Sector-Led Mini-Grid Energy Access Project (MGEAP) since September 2019 with support from the World Bank (WB). The objective of the MGEAP is to increase electricity access and delivery from renewable energy mini-grids (Micro/Mini Hydro, Solar, Wind and Solar/Wind Hybrid Subprojects) by mobilizing private Energy Service Companies (ESCOs). The subproject will deliver financial support to the ESCOs to facilitate financial closure and enhance financial viability of the subprojects, provided in the form of loans through Partner Banks (PBs).

Based on the above scenario, Monjo Khola Mini Hydro Pvt. Ltd., a private Energy Service Company registered at company registrar office, Kathmandu on ward number 8, Tilganga (**Annex I**), has proposed to develop Monjo Khola Mini Hydro Subproject at Khumbu Pasang Lhamu Rural Municipality, Ward No. 3 of Solukhumbu district in Province No. 1, Nepal. The proposed subproject is located in the buffer zone of the Sagarmatha National Park. The Monjo Khola Mini Hydro Pvt. Ltd. has received technical clearance from the Department of Electricity Development (DoED) on 18/11/2076 (1 March 2020) (**Annex II**). The Khumbu Pasang Lhamu Rural Municipality provided generation license on 03/12/2076 (16 March 2020) (**Annex III**). Department of National Park and Wildlife Conservation (DNPWC) provided permission for environmental assessment study on 18th August 2021 (**Annex IV**).

The proposed subproject is a run-off-river scheme and uses water from Monjo Khola, which is a perennial river and is a tributary of Dudhkoshi River. The subproject is planned to develop 942 kWcapacities to provide electricity facility to 582 households inJorsalle, Chyuma, Byankar, Tok Tok, ThuloGamela, Phakding, Sano Gamela, Chermading, Ghat, Thadakoshi, Chheplung, Muse and Chaurikharkavillages of Ward No. 3, where majority of residents are indigenous people. These areas are off-grid areas. Environmental and Social Impact Assessment (ESIA) is mandatory as per World Bank's OperationalPolicies (OPs)[1]to identify potential environmental and social (E&S) risks and impacts associated with the subproject. This is applicable herewith the proposed subproject as it lies in buffer zone (BZ) of the National Park (SNP), which is considered as ecologically sensitive area.

1.2 OBJECTIVES OF ToR

The main objective of the ToR is guide for the ESIA study of the proposed subproject as per the WB's Operational Policies (OPs). The general objectives of ToR are:

[1]This project was originally processed and approved under the World Bank's old safeguard policies, which therefore apply rather than the ESF.

- To list and delineate the specific activities to be performed during ESIA study
- To delineate subproject influence area
- To provide the technical guidance in order to accomplish the work within the time frame
- To list the major issues and impact to be address during ESIA study and
- To provide guidance for the ESIA report preparation

1.3 OBJECTIVES OF THE ESIA STUDY

The main objective of the study is to conduct ESIA and prepare environmental and social management plan (ESMP) to ensure safeguard compliance during implementation and operation of the proposed MKMHSP (942 kW). The specific objectives of the study are:

- To carry out Alternative Analysis and compare options in terms of social and environmental consequences. Options may include solar, extension of rural electrification program, alternative sites (including of components), construction technologies, and a 'no option';
- To provide information on the existing environmental and social setting of the subproject area with baseline data;
- To identify the subproject influence area;
- To identify the adverse and beneficial impacts that may arise as a result of proposed works on physical, biological, socioeconomic and cultural environment during preparation, construction and operation of the subproject structures and associated facilities in the subproject areas;
- To propose suitable, practical and time-bound mitigation & enhancement measures to avoid, reduce, mitigate, and/or compensate for identified impacts, including the institutional arrangements,budget and required human resources to implement all such measures and monitor their effectiveness;
- To determine the eligibility of the subproject for financing under the project considering country's legal provisions & requirements including guidelines of the Nepal Rastra Bank, requirements stipulated in the project's ESMF, and World Bank's OPs including OP 4.04 Natural Habitats and assess if the subproject, directly or indirectly, could have significant conversion or degradation of critical natural habitats.
- To define and prepare an ESMP as well as effective monitoring, reportingandauditing plan for the subproject;
- To prepare (i) Occupational Health and Safety Plan, (ii) Emergency Preparedness Plan, (iii) Labour Management Plan, (iv) Gender Development Plan, (v) Transport Management Plan, (vi) Biodiversity Management Plan,(vii) Stakeholder Engagement Plan and (viii) Benefit Sharing Plan; and (ix) Landslide and slope stability management plan.
- To carry out Cumulative Impact Assessment, if found necessary after initial assessment of the other hydropower schemes (operational, under construction, planned to be constructed in foreseeable future) in the upstream and downstream of the subproject,

- To identify relevant project stakeholders and inform them regularly about the proposed subproject, involve them in the implementation process and receive their feedback and concerns for safeguarding the natural environment and affected people; and

- To advise decision makers regarding environmental and social implication of the subproject.

1.4 STUDY METHODOLOGY

1.4.1 DATA REQUIREMENT FOR PREPARING THE REPORT

The study requires the baseline data on physico-chemical, biological, socio-economic and cultural environment. Relevant data on the environmental and social conditions of the subproject area will be collected and assembled into concise description.

1.4.1.1 PHYSICAL AND CHEMICAL ENVIRONMENT

The following baseline data on physical environment needs to be included in the ESIA report are;

- Topography
- Geomorphology
- Geology (soil, rock types, structures, slope condition and stability)
- Land use
- Seismicity
- Soil erosion and landslides
- Sediment yield
- Natural hazards
- Drainage (type and characteristics) and Hydrology (data on river regime)
- Climate (temperature and precipitation);
- Air and noise quality
- Surface water quality(testing different parameters like temperature, pH, turbidity, TDS, alkalinity, DO, COD, BOD, Sulfate, Iron, Total Coliform, E-Coli)
- River water quality
- Solid waste generation

1.4.1.2 BIOLOGICAL ENVIRONMENT

The following baseline data on biological environment will be included in the ESIA study:

- Forest Area, Forest types and Their Distribution and Management
- Vegetation status, distribution of plant species and their importance, plant density, tree volume and biomass
- Herb and shrub species
- Ecosystem services, including NTFPs and MAPs
- Wildlife (mammal, bird and Herpetofauna) found in and around subproject area;
- Human Wildlife Conflict
- Aquatic life (including macroinvertebrates, riparian vegetation and protected, endangered, endemic and migratory fish species)
- Natural and critical habitat (wildlife and their movement route and migratory bird movement route)
- Threat and Conservation status of flora and fauna based on Government of Nepal list, National Park and Wildlife Conservation Act (1973); IUCN's Red Data Book and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendices

- Presence and state of legally protected areas, internationally recognized areas of high biodiversity value and world heritage sites within the area of influence of the project.

1.4.1.3 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

Data required on Socio-economic and cultural environment basically at Rural Municipality level and specific at settlement level as needed and as appropriate include the following:

- General profile of the district, Rural municipality and Subproject influence area
- Demography characteristics (population, households' size, age and gender composition, migration) of the subproject influence area
- Ethnicity (marginalized groups and ethnic minorities), Language and Religion (including traditional and cultural practices)
- Status and Issues of women and Children
- Literacy and Education
- Occupation and Livelihood (Sources of income and expenditure pattern)
- Dependency of livelihood on ecosystem services
- Economic Status (employment, occupation and skill, income)
- Economic activities (agriculture/horticulture, livestock, trade, tourism, business etc.) and Sources of income and expenditure pattern
- Health and sanitation
- Social service facilities and community infrastructures (drinking water supply, educational institution, health care facilities, irrigation, electricity, communication, transportation, etc)
- Local institutions and activities: Government and non-government agencies, cooperatives, CBOs;
- Price list of commodity goods of subproject affected settlements
- Vulnerable groups (poor, people with disabilities, women-headed households, Dalits, religious minorities, people living in government land in the project area/squatters)
- Description of settlements of indigenous people, Dalits and other minorities within the project affected area (If any)
- Touristic sites and any aesthetically important/ unique sites
- Archaeological, cultural, historical and religious sites (Festivals, Tradition, Languages and Religious Landmarks)
- Major religious and social functions observed in the area
- Main source of information for locals (social media, TV, radio, newspapers etc.) and customary dispute settlement mechanism, if any
- Presence of social or community organizations (youth club, women/mothers clubs or groups, religious group etc.)
- Public infrastructures (schools, hospitals/health centers, community hall, public gathering/meeting places etc.)

1.4.2 METHODOLOGY FOR DATA COLLECTION

Data and information required for ESIA will be collected through primary as well as secondary sources. The data collection procedure includes the followings:

1.4.2.1 DESK STUDY AND LITERATURE REVIEW

Available useful data and information with the line agencies at the local, district and central level shall be collected and reviewed. Possible source of information are District Coordination Committee (DCC), Rural Municipality, SNP Office, Department of National Parks and Wildlife Conservation (DNPWC), UNESCO, RAMSAR, Birdlife International, WWF, IUCN, ICIMOD, NTNC, other line agencies, related NGOs and other project offices in the district. Topographic map, Geological map and maps/information the Department of Hydrology and Meteorology (DHM) are the other sources of information.

Topographic and Geologicalmaps of the subproject area will be reviewed to collect information about land use, topography, geology and other features. Study of climate and air quality of the study area will be done by analyzing the data of the nearest meteorological station and monitoring station. Meteorological and hydrological data will be collected from DHM. Other information such as Hydrology and Sedimentation, Geology and Seismicity, Watershed etc. will be collected referring from the secondary sources such as topographic, geological and seismic hazard maps and project technical reports and data base of DHM etc.

Secondary data on forest and wildlife will be obtained from publications of the Ministry of Forests and Environment (MOFE), SNP and DNPWC Office and other institutions and research papers. District/Rural Municipality level socio-economic and cultural information such as population of affected RM, household size, male-female ratio, infrastructures, ethnicity, schools, development activities in the subproject area, festivals and cultural activities will be reviewed from Central Bureau of Statistics (CBS) publication, RM profiles, District profiles and other available literatures.

Moreover, review of the pertinent legal documents such as Acts, Rules, Manuals, Standards, Guidelines, and Policies etc. will also be carried out in order to analyze the legal and policy implications of subproject implementation (**refer Chapter3**).

Additionally, EIA and IEE reports of the similar hydropower projects in basin and its vicinity (especially of the Dudhkoshi Basin) will be reviewed to take assistance in developing study methodologies, identifying impacts and mitigation measures. Hence, desk study and literature review work will start at the beginning till the completion of the ESIA study.

For the cumulative impact assessment, review the relevant documents of existing the projects/infrastructure. The planning documents of new development projects/infrastructure which are foreseeable in the near future will also be reviewed.

1.4.2.2 FIELD STUDY

A multi-disciplinary study team comprising of environmental expert, biodiversity expert, sociologist, hydrologist and geologist will visit the subproject site and carry out field investigation through survey, site inspection, observation and measurement to collect baseline information on physical, biological and socio-economic and cultural environments and identify possible issues including seasonal differences such as water flow and aquatic fauna and impacts on environmental and social aspects. Various participatory tools like focus group discussion, key informant interview, consultations and interactions will be employed to aid collection of relevant information. The collected baseline data will be verified by citing

standard references and evaluated before accessing impacts on them. Both the primary and secondary will be used for the information required for the study.

1.4.2.2.1 Physical Environment

Walkover survey and field observation will be carried out to collect site-specific information about physical environment of the subproject area. Geological investigation will be made to explore the general geology, geomorphology, geological features like discontinuities and possible geologic hazard, land stability within the subproject area. Hydrological analysis will be conducted using the method suggested by the GON Water and Energy Commission Secretariat (WECS). Information derived from secondary sources will be verified with site observation, site specific photography and consultation with local communities. Walkthrough survey and field observation will be carried out to study and record soil erosion prone area, landslide areas, and other geologically vulnerable areas in the subproject surroundings (including specific project locations) which could adversely affect the subproject activities during construction and operation phase. Baseline data on existing pollution levels of water, air and noise in the subproject area will be generated. Water samples from the Monjo Khola and the drinking water sources in the subproject area will be collected and tested for physical, chemical and biological parameters. Baseline data on noise level at the major construction sites such headwork and powerhouse sites as well as major settlement areas will be measured using a sound pressure level meter (dB meter). Visual observations and analysis of presence of the sources causing deterioration in air quality such as industries, quarry site, frequency of vehicular movement etc. will be made and qualitative information on air quality will be prepared. Quantitative data on sir quality will be collected from secondary sources if available. Solid waste situation of the subproject area will be studied through direct observations.

1.4.2.2.2 Biological Environment

(a) Vegetation

Composition, distribution patterns and characteristics of vegetation and forest types and sensitive habitat in the subproject area will be assessed from direct field observations, systematic forest sampling (wherever applicable), transect walk survey, photography, maps, interaction with local people and concerned authority. The type of forest and management practices around the subproject area will be studied and identified. Complete enumeration of the standing trees will be carried out during ESIA study in those component sites where tresses are there. Diameter at breast height (dBH) and height of each of the enumerated standing tree (>10cm dBH) within these sites will be recorded for calculation of timber and ecological values. In addition, random plots of size 5m×5m and 1m×1m will be laid to record saplings and seedlings in the subproject component sites, respectively. In addition, systematic vegetation sampling using quadrate method will be carried out to make an assessment of vegetation in subproject area. For this, quadrate plot of 20x20 m^2, 5 x5 $m^2$and 1x1 m^2will be laid out with systematic purposive sampling for trees, shrubs including tree sapling and herbs including tree seedling respectively. Canopy cover of the forest will be estimated by visual observation. Trees will be classified as per community forestry inventory guidelines 2061 BS.Standard vegetation record checklists will be prepared and used during forest measurement (**Annex V**). In the case of unknown plant species, pressed samples of twigs, flowers and/or seedpods will be prepared and identified with the help of botanical experts of the National Herbarium at Godawari, Lalitpur. Local names as well as the use of all species recorded on the data-sheet will be noted consulting with the local people. The data obtained

from the sampling of the vegetation and sample plots will be quantitatively analyzed only for density, frequency, abundance, dominance, basal area, standing wood volume and importance value index. These parameters will be calculated by using standard formulae **(Annex VI).**

The forest vegetation assessment will include calculation of forest loss at different subproject components, total loss in terms of plant species, total forest loss, loss of Non-Timber Forest Product (NTFP) and economic valuation of loss in forest product (**Annex VII**).

Ethno-botanical information will be obtained by conducting Rapid Rural Appraisal tools. The loss of protected, rare and endangered species based on the CITES Appendix, IUCN Red Data and Government of Nepal protected lists will be enumerated in the field throughout the subproject area. Local people shall be consulted regarding the local uses of the plant species such as medicinal, food, timber, fuel wood etc. Commercially important plant species will also be documented. Similarly, information on the protected floral and faunal species of the subproject area will also be identified by tallying the species list with GoN protected list and various international protection categories such as CITES appendices and IUCN Red Data Book and will be described in the ESIA report.

(b) Wildlife and Birds

Direct observation as well as study of pug marks, fecal droppings, vocal sounds, interaction with local communities etc. will be used to record the wildlife (mammals and avian fauna) in the subproject area and their natural as well as critical habitat. Birds will be observed with the help of binocular and identified using standard key developed by Fleming (1976) and Inskipp (1985). It has been reported that there are no records of herpetofauna and fishes in the area, but shall be confirmed through consultation with local communities. Key informant interviews will be taken for the information on crop and livestock depredation by the wild animals, hunting and poaching activities and human wildlife conflicts in the subproject area and other relevant information.

Recorded wildlife will be tallied with relevant references (IUCN Red Data Book, CITES Appendices, Government of Nepal's list of mammals and birds assigned to respective threat and protection statuses.

(c) Protected Areas

The current state of legally protected areas, UNESCO World Heritage Sites and internationally recognized areas of high biodiversity value (such as key biodiversity areas, important bird areas and Ramsar sites) and will be observed and documented. Assessments will include an overview of current threats, the standard of enforcement, management and capacity to implement actions provided in available management plans. Data will be collected through review of management plans, observations made in the field, consultation with local communities, field managers, DNPWC and UNESCO representatives. Particular focus will be placed on the Outstanding Universal Values (OUV) of the Sagarmatha National Park World Heritage Site.

1.4.2.2.3 Socio-economic and Cultural Environment

Primary information on socio-economic environment will be obtained through group discussion with communities, key informant interviews, onsite observation and questionnaires and stakeholder consultations. All these have been planned for basic health

and sanitation conditions, educational, gender issues, infrastructure facilities, water and energy related issues, customs, practices and traditions with focus on community consultations, dispute settlement and acquiring public information, and expectations from the subproject (**Annex VIII)**.

Focus Group Discussions with the peoples of the concerned wards (such as buffer zone user's group, women groups' etc.) and local level agencies will be carried out. Similarly, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) with women's group (gender), school teachers (education), CFUGs (Resource use) will be carried out during the field survey to gather information on socio-economic and cultural activities as well as customs & tradition of the subproject area communities. The information and data collected from the field will be processed and analyzed by using Statistical Package for the Social Sciences (SPSS) and Exce.

1.4.2.2.4 General

The study requires the baseline data on physical, biological, socio-economic and cultural environment. Relevant data on the environmental conditions of the subproject area will be collected and assembled into concise description. Such documentation should focus on those aspects likely to be altered through subproject implementation and will include physical, biological, social, cultural and economic environment. Source of all data and information given in the report will be identified. If the source is field survey and specific methodologies used will be given, and if source is published report or literature then standard reference format will be used with reference list. For a comprehensive ESIA study of the proposed subproject, database on the following environmental resources of the subproject's direct and indirect impact area is required.

CHAPTER 2: DESCRIPTION OF THE SUBPROJECT

2.1 GENERAL INFORMATION ON THE SUBPROJECT

Monjo Khola Mini Hydro Subproject is a Greenfield project to generate electricity. The proposed subproject is a run-off-river scheme and uses water from Monjo Khola. The subproject is planned to develop 942 kWcapacitiesreleasing 10% of minimum monthly flow as per **"Directive on Physical Infrastructure Construction and Operation in Conservation Areas, 2065"[2].** However, the required minimum discharge to maintain the riverine biota in the reduced flow zone of the river stretch will further be assessed during ESIA study. The subproject will provide electricity facility to 582 households inJorsalle, Chyuma, Byankar, Tok Tok, Thulo Gamela, Phakding, Sano Gamela, Chermading, Ghat, Thadakoshi, Chheplung, Muse and ChaurikharkaVillages of Ward No. 3.

2.2 LOCATION AND ACCESIBILITY

The subproject has been proposed to implement in Pangboche, Ward No. - 3,KhumbuPasangLhamu Rural Municipality, Solukhumbu District, Province 1 of Republic of Nepal (**For Maps, Annexes XI**). Major subproject components such as headworks (including intake, desanding basin) and some part of penstock pipe are proposed to be located on the left bank of Monjo Khola while remaining part of penstock, tailrace and powerhouse facility as well as the switchyard station are proposed to be located on the right bank of Monjo Khola, which is a tributary of of Dhudh Khosi River. Geographically, the proposed subproject lies between 27°46'00"N to 27°46'30"N latitude and 86°43'20.00"E to 86°44'30.00"E longitude. The elevation within the subproject area varies between 2744 m to 2960 mamsl.

From Kathmandu, the subproject site is accessible by commercial air flight and on foot. Flight from Kathmandu to Lukla takes around 30 minutes. From Lukla, the site is either accessible by helicopter or on foot. Travel on foot from Luklato subproject site is about 9.5 km.Materials and equipment to the subproject site can be transported either by helicopter or mules.Alternatively, the project site can be accessed by road along with walk on foot. Amotorable road of 216 km from Udaypurconnects to Salleri bazaar. From Salleri Bazaar there is seasonal road to Buksa which is 48 km long. From Buksa, the subproject site is accessible either by helicopter or on foot. Travel distance on foot from road head via Lukla to subproject site is around 45 km and requires 3 days for a loaded porter. From Lukla to Monjo, it is about 9.5 Km foot trail.

2.3 SALIENT FEATURES

The salient feature of the proposed subproject is as follows given in table.

Table 1: Salient feature of the Subproject

1	**Location**		
	Province	:	1
	District	:	Solukhumbu

[2]At least 10% of the monthly discharge should be released to river/stream in order to generate electricity using river/stream in National Parkes and Conservation area.

	Rural Municipality	:	Khumbu Pasanglhamu Rural Municipality Ward:3
	Project Boundary	:	27°46'00"N to 27°46'30"Nand 86°43'20.00"E to 86°44'30.00"E
	Intake	:	27°46'15.20"Nand86°44'15.80"E, elevation 2960 m amsl
	Power House	:	27°46'15.00"N and 86°43'20.18"E,elevation 2744 m amsl
2	**General**		
	Name of River	:	MonjoKhola
	Nearest Town	:	Lukla (9.5 km)
	Type of Scheme	:	Run of River
	Gross Head	:	215.50 m
	Installed Capacity	:	942 kW
	Annual Energy	:	7,186,131.69 kWh
3	**Hydrology**		
	Catchment Area at Headworks Site	:	43.26 km^2 (Total), 18.83 km^2 (>5000 m) 24.43 km^2(A> 2959, A < 5000 m)
	Measured Discharge	:	427 lps (5 March 2020)
	Design Discharge ($Q_{80\%}$)	:	0.560 m^3/s
	Design Flood (1 in 100 year)	:	15 m^3/s (Intake) , 31 m^3/s (Powerhouse)
	Compensation flow	:	10% of discharge of driest month (Min)*
4	**Diversion Weir**		
	Type	:	Concrete gravity type weir
	Length	:	8.5 m
	Height	:	1.45 m
	Crest level	:	El. 2960.50 m
	Resoirvoir (due to Diversion Weir)		
	Surface Area	:	180 m^2
	Volume	:	167.40 m^3
	Average depth	:	0.93 m
	Average Width	:	9 m
	Average Length	:	20 m
6	**Intake**		
	Type	:	Bottom/Drop intake
	No of Orifice	:	1 No.
	Size of trashrack	:	6.0 m (L) x 0.71 m (B)
	Inclination of trashrack	:	10^o
7	**Gravel Trap**		
	Size (L x B x H)	:	6 m x 1.5 m x 2.15 m
	Bed load size to trap	:	2 mm
8	**Approach Canal**		
	Type	:	Rectangular RCC canal
	Length	:	2.4 m
	Size (B x H)	:	0.7 m x 1.3 m
	Bed Slope	:	1:100
9	**Desanding Basin cum Forebay**		
	Type	:	Conventional with head pond
	Size (L x B x H)	:	28.5 m x 3.2 m x 2.34 m
	Number of Bay	:	1 No.
	Nominal size of trapped particle	:	0.2 mm
10	**Penstock Pipe**		
	Type	:	Mild Steel Pipe (Exposed & Buried)

	Internal Diameter	:	600 mm
	Pipe Thickness	:	4 mm thick 234.33 m long 6 mm thick 299.14 m long 8 mm thick 182.38 m long 10 mm thick 649.93 m long 12 mm thick 45.57 m long
	Branch pipe	:	MS 300 mm dia., 12 mm thick 10 m long (Each)
	Total Length of the pipe	:	1410 m
	No of Anchor Block	:	44 Nos
11	**Powerhouse**		
	Type of powerhouse	:	Surface Type
	Size (L x B x H)	:	21 m x 8.73 m x 6.7 m
	Turbine Axis Level	:	El. 2745.00 m
12	**Tailrace Conduit**		
	Type	:	Pipe and Canal
	Canal Size (L x B x H)	:	24.71 m x 0.66 m x 0.82 m
	Pipe		MS 600 mm dia, 4 mm thick, 47.22 m long
13	**Turbines**		
	Type	:	Horizontal Shaft Pelton Turbine Double Jet
	Number of Units		2 No.
	Discharge per unit	:	0.280 m^3/sec
	Rated Output (Mechanical)	:	496 kW X 2
	Synchronous Speed	:	1000 rpm
	Rated Net Head	:	204.99 m
	Rated Efficiency at 100% Discharge	:	88%
14	**Generators**		
	Type	:	3-Phase, Synchronous, Brushless
	Rated Output Capacity per Unit	:	650 kVA
	Rated Efficiency	:	96%
	Frequency	:	50 Hz
	Rated Voltage	:	0.4 kV
	Number of Poles	:	6
	Speed	:	1000 rpm
	No of units	:	2 Nos.
15	**Governor**		
	Type	:	Electronic, PID Oil-hydraulic, self-closing without electric power
	No of units	:	2 Nos.
16	**Transformer**		
	A. Power Transformer		
	Type	:	ONAN Cooling, YNd11, 3 phase
	Rated capacity	:	630 kVA
	Voltage ratio	:	0.4/11 kV
	Efficiency	:	98%
	No of units	:	2 Nos.
	B. Distribution Transformer		
	Type	**:**	11/0.4 kV, 3-phase, oil immersed, copper owned AVR with parallel operation
	Rated Capacity	:	150 kVA- 2 Nos
			125 kVA- 5 Nos
			100 kVA- 1 Nos

