Chipwi Nge Hydropower Co., Ltd.

Initial Environmental Examination (IEE)

on

132 kV War Shaung T-connection – Waingmaw, 230kV Waingmaw – Na Bar and Extension of

November, 2019

Table of Contents

List of Figure

List of Table

ABBREVIATION

EIA – Environmental Impact Assessment

IEE – Initial Environmental Examination

EMP – Environmental Management Plan

HPP – Hydropower

MOEE – Ministry of Electricity & Energy

ESAP – Environmental and Social Action Plan

MW – Mega Watt

kV – Kilo Volt

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora

UNFCCC – United Nations Framework Convention on Climate Change

NEQEG – National Environmental Quality Emission Guideline

ECD – Environmental Conservation Department

ECC – Environmental compliance certificate

MONREC – Ministry of Natural Resources and Environmental Conservation

MOECAF – Ministry of Environmental Conservation and Forestry

NCEA – National Commission on Environmental Affairs

ECL – Environmental Conservation Law

DPTSC – Department of Power Transmission and System Control

RoW – Right of Way

WHO – World Health Organization

USEPA – United States Environmental Protection Agency

IUCN – International Union for Conservation of Nature

DANML – Department of Archaeology, National Museum and Library

MoRAC – Ministry of Religious Affairs and Culture

UNESCO – United Nations Educational, Scientific and Cultural Organization

GHG – Green House Gas

EMF – Electric and magnetic field

PPE – Personal Protective Equipment

GAD – General Administrative Department

CBOs – Community Based Organizations

NGOs – Non Governmental Organizations

GRS – Grievance Redress System

PAP – Project Affected Person

GFP – Grievance Focal Person

GRM – Grievance Redress Mechanism

EMO – Environmental Management Officer

SMO – Social Management Officer

CNHC – Chipwi Nge Hydropower Company

ESMMP-CP – Environment and Social Management and Monitoring Plan for the Construction Phase

PMU – Project Management Unit

AD – Administration Department

CEMP – Construction Environmental Management Plan

Executive Summary

1. Project Description and Project Size

In order to overcome the current power deficiency crisis, Ministry of Electricity & Energy (MOEE) has been planning to accelerate the development of power generation, transmission and distribution facilities including exploring additional hydropower sources, construction of new power grid and substation, upgrading existing systems, seeking sustainable and renewable energy and other available means of energy sources in consultation with oversea finical institutions and development partners.

The present Chipwi Nge HPP 230kV Power Transmission and Transformation Project will strengthen the linkage of the power grid of Kachin State with the main power grid of Myanmar, improve the power supply capacity of the power grid and increase the output of units of Chipwi Nge HPP.

Waingmaw Substation is located in the northeast of Myitkyina, Kachin State in the north of Myanmar, with a coordinate of N25°26′1.54″ and E97°26′ 32.52″. The substation site is located about 7.5km northeast of downtown Myitkyina and 1.2km west of Irrawaddy River.

The new 132 kV line and 230kV line passes through Kachin State and Sagaing Region in Myanmar.

The main construction contents are as follows;

1. The expansion of Waingmaw Substation (230kV)
2. 2.New 230kV Waingmaw-Na Bar line: 223 km long, erected in double-circuit on the same tower;
3. New 132kV Waingmaw-War Shawng T-connection line: 17km long, erected in single-circuit.

The total length of the above two new lines is 240 km.

The double circuit self-support lattice tower will be used and 7 kinds of tower are planned for 230 kV line. The line is designed with 3 types of suspension tower, 3 types of tension tower and 1 type of transposition tower are designed.

Single circuit self-support lattice tower will be used and 4 kind of tower are planned for 132 kV line.

Long and short legs of steel towers are used for the project in combination with main foundation columns with unequal height, such design measure can effectively control the earthwork and stonework quantities of the foundation pit and excavation quantities of foundation surface, but there are inevitably often some natural slopes or original artificial slopes near the tower locations.

In the next stage of the tower location selection process, the designers will determine whether protection measures are to be taken tower by tower according to the specific conditions of the tower position, so as to avoid tower foundation collapse and water & soil erosion. Such protection measures include construction of protective slope, retaining wall, drainage (intercepting) ditches etc.

This report intends to assess the Initial Environmental Examination (IEE) of the proposed power transmission line and one extended substation. Detailed project description is provided in Chapter 1.

The location of power transmission lines and substation is shown in Figure 1.

2. Identification of the Project Proponent

Project Implementation Organization: Chipwi Nge Hydropower Company Limited (CNHC)

Address: Yit Gyaw Tract, Chipwi Town, Myitkyina, Kachin State

Email: yuke.du@gmail.com

Contact Person: Mr. Du Yuke

3 Identification of the IEE Experts

Leading Organization - Resource & Environment Myanmar Co., Ltd. (REM)

(REM) is located in the city of Yangon, Myanmar, in the country it is a leading resources and environment consulting firm that composed of geoscientists, engineers, biologist, botanist, socio-economic experts, cultural heritage experts, environmental engineers and physical resources management specialist.

Address: No. 702 B, Delta Plaza, Shwegonedaing Road, Bahan, Yangon.

Telephone: 959-73013448

Facsimile: 01-552901

Email: service@enviromyanmar.net

Contact Person: Mr. Thura Aung

Designation: General Manager

Secondary Organization - Sustainable Environment Myanmar Co., Ltd. (SEM)

Address: B 503 Delta Plaza, Shwegondaing Road, Bahan, Yangon

Telephone: +959 261328891

Email: services@sustainablemyanmar.com

Website: http://sustainablemyanmarsem.com

The SEM provides Environmental & Social/Health Impact Assessment service for development projects in Myanmar. SEM has resources and capacity to handle environmental management issues as per the provisions of Environmental Conservation Laws 2012 including, EIA, ESMP, environmental monitoring and auditing.

4. Legislation and Guidelines

The present IEE report has been prepared in accordance with the requirements and regulations of the Ministry of Natural Resources and Environmental Conservation (MONREC). The project implementation organization, CNHC will comply the all National Laws that related to the project activities. CNHC will follow and comply the National Environmental Quality

(Emission) Guidelines. The detailed descriptions of related laws, regulations and standard which shall follow and comply by CNHC are described in Chapter 3.

5. Description of the Surrounding Environmental and Social Conditions

The present transmission lines and substation are located within Kachin State and Sagaing Region. The transmission line route passes through 4 districts and 5 townships.

The landform along the 230kV and 132kV transmission line, include plains in most parts and river network and low mountains and hills in some parts. The elevation along the line route ranges from 120m to 350m above the sea level. The landform in the proposed substation site area is fully generated from erosion hills, where the substation site is located at the slope toe on the extension line of ridge on slope. Currently, the site area is of a barren land on which weeds and small trees are grown. This area has a ground elevation of about 99.1~101.9m.

Average value of ambient gaseous levels along the transmission line and Waingmaw substation for one day (24 hours) are stated as follows;

The concentrations of PM2.5 and PM10 are lower than the standard whereas SO_2 concentration is also lower than the applied standard. Generally, covering the all parameter of pollution, all parameters are commonly lower than the guideline standard. So, it indicated the area had some emission sources and it was certainly to say the measured data were baseline level in the area.

According to the monitoring results, daytime noise level along the transmission lines is lower than the National Environmental Quality (Emission) Guidelines and night time noise level are fairly higher than the standard.

The water quality monitoring results in the Ayeyarwady River and other two streams indicate that the DO levels are higher than 5mg/l which do not affect the survival of aquatic life in the river. DO below 5 mg/l generally puts aquatic life under stress. The BOD and COD concentration are considered good but the TSS is already high in one stream and Ayeyarwady River is lower than 50 mg/l. The allowable maximum concentration of TSS into the river is 50 mg/l. The pH values ranged between 8.3 and 8.5 which means that water quality is basic. The BOD and COD levels are well within the acceptable limit of 8 mg/l and 50 mg/l for aquatic life.

Total of 3 soil samples were collected and analyzed in the laboratory. There is no standard and guidelines for soil in Myanmar so far and therefore the results presented in Table 4.2.8-2 will be used as baseline data for future monitoring task.

The transmission line route is located about 10 km far from the “Indawgyi Wildlife Sanctuary” to the northwest and “Pidaung Wildlife Sanctuary” to the north.

A total of 124 plant species, 5 species of Mammals, 5 species of Herpet, 73 species of Birds, 20 species of Butterflies, 2 species of dragonfly and 11 species of Fish were recorded along the 230 kV transmission line during the survey period. The Dipterocarpaceae *Hopea odorata (Thingan) and* Fabaceae *Pterocarpus macrocarpus (Padauk)* are vulnerable and endangered plant species defined by IUCN. But, these tree species are found in the reserved forest and not observed in the RoW of transmission line. In this survey, one bird species was recorded as Threatened species (NT) in accordance with IUCN Red List. During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species.

A total of 4 species of Mammals, 2 species of Herpet, 50 species of Birds, 13 species of Butterflies, 2 species of dragonfly were recorded along the 132 kV transmission line during the

survey period. During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species.

The proposed transmission line will pass through five townships namely Waingmaw, Myitkyina, Mogaung, Mohnyin and Indaw which occupy one state and one region, namely Kachin and Sagaing.

There are about 59 villages around the transmission line. The installation of towers along the RoW will affect some farmland and agricultural land that owned by the 59 villages in five townships. Farmland, plantation, forest and reserved forests are involved along the proposed transmission line route.

Existing land uses along the transmission line alignment consists of residential, village land, Forest Land and Agriculture Land.

6. Identification and Assessment of Potential Environmental Impacts and Environmental Impact Mitigation Measures

The DPTSC under MOEE discussed and evaluated the Feasibility study design documents for Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project. According to the requirements and comments of DPTSC, the final version of design specification has been modified.

During IEE study, the consultations, focus group discussions, and key informant interviews with national level government, townships, villages and households and communities were organized and conducted to gather views of the stakeholders about the project and to identify measures to be undertaken in the next phases of project implementation.

The environmental and social impacts have been identified through field surveys, onsite measuring, and enquire with the village community. Discussions with project proponents, district officials, and village representatives were undertaken along the study area. A mix of quantitative and qualitative methods i.e. sampling, questionnaires, interviews, oral histories, have been used to derive these impacts. Potential impacts have also been predicted based on experience of working in past similar assignments.

The transmission line design will involve approximately 45 towers for 132kV and 582 towers for 230kV, based on proposed transmission line route by Department of Power Transmission and System Control, Ministry of Electricity and Energy.

According to the preliminary survey, the width of corridors for 230kV line and 132kV line are temporarily about 50m and 40m respectively.

The construction area of each tower is occupied by 60 ft. x 60 ft. and only used for foundation work for tower and four concrete blocks (L=2.5 ft. x W=2.5 ft. x H=2 ft.) will be remained on the ground after completion of foundation work.

In summary, project activities will include;

Construction Phase

- Clearing of vegetation for the RoW
- Earthworks for the installation of the transmission towers
- Construction of towers and stringing
- Rehabilitation of RoW areas not required to be permanently cleared and
- Construction of worker camp

Operation

- Maintenance of RoW, including repairs to transmission lines and trimming vegetation
- Road maintenance.

The major findings on the present transmission line alignment are:

- The proposed alignment will not pass through any environmentally critical area and avoids all known cultural heritage locations in the Kachin State and Sagaing Region.
- The potential human health and public safety effects on people living near the transmission lines will be minimized because the prescribed height of the towers are above the minimum safety requirement.
- There are five Major Rivers crossing along the proposed line route and need to protect river against sedimentation is necessary during piling activities.
- At the east side of Sili Khar Village, about 8 km south of Waingmaw Substation, there is a military camp surrounded by villages with dense houses. In order to avoid large-scale demolition of local people houses, the new 230 kV line will pass the military camp near the boundary area, and about 2 towers shall be built in military camp.
- Myitkyina airport is located about 5km away from the transmission line route. Section A11-A13about 7km of 230 kV line in the Project is located within the scope of clearance protection zone of the airport. According to the data collected, the permit height of the Inner Horizontal Surface is 45m, and the permit height of the Conical Surface is 60m~145m. The slope of the conical surface is 5%, and the Climbing Surface of airplane is 2.5%. The limit height of this section of the 230kV line is 60m~145m.
- There is a teak seedling cultivation zone at the east side of Maw Han, with teak seedlings all over the mountains and plains. These trees are about 1m~1.5m high now. Teak is regarded as the national tree of Myanmar and complex procedures shall be handled before cutting. Therefore, the 230kV line route shall avoid the teak seedling cultivation zone.
- There are many houses along the new 230kV line, especially in convenient transportation area and near rivers area. These houses are mainly residential houses and farmland houses, most of which are made of wooden, and a few are brick houses. The line is mainly in parallel with the highway. When the houses along the line cannot be avoided completely, part of residential houses shall be removed.
- Along the line, dense vegetation are spread, as well as shrubs and tall trees. The vegetation mainly include shrubs, bamboo, banana trees, camphor trees and large pieces of economic trees, such as rubber trees, teak, banana trees, etc. Teak is regarded as the national tree of Myanmar and complex procedures shall be handled before cutting.
- According to the preliminary survey, the width of corridors for 230kV line and 132kV line are temporarily about 50m and 40m respectively, and tall trees and residential buildings should generally be removed from the new line corridor.
- Through communication with the Employer, the new lines shall avoid the large area of teak forest, while other tall trees and teaks spread sporadically along the line shall be cleared.

To ensure that the transmission lines will not cause adverse effects on the operation of the railway and cause community hazards, the lines will be designed to follow the required vertical and horizontal safety clearances from the railway and other structures in accordance with international standards and the requirements of the Electricity Law.

Identified construction-related impacts of the substation, 132 kV and 230kV transmission lines are:

Minor impact on -

(i) noise,(ii) dust and air pollution, (iii) potential public and worker hazards e.g., excavations for tower/structure footings and from operation of heavy equipment, (iv) surface water and groundwater (v) aesthetic and visual impact

Moderate impact on -

(i) soil erosion causing clogged drainage and sedimentation of river, (ii) generation of solid waste and construction wastes, and (iii) biodiversity

In addition, it is impossible to avoid ROW clearance which affected natural and commercial trees where the alignment locates in mountainous area. Though the community did not raise social economic issues such as objection to access, loss of crop and impacts on agriculture due to project activities, there are expectations to receive power as a side product of the proposed transmission line. Community also had expectations for local benefits and other opportunities from project besides apprehension on potential exposure to electromagnetic fields during operation phase of the project.

MOEE agreed to pay the crop compensation along the ROW of transmission line. For seasonal crops and perennials tree, MOEE will give compensation according to the Farm Land Rules (2012).