			75 kVA-3 Nos
			50 kVA-3 No.
17	**Transmission & Distribution line[3]**		
	A. Single Line Distribution		
	Total Length of 11 kV underground line (underground PVC sheathed armored 3 core 70 sq. mm aluminum)	:	16.00 km
	Total length of 11 kV overhead line during river crossings (Dog ACSR)	:	0.80 km
	1.1 kV 120 sq.mm. 4 Core XLPE Insulated Unarmored Aluminum Cable	:	8.00 km
	1.1 kV 95 sq.mm. 4 Core XLPE Insulated Unarmored Aluminum Cable	:	6.0 km
	1.1 kV 35 sq.mm. 4 Core XLPE Insulated Unarmored Aluminum Cable	:	10.00 km
	B. Distribution Transformor		
	Type	:	Outdoor installation type
	Quantity required	:	Fifteen (15)
	Type of cooling	:	ONAN
	Number of phases	:	Three phase
	Frequency	:	50 Hz
	Rated voltage	:	
	1) Primary	:	11 kV
	2) Secondary	:	0.4 kV.
	Vector group symbol (by IEC designation)	:	Dyn11
	C. Major Crossings		Length of crossing (meters)
	Jorsalle	:	80
	Monjo	:	50
	Byankar	:	110
	Toktok 1	:	30
	Toktok 2	:	30
	Rangding	:	80
	Sano Gamela	:	60
	Chermading	:	65
	Lowa	:	65
	Thadokoshi	:	40
	D. Poles for Overhead Transmission During Crossings		
	Type	:	Galvanized Mild Steel Tubular poles
	Total Length	:	9 m

[3] Coordinates of transmission lines has been given in Annex X

	Bottom Section	:	5m long, outer diameter 165.1 mm, thickness 4.5 mm
	Middle section	:	2m long, outer diameter 139.7 mm, thickness 4.5 mm
	Top section	:	2m long, outer diameter 114.3 mm, thickness 3.65 mm
	Minimum weight	:	120 kg
	E. Sub-Station		
	Type	:	Pole mounted
	Total Sets	:	14
	Pole Type	:	Galvanized steel tubular poles
	Length of Poles	:	9 m
	F. Conductors		
	Type	:	ACSR Conductor (Dog)
	Code Name	:	Dog
	Nominal Aluminum Area, mm^2	:	100
	Specific Weight, kg/km	:	394
	Resistance, ohm/km	:	0.2745 A
	Inductive Reactance	:	0.315
	G. Underground Cables	:	Poly Vinyl Chloride (PVC) insulated armored aluminum cable
	H. Distribution Box		
	Total Number	:	92
	Coordinate of First DB	:	X: 86.722267ºE;Y:27.778681ºN [North most]
	Coordinate of Last DB	:	X: 86.719913ºE;Y: 27.687172ºN [South Most]
	System	:	Double Door
	Size	:	L X B X H = 45 cm X 30 cm X 60 cm
18	**Switchyard**		
	Type	:	Indoor, Single Bus Configuration, 11 kV
	Dimension	:	3.55 m X 6.32 m
	Location	:	Inside Powerhouse
19	**Load Center**	:	**No. of HHs (582 Beneficiary Households)**
i.	Bosum	:	9
ii.	Byankar	:	43
iii.	Chauri Kharka	:	34
iv.	Chaurikharka (Dungde)	:	54
v.	Chesurma	:	12
vi.	Chheplung	:	59
vii.	Chhermading	:	6
viii.	Chyuma	:	25
ix.	Ghat	:	40
x.	Ghattekhola	:	4
xi.	Jamphutte	:	8
xii.	Lowa	:	5
xiii.	Monjo	:	59
xiv.	Muse		40
xv.	Muse (Bakudingma)		4
xvi.	Ngamateng		6
xvii.	Phakding		56
xviii.	Rangding		13
xix.	Teka		5
xx.	Thadokoshi		17
xxi.	Tok-Tok		26
xxii.	ThuloGumela		32

xxiii.	Sano Gumela		25
20	**Power and Energy**		
	Type of Power Plant	:	Run-of-river
	Design Discharge	:	0.56 m^3/s
	Total Gross Head	:	215.50 m
	Rated Net Head	:	204.99 m
	Installed Capacity	:	942 kW
	Total Annual Energy	:	7,185,451.87kWh
21	**Project Cost Estimate**		
	Total Project Cost with VAT and Provisional Sums and IDC	:	NRs. 473,610,930.92
	Cost Per kW	:	NRs. 502,771.69
	Net Present Value (@ 10% discount factor)	:	NRs. 90,467,138.37
	Project rate of return	:	13.73%
	Payback	:	8.03 years
	BC Ratio	:	1.2
22	**Construction Period**	:	18 Months
	* the required minimum discharge to maintain the riverine biota in the reduced flow zone of the river stretch will further be assessed during ESIA study		

2.4 SUBPROJECT COMPONENTS

Water of Monjo Khola will be diverted by constructing 8.5 m long and 1.45 m high diversion weir to generate annual average energy of about 7,185,451.87kWh. The major civil components of the subproject are as follows.

2.4.1 HEADWORKS

The headworks of the proposed subproject are situated at about1.3 Km upstream from the confluence of Monjo settlement.

i) Diversion Weir

A permanent concrete gravity type weir is provided across the river to divert the required flow through the intake. The length of weir is 8.5m and its crest level is fixed at 2960.50 mamsl. The bed level of river at upstream side of weir is 2959.57 mamsl and at downstream of weir is 2959.35 m amsl.The high flood level at weir is 2961.38 mamsl for flood discharge of15 m^3/s at 100 years return period. The platform level for gates operation is fixed at 2962.38 m amsl.Upstream apron of 1.5m length is provided whereas downstream apron is of length 7.3m.

ii) Bottom Intake

As the gradient of river is steep, the bottom intake is proposed for the diversion of water from river. The length of trashrack provided along the axis of weir is 6m and the inclined width of trashrack is 0.71m. The trashrack is capable of diverting 0.67 m^3/s of discharge which is 20% more than the design turbine discharge (0.56 m^3/s). The normal water level at intake is fixed at 2960.50 mamsl.

iii) Approach Canal

The diverted water from intake is carried through approach canal to the gravel trap. The width of canal is 0.7m and overall depth is 1.3m. The length of canal is 2.4 m.

iv) Gravel Trap

The length of gravel trap is 6m, width is 1.5m and average depth is 2.15m.The normal water level at gravel trap is 2959.80 m amsl. Side spillway of length 4m is provided at gravel trap to spill the excess flood discharge. The crest level of spillway is fixed at 2959.85 m amsl. The size of flushing gallery provided at gravel trap is 0.4m x 0.4m. The inlet transition of length 1.5m is provided whereas outlet transition of length 0.9m is provided.

v) Desanding Basin

The length of basin is 28.5m, width is 3.2m and average depth is 2.34m.The design size of particle to settle at desanding basin is 0.2mm. The inlet transition of length 4.70m is provided to maintain the steady flow at basin. The size of flushing gallery provided at basin is 0.4m x 0.4m. The bed slope of 1:50 is provided at basin.At the end of desanding basin, headpond of length 2m, width 3.2m and depth 3.02m is provided to maintain the adequate submergence depth for penstock pipe. The normal water level at headpond is maintained at 2959.71 mamsl.

2.4.2 PENSTOCK PIPE AND SUPPORTS

Mild steel penstock pipe with internal diameter 600mm and length 1410 m is proposed for conveying water from headpond to the turbine. The thickness of pipe varies from 4mm to 12mm. After bifurcation, two manifolds of 10.35m length and 300mm internal diameter is provided.Anchor blocks are provided at each horizontal and vertical bends to restrain the forces generated at bends. Total 44 numbers of blocks are provided (including bifurcation and branches) in the sub-project.

2.4.3 POWERHOUSE AND TAILRACE

i) Power House

The powerhouse is located near Monjo Village on left bank of Dudh Koshi River. The powerhouse contains two units of turbine and generator, associated electrical and mechanical equipment and a maintenance bay. The powerhouse is surface type and is located at an elevation of about 2744 m. It contains two units of horizontal shaft Pelton turbine which drives a generator and generates a power of 471 kW each, with total installed capacity of 942 kW. The dimension of the powerhouse is 21m x 8.73m x 6.7m. The floor level of powerhouse is fixed at 2744.40 m amsl elevation and the turbine axis level is at 2745.00 m elevation.

ii) Tailrace

The water form two units of powerhouse are conveyed to Dudh Koshi River through combination of tailrace canal and pipe. The length of tailrace canal is 24.71m and that of pipe is 47.22 m. The bed slope of 1:200 is provided for tailrace canal. Tailrace canal have width of 0.66m and overall depth of 0.82m. The diameter of pipe used in tailrace is 600mm. At outlet portion, gabion and boulder riprap protection are provided to prevent erosion of soil.

2.4.4 SWITCHYARD AREA

An indoorswitchyard of 3.55 m X 6.32 mhas been proposed for the transmission of 942 kW of power. The generated powers from two 650 kVA alternators are transferred to a 400 V busbar. From this busbar two transformers of 630 kVA each are connected in parallel operation and the power is fed to a single bus system of 11 kV. This bus system will be used to transmit electricity in high voltage majorly through a high voltage underground cable. The transformers, transformer protection system, CTs, PTs, isolators, VCBs and bus bars are major equipment of the outdoor switchyard. The details of switchyard equipment can be viewed in the electrical single line diagram of Monjo Khola Mini Hydro Subproject.

2.4.5 TRANSMISSION AND DISTRIBUTION LINE

In the DFS, the transmission and distribution network are designed considering the following load centers:

i. 278HHs with the demand of 1.5 kW per household and 54HHs with 1 kW demand.
ii. 24 big hotels with the demand of 3 kW per hotel, 38 medium hotels with the demand of 2kW per hotel and 75 small hotels with the demand of 1.5 kW per hotel.
iii. 74 restaurants, with the demand of 1.5 kW each.
iv. 20 Social Institutionswith the demand of 3 kW each
v. 1 hospital with the demand of 3 kW
vi. 3 Snooker houses and 9 shops with demand of 1 kW each.
vii. A ward office with demand of 2.5 kW.
viii. 2 bakeries with 2 kW demand each and 3 end uses with 4 kW demand each.

Further as a part of subproject, the power/energy to be generated at MKMHP will be evacuated and distributed to the proposed Khumbu Pasang Lhamu RM-3 through a 40.80km long transmission and distribution with 11kV transmission line and 400/230 V as distribution voltage. The transmission line uses only public land along with foot trails through underground distribution system.

2.5 SUBPROJECT ACTIVITIES

2.5.1 PRE-CONSTRUCTION PHASE

- Detail design of the subproject components;
- Preparation of bid documents and Selection of contractors for the construction works;
- Arrangement of land for the subprojectand establishment of construction power;
- Appointment of contractors and suppliers and organization of subproject management group;
- Generation license acquisition and Power purchase agreement, and
- Financial closure of the subproject.
- Preparation of E&S document and plans
- Identification and consultations with the stakeholders
- Obtaining required permits, including the final approval of ESIA

- Institutional arrangement to implement EMIMAP and conduct
- Establishment of Grievance Redressal Mechanism

2.5.2 CONSTRUCTION PHASE

- **Preparatory works:** Land acquisition, Establishment of construction facilities and Arrangement of burrow area of construction materials
- **Civil works:**Construction Activities of subproject components
- **Hydromechanical works:** Fabrication, transportation, erection and testing of gates, trash racks, penstock pipes etc., Civil works for steel structures and then the installation works.
- **Electromechanical works:** Equipment installation
- **Transmission Line work**
- **Commissioning of Power Plant**
- Institutional arrangement to implement EMIMAP and conduct
- **Continuation of consultations with stakeholders and functioning of GRM**

2.5.3 OPERATION AND MAINTENANCE PHASE

- Trial Operation/Staff training;
- Defect liability maintenance;
- Adjustments and provisions;
- Final Bills and Completion Certificates;
- Review of output;
- Availability Declarations;
- & M Scheduling;
- ***Continuation of consultations with stakeholders and functioning of GRM***

2.6 CONSTRUCTION PLAN

2.6.1 LAND REQUIREMENTS

An estimated land area of about 5.648 ha is required for construction of the subproject components and provisioning for subproject facilities (**Table 2**).

Table 2: Estimated Land Requirement and Ownership for MKMHP

SN	Component	Land Area (Ha)	Acquisition (Temporary or Permanent)	Land Ownership
1	Headworks	0.054	Longterm Lease	Public
2	Penstock Alignment	0.411	Permanent for Private land and Long Term Lease for Public	Public + Private
3	Powerhouse, Switchyard and Tailrace	0.055	Permanent	Private
4	Spoil Disposal Sites	0.05	Temporary (Short term Lease)	Public
5	Quarry and Burrow Sites	0.39	Temporary (Short term Lease)	Public
6	Workshop and Material Storage	0.08	Temporary(Short term Lease)	Public

7	Project camps and offices	0.05	(long term Lease)	Public
8	Transmission Lines	4.55	Temporary	Public + Private
9	Electric pole Installation	0.008	Permanent for Private land and Long Term Lease for Public	Private + Public
10	Resoivoir	0.18	Long term Lease from BZCF	Public
	Total	**5.656**		

2.6.2 HUMAN RESOURCES

It has been estimated that about a total of 250 unskilled and 100 skilled workers will be involved daily during the peak construction period in two shifts. The details of workers and their type (in terms of skilled, semiskilled and unskilled) will be assessed during ESIA study as per different stages of the subproject.

2.6.3 CONSTRUCTION MATERIAL

Estimated volumes 783.73 $m^3$of concrete and stone masonry work of volume 287.53 $m^3$are estimated to be required for the subproject construction. The main construction materials and their estimated quantity are presented in **Table 3**.

Table 3: Estimate of construction materials

SN	Construction materials	Quantity	Source
1	Cement (bags)	9,500	Factory
2	Aggregate (m^3)	900	Quarry Sites
3	Sand (m^3)	850	Quarry Sites
4	Boulder Stone (m^3)	2,200	Quarry Sites
5	Reinforcement Bars (ton)	63	Factory

2.6.4 CONSTRUCTION WORK PLAN

The proposed MKMHSP will require an estimated time frame of about 18 months for completion from the date of commencement to the date of commercial operation (**Annex XII**).

2.6.4.1 ENERGY REQUIREMENTS

As there is no National Grid, two diesel generator sets each with 10 kVA capacities will be required at the headworks site and powerhouse respectively to meet the electricity demand of the construction purpose and for lighting of construction camps. Alternatively, a nearby micro hydro of 50 kW (Monjo MHP) can be used for required energy.

2.6.4.2 ANCILLARY FACILITIES

a) Site Access

Site access shall be provisioned by using existing trails from Monjo to reach to various subproject component sites. The details of the access trails are provided in **Table 4** hereunder.

Table 4: Site Access

SN	Description	Length	Width of trail	Remarks
1	Monjo to Powerhouse	150 m	4 ft	
2	Powerhouse to Headwork	1.5 Km	4 ft	

b) Subproject Camps and Storage

One subproject camp (nearthe forebay location of existing Monjo Khola Micro hydro Project) is proposed to accommodate Contractor's construction workforce as personnel of supervising Engineers and the Employer's staff. The campwill be located at the right bank of Monjo Khola on private land. A careful assessment is needed in the ESIA to understand potential E&S impacts of the labor camp, its location, proximity to settlements and the way workers will be managed.

c) Material Storage and Workshop

Material storage and mechanical workshops are located on the right bank of MonjoKhola at the camp site.

d) Quarry Site and Burrow Pits

Various probable quarry sites have been identified based on geological investigation which is discussed below in **Table 5**.

Table 5: Proposed quarry and burrow sites for MHKHP

SN	**Site Code**	**Location**	**Coordinate**	
			N	E
1	Quarry Site-1	Headworks	27°46'15.20"	86°44'15.80"
2	Quarry Site-2	Powerhouse	27°46'15.00"	86°43'20.18"

e) Batching Plants and Aggregate Crushing Plants

The facilities for aggregate crushing and batching plants will be located at the headwork and powerhouse sites close to the active construction sites. These facilities will be operated with provisions of air pollution control, noise control/arresting facilities, and water and waste water management facilities. These will be temporary facilities to be demolished at the end of the construction period.

f) Spoil Volume & Disposal Area

About 500 cubic meters of spoils has been estimated to be generated due to excavation for subproject component construction. Two disposal sites are proposed(**Table 6**). The ESIA study will prescribe rehabilitation of spoil disposal sites considering erosion prevention and aesthetic retention.

Table 6: Proposed Spoil disposal Sites for MKMHP

SN	**Site Code**	**Location**	**Coordinate**	
			N	E
1	Spoil Deposit Site-1	Desilting Basin Area	27°46'15.25"	86°44'15.02"
2	Spoil Deposit Site-2	Powerhouse	27°46'15.00"	86°43'20.18"

g) Materials and Equipment Transportation

Materials and equipment will be transported to site by appropriate means of transportation.

As the subproject area is lack of motorable road, air transport and manual carrying of load by man and animals will be used.

2.6.4.3 POWER AND ENERGY

The proposed MKMHP with an installed capacity of 942 kW will utilize a net head of 204.99 mwith design discharge of 0. 0.56 m^3/s to generate total average annual energy 7,185,461.87 kWh(**Table 7**).

Table 7: Estimated Monthly Power and Energy Generation from the proposed MKMHP

Month	Numbers of operating days/ month	Turbine discharge	Net head	Generation capacity	Energy
		m^3/s	m	kW	kWh
January	31	0.560	204.99	942.01	672832.10
February	28	0.448	208.45	766.39	494416.55
March	31	0.323	211.41	560.70	400471.44
April	30	0.249	212.71	434.31	300197.75
May	31	0.560	204.99	942.01	672832.10
June	30	0.560	204.99	942.01	651127.84
July	31	0.560	204.99	942.01	672832.10
August	31	0.560	204.99	942.01	672832.10
September	30	0.560	204.99	942.01	651127.84
October	31	0.560	204.99	942.01	672832.10
November	30	0.560	204.99	942.01	651127.84
December	31	0.560	204.99	942.01	672832.10
Total annual energy generated (kWh)					**7,185,461.87**

CHAPTER 3: LAW AND POLICY

Government of Nepal has developed various acts, regulations and guidelines for environmental friendly development activities. Similarly, WB has some guidelines and requirements for EIA study. The policies, laws, rules and regulations, and other guidelines and directives, which will govern the undertaking of ESIA, include the followings:

Table 8: Relevant law, regulations and policies

SN	Acts/Regulations/Guidelines
1	**Constitution of Nepal**
2	**Plans, Policies and Strategy**
2.1	**Plan**
2.1.1	Fifteenth Plan (FY 2076/77-2080/81)
2.1.2	Nepal Biodiversity Strategy and Action Plan 2071-2077 BS (2014-2020 A.D.)
2.1.3	Nepal Environmental Policy and Action Plan, 2050 B.S. (1993 A.D.)
2.2	**Policy**
2.2.1	National Occupational Safety and Health Policy, 2076
2.2.2	National Environmental Policy 2076 B.S. (2019)
2.2.3	Renewable Energy Subsidy Policy,2073B.S. (2016 AD)
2.2.4	AEPC Gender Equality and Social Inclusion Policy, 2075 (2018 AD)
2.2.5	Public-Private Partnership Policy, 2072 (2015)
2.2.6	Land Acquisition, Resettlement and Rehabilitation Policy, 2071 BS (2015 AD)
2.2.7	Rural Energy Policy 2063 BS (2006 AD)
2.2.8	Hydropower Development Policy, 2058 BS (2001 AD)
2.2.9	Environmental and Social Safeguard Policy of AEPC (undated)
2.3	**Strategy**
2.3.1	National Energy Efficiency Strategy, 2075
2.3.2	Water Resource Strategy, 2058 BS (2002 AD)
3	**Act, Rules and Regulations**
3.1	**Act**
3.1.1	Environment Protection Act, 2076 B.S. (2019 AD).
3.1.2	Local Government Operation Act, 2074 (2017)
3.1.3	Intergovernmental Fiscal Arrangement Act, 2074
3.1.4	Act to Regulate and Control on International Trade in Endangered Species of Wild Fauna and Flora Act, 2074 (2016)
3.1.5	Muluki Criminal Code Act, 2074(2017)
3.1.6	National Civil Code Act, 2074
3.1.7	Solid Waste Management Act, 2068 BS (2011 AD)
3.1.8	Plant Protection Act 2064 (2007)
3.1.9	Child labor (Prohibition and regularization) Act, 2056 BS (2000 AD)
3.1.10	Electricity Act, 2049 BS (1992AD)
3.1.11	Water Resources Act, 2049 BS (1992AD)
3.1.12	Land Acquisition Act, 2034 (1977)
3.1.13	National Parks and Wildlife Conservation Act, 2029 BS (1973AD)
3.1.14	Aquatic Animal Protection Act, 2017 BS (1960 AD)
3.2	**Rules/Regulations**
3.2.1	Environment Protection Regulation, 2077 (2020 AD)
3.2.2	Labor Rules, 2075 BS (2018 AD)
3.2.4	Electricity Regulatory Commission Rules, 2075
3.2.5	Solid Waste Management Regulation, 2070
3.2.6	Plant Protection Rules, 2067 BS (2010 AD)

SN	Acts/Regulations/Guidelines
3.2.7	Child Labor (Prohibition and Regulation) Rules, 2063 BS (2006 AD)
3.2.8	Conservation Area Management Rules, 2053
3.2.9	Buffer Zone Management Regulation, 2052
3.2.10	Forest Regulations, 2051 BS (1995 AD)
3.2.11	Electricity Rules, 2050 BS (1993)
3.2.12	Water Resources Regulations, 2050 BS (1993 AD)
3.2.13	Himali National Park Rule, 2036
3.2.14	National Parks and Wildlife Conservation Rules, 2030 BS (1974 AD)
4	**Guidelines/Manuals/Directives**
4.1	Directive Relating to Licensing of Power Projects 2075
4.2	Hydropower Environmental Impact Assessment Manual, 2075 (2018)
4.3	Working Policy on constructing and operating physical infrastructures in Protected Area 2065 (2008)
4.4	Community Forest Inventory Guidelines, 2061 BS (2003 AD)
4.5	National EIA Guidelines, 2050 BS (1993 AD)
4.6	Guideline on Environmental & Social Risk Management (ESRM) For Banks And Financial Institutions, May 2018
5	**Working Procedures/Work Plan**
5.1	Working Procedure for the Use of National Forest Area for National Priority Project, 2074 BS (2017 AD)
5.2	Renewable Energy Subsidy Delivery Mechanism 2073 BS (2016 AD)
5.3	Renewable Energy Subsidy Delivery Mechanism for Special Program 2073 BS (2016 AD)
6	**Standards**
6.1	National Ambient Air Quality Standard, 2069 BS (2012 AD)
6.2	National Noise Quality Standard, 2069 BS (2012 AD)
6.3	Standards for Emission from in-use and Imported Diesel Generators, 2069 BS (2012 AD)
6.4	Tolerance Limits for Industrial Effluents to be Discharged into Inland Surface Waters, 2003
7	**World Bank ESS Instruments**
7.1	**Operation Manual**
7.1.1	Environmental Assessment EA (OP/BP 4.01)
7.1.2	Natural Habitats (OP/BP 4.04)
7.1.3	Physical and Cultural Resources (0P/BP 4.11)
7.1.4	Involuntary Resettlement (OP/BP 4.12)
7.1.5	Indigenous People (0P/BP 4.20)
7.1.6	Forests (OP/BP 4.36)
8	**International Instruments**
8.1	The United Nations Declaration on the Rights of Indigenous Peoples, UNDRIP, 2007
8.2	International Labour Organization Convention, 1998
8.3	Convention on Biological Diversity (CBD), 1992
8.4	Concerning Indigenous and Tribal Peoples in Independent Countries, 1991 Convention (No.169)
8.5	World Heritage Convention, 1975
8.6	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), (1973 amended1979)

A brief review of the above policy and legal mechanisms shall be presented focusing on the provisions attracting the implementation and operation of the subproject. Moreover, an analysis on the gap between national legislation and WB policies will be done.

CHAPTER 4: BASELINE ENVIRONMENTAL CONDITIONS

4.1 PHYSICAL ENVIRONMENT

4.1.1 TOPOGRAPHY

Topographically the subproject area is rugged and undulated.The topography of the subproject area is of gentle to steep. The headworks lie in narrow river valley of Monjo Khola. The hill slope is steep. Monjo Khola Mini Hydro Subproject runs through steep to mild slope rock before some cultivated land at Monjo village. Powerhouse area is somewhat flat.

4.1.2 GEOLOGY

The subproject area is located at around the boundary of Higher and Trans Himalaya Zone. This zone is basically created by the tectonic upliftment, wind and glacial erosion, and slope degradation by rock disintegrations. Main rock type found in this region are Gneisses, schists and marbles of the Higher Himalayan Zone and Tethyan sediments (limestone, shale, sandstone etc.) belonging to the Tibetan-Tethys Zone.

The subproject area geologically lies on the Trans and Higher Himalayan Crystalline Zone in the eastern part of Nepal. The subproject area possesses the high-grade metamorphic rocks. The subproject site falls within the Khumbu Migmatite Schuppe Zone. This zone is distributed widely in the upper reaches of the BhoteKoshi Khola and Dudh Koshi, occupying the main part of the crystalline Schuppen in this region.

4.1.3 METEOROLOGICAL CONDITION

4.1.3.1 PRECIPITATION

The precipitation in the Khumbu Region may be considerably greater on the upper slopes than in the valleys. The average annual precipitation is about 2,100 mm at elevations between 2,500 to 3,000 mamsl. Between the altitudes 3,500 and 4,500 mamsl, precipitation is around 1,000 mm, and around 500 mm above 4,500 mamsl. The non-monsoon precipitation is around 150 mm at altitudes above 3,500 mamsl. At 3,000 mamsl, precipitation is around 250 mm. Data available from Chaurikharka Meteorological Station (2613 mamsl), is taken into consideration as our project also lies in its vicinity. The monsoon precipitation observed at this station is 81 per cent of the annual total. Likewise, monsoon wetness index of the catchment area is taken as 1000 from Isolines in Monsoon Index Map.

Table 9: Monthly Precipitation at Chaurikharka Station (mm)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chaurikharka	16	28	51	80	106	310	566	531	303	92	14	9

Source: DHM

4.1.3.2 TEMPERATURE

Meteorological Stations at Namche located at elevation 3450 m which shows the mean monthly temperatures. This has been taken as reference station for temperature data. According to the data observed January is the coldest month and July is the warmest month.

Table 10: Mean monthly temperature at Namche (degrees Celsius)

Meteorological Station	Elevation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Namche	3450	-0.7	0.6	3.5	7.2	9.2	11.4	12.4	12.1	11.0	7.6	4.0	0.8

Source: DHM

4.1.4 AIR QUALITY

The subproject area is in rural setting and there is no industry causing air pollution. Thus air quality of the area seems good.

4.1.5 NOISE QUALITY

The noise quality seems to be within tolerable limits and there are no any means of noise pollution sources except naturally flowing streams and helicopters movement in air.

4.1.6 SUBPROJECT LOCATION FROM FLOOD LEVEL

The intake area is in flood level. Other structures are away from flood plain areas.

4.1.7 SOIL QUALITY

Soil quality is poor as it mostly contains quaternery alluvial deposits alongwith colluvial deposits. The soil comprises boulders, gravels, cobble and pebbles of gneiss with sand. Most dominant proportion (about 60%) is of boulder and cobble in headwok areas. The soil around the water conveyance route is colluvium and alluvium, residual soil with thin soil cover in scattered forest area. The alignment mostly passes through the colluvial soil formed by the weathering and erosion of the bedrock gneiss consisting of boulder, gravel sandy silt along the cultivated land. The soil is sandy silt.

4.1.8 WATER RESOURCES

Dudhkoshi and Monjo Khola are the major streams in the area. Both are snow fed rivers. The Dudh Khosi water is not used for any household and irrigation purposes while water form Monjo Khola has been used for peltric set, micro hydro and drinking purposes by some households (HHs). Livestock use the water for drinking.

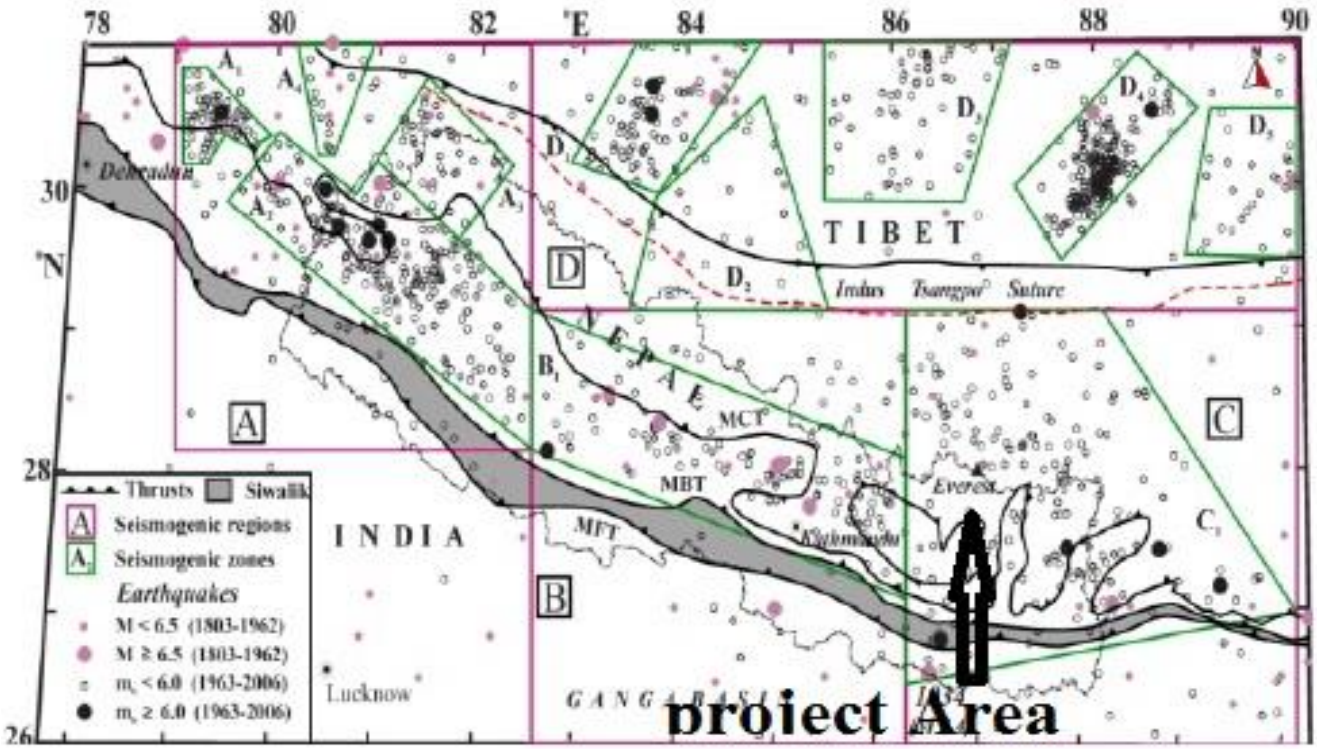
4.1.9 AGRO-ECOLOGICAL ZONES WITHIN SUBPROJECT AREA OF INFLUENCE

Agriculture land is very premium in the area. Crop diversity is also poor due to harsh climatic condition and vertical cliff towering to sky. Potato and buck wheat are major agriculture products in the area. Some people have started vegetable farming in plastic tunnel.

4.1.10 SEISMICITY

The Himalayan region is considered to be seismically active zone. Thus, being a part of the Himalayas, the Nepal Himalaya also falls in active seismic zone. Furthermore, the existence of tectonic features such as Main Central Thrust (MCT), Main Boundary Thrust (MBT) and

Himalayan Frontal Fault (HFF) further increases the amount of seismic risk. The recent seismic activities are mainly due to the shallow focus events and these are mostly confined between the surface manifestations of the MBT and the MCT in the Himalayan frontal arc and to the north of the Indus Tsangpo Suture (ITS) in the South-Central Tibet. The intermediate earthquakes have occurred mostly in three localities associated with intense shallow focus activity: Western Nepal, north-northeast of Mount Everest, and north of the ITS along 88°E. The medium size earthquakes (mb≥ 6) in Himalayan thrusts occur at deeper levels as compared to the similar magnitude earthquakes at shallowest level in the adjoining Tibet region.



Map 1: : Seismic Map (1803-2006) of Nepal and Seismic Zoning its adjoining Region in Nepal Himalaya.

(MCT, MBT, MFT and ITS are the major tectonic features in the region)

The subproject area falls in the Class (C) (Figure 1) having high seismic risk Considering the historical and recent earthquake and design parameter of Upper Karnali project and Arun 3 Hydropower Project, the Seismic coefficient for Monjo Khola Mini Hydropower Project is evaluated based on Nepalese and Indian Standards. During the recent earthquake 2015, the Peak Ground Acceleration recorded as 0.30g and same would be expected at the site and the same may be adopted as Maximum Credible Earthquake (MCE) value 0.30g for the project and a value of 0.18g may be appropriate as Design Base Earthquake (DBE). Further details for these parameters needs to be verified during detailed design phase. The recommended value for MCE of 0.30g has been considered to be sufficient to use for the detail design purpose.

4.1.11 CLIMATE CHANGE AND NATURAL DISASTERS

In Sagarmatha, air temperature has risen by 1ºC since the 70s, leading to a decrease in snow and ice cover of 30 percent in the same period and replacing a 4000 m high glacier on Mt. Everest by a lake (Khanal et. al. 2012). Glacier lake outburst floods (GLOFs) are now much more frequent, creating serious risks for human populations and having implications for the water supply in South Asia and the flow of major rivers such as the Ganges, Indus and Brahmaputra (Khanal et. al. 2012). The issue of climate change and GLOFs is prominent in the subproject area. The Dudh Koshi basin is the largest glacierized basin in Nepal. It has 278 glaciers of which 40, amounting to 70% of the area, are valley-type (Bajracharya and Mool 2010). The Monjo Khola starts from Kyasar Glacier. But GLOF due to Kyasar has not been recorded till date. So it has been assumed that it is safe from Kyasar glacier. Imja is another most dangerous glacial lake with high probability of burst. If it bursts, it will impact the power house region. It will be described briefly in ESIA reports.

4.2 BIO-ECOLOGICAL ENVIRONMENT

The subproject area lies in Temperate Life Zone (elevation range: 2000-3000 m). As per The Conservation Science Programme WWF-US (1998), the subproject area falls under East Himalayan Broadleaved Forest Ecoregion (1500-3000 m) with Upper Temperate Blue Pine Forest and Fir Birch Rhododendron Forest. The intake area along with about 150 m of penstock pipelining area lies in Fir Birch Rhododendron Forest while remaining project structures lie in Upper Temperate Blue Pine Forest Zone.

4.2.1 VEGETATION IN SUBPROJECT AREA

The subproject area lies in buffer zone Sagarmatha National Park (SNP). The area falls within *Chaurikharka Buffer Zone User Committee*. Under this committee, the forest has been managed by Himalaya Buffer Zone Community Forest User Groups. The forest user group manages all the protection, conservation and utilization activities of the forest taking permission from SNP authority. Thus Locals directly participate in forest management in the area. SNP authority provides opportunity to collect fuelwood, timer and other forest products as per operation plan of community forest.

4.2.1.1 HEADWORKS/INTAKE

Headworks/Intake area lies within Fir-Birch-Rhododendron Forest. As the area is ecotone of lower subalpine and temperate zone, it has mixed species of vegetation. Basically the area is dominancy of birch (*Betula utilis*) and fir (*Abies spectabilis*) along with a number of *Rhododendron* species.As the project area is confined to the river valley, the trees are sparse.Similarly, shrubs are also very few. Common shrubs found in the area are *Rosa sericea, Spiraea canescens,* Cotoneaster sp., *Ephedra gerardiana, Hydrangea heteromalla,* Lonicera sp.etc. Herbaceous and grass species in the area are *Aconitum heterophyllum, Anaphalis margaritacea, Arabis pterosperma, Astilbe rivularis, Cicerbita cyanea, Corydalis longipes,* Impatiens sp., Primula sp., Rhodiola sp., *Swertia macrosperma, Agrostis pilosula, Helictotrichon virescens etc.*

4.2.1.2 PENSTOCKS

The penstock pipe lies in elevation zone of 2960 to 2744 m. The area falls on Fir-Birch-Rhododendron Forest and Upper Temperate Blue Pine Forest Zone. Upper portion about 150 m of penstock pipe lies in Fir-Birch-Rhododendron Forest and remaining in Upper Temperate Blue Pine Forest Zone. All the area is not forest. About 950 m of the penstock pipe falls in forest area while remaining passes through cultivated land with settlements. The trees are *B.utilis,A. spectabilis and* a number of *Rhododendron* species in upper parts while *Abies pindrow, Acer caesium, Pinus wallichiana and* a number of Rhododendron species are found in middle of the penstock areas. In cultivated area, mostly *P. wallichiana* trees are seen.*Colquhounia coccinea,* Cotoneaster sp., Hydrangea sp., *Juniperus communis, Leptodermis lanceolata,* Lonicera sp., Potentilla sp.,Rhododendron sps., Rosa sp., Viburnum sp. etc. are found as shrubs in the area. *Aconitum heterophyllum, Anaphalis margaritacea, Arabis pterosperma, Astilbe rivularis, Cicerbita cyanea, Corydalis longipes,* Impatiens sp., Primula sp., Rhodiola sp., *Swertia macrosperma, Agrostis pilosula, Helictotrichon virescens,* Andropogon sp.etc are common herbs found in the area.

4.2.1.3 POWERHOUSE AND TAILRACE AREA

The powerhouse site lies in private land with mostly blue pine (*P. wallichiana*). Similarly the tailrace area is also dominated by blue pine with some *A. spectabilis*. *Colquhounia coccinea,* Cotoneaster sp., Hydrangea sp., *Leptodermis lanceolata,* Lonicera sp., Potentilla sp.,Rhododendron sps. Rosa sp., Viburnum sp. etc. are found as shrubs in the area. *Aconitum heterophyllum, Anaphalis margaritacea, Astilbe rivularis, Cicerbita cyanea,* Impatiens sp., Primula sp., Rhodiola sp., *Agrostis pilosula, Helictotrichon virescens,* Andropogon sp.etc. are common herbs found in the area.

4.2.1.4 NON-TIMBER FOREST PRODUCTS USED (NTFPS) IN SUBPROJECT AREA

There are many plants used by local communities as medicines, foods, incenses, timber, fuelwood, fodder and also decorative purposes. More than 50 plants species have been used by locals for various purposes. Some commonly used NTFPs by locals are Aconitum sp., Anaphilis sp., *Arisaema flavum, Barberis sp.,* Clematis sp., *Cotoneaster microphyllus,* Drepanostachyum sp., *Ephedra gerardiana, Euphorbia sikkimensis, Gaultheria fragrantissima,* Juniperus sp., *Meconopsis horidula, Michelia champaca, Nardostachys grandiflora, Plantago erosa, Rheum austtrale, Rhododendron anthopogon, Rhododendron campylocarpum, Rumex nepalensis, Urtica dioica* etc.Similarly, wild edible mushrooms are extensively used by local people. Such common mushrooms are *Armillariellamellea*, Boletus sp., *Hydnum repandum*, Ramaria sp., *Paxillus involutus, Tylopilus eximus* etc.

4.2.2 FAUNA (MAMMALIAN AND AVIAN)

In this section, wildlife found in and around the subproject areas have been given. According to locals, there are no any reptiles, amphibians and fishes seen till date. So, only lists of mammals and birds have been given here.

4.2.2.1 MAMMALS

More than 15 mammals were reported from the project areas. As the most of the project area is covered by forest, *Naemorhedus goral* is very common in the area. Beside this, *Ailurus fulgens, Hemitragus jemlahicus and Moschus chrysogaster* are also common in the area.

4.2.2.2 HERPETOFAUNA

*Bufo himalayanus, Amphiesma platyceps, Elaphe hodgsonii*and *Scincella ladecense himalayanus* are reported from the subproject area.

4.2.2.3 BIRDS

More than 90 different bird species have been reported from the project area. Some common birds are *Aquilla heliacal, Buteo buteo, Gyps himalayensis, Eremophila alpestris, Collocalia brevirostris, Columba leuconota, Corvus corax, Corvus macrorhynchos, Clamator jacobinus, Falco tinnunculus,* Carpodacus sp., *Delichon dasypus, Delichon nepalensis, Lanius tephronotus,* Luscinia sp., *Zoothera dixoni,* Motacilla sp., Montifringilla sp., *Passer domesticus,* Prunella sp., *Lerwa, Lophophorus impejanus,Tragopan satyra, Garrulax ocellatus,* Yuhina sp,*Upupa epops* etc.

4.2.3 PROTECTED AREAS

The subproject area lies in Buffer Zone of Sagarmatha National Park (SNP). The SNP is recognized by UNESCOas a world heritage site, whereas the Buffer Zone qualifies as a legally protected area of Nepal, listed as an IUCN Management Category IVreserve.A Management Category IV listing recognizes the continued sustainable use of resources by local communities. The Buffer Zone was established to buffer and provide additional protection to the outstanding universal values of the world heritage site. Any developments within the Buffer Zone should therefore consider any potential impacts to these OUV.

The Buffer Zone and SNP are described by Birdlife International as anImportant Bird Area (IBA), which recognizes the important biodiversity value of the area.

4.2.4 CONSERVATION STATUS OF WILD FLORA AND FAUNA

Conservation status of flora and fauna has been given in Table 11 to 13.

Table 11: Conservation Status of some Flora species of Subproject Area (not comprehensive)

S.N.	Nepali Name	English Name	Scientific Name	CITES Appendix	IUCN Red List	GoN
1	Talispatra	Webb Fir	*Abiesspectabilis*	-	NT	Protected
2	Chanp	Mangolia	*Micheliachampaca*	-	LC	Protected
3	Jatamansi, Bhutle	Himalayan Spikenard	*Nardostachys jatamansi(formerly N. grandiflora)*	II	CR	Protected
4	Jhyau	Lichen	*Parmelia sp. & others spp.*	-	-	Protected

Table 12: Conservation Status of Mammals potentially occurring in Subproject Area with updates from IBAT

SN	Nepali Name	Common Name	Scientific Name	Conservation Status		
				Nepal RedData Book (2012)	IUCN Red List	CITES Appendix
1	Ghanse Muso	Alpine/Sikkum Vole	*Pitymys sikimensis*	LC	LC	-
2	Chhuchundro	Brown Toothed Shrew	*Episoriculuscaudatus(formerly Soriculus caudatus)*	LC	LC	-

SN	Nepali Name	Common Name	Scientific Name	Conservation Status		
				Nepal RedData Book (2012)	IUCN Red List	CITES Appendix
3	Chituwa	Common Leopard	*Panthera pardus*	VU	VU	I
4	Pani Chuchundro	Elegant Water Shrew	*Nectogale elegans*	LC	LC	
5	Chuchundro	Golden Jackal	*Canis aureus*	LC	LC	III
6	Bwasho	Grey Wolf	*Canis lupus*	CR	LC	I
7	Kalo Bhalu	Himalayan Black Bear	*Ursusthibetanus*	EN	VU	I
8	Muse Thutekharayo	Himalayan Mouse-hare	*Ochotona roylei*	DD	LC	-
9	Jharal	Himalayan Thar	*Hemitragus jemlahicus*	NT	NT	-
10	DuhureGhar Muso	House Mouse	*Mus musculus*	LC	LC	-
11	Ghar Muso	House Rat	*Rattus rattus*	LC	LC	-
12	Dhendu	Langur	*Semnopithecus priam ssp. thersites (*formerly*Presbytis entellus)*	LC	VU	I
13	Kasturi	Himalayan Musk Deer	*Moschusleucogaster (formerly M. chrysogaster)*	DD	EN	I
14	Habre	Himalayan Red Panda	*Ailurus fulgens subsp. fulgens*	EN	EN	I
15	Rato Bandar	Rhesus Macaque Monkey	*Macaca mulatta*	LC	LC	-
16	Saiberiyalimalasapro	Siberian Weasel	*Mustelasibirica*	LC	LC	III
17	Malsapro	Yellow-throated Marten	*Martesflavigula*	LC	LC	III
18	Kalo Salak	Chinese Pangolin	*Manis pentadactyla*	EN	CR	I
19	Ban Kukur	Dhole	*Cuon alpinus*	EN	EN	II
20	Mandelliko Musakane Chamero	Mandelli's Mouse-eared Myotis (Bat)	*Myotis sicarius*	VU	VU	-
21	Dwanse Chituwa	Clouded Leopard	*Neofelis nebulosa*	EN	VU	I
22	Hiun Chituwa	Snow Leopard	*Panthera uncia*	EN	VU	I
23	Gainda	Greater One-horned Rhino	*Rhinoceros unicornis*	EN	VU	I
24	Jarayo	Rusa	*Rusa unicolor*	VU	VU	-
25	Sano Oat	Asian Small-clawed Otter	*Aonyx cinereus*	DD	VU	II
26	Thar	Mainland Serow	*Capricornis sumatraensis*	NT	VU	I

Key to threatened status: CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Neat Threatened; LC – Least Concern; DD – Data Deficient.

Table 13: Conservation Status of Birds in the Subproject Area (not comprehensive)

SN	Nepali Name	English Name	Scientific Name	CITES Appendix	IUCN Red List	Nepal Red Data Book
1	Giddha	CinereousVulture	*Aegypiusmonachus*	-	NT	EN
2	Chilime	Blood Pheasant	*Ithaginis cruentus*	II	LC	LC
3	Cheel	Osprey	*Pandion haliaetus*		LC	LC
4	Danphe	Impeyan Pheasant	*Lophophorusimpejanus*	I	LC	NT
5	Tibbati Him-Kukhura	Tibetan Snowcock	*Tetraogallustiebetanus*	-	LC	-

SN	Nepali Name	English Name	Scientific Name	CITES Appendix	IUCN Red List	Nepal Red Data Book
6	DadiBhayekoGiddha	Bearded Vulture	*Gypaetusbarbatus*	-	NT	VU
7	Munal	Crimson-horned Pheasant	*Tragopansatyra*	III	NT	VU
8	Shahi Baaj	Peregrine Falcon	*Falco peregrinus*	I	LC	LC

4.3 SOCIO-ECONOMIC AND CULTURALCONDITIONS

4.3.1 DISTRIBUTION OF POPULATION IN THE SUBPROJECT AREA IN TERMS OF AGE, SEX, HOUSEHOLD SIZE, ETHNICITY ANDRELIGION

The total population of Khumbu Pasanglahmu RM is 9084 in 1737 houses with average family size of 5.23(KPLRM, 2019). The female population (50.2%) is slightly more than male population. The total population in Ward No. 3 where the subproject site lies is 2370 in 395 HHs with average family size of 6. Nearly two third of the population of Ward No. 3 is economically active. Nearly 8% people are of old age group. The most dominant ethnic group is Sherpa (62.97%) (Figure 1). Other Castes are Tamang (12.20%), Rai (13.30%), Magar (2.88%), outcaste (4.66%) and others (3.99%). Based on religion, majority of HHs are Buddhists (53.13%), followed by Hindu (40.50%), Christian (5.43%) and Kirant (0.94%).

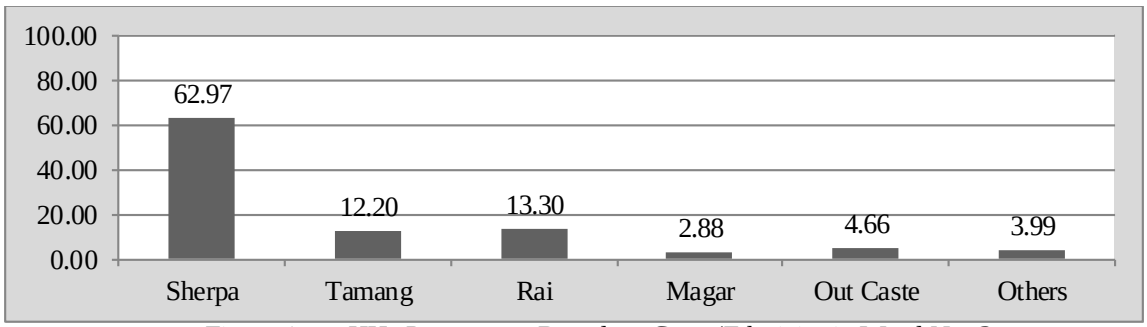


Figure 1: HHs Percentage Based on Caste/Ethnicity in Ward No. 3

(Source: KPLRM, 2019)

4.3.2 SUBPROJECT LAND

Land for Headworks and some parts of the penstock are of public land which has been used as buffer zone community forest. Remaining part of penstock and powerhouse site lies in private land. The tailrace area is also public land

4.3.3 LAND USE AND OWNERSHIP (INCLUDING TRADITIONAL USE AND OWNERSHIP)

Total area of the RM is 1539.11 Km^2. Out of total land area; nearly 44% is snow/glacier, followed by barren land (19.93%), grass land (15.61%), forest (9.98%) and shrub land (9.30%). Other land category areas are very less (Agriculture-0.67%, Built up Area- 0.005% and water Body-0.58%). Out of total area 280.42 Km^2in Ward No.3, snow/glacier is 38.66%,

barren land 16.90%, forest 16.28%, grassland 16.09%, shrub land10.40%, water body 0.88%, built up 0.64% and agriculture 0.15% (KPLRM, 2019).