In general, the environmental and social impacts caused by the construction activities will be short-term nature. During the construction phase, an estimated area of about 50 meter and 40 meter from the poles and lines will be temporarily disturbed due to movement of materials and workers and the reach of noise, dust, emissions and other construction-related disturbances.

The positive impacts from the construction and operation of substation and power transmission line are as follows:

Different sources of energy are used for generation of electricity. Electricity supply will ensure less individuals us diesel generators, less reliance on kerosene, and will be an alternative to wood fuel and charcoal because of better and effective electrical appliances like cookers and electric irons. This would mean less carbon dioxide is released to the environment and destruction of forests will be reduced hence decreasing greenhouse gases.

Stable and reliable power supply to small scale industries will increase business opportunities and self-employment opportunities etc. this implies improvement at the individual level and for the national economy.

7. Environmental Mitigation Measures and Institutional Arrangement

An environmental management plan (EMP) has been prepared for the implementation of the 132 kV War Shawng-Waingmaw transmission line, 230 kV Waingmaw – Na Bar transmission line and extension of 230 kV substation. An Environmental Management Plan (EMP) that has been incorporated in this IEE and in the bid documents.

The implementation of the mitigation measures will be monitored by the DPTSC through a Project Management Unit (PMU) of DPTSC. Training on environment and social safeguards will be undertaken by the PMU to orient the HSE department on Environmental Conservation Law, EIA Procedures, the EMP implementation, monitoring and reporting, and overall compliance with national environmental requirements.

8. Public Consultations

CNHC carried out meetings with DPTSC, MOEE at the DPTSC office of the Nay Pyi Taw on July 17, 2019 to discuss about Feasibility Study design documents for Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project.

Six public consultation meetings were organized and a total of 254 participants attended these consultations. The meetings were held at the townships of Myitkyina, Waingmaw, Mohnyin, Mogaung and Indaw.

The following were the issues and concerns that were raised during the consultation meetings:

- Consulted with the affected farmers and negotiated transparently.
- Need to know the compensation plan for damage crops and permanent land occupation for tower base
- Reduce the electricity charges because of the project.
- Need to know the numbers of tower pass through their region, construction period and benefits from the project
- Classified the kinds of plant that the transmission line pass through the reserve forest area.
- Cooperate with the land use department to record the lost before the start of the project.
- The project implementation company make sure survey and held public consultation in the villages before the project start. In charged person from Ministry of Electricity and Energy will also perform the surveying before the commencement of the project.
- Compensation price should be the price fixed by relevant committee of regional government.
- MOEE will compensate for crops damage according to the fixed price defined by regional government.
- Suggest to contractors to inform local authority before entering into the project site for construction

The comments, suggestions and response of public consultation meetings are presented in Appendix in the IEE report.

8. Environmental Management Plan and Monitoring Plan

Environmental management for the Project aims to minimize the negative impacts of the construction of transmission line and substation and at the same time, enhance the positive and beneficial impacts. Table 7.3-1 in IEE report presents the mitigation measures of construction of transmission line and substation.

These mitigation measures are an overview only, based on the potential impacts identified in this IEE. The mitigation plan is structured by the three development phases defined by the pre-construction, construction, and post construction-operation phases. Environmental issues and concerns raised at the stakeholder meetings are addressed in the mitigation plans.

Prior to construction, the construction contractor will develop a suite of Site- Specific ESMMPs which address specific segments of the RoW, based on site conditions (e.g. proximity to villages, waterways and natural habitats).

If there are changes to the project locations and scope which would significantly affect the outcome of the project, the updated IEE and EMP will be prepared again to check whether additional mitigation plans and corrective action plans are necessary to meet the final detailed designs of the 230 kV lines.

Environmental management plan include (1) Roles and responsibilities for implementation of EMP (2) Environmental management measures (3) Environmental monitoring program (4) Indicative budget for implementation of the EMP. Detailed EMP is provided in Chapter 7 of IEE report.

9 Conclusion and Recommendation

The Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project construction is necessary to enable connection of northern Myanmar power grid to main grid via 230kV line, mitigate the power shortage in Myanmar, drive the local economic development, increase the people's living standards and meet the requirements of power distribution from Chipwi Nge Hydropower Station.

The evaluation of the present power transmission project indicates that potential environmental impacts are restricted to the construction phase of the new 230 kV and 132 kV transmission lines and substation. The common construction-related disturbances such as elevated dust and noise levels, traffic disruptions, solid and liquid construction waste, soil erosion and sedimentation of the river and streams, and public and worker safety can be managed effectively with standard construction practices.

The total number of residential and farmland houses to be affected which located in the convenient transportation area and near river area shall be identified before construction phase to determine requirements of house owner for relocation.

Follow-up public consultation meeting shall be carried out organized by MOEE/DPTSC and project developer (CNHC) before commencement of construction of transmission lines to present the detailed line route, potential impacts and losses and proposed mitigation measures and management plan.

If there are changes to the project locations and scope which would significantly affect the outcome of the project, the updated IEE and EMP will be prepared again to check whether additional mitigation plans and corrective action plans are necessary to meet the final detailed designs of the 230 kV and 132 kV lines. During the implementation of the project, semi-annual environmental monitoring reports will be submitted by MOEE to ECD to validate implementation of the measures outlined in the EMP.

စီမံကိန်းအကျဉ်းချုပ်

၁။ စီမံကိန်းအကြောင်းအရာဖော်ပြချက်နှင့် စီမံကိန်းအရွယ်အစား

လက်ရှိအချိန်တွင် ရင်ဆိုင်နေရသည့် လျှပ်စစ်ဓာတ်အားမလုံလောက်သည့် အကျပ်အတည်းကို ကျော်လွှားနိုင်ရန်အတွက် လျှပ်စစ်ဓာတ်အားထုတ်လုပ်မှု တိုးတက်ရေး၊ အပိုဆောင်း ရေအားလျှပ်စစ် အရင်းအမြစ်များ စူးစမ်းရှာဖွေခြင်း၊ လျှစ်စစ်ဓာတ်အားလိုင်းသစ်များ နှင့် ဓာတ်အားခွဲရုံများတည်ဆောက်ခြင်း တို့ပါဝင်သော လျှပ်စစ်ဓာတ်အားလိုင်းများ သွယ်တန်းခြင်းနှင့် ဖြန့်ဖြူးရေး အထောက်အပံ့များ၊ လက်ရှိရှိနှင့်ပြီးသား စနစ်များကို အဆင့်မြှင့်တင်ခြင်း၊ စဉ်ဆက်မပြတ် ပြန်လည်ဖြည့်တင်းနိုင်သော စွမ်းအင်များ ရှာဖွေခြင်း၊ နိုင်ငံခြားမှ ဘဏ္ဍာရေးအဖွဲ့အစည်းများ၊ ဖွံ့ဖြိုးရေးမိတ်ဖက်များနှင့်အတူ တိုင်ပင်ဆွေးနွေးခြင်းများပြုလုပ်၍ အခြား စွမ်းအင်အရင်းအမြစ်များ ရရှိနိုင်သည့် နည်းလမ်းများရှာဖွေခြင်း စသည်တို့ကို အရှိန်မြှင့်တင်၍ ဆောင်ရွက်သွားရန် လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနမှ စီမံလျက်ရှိပါသည်။