Traditionally, Sherpa are the custodians of the whole Khumbu area. But after declaration of National Park, SNP is the major authority having the land within National Park area. All the lands except private registered land belong to SNP. For the conservation of the forest area outside the national park, the SNP has handover to local community as buffer zone community forest.

4.3.4 CROPPING AND/OR GRAZING PATTERNS

The RM has diverse climate due to altitudinal variation 1,543 m amsl to 8,848 m amsl. Ward numbers 1, 2 and 3 have relatively warm climate and so more people dependent on agriculture activities (KPLRM, 2019). Agriculture land is very premium in ward number 3.People in general cultivate barley and potato only. Now days some people are cultivating some vegetables in plastic tunnel. Cauliflower, cabbage, tomato, carrot, radish, capsicum, bean, chilly, cucumber etc, are grown as vegetables in plastic tunnel nowadays.

Yak, cow, horse, mule, goat, jyokpo and bull are the livestock reared in the Ward No. 3. Cow is the livestock that mostly reared by more HHs in more numbers. There is no specific grazing system. Open grazing is common.

4.3.5 VULNERABILITY OF THE AFFECTED PEOPLES (APS)

The subproject lies in public land as well in private land. Thus it affects the people directly or indirectly. During construction period, the private land will be excavated for penstock pipe lining, powerhouse construction activities and other purposes such as storage, camps etc. Thus these activities affect the local people and their livelihood.

4.3.6 EMPLOYMENT AND LIVELIHOOD

Tourism activities like trekking, mountain climbing, hotel and restaurant are the major economic activities of the area. Agriculture land is very premium and productivity is also very less. Major occupations are agriculture, tourism, services, foreign employment and business (Figure 2). Unemployment figure is also significant in Ward No.3 of the RM.

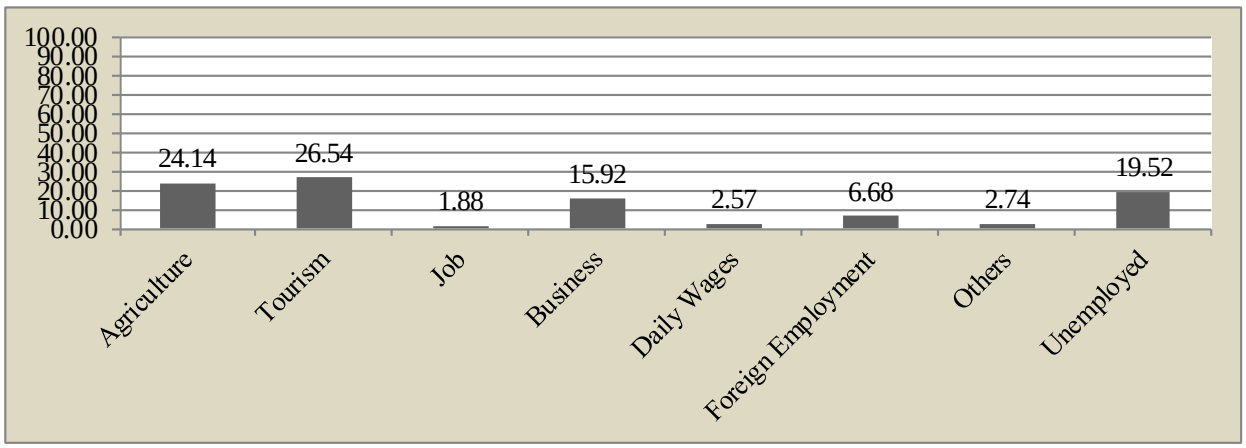


Figure 2: Population Percentage by Occupation in Ward Number 3

(Source: KPLRM, 2019)

4.3.7 LABOUR INFLUX

Very less Sherpas are involved in off-tourism activities. Most of the working people come from other parts of the district and neighboring districts. Shankhuwasabha, Kotang, Ramechhap, Okhaldhunga Bhojpur and Dolakha are the major sources of workforce in the area.. The outsider workers mainly involve in hotels/restaurants, construction activities and tourism industries

4.3.8 PHYSICAL AND CULTURAL RESOURCES

There are 4 schools in Ward Number 3; three basic and one secondary school. Similarly, there are two health institutions in ward number 3: Monjo clinic and Chaurikharka Health Post. There is no temple in the Ward No. 3 but 5 Gumba (KPLRM, 2019). The nearest Gumbais Uchche Chholing Gumba in Monjo which is about 200 m up eastwards from the Monjo settlement (Field Visit 2020).

4.3.9 INDIGENOUS SETTLEMENT

There are more than 20 different settlements in Ward No. 4 of the RM (KPLRM, 2019). The nearest settlements are Monjo (adjacent to subproject), Jor-Salle (about 1 Km northwards) and Chhamuwa (200 m southwards). In most of the settlements, indigenous people reside. Majority of them are Sherpa people.

4.3.10 COMMUNICATION FACILITY

4G mobile network facilities are available in the subproject area. Basically, it has 3G services. Network or quality is poor. Similarly, internet facilities are also available in major settlements, but quality is poor. There are two post offices in the RM.

CHAPTER 5: TIME, BUDGET AND HUMAN RESOURCES

5.1 TIME REQUIRED FOR REPORT PREPARATION

The ESIA study is planned to be completed within a period of 5 months after the approval of Terms of Reference (**Table 14**).

Table 14: Time Schedule for ESIA

SN	Activities	Time in Month																											
		June				July				August				Sept				Oct				Nov.				Dec			
1	ToR of ESIA Submission to AEPC/WB																												
2	Approval of ToR from AEPC/WB																												
3	Preparation of ESIA Report [includes field study also]																												
4	Public Hearing																												
5	Incorporation the issues form Public Hearing in ESIA Report																												
6	ESIA Report Submission																												
7	Submission of Final ESIA for Approval																												

*Note: It does not include the time taken by concerned authority for approval.

5.2 ESTIMATED BUDGET

The estimated budget for the ESIA study of the proposed subproject will be as per agreement between Developer (Monjo Khola Mini Hydro Pvt. Ltd.) and consultant (EFI), and it has been estimated to NPR 795,000.

5.3 EXPERTS (HUMAN RESOURCES)

The ESIA team includes multidisciplinary experts on different environment domains (physical, biological and socio-economic and cultural environment) as follows:

Table 15: Study Team and Qualification

SN	Name	Expertise	Academic Qualification	Experience
1	Dhan B. Shrestha	Environment/ EIA/Team Leader	MSc, Environmental Science	14 Years
2	Lokesh Sapkota	Physical Environment Expert	ME, Environmental Engineering	10 Years
3	Ramji Bogati, PhD	Biologist	PhD-Spatial Planning: Landscape Ecology and Landscape Planning; MSc, Zoology	10 Years

4	Heramba Adhikari	Scocio-economic and Cultural Expert	MA, Sociology/Economics	10 Years
5	Toya Nath Ghimire	Geologist	MSc, Geology	10 years

Independent Biodiversity Specialist and Geological Specialist will review the different milestone of ESIA and provide suggestion/guidance on the ESIA report. ESCO and the consulting firm shall coordinate and cooperate with the independent specialists.

CHAPTER 6: ALTERNATIVES

Alternative analysis has been considered as an integral part of ESIA study, which involves an alternative ways of achieving the objectives of the proposal. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the unwanted impacts. The likely impacts of each alternative will be assessed and compared in terms of adverse environmental impacts and benefits, and the environmentally sound alternative will be recommended. Alternative analysis shall be assessed based on the following 5 aspects i.e. technical, financial, administrative and environmental & social ground. The study team will conduct alternative analysis considering the following issues keeping these as an option:

- **No subproject option:** The alternative analysis will be done on implementation of subproject or without subproject scenarios.
- **Types of Subproject:** Alternative analysis will be done based on different types of subproject including solar, extension of rural electrification program.
- **Use of Forest Area:**Subproject will be designed in such a way to use forest area in minimal, so its alternatives will be analyzed.
- **Design of the subproject:**Various design alternatives (diversion weir and intake, waterway alignment Transmission& Distribution and powerhouse) shall be considered and analyzed with a view to opt for the best alternative so as to minimize impacts on environment and ensuring safety
- **Subproject Site: A**nalysis of different alternatives of subproject component sites could result in recommendation of best alternative so as to avoid some of the significant impact such as decreased number of trees to be clear felled, avoiding prime cultivation land or major forest area, interference with the local trails etc. If the subproject requires houses and property acquisition culminating to relocation or resettlement of the people, location alternatives of the subproject component shall be assessed to avoid resettlement as far as possible.

- **Technology, Procedures of Operation Time Schedules:** Subproject implementation technology (mechanized, labor intensive, labor based); process of proposal implementation (contractors, local labor groups etc.) shall be assessed. Similarly, subproject operation time shall be assessed in terms of whether it is round the year operation or seasonal operation.

- **Energy and Raw Materials to be used:** Alternatives to different sources of energy which would be required for subproject construction as well as for camps for day to day living will be assessed and the best suitable energy (from environmental point of view) will be recommended. Similarly, alternative resources required for the subproject works shall be assessed including use of local resources.

- **Alternate Technology Analysis**: Alternative analysis shall be carried out for other technology such as solar. The analysis shall be carried out based on secondary information.

- **Capability to deal with Risk:** The various subproject alternatives shall be evaluated based on the acceptability of risks during subproject implementation. The ESIA study shall critically scrutinize and identify environmental risks, if any associated with the subproject implementation and shall prescribe the measures to avoid those risks.

CHAPTER 7: IMPACTS AND MITIGATION MEASURES

This section provides a description of beneficial and adverse physical, biological and socioeconomic and cultural environmental impacts and issues that have been identified to date for both construction and operation phase. The impact assessment will be focused within the coordinate (Boundary)/subproject influence area considering general profile at district level. These issues will be considered by the proponent to develop and follow the detail field investigation program and data collection on physical, biological and socio-economic and cultural environment to predict impacts and propose appropriate mitigation measures. The impacts will be classified in terms of magnitude (low, medium and high), extent (site specific, local, and regional) and duration (short term, medium term and long term) as per National EIA Guidelines 1993. The likely impact shall be assessed covering both adverse and beneficial ones. Adverse and beneficial impacts/issues that are not identified or anticipated at this stage but discovered during ESIA study, will be incorporated in ESIA study report.

The methodology adopted for impact identification and prediction shall be standard checklist and matrix methods. Moreover, impact identification and prediction shall also be based on experts' judgment and literature review. More importantly, public consultation to be carried out during different phases of ESIA study such as during baseline data collection and public hearing will be an essential tool for impact identification and prediction.

7.1 IMPACTS

7.1.1 BENEFICIAL ISSUES

7.1.1.1 CONSTRUCTION PHASE

i) Employment generation and skill enhancement
ii) Benefits from community and social support programs
iii) Benefits from implementation of environmental mitigation programs and benefit augmentation measures
iv) Increase in economic activities in the subproject area and associated beneficial impacts in local economy
v) Benefits for exposure of local population to new technologies and technology transfer
vi) Utilization of local resources

7.1.1.2 OPERATION PHASE

i) Employment generation and skill enhancement
ii) Benefits to be incurred from addition of 942 KW of power to local people
iii) Sharing of electricity royalty to concerned authorities

7.1.2 ADVERSE ISSUES

7.1.2.1 PHYSICAL ENVIRONMENT

7.1.2.1.1 Construction Phase

i) Change in Land Use
ii) Change in Topography

iii) Possible Glacier Lake Outburst Flood (GLOF) and associated impacts
iv) Landslide and Soil Erosion
v) Generation of spoils and spoil disposal related issues
vi) Impact due to quarrying activity
vii) Impact on material quarrying sites
viii) Water Pollution and Increase in sediment loads
ix) Noise Pollution
x) Soil Pollution
xi) Issues of Haphazard Stockpiling of Construction Material
xii) Solid Waste Generation
xiii) Air pollution related issues
xiv) Hydrology and River Morphology
xv) Loss of Top Soil

7.1.2.1.2 Operation Phase

i) GLOF and associated impacts
ii) Change in topography and land use
iii) Impacts on river morphology and possible microclimatic changes
iv) Land submergence due to diversion weir and associated impacts
v) Management/final disposal of solid waste and waste water (both black water and grey water)
vi) Change in water quality
vii) Noise and vibration at power house
viii) Soil erosion due to tailrace discharge
ix) Impact on downstream due to sediment flushing

7.1.2.2 BIOLOGICAL ENVIRONMENT

7.1.2.2.1 Construction Phase

i) Loss of forest area
ii) Loss of forest vegetation and overall vegetation diversity
iii) Pressure on Forest for Fuelwood
iv) Impact on natural and critical habitat (wildlife and their movement route and migratory bird movement route) avian fauna
v) Impact on aquatic flora and fauna
vi) Road kills of wildlife along the access road
vii) Impact on legal harvest of non-timber forest products/MAPs
viii) Possible Risk of forest fire
ix) Illegal wildlife hunting and poaching
x) Increased incidence of Human wildlife conflict
xi) Impacts to integrity of protected areas

7.1.2.2.2 Operation Phase

i) Reduced river flow between intake point and the powerhouse outlet
ii) Disturbance to the wildlife due to resident workforce

iii) Fragmentation of wildlife habitat and disturbance to wildlife movement
iv) Blocked and disrupted fish movement and migration
v) Impact on rare , endangered, protected and threatened species of flora and fauna
vi) Birdcasualties duetoelectrocution and collision with transmission line
vii) Forest fire
viii) Pressure on fuelwood
ix) Impacts to integrity of protected areas

7.1.2.3 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

7.1.2.3.1 Construction Phase

i) Land acquisition and compensation related issues
ii) Loss of agriculture land
iii) Loss of private land and property
iv) Crop loss
v) Loss or restricted access of ecosystem services and its impact on livelihood
vi) Affect on existing social infrastructures [existing micro hydro (structures and facilities), drinking water pipe, public trail]
vii) Pressure on existing facilities, services and resources of the subproject area
viii) Health and sanitation
ix) Occupational health and safety related issues
x) Social-cultural conflict between local community and the outside work force
xi) Issues relating to unsocial activities like gambling, alcoholism , girl trafficking and prostitution
xii) Gender discrimination (issues of equal pay between women & men for work of equal value)
xiii) Stakeholder Engagement and information disclosure
xiv) Issues of Grievances Management and Gender Based Violence (GBV)
xv) Issues related to disturbance to community during construction
xvi) Issues related with COVID-19 Pandemic
xvii) Issues related to management of micro hydro subproject that exist in project affected area
xviii) Child labor
xix) People's Behaviors due to change in economy
xx) Impact on historical , religious, cultural and touristic important sites
xxi) The pattern of uses of natural resources in festivals and religious rituals (if any)

7.1.2.3.2 Operation Phase

i) Occupational health and safety related issues of the power station workers
ii) Public Safety Related Issues/Movement of people in dangerous places
iii) Issues relating to sudden release of water to downstream
iv) Withdrawal of economic opportunity
v) Water right issues
vi) Issues related to benefit sharing of subproject

vii) Issues related to tariff of electricity
viii) Stress on local resources &infrastructure

7.2 MITIGATION MEASURES

To overcome any adverse impacts by the subproject, the team will suggest appropriate site specific measures to avoid, reduce, mitigate, and/or compensate for all evaluated impacts. The basic philosophy of mitigation is to outline measures appropriate to mitigate the adverse impacts to the level required by National Standards and Guidelines as well as WB Safeguard Policies and EHS Guidelines; or to reduce the impacts to what may be considered as tolerable level, or as indicated by the National Standards as well as WB Safeguard Policies and EHS Guidelines where available. Therefore, the proposed mitigation measures will be in commensurate with the level of impact and compatiblewith the related existing laws of Nepal and WB policies and guidelines. Measures will be proposed based on nature of environmental impacts and components of environment that is affected, appropriateness and cost analysis. Each of the identified adverse impacts will be evaluated in detail and cost effective mitigation measures shall be suggested to avoid and/or minimize the adverse impacts. The criteria of such evaluation will be included in the ESIA report. Furthermore, enhancement measures shall be proposed to enhance or augment beneficial impacts due to implementation of the subproject.

Furthermore, the ESIA report shall also include Environmental and Social Mitigation and Management Action Plan with responsible agency/party to carry out mitigation activity, the location of mitigation implementation, methods, time schedule and estimated budget. The ESIA report shall define organizational set up to carry out these activities. The cost for mitigation and enhancement measures will be provided separately for both construction and operation stages for physical, biological,socio-economic and cultural environment.The proposed mitigation matrix will be as given in **Table 16**.

Table 16: Proposed Mitigation Matrix

SN	Environment & Social Impact	Mitigation Measures	Mitigation Cost(NPR)	Responsibility	Timeline	Remarks
Pre-Construction/Construction/operation phase						

CHAPTER 8: STAKEHOLDERS ENGAGEMENT AND GRIVANCE READDRESS MECHANISM

8.1 STAKEHOLDER ENGAGEMENT

The stakeholder engagement process will be focused on obtaining free, prior and informed consultation (FPIC) with local community and other stakeholders taking consideration of indigenous peoples or other types of vulnerable and marginalized communities.The consultation shall be included prior disclosure of information in a manner appropriate to local culture, accessible and understandable to communities, key informant interviews, focus group discussion (male& female, youth) and public consultation. The consultation shall be documented with required facts, figures and evidence including disagreegated participant list with contact details, gender, cast& ethnicity, race age and photographs. Information shall be disclosed as per the requirement of National Regulations and relevant OPs of the World Bank.

Mechanisms of stakeholder's engagement will include: (1) identification of stakeholders;(2) prior-informed periodicpublic meetings in the subprojects' influence area; (3) information disclosure and awareness campaigns through the engagement with locally formed Clubs and Groups and NGOs; (4) interviews/surveys in subproject affected households; (5) focus group discussions; (6) formation of committees and/or groups including stakeholders at various stages; (7) development of grievance redresses mechanism; (8) disclosure/dissemination of subproject information including decision making process and how the grievances of Affected Persons (APs) will be addressed.

The key stakeholders at the centre include MoFE, DNPWC, NTNC, WWF Nepal, IUCN Nepal, Sagarmatha National Park, Buffer Zone Management Committee. Stakeholder analysis and mapping will be done for effective stakeholder's engagement. Information disclosure will be done by various means of communication such as mass media (FM radio, Newspaper etc.), meeting/workshops and distribution of subproject document. Consultation will be made meaningful to ensure effective public participation in subproject implementation. Mechanism of involvement of local people in subproject monitoring will be developed in consultation with the stakeholders. A strategic engagement strategy shall be developed to engage vulnerable groups, if required.

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8.2 GRIEVANCE REDRESS MECHANISM

Stakeholders may have different types of grievances regarding the subproject. So, a Grievance Redress Mechanism (GRM) will be put in place wherein all subproject stakeholders are given a venue to lodge complaints regarding any aspect of issues related to the subproject along with the strategy to inform the local stakeholders about the GRM and its functioning procedures through stakeholder consultations. ESMF document (Environmental and Social Management Framework for Nepal: Private Sector-Led Mini-Grid Energy Access Project) have already proposed four tiers of GRM system. Based on this document, GRM will be established as such or modified to address subproject's specific issues.

CHAPTER 9: INSTITUTIONAL ARRANGEMENT

Environmental and Social Institutional Arrangement will be made within the institutional structure of the developer of the subproject. It will clearly spell out the roles and responsibilities of each position for the implementation of the identified mitigation measures. In addition, it will also lay out a plan to provide training/orientation to the E&S team members once they are hired. It will provide a clear map regarding the human resources and their experience and qualification including capacity building activities, and also identify other responsible and relevant institutions, such as MoEWRI, AEPC, AEPC/MGEAP, Local Government Authorities, World Bank, proponent, Partner Banks, Consulting Firms and Contractor along with their roles and responsibilities to ensure implementation of identified mitigation measures. It should also discuss about internal reporting mechanism within the subproject. Details of the institutional arrangement will be made in ESIA report.

CHAPTER 10: MONITORING AND REPORTING PLAN

To ensure the effective implementation of EMIMAP, the environmental and social safeguard compliance monitoring will be conducted internally based on the monitoring indicators. The safeguards staffs (E&S) of AEPC and the proponent will be responsible to carry out monitoring during different stages of the project cycle i.e., construction and operational phases of subproject.

10.1 MONITORING PLAN

'Environmental and Social Monitoring' of the subproject activities will be carried out during construction and operation phases of the subproject implementation. ESIA reports shall contain plans for;

i) Baseline Monitoring: To assess the changes in environmental baseline conditions just prior to commencement of subproject construction with reference to the baseline conditions provided in the ESIA report.
ii) Impact monitoring: To assess the changes (beneficial or adverse) in the various component of the environment in comparison to the baseline conditions. Also, impact monitoring would help to identify impacts those may have been overlooked by the ESIA study.
iii) Compliance Monitoring: To assess compliance activities of the responsible parties (including contractors, employer, consultant and other stakeholders) in complying the environmental protection matters mentioned in the EIA report.

The baseline and impact monitoring plans shall indicate parameter, indicator, schedule, location, and methods. Compliance monitoring plans shall indicate parameter, indicator, schedule and methods. An end-of-pipe based monitoring plan shall be developed rather than an ambient level monitoring. The cost of monitoring, activities and manpower requirements to carry out the proposed activities and organizational set up to carry out the proposed monitoring activities shall be included in the ESIA report.

The monitoring plan matrix will be as follows in Table 17.

Table 17: Proposed Monitoring Plan Matrix

S.N.	Type	Parameters	Responsible Implementing agency	Verifiable Indicators	Verification Methods	Schedule	Responsible Monitoring Agency	Cost (NPR)

10.2 REPORTING PLAN

The ESCOwill prepare monthly progress report and shares with AEPC. AEPC shall be preparing Quarterly E&S Monitoring Reportbased on monthly reports and share with the WB.

10.3 BUDGET

Budget required for monitoring activities will be estimated.

CHAPTER 11: ENVIRONMENTAL AUDIT

An audit plan will be prepared in order to provide guidelines to the auditing authority in order to assess actual environmental impact, accuracy of prediction, effectiveness of environmental impact mitigation and enhancement measures and functioning of monitoring mechanisms. The Environmental Auditing Plan will outline auditing type (such as Decision Pint Audit, Implementation Audit, Performance Audit, Subproject Impact Audit, Predictive Technique Audit and Environmental Impact Assessment Procedure Audit), auditing procedures (defining parameter, indicator and methods) and timing, human resource requirements with audit costs.

CHAPTER 12: ENVIRONMENTAL AND SOCIAL SAFEGUARD PLAN

Various Environmental and Social Safeguard Plans (ESSP) will be developed as necessity to ensure the implementation of environmental and social protection measures and make subproject environmentally friendly and sustainable. It will include aspects that should be implemented during construction and operation phases of the subproject detailing (i) what to implement, (ii) when to implement, (iii) where to implement, (iv) what technique/method to be employed, and (v) who is responsible. Moreover, Standard Operating Procedure (SOP) will be prepared for construction and operation phase considering the current pandemic situation of COVID-19.Different legislative frameworks and directives of the GON will be taken into account while developing these plans.

Different alternatives of design and subproject site will be analyzed during detail feasibility study report stage for avoidance and preventive measures for safeguard of environment and society. Steps for necessary co-ordination that is required in implementing Preventive, Avoidance and Mitigation Measures with – local, district and central level institutions – as well as contractors, proponent, and consultant will be proposed. Organization chart of the monitoring unit for implementation of the mitigation measures, with a clear provision of mitigation will be proposed. Those mitigation measures that can be or are part of contractual obligation for subproject construction will be clearly identified; Mechanisms of ensuring implementation of those mitigation measures as compliance of contractors will be proposed. In order check if the contractors complied with the implementation of proposed preventive, avoidance and mitigation measures, which fall under the responsibility of the contractor a written agreement, will be signed with the contractors.

The cost of mitigation and enhancement measures will be provided separately differentiating into Construction Phase and Operation Phase for Physical Environment, Biological Environment and Socio economic and Cultural Environment. Enhancement measure will be proposed for heightening benefits accrued from the subproject. This chapter will propose following mitigation plans;

- Construction Site and Temporary Facilities Rehabilitation Management Plan,
- Occupational Health and Safety Plan
- Community Health and Safety Plan
- Emergency Response Plan
- Benefit Sharing Plan
- Labor Management Plan
- Transport Management Plan
- Stakeholder Engagement Plan
- Gender Equality and Social Inclusion (GESI) Action Plan
- Biodiversity Management Plan
- COVID Pandemic Management Plan and SoPs

The study will incorporate the cost estimates of all management plans.