ချီဖွေငယ် ရေအားလျှပ်စစ်၊ ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း နှင့် မြှင့်တင်ရေး စီမံကိန်းသည် ကချင်ပြည်နယ်ရှိ လျှပ်စစ်ဓာတ်အားလိုင်းများနှင့် မြန်မာနိုင်ငံအတွင်းရှိ ပင်မလျှပ်စစ်ဓာတ်အားလိုင်းများ ချိတ်ဆက်မှုကို အားကောင်းလာစေပြီး လျှပ်စစ်ဓာတ်အားလိုင်း၏ လျှပ်စစ်ထောက်ပံ့မှု စွမ်းဆောင်ရည်ကို တိုးမြှင့်လာစေသည့်အပြင် ချီဖွေငယ် ရေအားလျှပ်စစ်စက်ရုံ၏ လျှပ်စစ်ဓာတ်အားထွက်ရှိမှုကိုလည်း တိုးတက်လာစေလိမ့်မည်။

ဝိုင်းမော်လျှပ်စစ်ဓာတ်အားခွဲရုံသည် မြန်မာနိုင်ငံမြောက်ပိုင်း ကချင်ပြည်နယ်၊ မြစ်ကြီးနားမြို့၏ အရှေ့မြောက်၊ မြောက်လတ္တီကျူ ၂၅ ဒီဂရီ ၂၆ မိနစ် ၁.၅၄ စက္ကန့် နှင့် အရှေ့လောင်ဂျီကျူ ၉၇ ဒီဂရီ ၂၆ မိနစ် ၃၂.၅၂ စက္ကန့်တွင် တည်ရှိပါသည်။ ဓာတ်အားခွဲရုံသည် မြစ်ကြီးနားမြို့လည်၏ အရှေ့မြောက် ၇.၅ ကီလိုမီတာခန့် နှင့် ဧရာဝတီမြစ်၏ အနောက်ဘက် ၁.၂ ကီလိုမီတာတွင် တည်ရှိပါသည်။

ယခုတည်ဆောက်မည့် ၁၃၂ ကေဗွီ နှင့် ၂၃၀ ကေဗွီ ဓာတ်အားလိုင်းသစ်သည် မြန်မာနိုင်ငံရှိ ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်းဒေသကြီး တို့ကို ဖြတ်သန်းသွားပါသည်။

ယခု စီမံကိန်းတွင် အောက်ပါတို့ကို အဓိကထား ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

၁။ ဝိုင်းမော်လျှပ်စစ်ဓာတ်အားခွဲရုံ တိုးချဲ့ခြင်း (၂၃၀ ကေဗွီ)

၂။ ၂၃၀ ကေဗွီ ဝိုင်းမော်နဘားလိုင်း - ၂၂၃ ကီလိုမီတာ အရှည်ရှိသော double-circuit ဓါတ်အားလိုင်း

၃။ ဝါရှောင် အနီးရှိ လက်ရှိတာဝါတိုင်အဆုံ T Point မှ ဝိုင်းမော် ဓါတ်အားခွဲရုံအထိ ၁၇ ကီလိုမီတာ အရှည်ရှိ ၁၃၂ ကေဗွီ ၊ - single-circuit ဓါတ်အားလိုင်းသစ်

လိုင်းသစ်နှစ်ခု၏ စုစုပေါင်းအရှည်မှာ ၂၄၀ ကီလိုမီတာ ဖြစ်ပါသည်။

၂၃၀ ကေဗွီလိုင်းအတွက် Double circuit self-support lattice အမျိုးအစား တာဝါများကို စိုက်ထူသွားမည်ဖြစ်ပြီး တာဝါ ၇ မျိုး စီစဉ်ထားပါသည်။ ဓါတ်အားလိုင်းကို suspension tower အမျိုးအစား ၃ ခု၊ tension tower အမျိုးအစား ၃ ခု၊ transposition tower ၁ ခု တို့ဖြင့် ဒီဇိုင်းရေးဆွဲထားပါသည်။

၁၃၂ ကေဗွီလိုင်းအတွက် Single circuit self-support lattice အမျိုးအစား တာဝါကို စိုက်ထူသွားမည်ဖြစ်ပြီး တာဝါ ၄ မျိုး စီစဉ်ထားပါသည်။

စီမံကိန်းအတွက် စတီးတာဝါတိုင် အရှည်၊ အတိုများ အသုံးပြုသွားမည်ဖြစ်ပြီး အမြင့်မတူသော ပင်မ အခြေခံအုတ်မြစ်လေးတိုင်ဖြင့် ပေါင်းစပ်သွားမည်။ ထိုကဲ့သို့သော ပုံစံများသည် အခြေချမည့် အုတ်မြစ်အတွင်းရှိ မြေကြီးနှင့် ကျောက်တုံးများ၊ အုတ်မြစ်တူးဖော်ထားသည့် မျက်နှာပြင်များကို ကောင်းစွာ ထိန်းချုပ်နိုင်သော နည်းလမ်းဖြင့် အကောင်အထည်ဖော်ဆောင်ထားခြင်း ဖြစ်သည်။ သို့ရာတွင် တာဝါနေရာများအနီးတွင် ရှောင်တိမ်း၍မရသော သဘာဝလျှောစောက်များနှင့် ယခင်ကတည်းကရှိနေသော ပြုပြင်ထားသောဆင်ခြေလျှောများ ရှိနေပါသည်။

တာဝါတိုင်နေရာရွေးချယ်သည့် လုပ်ငန်းစဉ်၏ နောက်တစ်ဆင့်တွင် တာဝါတိုင်အခြေရှိ အုတ်မြစ်များ ပြိုကွဲခြင်း၊ ရေ နှင့် မြေဆီလွှာတိုက်စားခြင်းများကို ရှောင်လွှဲရန် တာဝါတိုင်အနေအထားအတွက် အထူးသတ်မှတ်ထားသော အခြေအနေများအရ ကာကွယ်ရေးနည်းလမ်းများကို ဆောင်ရွက်သွားရန် ရှိ မရှိကို ဒီဇိုင်းဖော်ဆောင်သူများမှ ဆုံးဖြတ်သွားမည်ဖြစ်ပါသည်။ အဆိုပါ ကာကွယ်ရေး နည်းလမ်းများတွင် အကာအကွယ်ပြုလုပ်ထားသော ဆင်ခြေလျှောများ၊ နံရံထိန်းများ၊ ရေမြောင်းများ စသည်တို့ ဆောက်လုပ်ခြင်းများ ပါဝင်ပါသည်။

ဤအစီရင်ခံစာသည် အဆိုပြု လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်းနှင့် တိုးချဲ့ဓာတ်အားခွဲရုံတစ်ခု စီမံကိန်းအတွက် ရည်ရွယ်ပါသည်။ စီမံကိန်းအကြောင်းအရာ အသေးစိတ်ကို အခန်း(၁)တွင် ဖော်ပြထားပါသည်။

လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်းနှင့် ဓာတ်အားခွဲရုံ၏ တည်နေရာကို ပုံ - ၁ တွင် ဖော်ပြထားပါသည်။