CHAPTER 13: ESIA REPORT TEMPLATE

The ESIA report shall be prepared in the template as provided by AEPC, as follows:

Cover Page
Acronym and Abbreviation
Table of Content
List of Figures
List of Tables

Executive Summary (5 pagesmax)
This section shall describe the subproject activities, critical environmental and social issues, significant findings and recommended actions.

Chapter 1: Introduction (5 pagesmax)
1.1 Background of the Subproject
1.2 Objectives of the ESIA Study
1.3 Study Methodology
Methodology for Data Collection of Physical and Chemical Environment, Biological Environment, and Socio-Economic and Cultural Environment

a) Literature Review of Published/unpublished Documents
b) Direct and Indirect Impact Zone
c) Study and Analysis of Location Map
d) Data Collection by using Checklist/Matrix and Questionnaire
e) Field Assessment: observation and photographs, sampling, use checklist and Questionnaire
f) Laboratory Analysis of Collected Sampleof Soil, Water etc.
g) Data Analysis
h) Methodology for Impact Identification, Prediction and Ranking
i) Preparation of Draft Report
j) Public Consultation, Discussion, Interaction and Public Hearing, Disclosure of Draft Report
k) Public Notice and Notice Disclosure and Collection of Suggestions
l) Preparation of Final Report Incorporating the Collected Suggestions

Chapter 2: Description of the Subproject (8 pagesmax)
2.1 General Information on the Subproject
2.2 Subproject Locations and Accessibility

a) Description of the location of the proposed subproject with maps
b) Subproject area of influence
c) Nearby communities and forests, environmentally sensitive areas, and heritage sites (for solar mini grid buffer zone should be at least 1 km)

2.3 Salient Features of the Subproject
2.4 Technical Aspects

a) Description of the subproject components, permanent and temporary facilities
b) Technology to be used (associated/ancillary facility)
c) Project equipment and civil works
d) Project ownership
e) Description of land required for the project

f) Summary of project structures and operating regime
g) Construction, Operation and Maintenance activities
h) Human Resources requirements (including local and migrant workforce)
i) Construction equipment, materials and other supplies (including estimated numbers/quantities)
j) Land filling activities (if any)
k) Power supply arrangements
l) Waste generation and disposal (including estimated quantities)
m) Subproject Implementation Schedule and Construction Work Plan

Chapter 3: Policy, Act, Regulation, Directives, Guidelines, International Conventions relevant to the Subproject (5 pagesmax)

3.1 Policy and Strategy
3.2 Periodic Plan
3.3 Act
3.4 Rules
3.5 Directives/Guidelines/ Working Policy
3.6 Environmental and other Standards
3.7 International Convention and Treaties

The above-mentioned laws and regulations relevant to the subproject should be discussed briefly in the following format.

Laws and Regulations	**Clause/Rules/Section etc triggered for the implementation of the Subproject**
Policy	
Strategy	
Acts	
Rules	
Directives	
Guideline	
Standards	
International Convention and Treaties	

Chapter 4: Environmental and Social Baseline Assessment (15 pages max)

4.1 Physical Environment
a) Topography
b) Geological Condition
c) Meteorological Condition (Rainfall, Temperature, Humidity, Wind speed)
d) Air Quality
e) Noise Quality
f) Surface and Ground water quality
    i. Surface:(testing of: pH, TDS, DO, COD, BOD)
    ii. Ground:(testing of: pH, Arsenic, TDS, alkalinity, Cl, Fe)
g) Project location from flood level
h) Soil Quality
i) Water resources
j) Agro-ecological zones within project area of influence

k) Seismicity
l) Climate change and natural disasters
    a. Explain in detail about how the project will be affected by the climate change impact
    b. Explain how the project is vulnerable to various natural calamities including flood, earthquake, drought, cyclone and so on

4.2 BiologicalEnvironment
a) Forest and vegetation
b) Flora and Fauna
c) Non-timber forest products
d) Terrestrial Ecosystem, Protected areas and red book species
e) Aquatic life

4.3 Socio-economicand CulturalEnvironment
a) Subproject Load Centre (Beneficiary) and distance from the subproject site
b) Identification and description of subproject Affected Peoples (APs)in the area in terms of family size, religion, age, sex, ethnicity, income, household size, occupational patterns and their relevance with the subproject, poverty
c) Land use and ownership (including traditional use and ownership)
d) Other household property such as physical structure and tress (fruits tress, timber tress and others)
e) Cropping and/or grazing patterns
f) Vulnerability of the Affected Peoples (APs)
g) Education (Literacy rate, Educational institutes etc)
h) Employment pattern
i) Means of sources of livelihood
j) Physical and cultural resources (school, health post/ hospital, college, temple, monasteries etc.) in the subproject area
k) Description of settlements of indigenous people, Dalits and other religious and minorities within the project affected area (If any)
l) Communication facility
m) Local amenities (access road, infrastructures etc)

Chapter 5: Alternative Analysis (10 page max)

At least 2 alternatives for the following parameters should be suggested forSubprojectimplementation.

Alternative	Beneficial Impact	Adverse Impact
Alternative 1/ Alternative 2/ Alternative 3		
Design		
Project site		
Topography		
Technology		
Operation method		
Work plan		
Raw material		
Use of forest and government land		

No project option, types of project, use of forest area, design of project, site, technology and procedures of operation, time schedule, energy and raw materials to be used, capability to deal with risk

Chapter 6: Impacts and Mitigation Measures (20 pagesmax)

This chapter should focus on risks assessment and mitigation measures. In addition, this chapter demands a high degree of coherent between the identification of possible risks and impacts (of both beneficial and adverse impacts for physical, biological and socio-economic & cultural)) of the subproject and appropriate mitigation measures for each identified risks and impacts. The risks and impacts should be categorized into preparation, construction and operation. This chapter should include Table for Impact Prediction and ranking based on magnitude, extent and duration.

Activity	Impacts	Impact Prediction and ranking							Total
		Direct	Indirect	Beneficial	Adverse	Magnitude	Extent	Duration	
Construction Phase									
Operation Phase									

This chapter should also include Table for Environmental and Social Management Plan in the form of following matrix.

S.No.	E&S Impact	Mitigation Measures	Mitigation Cost (NRs)	Responsibility	Timeline	Remarks
Pre-construction Phase						
Construction Phase						
Operation Phase						

Following techniques should be used to mitigate adverse impacts

6.1 Preventive Measures
6.2 Corrective Measures
6.3 Compensatory Measures

If Cumulative Impact Assessment is found required during scoping phase, the analysis should be separately carried out and reported in an independent chapter as per methodology defined in IFC Good Practice Handbook-Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets .

~~Please follow the methodology defined in IFC Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets~~.

Chapter 7: Stakeholder Engagement and GRM (5 pagesmax)

This chapter should include mapping of potential stakeholders of the subproject, developing engaging strategy with identified stakeholders and developing strategic engagement with indigenous and vulnerable communities through periodic consultations.Stakeholders may have different types of grievances regarding the subproject, so this chapter should also include best possible approach to ensure an effective GrievanceRedressed Mechanism (GRM) along with the strategy to communicate the local stakeholders about the GRM and its functioning procedures. It will also contain effective means of disclosing project related information to the stakeholders in a manner appropriate to local culture and practice.

Chapter 8: Institutional Arrangement (4 pagesmax)

This chapter should provide an E&S institutional arrangement within the institutional structure of the ESCO of the subproject. The E&S institutional arrangement should clearly spell out the roles and responsibilities of each positions for the implementation of the identified mitigation measures. It should also talk about required human resources and their experience and qualification including capacity building activities. In addition, it should also identify other responsible and relevant institutions, such as MoEWRI, AEPC, AEPC/MGEAP, Local Government Authorities, World Bank, Partner Banks, Consulting Firms and Contractor along with their roles and responsibilities to ensure implementation of identified mitigation measures. It should also discuss about internal reporting mechanism within the project.

Chapter 9: Monitoring and Reporting Plan (5 pages max)

This chapter should discuss the monitoring and reporting mechanism based on the ESMF. (The monthly reporting will be undertaken by ESCO and share with AEPC. AEPC will be preparing Quarterly Report based on monthly reports and share with the WB). The following types of monitoring should be conducted and reported in the following format.

Type of Monitoring	Monitoring Indicator	Monitoring Method	Location	Time	Cost	Monitoring Authority
Baseline Monitoring						
Impact Monitoring						
Compliance Monitoring						

Chapter 10: Environmental Audit (2 page)

This chapter should include time frame and responsible authority to conduct environmental audit.

Chapter 11: Environmental and Social Safeguard Plans (10 pages max)

This chapter should recommend to prepare any of the following mitigation plans as required.

11.1 Occupational Health and Safety Plan

11.2 Community Health and Safety Plan
11.3 Emergency Response Plan
11.4 Benefit Sharing Plan
11.5 Labor Management Plan
11.6 Traffic Management Plan
11.7 Battery Management Plan, if necessary
11.8 Stakeholder Engagement Plan
11.9 Gender Equality and Social Inclusion (GESI) Action Plan
11.10 Fire Safety Management Plan

Chapter 12: Conclusion and Recommendation

Chapter 13: References

Annexes

a) Topographic, land use, GIS, Google maps
b) Arial photographs of subproject location and load centres
c) Land ownership document
d) Checklist/Questionnaire used for field survey
e) Baseline data of air quality, water quality and noise level
f) Meeting Minutes of public consultations, discussions etc
g) List of stakeholders/people contacted for the study
h) Brief resume of study team member
i) Required GoN approvals

CHAPTER 14: REFERENCES

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CHAPTER 15: ANNEXES

Annex I: Company Registration Certificate

नेपाल सरकार

उद्योग, वाणिज्य तथा आपुर्ति मन्त्रालय

कम्पनी रजिष्ट्रारको कार्यालय

कम्पनी दर्ताको प्रमाण-पत्र

दर्ता नं: २१४५७७/७५/०७६

श्री मोन्जो खोला मिनि हाईड्रो नामको प्राइभेट लिमिटेड कम्पनी संम्वत् २०७६ साल बैशाख महिना २४ गते रोज ३ मा दर्ता भएको हुनाले कम्पनी ऐन, २०६३ को दफा ५ को उपदफा (१) बमोजिम यो प्रमाण-पत्र दिइएको छ ।

स. रजिष्ट्रार

मिति: २०७६-०१-२५

Government of Nepal

Ministry of Industry, Commerce & Supplies

सहायक रजिष्ट्रार

Office of the Company Registrar

Registration No: 214577/75/076

CERTIFICATE OF INCORPORATION OF COMPANY

This Certificate of Incorporation has been issued to M/s Monjo Khola Mini Hydro Private Limited having incorporated it on the 7 day of May, 2019 pursuant to sub-section (1) of section 5 of the Companies Act, 2006.

Asst. Registrar

Date: 2019-05-08

शर्त कम्पनी संस्थापनलाई मात्र कम्पनीको उद्देश्य कार्यान्वय गर्ने इजाजत प्रदान गरिएको नमानिने हुनाले कानून अनुसार लिनुपर्ने अनुमति सम्बन्धित निकायबाट लिएर मात्र कम्पनीको उद्देश्य अनुसार कारोबार गर्नु पर्नेछ ।

नेपाल सरकार
अर्थ मन्त्रालय
आन्तरिक राजस्व विभाग

स्थायी लेखा नम्बर (PAN) दर्ता प्रमाण पत्र

कर अधिकृत

दर्ता मिति
आयकर: ०१ | ०३ | २०७६
दिन महिना साल

स्थायी लेखा नम्बर : ६ ० ९ ५ २ ९ ९ १ ३
आन्तरिक राजस्व कार्यालय : आन्तरिक राजस्व कार्यालय बनीसपुतली

कारोबारको नाम : मोन्जो खोला मिनि हाईड्रो प्रा .लि.

करदाताको प्रकार : प्राइभेट लिमिटेड

ठेगाना : वार्ड नं. ८, तिलगंगा
महानगरपालिका: काठमाडौं,
काठमाडौं

व्यवसायका कारोबारहरु : विद्युत उत्पादन तथा वितरण,

करदाताको दस्तखत

Monjo Khola Mini Hydro Pvt. Ltd. Kathmandu

कर अधिकृत
कर अधिकृत

करदाताले पालना गर्नुपर्ने कर्तव्यहरु:

- कारोबार सदा अनिवार्य रुपमा बिल बिजक जारी गर्नुपर्छ ।
- मू.अ.करमा दर्ता हुनेले प्रत्येक कर अवधि (मासिक वा द्वैमासिक वा चौमासिक) समाप्त भएको २५ दिनभित्र मू.अ.कर विवरण तथा मू.अ.कर रकम बुझाउनु पर्छ ।
- अन्त:शुल्क लाग्ने कारोबार गर्नेले अन्यथा व्यवस्था गरेकोमा बाहेक प्रत्येक महिना समाप्त भएको २५ दिनभित्र मासिकवारी र अन्त:शुल्क रकम बुझाउनु पर्छ ।
- प्रत्येक आर्थिक वर्षका आय विवरण असोज मसान्तभित्र बुझाउनु पर्छ ।
- समयमा विवरण र कर रकम नबुझाएमा ब्याज, शुल्क र जरिवाना लाग्नेछ ।
- यो प्रमाणपत्र देखिने गरी कारोबार स्थल/मुख्य कार्यालयमा राख्नु पर्नेछ ।
- कुनै द्विविधा भएमा कार्यालयमा सम्पर्क राख्नुहोला ।

Annex II: Technical Clearance From DoED

नेपाल सरकार
ऊर्जा, जलस्रोत तथा सिंचाइ मन्त्रालय
विद्युत विकास विभाग
(.....अनुमतिपत्र महाशाखा.....)

फोन नं. ४४११०७४, ४४११५३७
४४११७६८, ४४१९५०१
४४४५७७५, ४४३४११९
४४३९३६२
फ्याक्स ४४४३९०३
पोष्ट बक्स नं. २५०७
सानोगौचरण
काठमाडौं, नेपाल

पत्र संख्या :- २०७६/०७७
चलानी : ११६०

मितिः २०७६/११/१८

विषयः- Technical Clearance उपलब्ध गराइएको सम्बन्धमा ।

श्री खुम्बु पासाङल्हामु गाउँपालिका
गाँउ कार्यपालिकाको कार्यालय,
चौरीखर्क,सोलुखुम्बु ।

प्रस्तुत विषयमा तहाँको पत्र संख्या २०७६/०७७ , च.नं.३०७ को Technical Clearance (प्राविधिक सफाई/परामर्श) सम्बन्धी पत्र प्राप्त भइ व्योहोरा अवगत भयो ।

प्रस्तावित मोन्जो खोला मिनी जलविद्युत आयोजना(off-grid) को लागि तहाँबाट माग भएको Technical Clearance सम्बन्धमा कारवाही हुँदा सो आयोजनाको क्षमता प्रोब्याब्लिटी अफ एक्सीडेन्स Q80 मा १(एक)मे.वा. भन्दा कम देखिएकोले क्षेत्र दोहोरो पर्ने दुधकोशी-१० जलविद्युत आयोजनालाई कुनै पनि प्रतिकूल असर नपार्ने शर्तसहित तपसिल बमोजिमको सर्वेक्षण क्षेत्रमा Technical Clearance उपलब्ध गराइएको व्योहोरा विभागको मिति २०७६/११/१२को निर्णयानुसार जानकारी गराइन्छ । साथै उक्त आयोजना विकास सम्बन्धी तहाँ बाट भए गरेको निर्णय कार्यान्वयनको जानकारी यस विभागलाई उपलब्ध गराइदिनु हुन अनुरोध छ ।

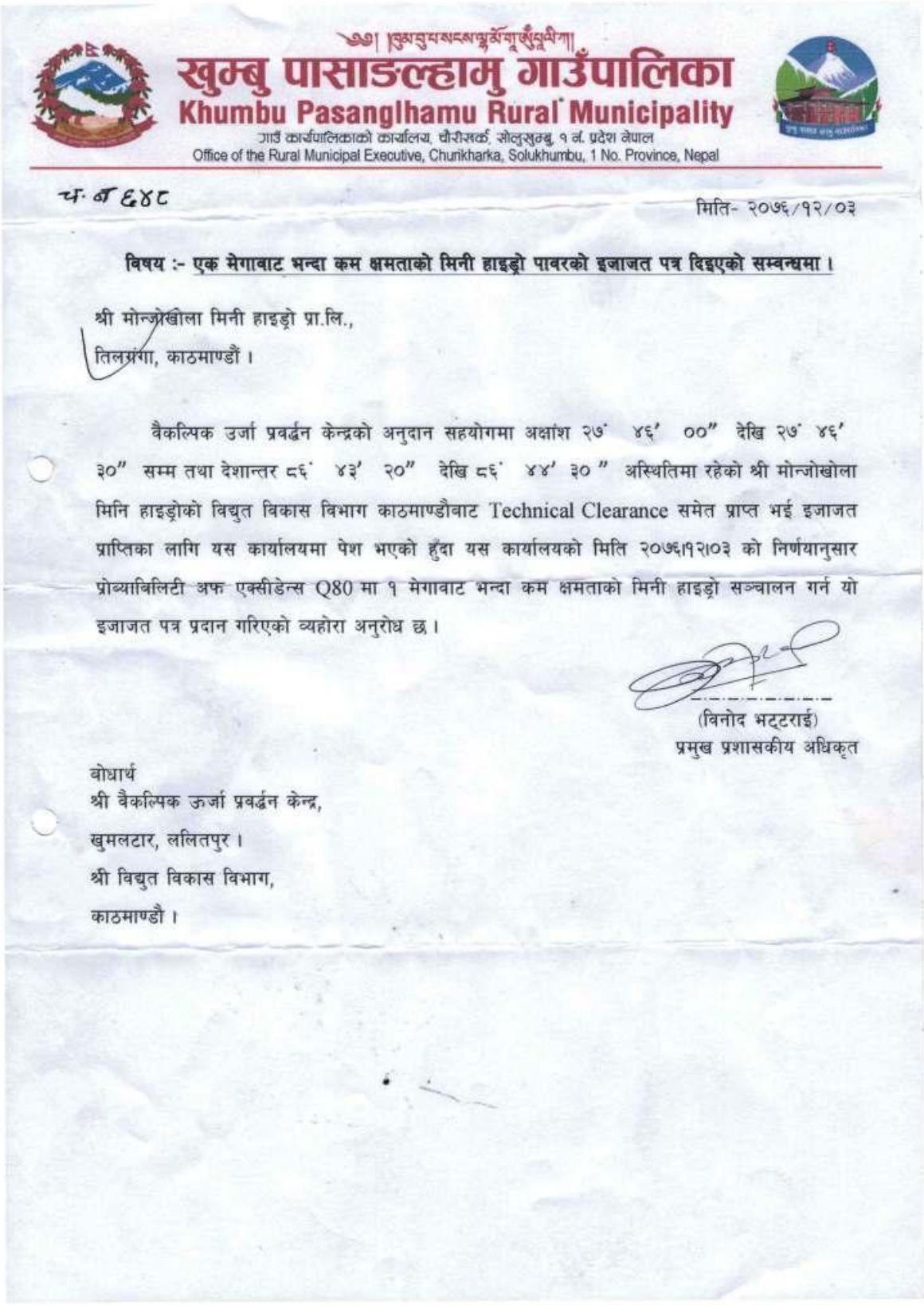
तपसिल:

अक्षांश: २७° ४६' ००" देखि २७° ४६' ३०" सम्म
देशान्तर: ८६° ४३' २०" देखि ८६° ४४' ३०" सम्म

(प्रदिप कुमार राउत)
इञ्जीनियर

बोधार्थ:
१.श्रीमान महानिर्देशकज्यू,विद्युत विकास विभाग
२.श्री मोन्जो खोला मिनी हाइड्रो प्रा.लि. ,तिलगंगा ,काठमाडौं,९८०१०६५९२८

Annex III: Generation License From RM



खुम्बु पासाङल्हामु गाउँपालिका
Khumbu Pasanglhamu Rural Municipality
गाउँ कार्यपालिकाको कार्यालय, चौरीखर्क, सोलुखुम्बु, १ नं. प्रदेश नेपाल
Office of the Rural Municipal Executive, Churikharka, Solukhumbu, 1 No. Province, Nepal

च.नं ६४८

मिति- २०७६/१२/०३

विषय :- एक मेगावाट भन्दा कम क्षमताको मिनी हाइड्रो पावरको इजाजत पत्र दिइएको सम्वन्धमा ।

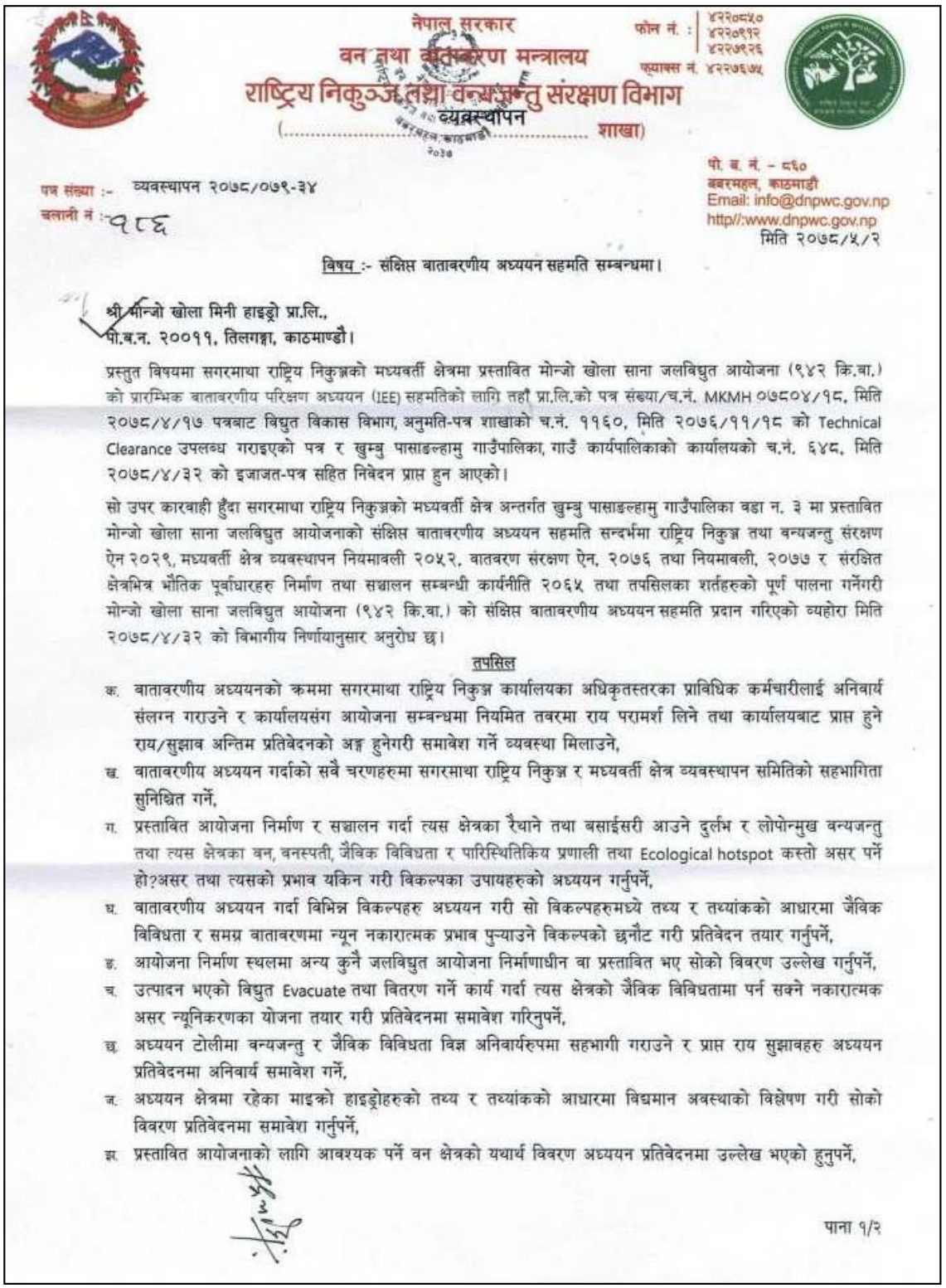
श्री मोन्जोखोला मिनी हाइड्रो प्रा.लि.,
तिलगंगा, काठमाण्डौं ।