၂။ စီမံကိန်းအဆိုပြုသူ

စီမံကိန်းအကောင်အထည်ဖော်ဆောင်သည့်

အဖွဲ့အစည်း	- ချီဖွေငယ် ရေအားလျှပ်စစ် ကုမ္ပဏီလီမိတက်
လိပ်စာ	- ရစ်ကျော်အုပ်စု၊ ချီဖွေမြို့၊ ချီဖွေမြို့နယ်၊ ကချင်ပြည်နယ်။
အီးမေးလ်	- yuke.du@gmail.com
ဆက်သွယ်ရမည့် ပုဂ္ဂိုလ်	- Mr. Du Yuke

၃။ ကနဦး ပတ်ဝန်းကျင်ထိခိုက်မှု စစ်ဆေးခြင်းဆောင်ရွက် ကျွမ်းကျင်ပညာရှင်များ

ဦးဆောင် အဖွဲ့အစည်း - Resource & Environment Myanmar Co., Ltd. (REM)

REM သည် မြန်မာနိုင်ငံ ရန်ကုန်မြို့တွင် တည်ရှိပြီး ဘူမိသိပ္ပံပညာရှင်များ၊ အင်ဂျင်နီယာများ၊ ဇီဝဗေဒ ပညာရှင်များ၊ ယဉ်ကျေးမှုအမွေအနှစ်ဆိုင်ရာ ကျွမ်းကျင်ပညာရှင်များ၊ ပတ်ဝန်းကျင်ဆိုင်ရာ အင်ဂျင်နီယာများ နှင့် ရူပအရင်းအမြစ် စီမံခန့်ခွဲမှု ကျွမ်းကျင်သူများဖြင့် ဖွဲ့စည်းထားသော သယံဇာတနှင့် ဝန်းကျင်ဆိုင်ရာ တိုင်ပင်ဆွေးနွေးသည့် အဖွဲ့အစည်းတစ်ခု ဖြစ်ပါသည်။

လိပ်စာ - အမှတ်၊ ၇၀၂ (ဘီ)၊ ဒယ်လ်တာ ပလာဇာ၊ ရွှေဂုံတိုင်လမ်း၊ ဗဟန်းမြို့နယ်၊ ရန်ကုန်မြို့။

ဖုန်းနံပါတ်	-	၉၅၉-၇၃၀၁၃၄၄၈
ကြေးနန်း	-	၀၁-၅၅၂၉၀၁
အီးမေးလ်	-	service@enviromyanmar.net
ဆက်သွယ်ရမည့် ပုဂ္ဂိုလ်	-	ဦးသူရအောင်

ရာထူး	-	အထွေထွေမန်နေဂျာ
ဒုတိယအဖွဲ့အစည်း	-	**Sustainable Environment Myanmar Co., Ltd. (SEM)**
လိပ်စာ	-	တိုက် (ဘီ)၊ ဒယ်လ်တာ ပလာဇာ၊ ရွှေဂုံတိုင်လမ်း၊ ဗဟန်းမြို့နယ်၊ ရန်ကုန်မြို့။
ဖုန်းနံပါတ်	-	၉၅၉-၂၆၁၃၂၈၉၉၁၁
အီးမေးလ်	-	services@sustainablemyanmar.com
ဆက်သွယ်ရမည့် ပုဂ္ဂိုလ်	-	ဦးသန်းဦး
ရာထူး	-	အထွေထွေမန်နေဂျာ
အင်တာနက်စာမျက်နှာ	-	http://sustainablemyanmarsem.com

SEM သည် မြန်မာနိုင်ငံတွင်ရှိသော ဖွံ့ဖြိုးရေး စီမံကိန်းများအတွက် ပတ်ဝန်းကျင်၊ လူမှုဝန်းကျင် နှင့် ကျန်းမာရေးဆိုင်ရာ ထိခိုက်မှု ဆန်းစစ်ခြင်း ဝန်ဆောင်မှုများကို ဆောင်ရွက်လျက်ရှိပါသည်။ SEM တွင် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း၊ ပတ်ဝန်းကျင်နှင့် လူမှုဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်၊ ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာစောင့်ကြည့်ရေး နှင့် စစ်ဆေးခြင်းများအပါအဝင် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ ၂၀၁၂ ၏ ပြဋ္ဌာန်းချက်များအတိုင်း ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲရေး အကြောင်းအရာများကို ကိုင်တွယ်ဖြေရှင်းနိုင်သည့် အရင်းအမြစ် နှင့် စွမ်းဆောင်ရည်များ ရှိနေပါသည်။

၄။ ဥပဒေနှင့် လမ်းညွှန်ချက်များ

ယခု ကနဦး ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း အစီရင်ခံစာအား သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၏ လိုအပ်ချက်များနှင့် ဥပဒေများအတိုင်း ပြင်ဆင်ရေးသားထားပါသည်။ စီမံကိန်း အကောင်အထည်ဖော်ဆောင်ရေးအဖွဲ့ CNHC သည် စီမံကိန်းလုပ်ငန်းများနှင့်သက်ဆိုင်သည့် အမျိုးသားဥပဒေများအားလုံးကို လိုက်နာမည်ဖြစ်ပါသည်။ CNHC သည် အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ (ထုတ်လွှတ်မှု) အရည်အသွေးစံချိန်စံညွှန်းများအား လိုက်နာမည်ဖြစ်ပါသည်။ CNHC မှ လိုက်နာမည့် သက်ဆိုင်ရာ ဥပဒေများ၊ နည်းဥပဒေများနှင့် စံချိန်စံညွှန်းများအား အခန်း (၃) တွင် အသေးစိတ် ဖော်ပြထားပါသည်။

၅. အနီးနားဝန်းကျင်ရှိ ပတ်ဝန်းကျင်နှင့် လူမှုရေးအခြေအနေများအား ဖော်ပြခြင်း

လက်ရှိ လျှပ်စစ်မာတ်အားလိုင်းများနှင့် မာတ်အားခွဲရုံများသည် ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်း ဒေသကြီးတွင် တည်ရှိပါသည်။ လျှပ်စစ်မာတ်အားလိုင်း လမ်းကြောင်းသည် ခရိုင်လေးခုနှင့် မြို့နယ်ငါးခုကို ဖြတ်သန်းမည်ဖြစ်ပါသည်။

၂၃၀ကေဗွီနှင့် ၁၃၂ကေဗွီ မာတ်အား သယ်ပို့ဖြန့်ဖြူးရေး လိုင်းတစ်လျောက် မြေမျက်နှာသွင်ပြင်မှာ လွင်ပြင်များ များပြားပြီး မြစ်ကြောင်းနှင့် အချို့နေရာများတွင် နိမ့်သောတောင်တန်း နှင့် တောင်ကုန်းများ ရှိပါသည်။ မာတ်အားလိုင်းတစ်လျောက် မြေမျက်နှာပြင်မှာ ပင်လယ်ရေမျက်နှာပြင်အထက် ၁၂၀ မီတာ မှ ၃၂၀ မီတာ အတွင်း ရှိပါသည်။ အဆိုပြု ဓါတ်အားခွဲရုံတည်ရှိသောလုပ်ငန်းနေရာ၏ မြေမျက်နှာသွင်ပြင်မှာ တိုက်စားခံထားရသည့် ကုန်းမြင့်များနှင့် ပြည့်နှက်နေပြီး ဓါတ်အားခွဲရုံတည်ရှိရာနေရာသည် ဆင်ခြေလျော ထိပ်၏ တိုးချဲ့လိုင်းပေါ်ရှိ ဆင်ခြေလျောခြေရင်းတွင် တည်ရှိပါသည်။ လက်ရှိတွင် လုပ်ငန်းနေရာသည်