वैकल्पिक उर्जा प्रवर्द्धन केन्द्रको अनुदान सहयोगमा अक्षांश २७° ४६' ००" देखि २७° ४६' ३०" सम्म तथा देशान्तर ८६° ४३' २०" देखि ८६° ४४' ३० " अस्थितिमा रहेको श्री मोन्जोखोला मिनि हाइड्रोको विद्युत विकास विभाग काठमाण्डौबाट Technical Clearance समेत प्राप्त भई इजाजत प्राप्तिका लागि यस कार्यालयमा पेश भएको हुँदा यस कार्यालयको मिति २०७६।१२।०३ को निर्णयानुसार प्रोब्याबिलिटी अफ एक्सीडेन्स Q80 मा १ मेगावाट भन्दा कम क्षमताको मिनी हाइड्रो सञ्चालन गर्न यो इजाजत पत्र प्रदान गरिएको व्यहोरा अनुरोध छ ।

(विनोद भट्टराई)
प्रमुख प्रशासकीय अधिकृत

बोधार्थ
श्री वैकल्पिक ऊर्जा प्रवर्द्धन केन्द्र,
खुमलटार, ललितपुर ।
श्री विद्युत विकास विभाग,
काठमाण्डौ ।

Annex IV: Permission Letter for DFS from DNPWC



नेपाल सरकार
वन तथा वातावरण मन्त्रालय
राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण विभाग
(व्यवस्थापन शाखा)

फोन नं. : ४२२०८५०, ४२२०९१२, ४२२७९२६
फ्याक्स नं. ४२२७६७५

पो. ब. नं. - ८६०
बबरमहल, काठमाडौं
Email: info@dnpwc.gov.np
http//:www.dnpwc.gov.np

पत्र संख्या :- व्यवस्थापन २०७८/०७९-३४
चलानी नं :- ९८६

मिति २०७८/५/२

विषय :- संक्षिप्त वातावरणीय अध्ययन सहमति सम्बन्धमा।

श्री मोन्जो खोला मिनी हाइड्रो प्रा.लि.,
पो.ब.न. २००११, तिलगङ्गा, काठमाण्डौं।

प्रस्तुत विषयमा सगरमाथा राष्ट्रिय निकुञ्जको मध्यवर्ती क्षेत्रमा प्रस्तावित मोन्जो खोला साना जलविद्युत आयोजना (९४२ कि.वा.) को प्रारम्भिक वातावरणीय परिक्षण अध्ययन (IEE) सहमतिको लागि तहाँ प्रा.लि.को पत्र संख्या/च.नं. MKMH ०७८०४/१८, मिति २०७८/४/१७ पत्रबाट विद्युत विकास विभाग, अनुमति-पत्र शाखाको च.नं. ११६०, मिति २०७६/११/१८ को Technical Clearance उपलब्ध गराइएको पत्र र खुम्बु पासाङल्हामु गाउँपालिका, गाउँ कार्यपालिकाको कार्यालयको च.नं. ६४८, मिति २०७८/४/३२ को इजाजत-पत्र सहित निवेदन प्राप्त हुन आएको।

सो उपर कारवाही हुँदा सगरमाथा राष्ट्रिय निकुञ्जको मध्यवर्ती क्षेत्र अन्तर्गत खुम्बु पासाङल्हामु गाउँपालिका वडा न. ३ मा प्रस्तावित मोन्जो खोला साना जलविद्युत आयोजनाको संक्षिप्त वातावरणीय अध्ययन सहमति सन्दर्भमा राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण ऐन २०२९, मध्यवर्ती क्षेत्र व्यवस्थापन नियमावली २०५२, वातवरण संरक्षण ऐन, २०७६ तथा नियमावली, २०७७ र संरक्षित क्षेत्रभित्र भौतिक पूर्वाधारहरु निर्माण तथा सञ्चालन सम्बन्धी कार्यनीति २०६५ तथा तपसिलका शर्तहरुको पूर्ण पालना गर्नेगरी मोन्जो खोला साना जलविद्युत आयोजना (९४२ कि.वा.) को संक्षिप्त वातावरणीय अध्ययन सहमति प्रदान गरिएको व्यहोरा मिति २०७८/४/३२ को विभागीय निर्णायानुसार अनुरोध छ।

तपसिल

क. वातावरणीय अध्ययनको क्रममा सगरमाथा राष्ट्रिय निकुञ्ज कार्यालयका अधिकृतस्तरका प्राविधिक कर्मचारीलाई अनिवार्य संलग्न गराउने र कार्यालयसंग आयोजना सम्बन्धमा नियमित तवरमा राय परामर्श लिने तथा कार्यालयबाट प्राप्त हुने राय/सुझाव अन्तिम प्रतिवेदनको अङ्ग हुनेगरी समावेश गर्ने व्यवस्था मिलाउने,

ख. वातावरणीय अध्ययन गर्दाको सबै चरणहरुमा सगरमाथा राष्ट्रिय निकुञ्ज र मध्यवर्ती क्षेत्र व्यवस्थापन समितिको सहभागिता सुनिश्चित गर्ने,

ग. प्रस्तावित आयोजना निर्माण र सञ्चालन गर्दा त्यस क्षेत्रका रैथाने तथा बसाईसरी आउने दुर्लभ र लोपोन्मुख वन्यजन्तु तथा त्यस क्षेत्रका वन, वनस्पती, जैविक विविधता र पारिस्थितिकिय प्रणाली तथा Ecological hotspot कस्तो असर पर्ने हो?असर तथा त्यसको प्रभाव यकिन गरी विकल्पका उपायहरुको अध्ययन गर्नुपर्ने,

घ. वातावरणीय अध्ययन गर्दा विभिन्न विकल्पहरु अध्ययन गरी सो विकल्पहरुमध्ये तथ्य र तथ्यांकको आधारमा जैविक विविधता र समग्र वातावरणमा न्यून नकारात्मक प्रभाव पुऱ्याउने विकल्पको छनौट गरी प्रतिवेदन तयार गर्नुपर्ने,

ङ. आयोजना निर्माण स्थलमा अन्य कुनै जलविद्युत आयोजना निर्माणाधीन वा प्रस्तावित भए सोको विवरण उल्लेख गर्नुपर्ने,

च. उत्पादन भएको विद्युत Evacuate तथा वितरण गर्ने कार्य गर्दा त्यस क्षेत्रको जैविक विविधतामा पर्न सक्ने नकारात्मक असर न्यूनिकरणका योजना तयार गरी प्रतिवेदनमा समावेश गरिनुपर्ने,

छ. अध्ययन टोलीमा वन्यजन्तु र जैविक विविधता विज्ञ अनिवार्यरुपमा सहभागी गराउने र प्राप्त राय सुझावहरु अध्ययन प्रतिवेदनमा अनिवार्य समावेश गर्ने,

ज. अध्ययन क्षेत्रमा रहेका माइक्रो हाइड्रोहरुको तथ्य र तथ्यांकको आधारमा विद्यमान अवस्थाको विश्लेषण गरी सोको विवरण प्रतिवेदनमा समावेश गर्नुपर्ने,

झ. प्रस्तावित आयोजनाको लागि आवश्यक पर्ने वन क्षेत्रको यथार्थ विवरण अध्ययन प्रतिवेदनमा उल्लेख भएको हुनुपर्ने,

पाना १/२

नेपाल सरकार
वन तथा वातावरण मन्त्रालय
राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण विभाग
(..... व्यवस्थापन ..... शाखा)

फोन नं. : ४२२०८५०
४२२०९१२
४२२७९२६
फ्याक्स नं. ४२२७६७५

पो. ब. नं. - ८६०
बबरमहल, काठमाडौं
Email: info@dnpwc.gov.np
http//:www.dnpwc.gov.np

पत्र संख्या :- व्यवस्थापन २०७८/०७९-३४
चलानी नं :-

ञ. निर्माण गर्न प्रस्ताव गरिएका संरचनाहरुको GPS कोअर्डिनेट सहित निकुञ्जको सिमाना देखिने GIS प्रविधि समेत प्रयोग गरी तयार गरिएको टोपोनक्सा प्रतिवेदनमा संलग्न गराउने,

ट. अध्ययनको क्रममा स्थानीय जनता र सरोकारवाला निकायहरुबाट उठान भएका आर्थिक, सामाजिक, जैविक प्रभाव सम्बन्धी सवालहरु सम्बोधन गर्ने सम्बन्धमा अवलम्बन गर्नुपर्ने न्यूनीकरणका उपायहरु प्रतिवेदनको अभिन्न अङ्गको रुपमा समेटिनु पर्ने,

ठ. वातावरण संरक्षण नियमावली, २०७७ को नियम ९ बमोजिम वातावरणीय अध्ययन प्रतिवेदन स्वीकृत गर्ने सम्बन्धित निकायले प्राप्त वातावरणीय अध्ययन प्रतिवेदन सम्बन्धमा जाँचबुझ गर्दा सो विषयमा थप वातावरणीय अध्ययन गर्नुपर्ने देखिएमा संक्षिप्त वातावरणीय अध्ययनको हकमा प्रारम्भिक वातावरणीय परिक्षण र प्रारम्भिक वातावरणीय परिक्षणको हकमा वातावरणीय प्रभाव मुल्यांकन गर्न प्रस्तावकलाई आदेश दिनुपर्नेछ भन्ने व्यवस्था भए बमोजिम थप वातावरणीय अध्ययन गर्नुपर्ने भएमा सोही बमोजिम गर्नुपर्ने,

ड. अन्तिम प्रतिवेदन स्विकृती गर्नु पुर्व स्वीकृत गर्ने निकायले सगरमाथा राष्ट्रिय निकुञ्ज कार्यालय र राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण विभागको लिखित सहमति लिनुपर्ने,

ढ. प्रस्तावित आयोजना निर्माण तथा संचालन गर्दा सगरमाथा राष्ट्रिय निकुञ्जको Outstanding Universal Value (OUV) मा पर्नसक्ने प्रभाव समेतको अध्ययन गरी यकिन विवरण प्रतिवेदनमा उल्लेख गर्नुपर्ने र नकारात्मक असर पर्ने पाईएमा यूनेस्को (UNESCO) मा राय सुझावको लागि पठाउनु पर्ने, र

ण. यस वातावरणीय अध्ययन सहमति उपलब्ध गराइएको आधारमै यसपछिका अन्य कार्यका लागि सहमति प्रदान गर्न विभाग बाध्य हुने छैन।

2076/12/2

(नुरेन्द्र अर्याल)
सहायक व्यवस्थापन अधिकृत

बोधार्थ :
श्री वन तथा वातावरण मन्त्रालय,
सिंहदरवार, काठमाडौं।

श्री सगरमाथा राष्ट्रिय निकुञ्जको कार्यालय,
नाम्चेबजार सोलुखुम्बु

श्री खुम्बु पासाङल्हामु गाउँपालिका,
गाउँ कार्यपालिकाको कार्यालय, चौरीखर्क सोलुखुम्बु।

पाना २/२

Annex V: Vegetation Survey Form

HERBS

Date: _____ Time: _____

Plot No: _____ Forest Name: _____

Area of the quadrate: _____ Location: _____

SN	Common Name of Species	No. of Saplings	Height	Coverage (%)	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Shrubs

Date: _____ Time: _____

Plot No: _____ Forest Name: _____

Area of the quadrate: _____ Location: _____

SN	Common Name of Species	No. of Saplings	Height	Coverage (%)	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

TREES

Date: _____

Time: _____

Plot No: _____

Forest Name: _____

Area of the quadrate: _____

Location: _____

SN	Common Name of Species	DBH (cm)	Height (m)	No. Saplings	No. of Seedlings	Crown Coverage (%)	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							

Annex VI: Vegetation Characteristics Calculation Formulae

Density:

$Density\ (No./ha) = \frac{I}{AXN} x\ 100$ ..... (i)

Where,

I = Total number of individuals

A = Area of each sampling plot

N = Total number of plots

$RelativeDensity\ (\%) = \frac{D}{TD} x100$ ..... (ii)

Where, D = Density of an individual species; TD = Total density of all species

Frequency:

$Frequency\ (\%) = \frac{E}{N} x100$ ..... (iii)

Where,

E = Encounter (Total Number of plots in which an individual species occurred)

N = Total number of plots

$RelativeFrequency\ (\%) = \frac{F}{TF} X100$ ..... (iv)

Where, F = Frequency of an individual species; TF = Total frequency of all species

Coverage:

$Coverage\ (\%) = CI$ ..... (v)

Where,

CI = Coverage of an individual species in a sampling plot

$RelativeCoverage\ (\%) = \frac{TCI}{TC} X100$ ..... (vi)

Where, TCI = Total coverage an individual species; TC = Total coverage of all species

Importance Value Index:

$IVI = RD + RF + RBA$ or RC ..... (vii)

Where,

RD = Relative Density

RF= Relative Frequency

RBA = Relative Basal Area (for tree)

RC= Relative Coverage (for shrubs and herbs)

Basal Area:

$BasalArea(m^2) = \frac{\pi d^2}{4}$ ..... (viii)

Where,

d (m) = diameter at breast height of an individual tree

$RelativeBasalArea\ (\%) = \frac{TIBA}{TBA} X100$ ..... (ix)

Where, TIBA = Total basal area of an individual tree; TBA = Total basal area of all trees

Tree Volume:

Basal area and height were measured for calculation of standing trees trunk volume. This is estimated as

$TreeVolume = \frac{BA \times H}{2}$ ..... (x)

Where, BA was basal area at 1.3-meter height, which is πr^2, where r is radius (in meter) at 1.3 m height of the tree and H = height (in meter) of the tree (DoF 2061).

Annex VII: Vegetation Loss and Valuation

(a) Forest Loss at different project components

SN	Project Structure	Forest Type	Area, ha	Loss of vegetation				Crown Cover (%)	BA (SqM)	Vegetation Type
				Seedlings /ha	Saplings/ ha	No. of Poles	No. of Trees			

(b) Total Loss in terms of Plant Species

Botanical Name	Local Name	Avg. DBH/ Range * (for >= 10 cm dbh)	Loss of vegetation				Standing Wood Volume/ha		Biomass for Standing tree and poles MT (Wet) /ha	Biomass usages
			Loss of Regeneration/ha		Loss of tree					
			Seedlings	Saplings	Pole	Tree	Timber (Cft)	Fuel wood (Chatta)		

(c) Total forest loss

Type of Forest	Area (ha)	Loss of vegetation** /ha				Standing Wood Volume/ha		Biomass for Standing tree and poles MT (Wet) /ha	Biomass usages
		Loss of Regeneration (**/ha)		Loss of tree					
		Seedlings	Saplings	Pole	Tree	Timber (Cft)	Fuel wood (Chatta)		
Government									
Community									
Religious									
Leasehold									
Private									
Total									

(a) Loss of Non-Timber Forest Product (NTFP)

SN	Commercially Important Species	Common Name	Loss of vegetation** /ha			
			Community Forest		Private Forest	
			Seedlings No./ha	Saplings No./ha	Seedlings No./ha	Saplings No./ha

(b) Valuation of Forest Product Loss

SN	Botanical Name	Common Name	Valuation (NPR.)	
			Timber	Fuelwood

Annex VIII: Socio-Economic and Cultural Survey Form

बस्तीको जानकारी:

१ ठेगाना: २ बस्तीको नाम:

३. घरधुरी संख्या: ४. जनसंख्या:

५. मुख्यजातजातिहरु:

क्र. सं.	जातजाति	प्रतिशत	कैफियत

६ . पेशा

क्र. सं.	मुख्य पेशा	प्रतिशत	सहायक पेशा	प्रतिशत
	कृषि तथा पशुपालन			
	ज्याला मजदुरी			
	व्यापार			
	घरेलु उध्योग			
	सरकारी तथा गैर-सरकारी सेवा			
	बैदेशिक रोजगार			
	अन्य (उल्लेख गर्ने)			

७. जमिन सम्बन्धि जानकारी

	जमिन को क्षेत्रफल							
	भूमिहीन	१ रोपनी भन्दा कम	१-५ रोपनी	५-१० रोपनी	१०-१५ रोपनी	१५-२० रोपनी	२०-५० रोपनी	>५० रोपनी
घर धुरी संख्या								

८. खाध्यान्नको अवस्था

	खाध्यान्नको उपलब्धता					
	३ महिना भन्दा कम	३ महिना सम्म	३-६ महिना	६-९ महिना	९-१२ महिना	१ वर्षभन्दा बढि
घरधुरी संख्या						

९. मुख्यबाली

अन्न	
नगदेबाली	

१०. बस्तुभाउ (घरपालुवा जनावर)

बस्तुभाउ	संख्या	बस्तुभाउ	संख्या
गाइ		सुँगुर	
गोरु		खरायो	
भैसी		माछापालन (घरधुरी)	
घोंडा		मौरीपालन (घरधुरी)	
बाख्रा		कुखुरा	
भेंडा		अन्य भएमा उल्लेख गर्ने	

११. नजिकैको बजार:

१२. स्थानीय सरकारी, गैर-सरकारी, व्यक्तिगत तथा सेवा प्रदायक संघसस्था तथा पुर्बाधारहरु, धार्मिक, सांस्कृतिक तथा पुरातात्विक सम्पदाहरु र अन्य संस्थाहरु:

क्र.सं.	नाम	ठेगाना	संख्या	कैफियत
१.	**स्वाथ्य**			
१.१	अस्पताल			
१.२	प्राथमिक स्वास्थ्य चौकी			
१.३	स्वास्थ्य चौकी			
१.४	उपस्वास्थ्यचौकी			
२.	**शिक्षा**			
२.१	क्याम्पस			
२.२	उच्च मा. वि.			
२.३	मा. वि.			
२.४	नि. मा. वि.			
२.५	प्रा. बि.			
३.	**संचार**			
३.१	मोबाइल			
३.२	ल्याण्डलाइन			
३.३	स्काई/CDMA			
३.४	हुलाक			
३.५	इन्टरनेट			
४.	**उधोग तथा बाणिज्य**			
४.१	होटल तथा लज			
४.२	रेस्टुरेन्ट तथा चिया पसल			
४.३	खाध्य पसल			
४.४	स्टेशनरी तथा पुस्तक पसल			

क्रमश:

क्र.सं.	नाम	ठेगाना	संख्या	कैफियत
४.५	औषधि पसल			
४.६	अन्य भए उल्लेख गर्ने			
५.	**विधुत्**			
५.१	मिनी/माइक्रो-हाइड्रो			
५.२	राष्ट्रिय प्रसारण			
५.३	सोलार			
५.४	अन्य भएमा उल्लेख गर्ने			

६.	**खानेपानी**			
६.१	धारा			
६.२	कुवा तथा मुहान (संख्या)			
७.	**सिंचाईको अवस्था**			
७.१	सिंचाई भएको जमिन (रोपनी/हे./कट्ठा)			
७.२	सिंचाई नपुगेको जमिन (रोपनी/हे./कट्ठा)			
८.	**अन्य भौतिक पुर्बाधार**			
८.१	माइक्रोहाइड्रो (संख्या तथा क्षमता)			
८.२	पानी मिल (संख्या)			
८.३	झोलुंगे पुल (संख्या)			
८.४	काठे पुल (संख्या)			
८.५	अन्य पुल भएमा उल्लेख गर्ने			
९.	**उद्योग**			
९.१	सिलाई बुनाई			
९.२	अन्न कुटानी पिसानी मिल			
९.३	अन्य उध्योग भएमा उल्लेख गर्ने			
१०.	**आर्थिक कारोबार गर्ने संस्था**			
१०.१	बैंक			
१०.२	सहकारी			
१०.३	फाइनान्स			
११.	**सार्बजनिक सम्पति**			
११.१	घाट			
११.२	खेलमैदान			
११.३	हाट बजार			
११.४	सामुदायीक केन्द्र			
११.५	मन्दिर			
११.६	गुम्बा/मस्जिद/चर्च			
११.६	पुरातत्तिक सम्पदा			
११.७	अन्य केहि भएमा उल्लेख गर्ने			

१३. मुख्य चाडपर्बहरु:

१४. योजनाले प्रत्यक्ष असर पार्ने क्षेत्रहरु

क्षेत्र	ठेगाना	दुरी
घर (संख्या) :		
खेतीयोग्य जमिन (क्षे.) :		
बन (नाम र क्षे.) :		
मन्दिर/गुम्बा/मस्जिद/चर्च (नाम) :		

पानीका श्रोत		
झोलुंगे पुल		
कुलो		
अन्य भौतिक पुर्बाधार भएमा उल्लेख गर्ने		

Ethnicity and Social Status

qm=;+	pkef]Qmfsf] gfd	lnË	7]ufgf -6f]n, j8f, ufpFkflnsf_	hft÷ hghflt					ju{*				;fdflhs :t/					zfl//Ls cj:yf	
				blnt	hghflt	a]ɑur÷lr]qL÷7s'/	d'zndfg	cGo	clt u/La	u/La	dWodau ſ	;DkGg	Psndlxnf	lakIQ lkl8t	nf]kf]Gd' vhghflt	lk5l8Psf iuſ	4Gb lkl8t	zfl//Ls÷ dfgl;sczS ttf	Pr=cfO +{=eL

*clt u/La-# dlxgf ;Ddvfgk'Ug_ u/La-^ dlxgf ;Dd vfgk'Ug]_ dWodau{-^ b'']]]lv (dlxgf ;Dd vfgk'Ug]_ ;DkGg-Afif{el/ vfgk'Ug]_

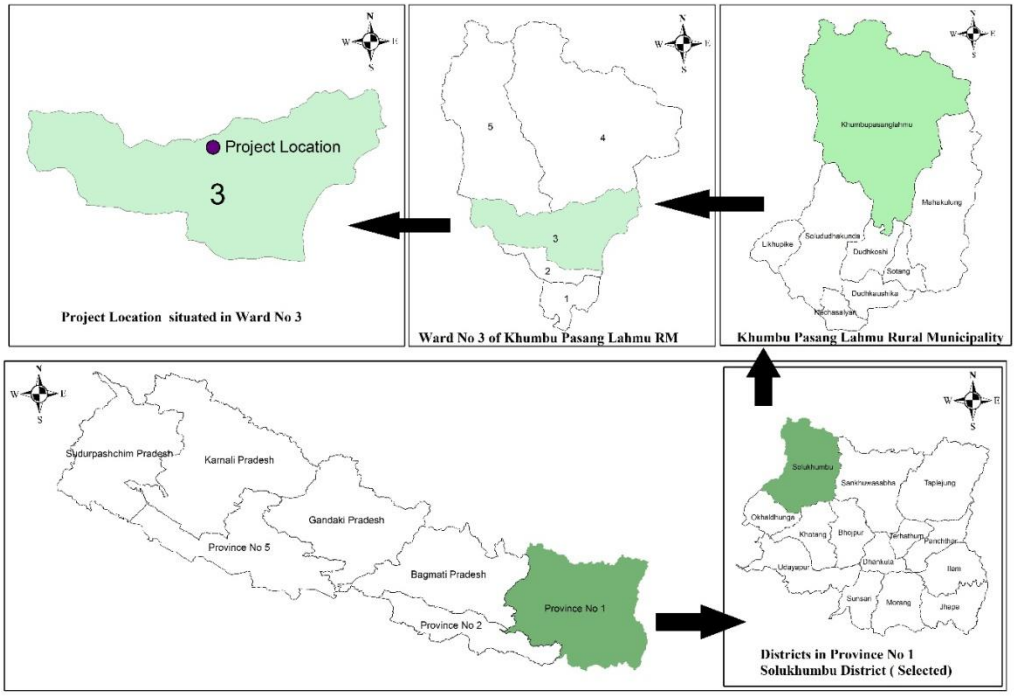
Consumer Details

Ref.No	**Consumer Detail** (Name, Contact no., Owner)	GPS Address (Degree decimal)		No. of Members		No. of Rooms Dining, Bathroom	Existing Tariff rate per Unit Amount per month Expected Rate/Unit (Nrs.Unit/	Existing Energy Source (solar, MHP, Other)	Lights (No1, Watts)		Television (No, Watts)		Oven/Induction (No, Watts)		Deep Fridge Refrigerator(No, Watts)		Rice Cooker(No, Watts)		AC/ Heater (No, Watts)		Mixer/Grinder (No, Watts)		Water Pump(No, Watts)		Others (No, Watts)	
		Easting	Northing	Male	Female				Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional	Existing	Additional