အပင်ငယ်နှင့် ပေါင်းပင်များသာ ပေါက်ရောက်သည့်မြေညီပေါ်တွင် တည်ရှိပါသည်။ အဆိုပါ ဇရိယာသည် မြေမျက်နှာပြင်မှာ ၉၉.၁မီတာမှ ၁၀၁.၉ မီတာအကြား အမြင့်ရှိပါသည်။

ဝိုင်းမော်ခါတ်အားခွဲရုံနှင့် ဓာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းတစ်လျောက်၏ တစ်ရက်(၂၄ နာရီ) အတွက် ထိတွေ့ခါတ်ငွေ့ပျမ်းမျှ တန်ဖိုး အဆင့်များမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

PM2.5 နှင့် PM10 ပါဝင်မှုများမှာ စံချိန်စံညွှန်းအောက် လျော့နည်းနေပြီး SO_2 ပါဝင်မှုမှာလည်း အသုံးပြုမည့် စံချိန်စံညွှန်းအောက် လျော့နည်းနေပါသည်။ ယေဘုယျအားဖြင့် ညစ်ညမ်းမှု သတ်မှတ်ချက်များ အားလုံးကို ခြုံငုံမိပြီး သတ်မှတ်အတိုင်းအတာအားလုံးမှာ ပုံမှန်အားဖြင့် လမ်းညွှန်ချက်စံ ချိန်စံညွှန်းထက် လျော့နည်းနေပါသည်။ ထို့ကြောင့် ၄င်းဇရိယာသည် ထုတ်လွှတ်အရင်းအမြစ်အချို့ ရှိခဲ့သည်ဟု ညွှန်ပြနေပြီး ၄င်းဇရိယာအတွင်း တိုင်းတာရရှိသည့် အချက်အလက်များသည် အခြေခံအဆင့်တွင်သာ ရှိသည်ကို အခိုင်အမာပြောဆိုနိုင်ပါသည်။

စောင့်ကြည့်လေ့လာသည့် ရလဒ်များအရ ဓာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းတစ်လျောက်နေ့အချိန် ဆူညံသံအဆင့်သည် အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ (ထုတ်လွှတ်မှု) အရည်အသွေးစံချိန်စံညွှန်းများ အားလုံးထက် လျော့နည်းနေပြီး ညအချိန် ဆူညံသံအဆင့်သည် စံချိန်စံညွှန်းထက် အနည်းငယ်မြင့်တက်နေပါသည်။

ဇရာဝတီမြစ်နှင့် အခြားချောင်းငယ်နှစ်ခု၏ ရေအရည်အသွေး စောင့်ကြည့်လေ့လာရေး ရလဒ်များမှာ DO အဆင့် သည် 5mg/l ထက် မြင့်တက်နေပြီး မြစ်အတွင်းရှိ ရေနေသတ္တဝါများ၏ ရှင်သန်မှုကို သက်ရောက်မှု မရှိပါ။ 5mg/l အောက်လျော့နည်းသည့် DO အဆင့် သည် ရေနေသတ္တဝါများအတွက် ယေဘုယျအားဖြင့် အခက်အခဲဖြစ်စေပါသည်။ BOD နှင့် COD ပါဝင်မှုများသည် ကောင်းမွန်သော်လည်း TSS သည် ချောင်းငယ်တစ်ခုတွင် မြင့်မားနေပြီး ဇရာဝတီမြစ်တွင် 50 mg/l ထက်လျော့နည်းနေပါသည်။ တစ်ခုအတွက် လက်ခံနိုင်သည့် TSS အမြင့်ဆုံးပါဝင်မှုမှာ 50 mg/l ဖြစ်ပါသည်။ PH တန်ဖိုးမှာ ၈.၃ မှ ၈.၅ အတိုင်းအတာကြားရှိပြီးရေအရည်အသွေးမှာ အခြေခံဖြစ်သည်ဟု အဓိပ္ပါယ်ရပါသည်။ BOD နှင့် COD အဆင့်များမှာ ရေနေသက်ရှိတို့အတွက် လက်ခံနိုင်သည့်အတိုင်းအတာဖြစ်သော 8 mg/l မှ 50 mg/l ကြားကောင်းစွာရှိနေပါသည်။

စုစုပေါင်းမြေနမူနာ ၃ခုကို ကောက်ယူခဲ့ပြီး ခါတ်ခွဲခန်းတွင် ဆန်းစစ်ခဲ့ပါသည်။ မြန်မာနိုင်ငံတွင် မြေသားအတွက် စံချိန်စံညွှန်းနှင့် လမ်းညွှန်ချက်များ ယခုအထိ မရှိသေးပါ။ ထို့ကြောင့် ဇယား ၄.၂.၈-၂ တွင် ဖော်ပြထားသည့် ရလဒ်များအား နောင်စောင့်ကြည့်လေ့လာရေးလုပ်ငန်းအတွက် အခြေခံအချက်အလက်အနေဖြင့် အသုံးပြုသွားမည်ဖြစ်ပါသည်။

ဓာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းသည် အင်းတော်ကြီးကန် ဘေးမဲ့တောမှ အနောက်မြောက်ဖက် ၁၀ ကီလိုမီတာခန့်အကွာနှင့် Pidaung ဘေးမဲ့တော၏ မြောက်ဘက်တွင် တည်ရှိပါသည်။

ကွင်းဆင်းလေ့လာရေးကာလအတွင်း ၂၃၀ ကေဒို ဓာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းတစ်လျောက်တွင် အပင်မျိုးစိတ် ၁၂၄ မျိုး၊ နို့တိုက် သတ္တဝါမျိုးစိတ် ၅ မျိုး၊ တွားသွားအုပ်စု သတ္တဝါမျိုးစိတ် ၅ မျိုး၊ ငှက်မျိုးစိတ် ၇၃ မျိုး၊ လိပ်ပြာမျိုးစိတ် ၂၀ မျိုး၊ ပုစဉ်း မျိုးစိတ် ၂ မျိုးနှင့် ငါး မျိုးစိတ် ၁၁ မျိုး အားမှတ်တမ်းတင်ရပါသည်။ IUCN ရှာပါးမျိုးနွယ်စာရင်းများအရ သဃ်နိုးနှင့် ပိတောက်အပင်မျိုးစိတ်များအား ရှားပါးမျိုးစိတ်နှင့် မျိုးဆက်ပျက်သုဉ်းမည့်အန္တရာယ်ရှိမျိုးစိတ်များအဖြစ် သတ်မှတ်ထားပါသည်။ သို့သော် အဆိုပါ အပင်မျိုစိတ်များအား ထိန်းသိမ်းထားသောသစ်တောတွင်သာ တွေ့ရှိရပြီး ခါတ်အားလိုင်း လမ်းကြောင်း တလျောက်တွင် မတွေ့ရှိရပါ။ ယခုလေ့လာမှုတွင် ရှာပါးမျိုးနွယ်စာရင်းဝင် (IUCN) မျိုးဆက်ပျက်သုဉ်းမည့် အန္တရာယ်ခြိမ်းခြောက်ခံ မျိုးစိတ်ဝင် ငှက်မျိုးစိတ်တစ်ခုအားတွေ့ရှိ မှတ်တမ်းတင်ခဲ့ပါသည်။ လေ့လာရေး

ကာလအတွင်းဌက်၊ လိပ်ပြာနှင့် ငါးမျိုးစိတ်များအား ပိုမိုတွေ့ရှိရပြီး ပုစဉ်း၊ တွားသွားနှင့် နို့တိုက်သတ္တဝါများအား လျော့နည်းစွာ တွေ့ရှိရပါသည်။

ကွင်းဆင်းလေ့လာရေးကာလအတွင်း ၁၃၂ ကေဒို မာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းတစ်လျောက် နို့တိုက်သတ္တဝါ ၄ မျိုး၊ တွားသွားသတ္တဝါ ၂မျိုး၊ ငှက် မျိုးစိတ် ၅၀မျိုး၊ လိပ်ပြာမျိုးစိတ် ၁၃မျိုးနှင့် ပုစဉ်းမျိုးစိတ် ၂ မျိုးအား မှတ်တမ်းတင်ရပါသည်။

အဆိုပြုမာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းသည် ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်းဒေသကြီးအတွင်းရှိ ဝိုင်းမော်မြို့နယ်၊ မြစ်ကြီးနားမြို့နယ်၊ မိုးညှင်းမြို့နယ်နှင့်အင်းတော်မြို့နယ်တို့အား ဖြတ်သန်းသွားမည်ဖြစ်ပါသည်။

မာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းအနီးတွင် ကျေးရွာပေါင်း ၅၉ ရွာခန့် ရှိပါသည်။ လမ်းကြောင်းတစ်လျောက် တာဝါတိုင်များတပ်ဆင်ခြင်းသည် မြို့နယ်ငါးမြို့နယ်အတွင်းရှိ ကျေးရွာ ၅၉ ရွာ၏ အချို့သော လယ်မြေများနှင့် စိုက်ပျိုးမြေများအား သက်ရောက်မှုရှိမည် ဖြစ်ပါသည်။ အဆိုပြု မာတ်အားသယ်ပို့ဖြန့်ဖြူးရေးလိုင်းတစ်လျောက် လယ်မြေ၊ ယာမြေ၊ သစ်တောနှင့် ဘေးမဲ့တောများ တည်ရှိနေပါသည်။

ဓါတ်အားလိုင်းတစ်လျောက် လက်ရှိ မြေအသုံးချမှုများတွင် လူနေဇရိယာများ၊ ရွာမြေများ၊ သစ်တောမြေများနှင့် စိုက်ပျိုးမြေတို့ ပါဝင်ပါသည်။

၆။ ဖြစ်နိုင်ခြေရှိသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှု လျော့ချရေး နည်းလမ်းများ သတ်မှတ်ခြင်း နှင့် ဆန်းစစ်ခြင်း

ချီဖွေငယ် ရေအားလျှပ်စစ် တိုးချဲ့ခြင်း၊ ၂၃၀ ကေဗွီ လျှပ်စစ်မာတ်အားလိုင်းသွယ်တန်းခြင်း နှင့် အဆင့်မြှင့်တင်ရေး စီမံကိန်းအတွက် ဖြစ်နိုင်မှုအခြေအနေ လေ့လာမှု ဒီဇိုင်းဆိုင်ရာ အချက်အလက်များကို လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန လက်အောက်ရှိ DPTSC မှ ညှိနှိုင်း သုံးသပ်ခဲ့ပါသည်။ DPTSC ၏ လိုအပ်ချက်နှင့် သဘောထား မှတ်ချက်များအရ နောက်ဆုံးတင်ပြထားသော ဒီဇိုင်း၏ အချက်အလက်များကို ပြန်လည်ပြုပြင် ထားပါသည်

ကနဦး ပတ်ဝန်းကျင်းဆန်းစစ်ခြင်း အဆင့်တွင် နိုင်ငံတော်အဆင့် အစိုးရ၊ မြို့နယ်များ၊ ကျေးရွာများ နှင့် အိမ်ထောင်စုများ၊ ဒေသခံပြည်သူများနှင့် တိုင်ပင်ဆွေးနွေးခြင်း၊ အဖွဲ့လိုက်ဆွေးနွေခြင်း၊ အရေးကြီးသော သတင်းအချက်အလက်များ မေးမြန်းခြင်းကိုပြုလုပ်ခဲ့ပြီး စီမံကိန်း အကောင်အထည်ဖော် ဆောင်ရွက်မှု၏ နောက်အဆင့်တွင် လုပ်ဆောင်ရမည့် နည်းလမ်းများ သတ်မှတ်ခြင်း နှင့် စီမံကိန်းနှင့် သက်ဆိုင်သူများ၏ သဘောထားအမြင်များကို မှတ်တမ်းယူခဲ့ ပါသည်။

ကွင်းဆင်း လေ့လာခြင်းများ၊ လုပ်ငန်းခွင် အခြေအနေ စူးစမ်းလေ့လာမှုများ၊ ကျေးရွာအတွင်း နေထိုင်သူများနှင့် စုံစမ်းလေ့လာမှုများ ပြုလုပ်၍ ပတ်ဝန်းကျင် နှင့် လူမှုဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများကို သတ်မှတ်ခဲ့ပါသည်။ တိုင်းတာခြင်း၊ ကျေးရွာလူထုနှင့်မေးမြန်းခြင်းများကို ပြုလုပ်ခဲ့ပါသည်။ လေ့လာသည့် နေရာ တလျောက်တွင် စီမံကိန်း အဆိုပြုသူများ၊ ခရိုင်အစိုးရရုံးမှ အရာရှိများ၊ ကျေးရွာကိုယ်စားပြုများနှင့် ဆွေးနွေးခြင်းများကို လေ့လာမှု ပြုလုပ်နေစဉ်အတွင်း ပြုလုပ်ခဲ့ပါသည်။ နမူနာကောက်ယူခြင်း၊ မေးခွန်းလွှာများ၊ လူတွေ့မေးမြန်းခြင်းများ၊ နှုတ်ဖြင့်ပြောကြားသော သမိုင်းကြောင်း အချက်အလက်များ စသည့်တို့ပါဝင်သည့် အရေအတွက်နှင့် အရည်အသွေး ဆိုင်ရာနည်းလမ်းများအား ရောနှောသုံးပြုခဲ့ပြီး သက်ရောက်မှုအား ဆန်းစစ်ရာတွင် အသုံးပြုခဲ့ပါသည်။ ယခင်ရေးသားခဲ့သော အစီအရင်ခံစာများ၏ ဆောင်ရွက်ချက်များပေါ် အခြေခံ၍ ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများကို ခန့်မှန်းသုံးသပ်ထားပါသည်။

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၊ လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေး ဦးစီးဌာန၏ အဆိုပြုထားသော ဓါတ်အားလိုင်း လမ်းကြောင်းပေါ် အခြေခံ၍ ဓါတ်အားလိုင်း၏ ဒီဇိုင်းအား ခန့်မှန်းခြေအားဖြင့် ၁၃၂ ကေဗွီ အတွက် တာဝါတိုင် ၄၅တိုင် နှင့် ၂၃၀ ကေဗွီ အတွက် တာဝါတိုင် ၅၈၂တိုင် ပါဝင်ပါသည်။

ကြိုတင် လေ့လာခြင်းအရ ၂၃၀ ကေဗွီ နှင့် ၁၃၂ ကေဗွီ ဓါတ်အားလိုင်းများ ၏ လမ်းတစ်လျှောက်အကျယ်အား မီတာ ၅၀ နှင့် မီတာ ၄၀ အသီးသီး သတ်မှတ်ထားပါသည်။