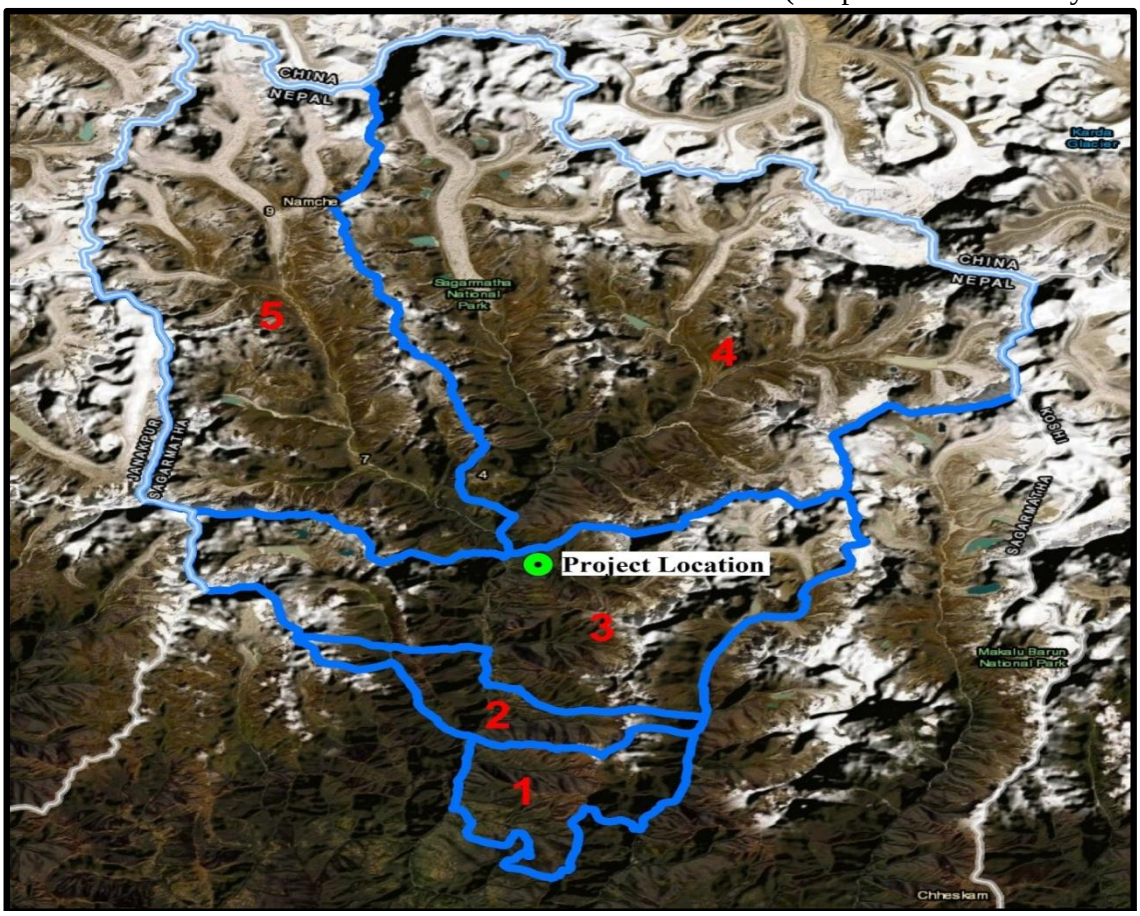
Operating Hours:

Ref No.	Religion/ Festivals	Mother tongue	Migration (from where When Why)	Occupation (Agri, Job, Remittance, Business, Other)	Education	Land Ownership and area	Major Crops with area and last year production	Domestic animals	Affiliation to local NGOs/INGOs	Source of Energy (Wood/LPG /Kerosene) Per month	Water Source/ Toilet status	Major Illness in past 2 years

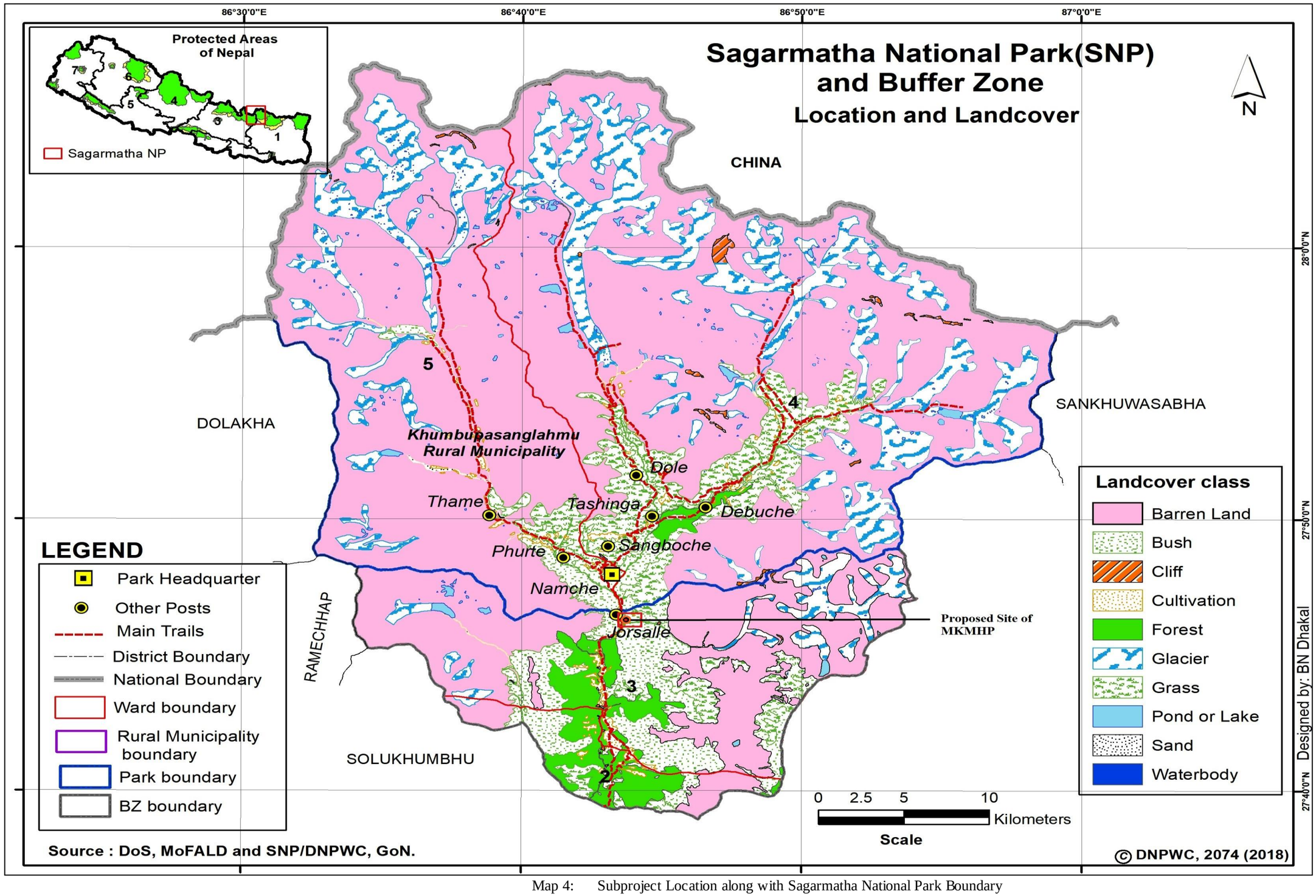
Annex IX: Maps of Sub-Project Site



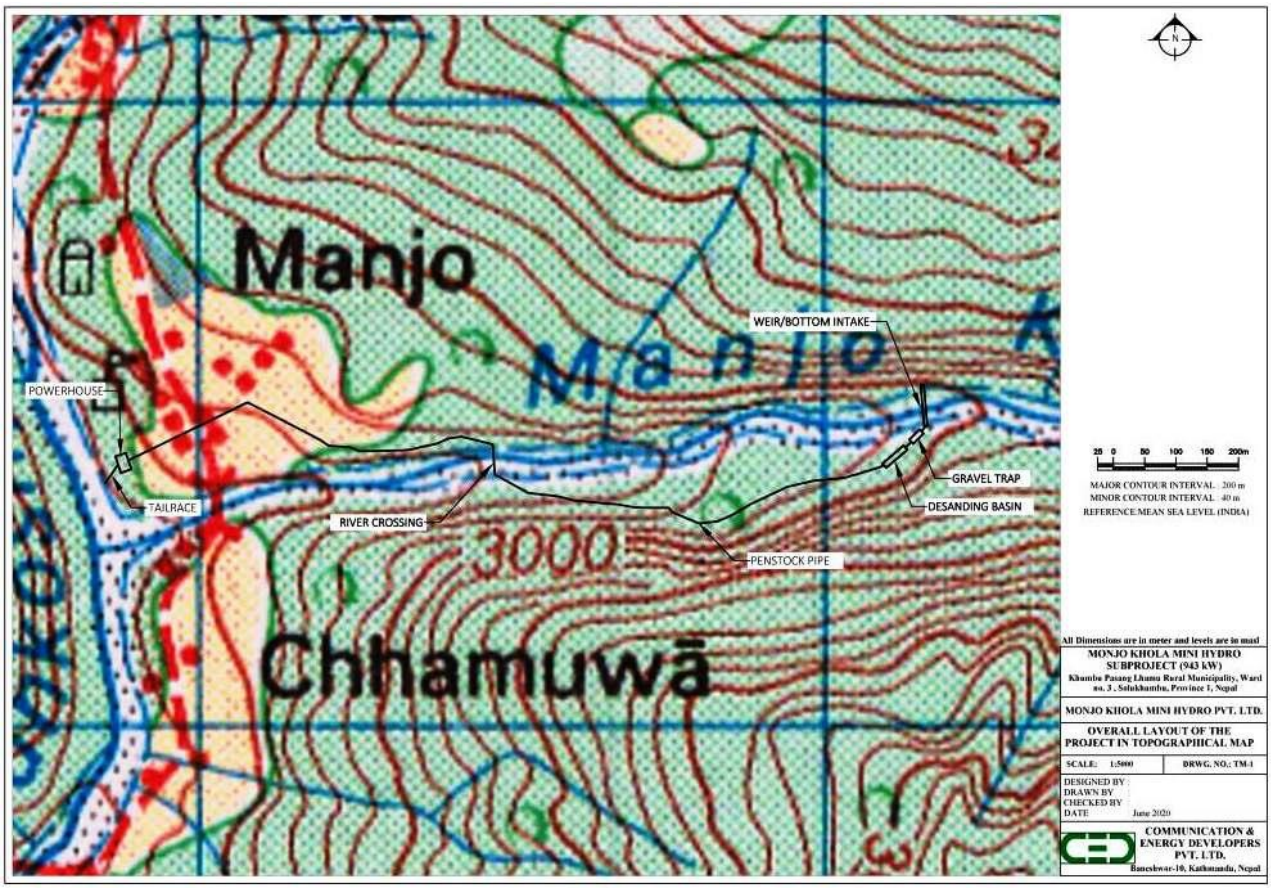
Map 2: Subproject Location in District Map
(Shape file modified by CED)



Map 3: Subproject Location on Google Earth Map
(Map Source: Over lay on Google map, Modified by CED)



Map 4: Subproject Location along with Sagarmatha National Park Boundary



Map 5: Subproject Location in Topographic Map

Annex X: Coordinates of Transmission Lines

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
DB1				
	78.48	86.72246	27.77935	1.5
	70.09	86.72237	27.77922	1.5
	46.65	86.7223	27.779	1.5
	16.01	86.72232	27.77882	1.5
	13.2	86.72219	27.77863	1.5
	24.6	86.72215	27.77855	1.5
	46.53	86.72206	27.7783	1.5
	46.53	86.72231	27.77865	1.5
	62.46	86.72196	27.77829	1.5
	53.66	86.72215	27.77828	1.5
DB2				
	15.24	86.72184	27.77782	1.5
	50.27	86.72203	27.77804	1.5
	17.51	86.72174	27.7778	1.5
	15.49	86.72166	27.7777	1.5
	15.49	86.72173	27.77762	1.5
	11.09	86.72173	27.77762	1.5
	24.62	86.72164	27.77755	1.5
	35.78	86.7216	27.77746	1.5
DB3				
	70.28	86.72217	27.77671	1.5
	70	86.78661	27.85792	1.5
	71.53	86.72188	27.77579	1.5
DB4				
	23.94	86.72263	27.77292	1.5
	22.22	86.72232	27.77286	3
	82.32	86.72196	27.7733	3
	32.9	86.72227	27.77261	3
	78.62	86.72178	27.77269	3
	78.43	86.72311	27.77299	1.5
DB5				
	29.99	86.72225	27.77365	3
	62.56	86.72304	27.77377	1.5
	13.95	86.72253	27.77338	1.5
DB6				
	102.05	86.72483	27.77176	1
	32.55	86.72437	27.77225	1.5
	72.34	86.72464	27.77197	1.5
	29.42	86.72395	27.77199	1.5
	60.34	86.72404	27.77173	1.5
	68.12	86.72361	27.77188	1.5
	58.85	86.72373	27.77261	1.5
	85.66	86.72337	27.77226	1
	79.74	86.72327	27.77211	1
	89.54	86.72323	27.77195	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
DB7				
	107.19	86.72307	27.77219	1
	89.87	86.7227	27.77214	1.5
	47.86	86.72267	27.77178	1.5
	45.87	86.72288	27.77175	1.5
	45.87	86.72288	27.77175	1.5
	45.73	86.72288	27.77175	1.5
	45.87	86.72288	27.77175	1.5
	45.87	86.72288	27.77175	1.5
	44.52	86.72299	27.7717	1.5
	31.49	86.72275	27.7716	1.5
	28.76	86.72311	27.77154	1.5
	42.58	86.72327	27.77161	1.5
	22.4	86.72298	27.77127	3
	45.08	86.72328	27.77117	3
	75.74	86.7233	27.77087	1.5
	108	86.72369	27.77076	3
DB8				
	99.04	86.72366	27.77024	1.5
	66.22	86.72443	27.77095	1.5
	84.01	86.72519	27.7708	1.5
DB9				
	102.12	86.72382	27.76924	1.5
	71.69	86.72348	27.76917	1.5
	65.08	86.72324	27.76911	1.5
	41.16	86.72317	27.76894	1.5
	7.3	86.72307	27.76875	1.5
	22.39	86.72298	27.76853	1.5
	81.42	86.72309	27.76795	3
DB10				
	92.06	86.72315	27.7677	1.5
	101.09	86.72343	27.76757	1.5
	79.11	86.72296	27.76733	1
	59.92	86.72338	27.76728	1.5
	52.98	86.72338	27.76714	1.5
	44.69	86.72295	27.76703	1.5
	24.11	86.72339	27.76662	1.5
	49.87	86.72341	27.76638	1.5
DB11				
	90.59	86.72393	27.76573	1.5
	48.67	86.72357	27.76599	1.5
	8.44	86.72314	27.76595	1.5
	38.79	86.72291	27.76579	1
	82.97	86.72311	27.76557	1.5
DB12				
	41.34	86.72251	27.7649	1.5
	91.81	86.72281	27.76519	1.5
	54.25	86.72251	27.76503	1
	74.08	86.7225	27.76466	1.5
	74.77	86.72235	27.76459	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
DB13				
	82.61	86.72001	27.76419	1.5
	52	86.71992	27.76389	1.5
	35.94	86.71959	27.76393	1.5
	18	86.71974	27.76363	1.5
	12.95	86.71951	27.76359	1.5
	48.84	86.71927	27.76335	1.5
	48.85	86.71916	27.76344	1.5
DB14				
	98.1	86.71833	27.76303	1.5
	81.23	86.71808	27.76304	1.5
	62.64	86.71806	27.76282	1.5
	26.21	86.71767	27.76275	3
	5.23	86.71756	27.76263	1.5
	30.62	86.71779	27.76274	1.5
	12.31	86.71768	27.76249	1.5
	14.22	86.71759	27.76247	1.5
	36.6	86.71742	27.76233	1.5
	63.37	86.71723	27.76226	1.5
	68.69	86.71722	27.76206	1.5
	86.04	86.71713	27.76192	1.5
	97.42	86.71701	27.76196	1.5
DB15				
	99.38	86.71678	27.76183	1.5
	91.39	86.71687	27.76168	1.5
	76.97	86.71664	27.76176	1
	22.4	86.71634	27.7614	1.5
	9.43	86.71623	27.76134	1
	24.91	86.71608	27.76151	1
	47.9	86.71572	27.76119	1.5
	61.92	86.71558	27.76131	1.5
	89.88	86.71553	27.76145	1.5
	85.35	86.71536	27.76135	1.5
DB16				
	100.07	86.71515	27.76148	1.5
	40.02	86.7149	27.76185	1.5
	42.34	86.71476	27.7618	1.5
	70.17	86.71387	27.76176	1.5
	72.67	86.71453	27.76164	1.5
	64.08	86.71393	27.76218	1.5
DB17				
	98.02	86.71351	27.76191	1.5
	86.38	86.71342	27.7617	1.5
	44.62	86.71284	27.76135	1.5
	73.61	86.71313	27.76176	1.5
	61.26	86.71283	27.76165	1.5
	87.49	86.71261	27.76156	1.5
	84.47	86.71333	27.76159	1.5
DB18				
	63.37	86.71003	27.75721	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	44.52	86.71012	27.75696	3
	35.21	86.70997	27.75638	2
DB19				
	96	86.71042	27.75429	1.5
	66.15	86.71047	27.7541	1
	50.91	86.71041	27.75393	1.5
	40.34	86.71054	27.75381	1.5
	22.16	86.71047	27.75366	1.5
	14.12	86.71057	27.7535	1.5
	27.62	86.71061	27.75338	1.5
	42.41	86.71061	27.75324	1.5
	77.19	86.7108	27.75308	1.5
	49.25	86.71045	27.75308	1.5
	61.21	86.71056	27.75299	1.5
	62.79	86.71043	27.75294	3
	78.99	86.71048	27.75283	1.5
	83.65	86.71041	27.75277	1.5
	98.04	86.71036	27.75261	1.5
DB20				
	84.6	86.71047	27.75253	1.5
	72.09	86.71047	27.75241	1.5
	100.03	86.71025	27.75249	1.5
	89.17	86.71029	27.75239	1.5
	36.45	86.70995	27.75231	1.5
	56.93	86.70971	27.75232	3
	50.15	86.7094	27.75225	1.5
	94.17	86.70922	27.75211	1
DB21				
	33.16	86.71076	27.75121	1.5
	98.06	86.71031	27.75175	1.5
	60	86.71063	27.75144	1.5
	97.79	86.71056	27.75183	1.5
	36.24	86.71123	27.75092	1.5
	74.73	86.71152	27.75086	3
	75.78	86.71138	27.75063	1.5
	79.22	86.71127	27.75048	1.5
DB22				
	78	86.71191	27.75019	1.5
	82.23	86.71237	27.74953	3
	52.85	86.71238	27.74997	3
DB23				
	18.23	86.71273	27.74818	3
DB24				
	108.31	86.71239	27.74575	3
	54.33	86.71243	27.74524	1.5
		86.71251	27.74539	1.5
	9.44	86.71246	27.74494	1.5
	92.9	86.71189	27.74495	1.5
	95.13	86.71238	27.74404	2
	70.9	86.7124	27.74433	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
DB25				
	91.23	86.71178	27.74425	1.5
	37.93	86.71211	27.7436	1.5
	37.18	86.71264	27.74377	3
	83.37	86.71166	27.74354	3
	77.76	86.71178	27.74332	3
	55.91	86.71223	27.74324	3
DB26				
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	250	86.70826	27.74622	3
	430	86.70708	27.74648	3
	55.25	86.71034	27.7466	1.5
	33.02	86.70983	27.74594	1.5
	66.39	86.71013	27.74568	1.5
	66.63	86.70969	27.74666	1.5
	104.02	86.70984	27.74541	1.5
DB27				
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	60.13	86.70925	27.75016	1.5
	63.4	86.70881	27.74999	1.5
	30.89	86.7092	27.74947	1.5
	103.65	86.70831	27.74966	1.5
	105.93	86.70972	27.74892	1.5
DB28				
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	70	86.7111	27.74979	1.5
	82.38	86.70911	27.74821	1.5
	104.25	86.70944	27.74767	1.5
	105.29	86.7106	27.7483	4
	76.02	86.71022	27.74858	4
DB29				
	37.91	86.71401	27.74309	1.5
	13.17	86.71379	27.74308	1.5
DB30				
	86	86.71296	27.74146	1.5
	95.82	86.71295	27.74166	1.5
	70.59	86.71296	27.7413	1.5
	43.43	86.713	27.74118	1

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	29.22	86.71296	27.74108	1
	40.12	86.71292	27.74121	1.5
	27.31	86.71288	27.74109	1.5
	16.89	86.71287	27.74097	1.5
	15.9	86.71296	27.74091	1
	21.62	86.71294	27.741	1.5
	28.3	86.71274	27.74081	1.5
	14.62	86.71282	27.74074	1.5
	23.15	86.71293	27.74069	1.5
	37.09	86.71261	27.74075	1.5
	19.15	86.71277	27.74082	1.5
	14.18	86.71277	27.74082	1.5
	40	86.71277	27.74082	1.5
	40	86.71277	27.74082	1.5
	50	86.71277	27.74082	1.5
	50	86.71277	27.74082	1.5
	50	86.71277	27.74082	1.5
DB31				
	54.37	86.71289	27.74062	1.5
	40.89	86.71297	27.74009	4
	42.85	86.71272	27.74063	1.5
	28.89	86.7127	27.74052	1.5
	37.71	86.71281	27.74054	1.5
	28.61	86.71277	27.74046	1
	30	86.71249	27.74023	1
	19	86.71271	27.74038	1
	22.63	86.71279	27.74018	3
	49.06	86.71238	27.7404	1.5
	29.86	86.71292	27.74026	1.5
	38.55	86.71267	27.74003	3
	43.14	86.71225	27.74022	3
	26.61	86.71245	27.7401	1.5
	34.47	86.71255	27.74004	3
DB32				
	97.45	86.71254	27.73978	3
	94.33	86.71233	27.73975	3
	81.03	86.7129	27.73918	1.5
	77.37	86.71221	27.73949	1.5
	87.69	86.71251	27.73967	1.5
	36.92	86.71244	27.73914	3
	57.93	86.71245	27.73935	1.5
	80.5	86.71142	27.73904	1.5
	30.42	86.71223	27.7392	1.5
	6.03	86.71211	27.73897	3
	10.76	86.71226	27.73897	1.5
	33.71	86.71198	27.73864	1.5
	41.26	86.71223	27.73878	3
	83.06	86.71175	27.73839	3
	100.44	86.71202	27.73825	1.5
DB33				

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	48.77	86.71169	27.73572	1.5
	32.54	86.71183	27.73485	1.5
	65.31	86.71176	27.73555	3
DB34				
	103.84	86.71344	27.73096	1.5
	95.02	86.71344	27.73096	1.5
	106.01	86.71344	27.73096	1.5
	16.29	86.7137	27.73024	1.5
	25.81	No	No	1.5
DB35				
	80.66	86.70825	27.73764	1.5
	98.2	86.70817	27.73747	1
	126.19	86.70819	27.73731	1.5
	115.03	86.70803	27.73733	1.5
	85.17	86.70916	27.73665	3
DB36				
	15	86.70792	27.73806	1.5
	94.29	86.70728	27.73794	1.5
	77.19	86.70736	27.73786	1.5
	59.68	86.70758	27.73803	1.5
	62.22	86.7075	27.73794	1.5
	63.55	86.70767	27.73867	1.5
	53.6	86.70761	27.73861	1.5
	20	86.70785	27.73835	1.5
DB37				
	40.14	86.70564	27.73808	1.5
	56.14	86.70603	27.73764	1.5
	57.24	86.70656	27.73811	1
	65.68	86.70656	27.73808	1.5
	23.93	86.70614	27.73817	1.5
	34.47	86.70608	27.73828	1.5
	77.56	86.70661	27.73844	1.5
DB38				
	84.16	86.70461	27.73767	1.5
	50	No	No	1.5
	92.17	86.70503	27.73736	1.5
	73.75	86.70553	27.73747	1
	57.01	86.70536	27.73747	1
DB39				
	40	No	No	1.5
	61.88	86.71131	27.73219	1.5
	93.08	86.71092	27.73361	1.5
DB40				
	38.53	86.71156	27.73125	1
	29.64	86.71158	27.73122	3
	97.1	86.71158	27.73219	2
DB41				
	87.43	86.70675	27.73239	2
	66.82	86.70706	27.73194	1.5
	68.88	86.70692	27.73167	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	15.96	86.7075	27.73204	1
	79.11	86.70803	27.73153	1.5
	90.8	86.70819	27.73189	1.5
DB42				
	100.32	86.70628	27.73558	1
	79.78	86.70606	27.73508	1.5
	25.37	86.70689	27.73481	1.5
	40.96	86.70703	27.73489	1.5
DB43				
	60.96	86.70719	27.73361	1.5
	14.26	86.70708	27.73358	1.5
DB44				
	100	86.71336	27.72911	2
	99.84	86.71425	27.72708	2
	76.29	86.71505	27.72627	3
	52.66	86.7145	27.72667	2
	17.56	86.71453	27.72622	2
	36.58	86.71439	27.726	1.5
	63.04	86.71419	27.72592	2
	87.24	86.71458	27.7255	1.5
	97.02	86.71458	27.72539	1.5
DB45				
	99.94	86.71434	27.72514	1.5
	56.15	86.71444	27.72483	3
	63.69	86.71453	27.72489	1.5
	33.89	86.71486	27.72467	2
	25.13	86.71453	27.7245	2
DB46				
	108.69	86.71202	27.72351	2
	94.95	86.71203	27.72316	1.5
	62.08	86.71242	27.7235	1.5
	56.64	86.71342	27.72336	1.5
	103.03	86.71311	27.72394	1
	103.82	86.71314	27.72392	1
DB47				
	4.36	86.71447	27.72397	2
	72.01	86.71386	27.72388	2
	86.88	86.71375	27.72417	1.5
	105.79	86.71456	27.72364	1.5
DB48				
	99.09	86.71431	27.72342	1.5
	41.03	86.71433	27.72303	1.5
	99.46	86.71439	27.72342	1.5
	57.91	86.71425	27.72308	1.5
	43.52	86.71448	27.72241	2
	66.42	86.71426	27.72211	1.5
	71.58	86.71373	27.72268	1.5
DB49				
	31.4	86.71426	27.72115	1
	24.39	86.71431	27.72144	2

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	33.5	86.71436	27.72158	1.5
	61.47	86.71447	27.72081	2
DB50				
	88.21	86.71047	27.7205	1.5
	59.87	86.71064	27.72133	1.5
	27.74	86.71039	27.72109	1
	54.11	86.71053	27.721	1
	87.53	86.71069	27.72069	1.5
DB51				
	32.01	86.71375	27.71867	2
	30.99	86.71392	27.71872	2
	14.83	86.714	27.71847	2
	36.02	86.71406	27.71833	2
	71.58	86.71435	27.71833	2
DB52				
	88.21	86.71528	27.71864	2
	10.15	86.71606	27.71834	1.5
	28.44	86.71622	27.71842	2
	28.68	86.71586	27.71858	1.5
	35.34	86.71603	27.71811	1.5
	54.14	86.7164	27.71826	1.5
	46.5	86.71586	27.71803	1.5
	23.28	86.71601	27.71823	1.5
DB53				
	38.79	86.71469	27.7165	1.5
	74.67	86.71516	27.71725	1.5
	114.01	86.71543	27.7173	1.5
DB54				
	13.65	86.71422	27.71525	1.5
DB55				
	90	No	No	1
	111.31	86.70742	27.71836	1.5
	73.78	86.70686	27.71825	1.5
	81.92	86.70706	27.7185	1
	94.86	86.70567	27.71914	1.5
DB56				
	54.11	86.71355	27.71237	1.5
	50.69	86.71391	27.71162	1.5
DB57				
	13.75	86.71464	27.71008	2
	90.46	86.71442	27.71094	1.5
	88.06	86.71442	27.71094	1.5
	74	86.71453	27.71081	1.5
	44.68	86.71461	27.71053	1.5
	73.33	86.71438	27.71069	1.5
	27.53	86.71444	27.71039	2
	14.88	86.7146	27.71027	2
	52.19	86.71494	27.71008	2
	70.35	86.71472	27.70967	1.5
	75.11	86.71478	27.70956	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	83.34	86.71481	27.7095	1.5
	83.34	86.71463	27.70953	1.5
	20.12	86.71439	27.71017	2
	35.81	86.71442	27.71	1
	35.38	No	No	1.5
DB58				
	82.03	86.71497	27.70922	1.5
	73.39	86.71564	27.70936	2
	22.94	86.71567	27.70911	1.5
	25.54	86.71539	27.70903	2.5
	56.79	86.71565	27.70838	3
DB59				
	95.94	86.71686	27.70594	1.5
	35.44	86.71735	27.70553	1.5
	14.88	86.71765	27.70531	1.5
	53.24	86.718	27.70516	1.5
	91.37	86.7183	27.70495	1
DB60				
	37.31	86.71792	27.70594	1.5
	100.39	86.71756	27.70669	1.5
DB61				
	76.7	86.71889	27.70453	1.5
	71.49	86.71936	27.70528	1.5
	47.72	86.7195	27.70514	1.5
	91.81	86.71892	27.70458	1
	10.14	86.71814	27.70408	1.5
	110	86.72065	27.70631	3
	84.14	86.71942	27.70544	3
DB62				
	70.89	86.71873	27.70374	1
	73.22	86.71777	27.70377	2
	49.24	86.71794	27.70386	2
	47.02	86.71794	27.70389	2
	94.07	86.7175	27.70369	1.5
	13.17	86.71814	27.70408	1.5
	59.57	86.71769	27.70413	1.5
	82.37	86.71756	27.70386	1
	79.94	86.71753	27.70383	1.5
DB63				
	8.58	86.71694	27.70358	1
	61.63	86.71762	27.70346	1.5
	34.52	86.71667	27.70381	1.5
	57.06	86.71725	27.70308	2
	56.32	86.71728	27.70311	1.5
	62.62	86.71733	27.70314	1.5
DB64				
	46.01	86.71722	27.70213	1.5
	65.04	86.71717	27.70239	2
	92.97	86.71744	27.70239	2
	88.83	86.71761	27.70208	3

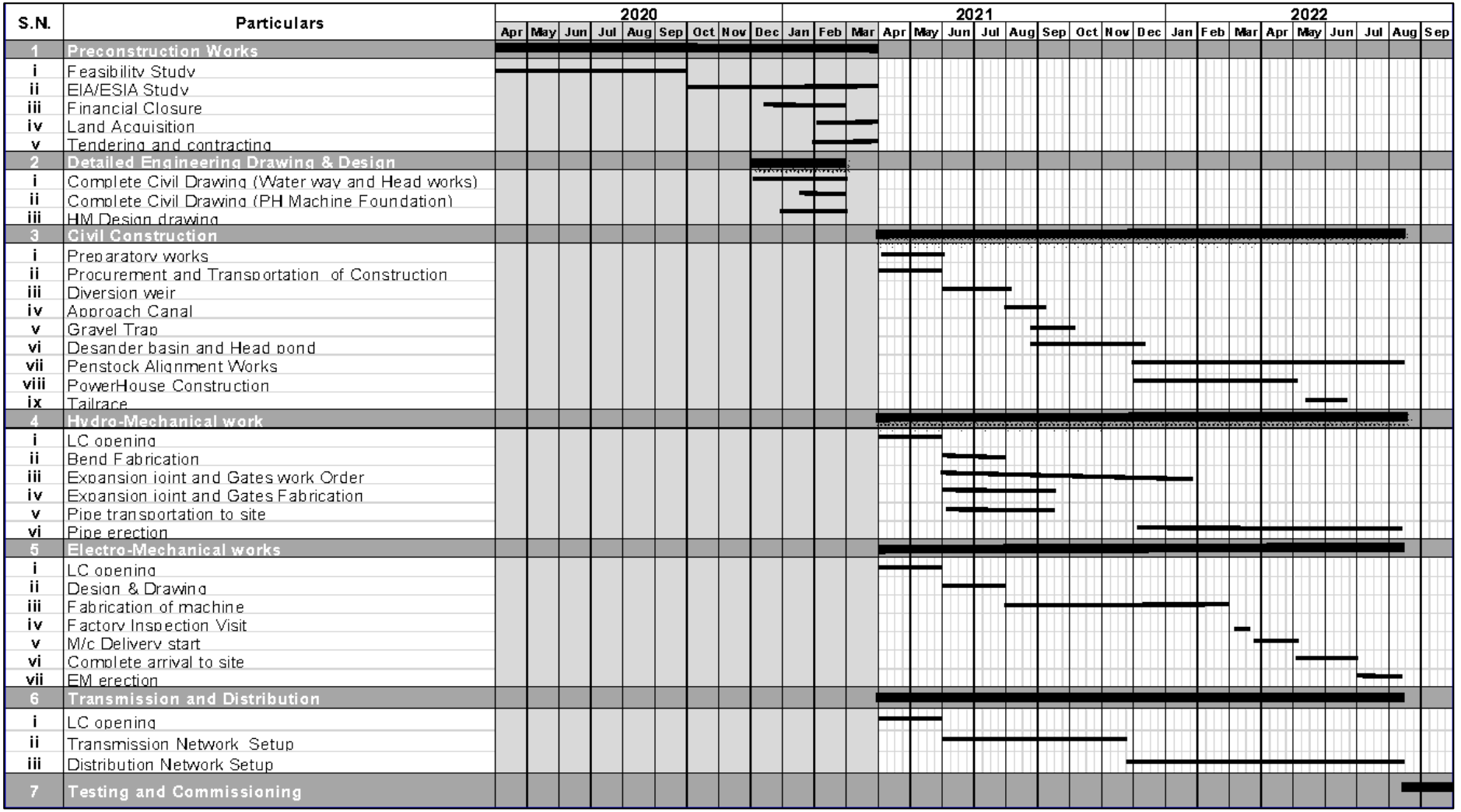
DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	27.86	86.71694	27.70228	2
	21.72	86.71681	27.70236	1.5
	97.69	86.71711	27.70142	1.5
DB65				
	94.68	86.71697	27.70119	1.5
	20.21	86.71703	27.70056	1.5
	21.11	86.71729	27.70042	1.5
	71	86.71678	27.7	1.5
	102.84	86.71674	27.6996	1.5
	100.52	86.71692	27.69956	1.5
DB66				
	14.5	86.71494	27.69947	1
	84.46	86.71517	27.69988	1.5
	70.7	86.71458	27.69964	1.5
DB67				
	103.87	86.71358	27.6995	1
	13.73	86.71423	27.6999	1
	20.85	86.71406	27.70011	1.5
	107.41	86.71406	27.70075	1.5
DB68				
	90.99	86.71478	27.70313	1.5
	9.16	86.71439	27.70254	1
DB69				
	71.3	86.71737	27.69887	1.5
	92.44	86.7176	27.69882	1
	68.18	86.71731	27.69867	1.5
	99.04	86.71694	27.69927	1.5
	74.16	86.71698	27.69908	1.5
	6.64	86.71693	27.69849	1.5
	71.79	86.71669	27.69786	1.5
	85.7	86.71713	27.69824	1.5
DB70				
	60.51	86.71667	27.69747	1.5
	39.44	86.717	27.69753	1.5
	73.39	86.71731	27.69769	1
	93.74	86.71714	27.69781	1
	18.64	86.71703	27.69708	1.5
	84.72	86.71733	27.69669	1.5
	56.75	86.71711	27.69708	1.5
	40	86.71708	27.69708	1.5
	33.64	86.71672	27.69703	1.5
	57.96	86.71703	27.69672	1.5
DB71				
	11.81	86.71817	27.69808	1
	29.7	86.71814	27.69797	1.5
	41.58	86.71806	27.69789	1
	51.87	86.71769	27.69806	1
DB72				
	95.31	86.72031	27.7	1.5
	85.39	86.72008	27.70053	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	42.64	86.72042	27.70039	1.5
	57.58	86.72042	27.70039	1.5
	8.33	86.72081	27.70008	1.5
	72.73	86.72122	27.69956	1.5
DB73				
	37.84	86.72192	27.69858	1.5
	76.29	86.72181	27.69911	1.5
	30.91	86.72217	27.69883	1.5
	60.32	86.72172	27.69903	1.5
	68.06	86.72183	27.69906	1.5
DB74				
	74.66	86.72089	27.69878	1.5
	59.86	86.7193	27.69882	1.5
DB75				
	37.2	86.71711	27.69636	1.5
	12.53	86.71711	27.69617	1.5
	29.68	86.71697	27.69625	1.5
	27.51	86.71706	27.69631	1.5
	19.33	86.71717	27.69617	1
	15.13	86.71711	27.69603	1.5
	60	86.71761	27.69631	1.5
	60.45	86.71758	27.69647	1
	78.32	86.71783	27.69636	1.5
	98.67	86.71817	27.69669	1
	11.35	86.71714	27.69619	1
DB76				
	35	86.71783	27.69636	1.5
	22.91	86.71792	27.69503	1.5
	30.15	86.71778	27.69464	2
	48.09	86.718	27.69447	1.5
	61.13	86.71756	27.69528	1.5
	97.99	86.71725	27.69531	1.5
	21.97	86.71767	27.69486	1.5
	20.76	86.71767	27.69486	1.5
	35.17	86.71778	27.69464	1.5
DB77				
	74.1	86.71806	27.69586	1.5
	7.22	86.71839	27.69528	1.5
	60.01	86.71858	27.69556	1.5
DB78				
	101.35	86.72072	27.69792	1.5
	69.26	86.71994	27.69758	1.5
	5.81	86.72017	27.69725	1.5
	34.53	86.71981	27.69714	1.5
	70	86.71961	27.69692	1
	78.04	86.71939	27.69744	1
DB79				
	34.95	86.72019	27.69633	1.5
	62.37	86.72061	27.69614	1.5
	90.83	86.72086	27.69554	3

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	95.3	86.72108	27.69606	1.5
	90	No	No	1.5
	88.1	86.72089	27.69642	1.5
	91.8	86.72106	27.69594	1.5
DB80				
	93.67	86.72217	27.69618	1.5
	42.88	86.72256	27.69683	1
	32.29	86.72264	27.69686	1.5
	107.31	86.72278	27.69756	1.5
	98.48	86.72314	27.69742	1.5
	103.3	86.72314	27.69742	1.5
	95.96	86.72306	27.69728	1.5
DB81				
	40.33	86.72481	27.69642	1.5
	57.3	86.725	27.69642	1.5
	70.86	86.72514	27.69625	1.5
	75.19	86.72514	27.69625	1.5
DB82				
	101.96	86.71694	27.69333	1
	64.33	86.71831	27.69303	1
	94.52	86.71866	27.69345	1.5
DB83				
	11.6	86.71867	27.69419	1
	39.96	86.71894	27.69411	1.5
	64.97	86.71911	27.69433	1.5
	10.86	86.71867	27.69422	1
	40.25	86.71894	27.69411	1.5
DB84				
	47.83	86.71456	27.69122	1
	102.7	86.71417	27.69142	1.5
	105.59	86.71417	27.69152	1.5
	87.41	86.71517	27.69203	1.5
DB85				
	101.77	86.7203	27.69391	1.5
	35.76	86.72139	27.69344	1.5
	108.63	86.72222	27.69403	1.5
	106.89	86.72222	27.69403	1.5
	94.97	86.72205	27.69433	3
DB86				
	91.99	86.72144	27.69294	1.5
	28.41	86.72114	27.69211	1.5
	99.77	86.722	27.69185	1
DB87				
	26.88	86.72049	27.69147	1
	90.96	86.72025	27.6905	1
DB88				
	92.37	86.71908	27.69198	1.5
	98.86	86.71814	27.69269	1.5
	93.81	86.71827	27.69253	1
	60.53	86.71831	27.69231	1.5

DB Name	Service wire Length from Distribution box (in meters)	Northing	Easting	Allocated power
	51.44	86.71822	27.69222	1
	10	86.71829	27.69186	1.5
	34.03	86.71825	27.69151	1.5
	70.45	86.71831	27.69119	1.5
	108.33	86.71844	27.69093	1.5
DB89				
	87.43	86.71922	27.69142	1.5
	65.54	86.71867	27.69047	1.5
	92.3	86.71881	27.69033	2
	102.78	86.71865	27.69017	1
DB90				
	49.74	86.71976	27.68891	1.5
	100.5	86.71918	27.6893	1.5
	29.89	86.71992	27.68869	1.5
	93.76	86.72008	27.68792	1.5
	16.77	86.71949	27.68862	1.5
DB91				
	70.32	86.72006	27.68769	1.5
	69.91	86.71948	27.68673	1.5
	23.09	86.71981	27.68708	2
	14.75	86.71975	27.68718	1.5
DB92				
	79.93	86.70826	27.75382	1.5
	74.08	86.70847	27.75393	1.5
	56.12	86.70869	27.75373	1.5
	37.98	86.70889	27.75366	1.5
	21.74	86.70902	27.75335	1.5
	64.98	86.70877	27.75305	1.5

Annex XI: Construction Schedule of Sub-Project



Annex XII: Photographs

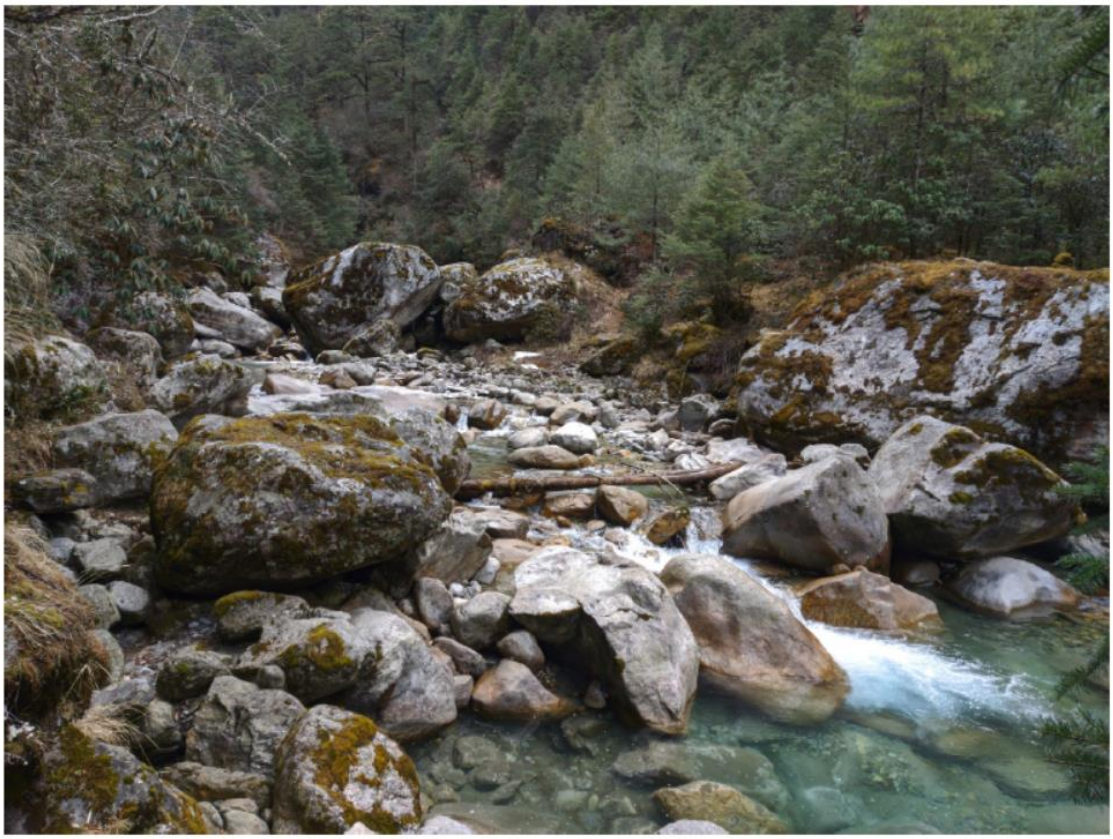


Figure 1: Monjo River

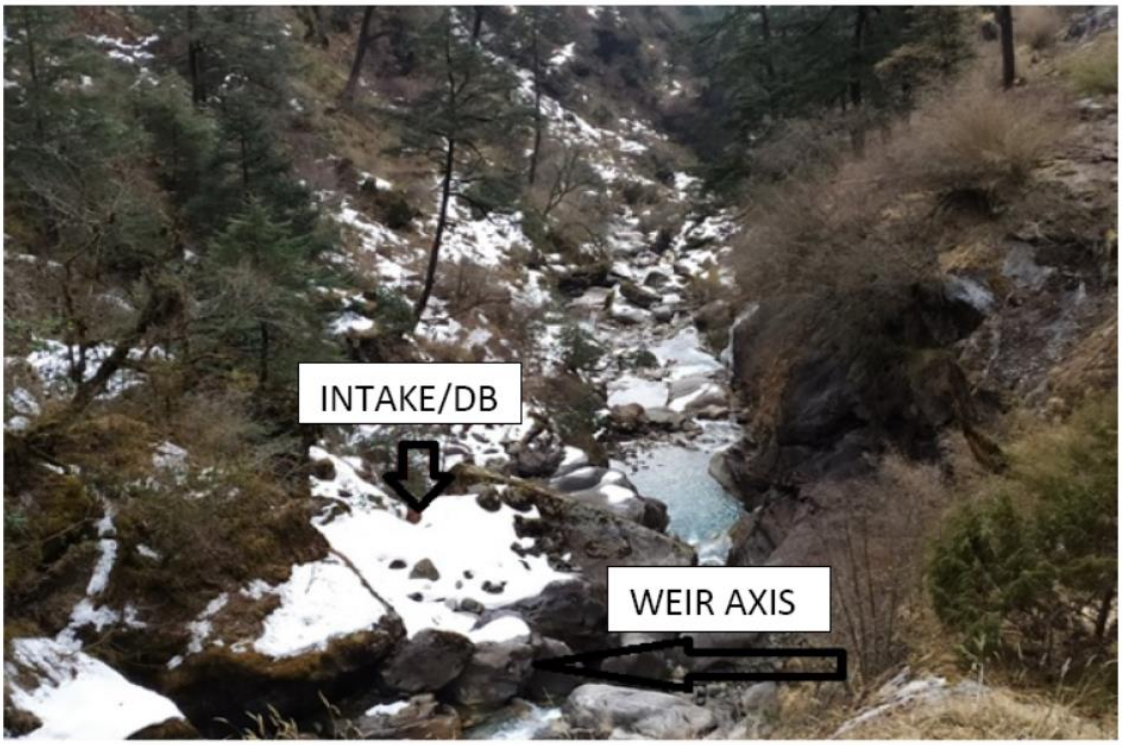


Figure 2: Weir, Intake and Desilting Basin(DB) Location

Figure 3: Penstock Route

Figure 4 : River Crossing

Figure 5 : Penstock Route

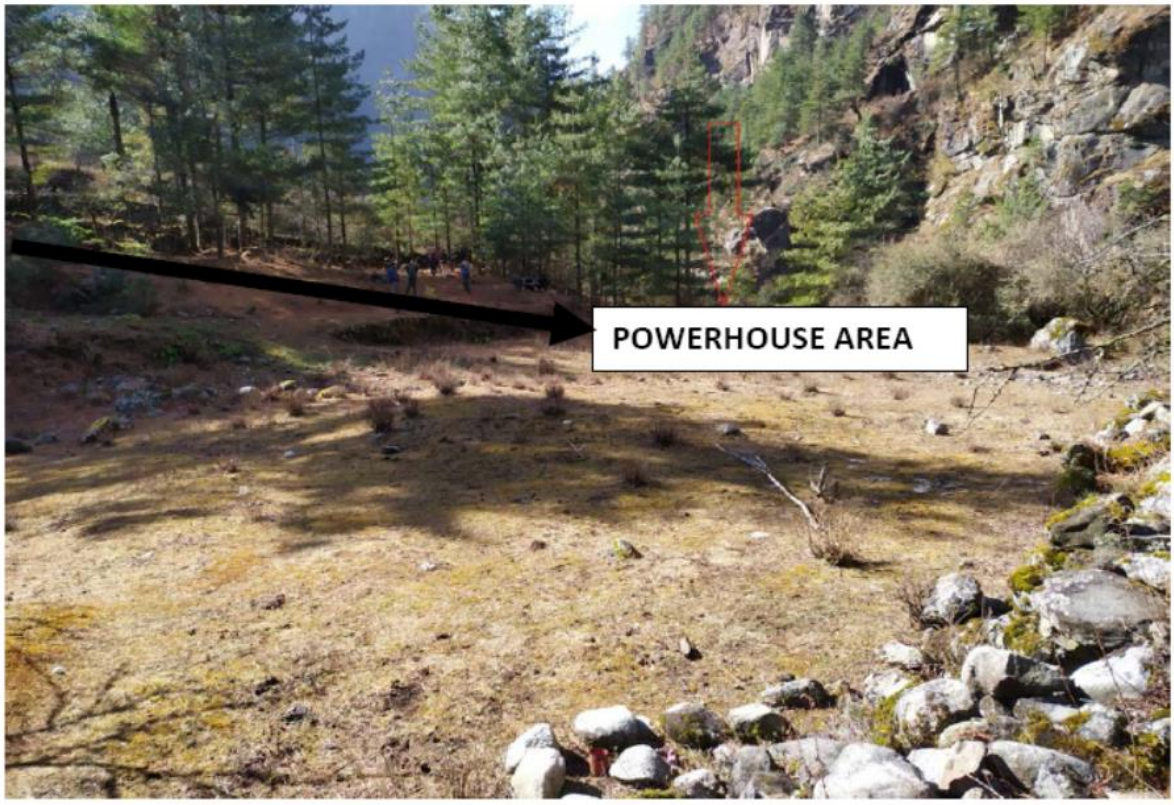


Figure 6: Penstock Route and Powerhouse (PH)

(Photo Source: DFS Report)