တာဝါတိုင်တစ်ခုခြင်းအတွက် ဆောက်လုပ်ရေး ဇရိယာအား ပေ ၆၀ x ပေ ၆၀ ပတ်လည် အသုံးပြုမည်ဖြစ်ပြီး ၄င်းသည် တာဝါတိုင်၏ အောက်ခြေ အုတ်မြစ်ချခြင်းလုပ်ငန်းအတွက်သာဖြစ်ပြီး အောက်ခြေအုတ်မြစ်ချပြီးနောက် မြေပြင်ပေါ်တွင် ကွန်ကရစ်တုံးလေးတုံးသာ (အလျား=၂.၅ပေ x အကျယ်=၂.၅ပေ x အမြင့်=၂ပေ) ကျန်ရှိမည်ဖြစ်ပါသည်။

အကျဉ်းချုပ်ဆိုရလျှင် စီမံကိန်း လုပ်ငန်းများတွင် အောက်ပါတို့ပါဝင်ပါသည်။

တည်ဆောက်ရေးအဆင့်

- လမ်းကြောင်းတစ်လျှောက် အပင်များအားရှင်းလင်းခြင်း
- ဓါတ်အားလိုင်း ၏ တာဝါတိုင်များ တပ်ဆင်ခြင်းအတွက် မြေသားလုပ်ငန်းများ
- ဓါတ်အားလိုင်းကြိုး နှင့် တာဝါတိုင် တည်ဆောက်လုပ်ရေးလုပ်ငန်း
- အမြဲရှင်းလင်းရန် မလိုအပ်သည့် လမ်းကြောင်းတလျှောက်တွင်း ပြန်လည်မွမ်းမံမှုများ ဆောင်ရွက်ခြင်း
- အလုပ်သမား အဆောင်များ ဆောက်လုပ်ခြင်း

လုပ်ငန်းလည်ပတ်ခြင်း (ဓာတ်အားပို့လွှတ်ခြင်း) အဆင့်

- ဓါတ်အားပေးလိုင်း ပြုပြင်ခြင်း နှင့် ချုပ်နွယ်ပင်ရှင်းလင်ခြင်းများ အပါအဝင် လမ်းကြောင်းတစ်လျှောက် ထိန်းသိမ်းပြုပြင်ခြင်း
- လမ်းများအား ပြုပြင် ထိန်းသိမ်းခြင်း

ယခု လက်ရှိ ဓါတ်အားပေးလိုင်း လမ်းကြောင်း၏ အဓိကတွေ့ရှိချက်များမှာ

- အဆိုပြုထားသော လမ်းကြောင်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာ အရေးပါသော နေရာများ၊ ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်းဒေသကြီး တို့တွင် ထင်ရှားသော ယဉ်ကျေးမှု အမွေအနှစ်များ တည်ရှိရာနေရာများအား ဖြတ်သန်းခြင်းမပြုပဲ ရှောင်ရှားသွားမည်ဖြစ်ပါသည်။
- တာဝါတိုင်များ၏ သတ်မှတ်အမြင့်သည် အနည်းဆုံးဘေးကင်းလုံခြုံမှု လိုအပ်ချက်၏ အထက်တွင်ရှိသောကြောင့် ဓါတ်အားပေးလိုင်း အနီးအနားတွင် နေထိုင်သော အများပြည်သူများအပေါ် ဖြစ်နိုင်ခြေရှိသော ကျန်းမာရေးနှင့် ဘေးအန္တရယ်ကင်းရှင်းရေး ဆိုင်ရာ သက်ရောက်မှုများအား လျော့ချပေးထားမည်ဖြစ်သည်။
- အဆိုပြုထားသော လမ်းကြောင်းတစ်လျှောက်တွင် ဖြတ်သန်းသွားသော အဓိက မြစ်ကြီးငါးခုရှိပြီး တိုင်စိုက်ထူခြင်း လုပ်ငန်းလုပ်ဆောင်နေစဉ်အတွင်း မြစ်အနည်ထိုင်ခြင်းမဖြစ်စေရန်အတွက် ကာကွယ်သွားရန် လိုအပ်ပါသည်။
- စလီခါးရွာ၏ အရှေ့ဘက်ခြမ်း၊ ဝိုင်းမော် ဓါတ်အားပေးခွဲရုံ၏ တောင်ဘက် ၈ကီလိုမီတာခန့် အကွာတွင် လူနေ ထူထပ်သောအိမ်များဖြင့် ပတ်လည်ကာရံနေသော တပ်စခန်းတစ်ခုရှိသည်။ ဒေသခံပြည်သူ

လူထု၏ နေအိမ်များ ထိခိုက်ပျက်စီးမှုကို ရှောင်ရှားနိုင်ရန် အတွက် ၂၃၀ ကေဗွီ ဓါတ်အားပေး လိုင်းသစ်အား တပ်စခန်း၏ နယ်နိမိတ်အနီးတွင် ထားရှိမည်ဖြစ်ပြီး တာဝါတိုင် ၂တိုင် ဆောက်လုပ်မည် ဖြစ်ပါသည်။

- မြစ်ကြီးနားလေဆိပ်မှာ ဓာတ်အားပေးလိုင်းလမ်းကြောင်းမှ ၅ ကီလိုမီတာ အကွာတွင် တည်ရှိပါသည်။ စီမံကိန်း အတွင်း ၂၃၀ ကေဗွီလိုင်း၏ ၇ ကီလိုမီတာခန့်ရှိသော အပိုင်း A11-A13 မှာ လေယာဉ်ကွင်း၏ ရှင်းလင်းကာကွယ် စောင့်ရှောက်ရေးဇုန် အတွင်း တည်ရှိပါသည်။ အချက်အလက် ကောက်ခံချက်များ အရ အတွင်းပိုင်း အလျားလိုက် မျက်နှာပြင်၏ ခွင့်ပြု အမြင့်မှာ ၄၅ မီတာနှင့် ကတော့ပုံ မျက်နှာပြင်၏ ခွင့်ပြု အမြင့်မှာ ၆၀-၁၄၅ မီတာ ဖြစ်ပါသည်။ ကတော့ပုံ မျက်နှာပြင်၏ လျှောစောက်မှာ ၅% ဖြစ်ပြီး လေယာဉ် ပျံတက်မည့် မျက်နှာပြင်မှာ ၂.၅% ဖြစ်ပါသည်။ ၂၃၀ ကေဗွီ လိုင်းရှိ ၎င်းအပိုင်း၏ ခွင့်ပြု အမြင့်မှာ ၆၀ မှ ၁၄၅ မီတာ ဖြစ်ပါသည်။
- တောင်ပေါ်နှင့်မြေပြန့်များတွင် စိုက်ပျိုးထားသည့် ကျွန်းစိုက်ပျိုးခင်းဇုန်မှာ မော်ဟန်၏ အရှေ့ဘက်တွင် တည်ရှိပါသည်။ ၎င်းအပင်များမှာ လက်ရှိတွင် ၁ မီတာမှ ၁.၅ မီတာခန့် ရှိပါသည်။ ကျွန်းပင်မှာ မြန်မာနိုင်ငံ၏ အမျိုးသားရေးဆိုင်ရာ အပင်အမျိုးအစားဖြစ်ပြီး မခုတ်လှဲမီ ရှုပ်ထွေးသော လုပ်ထုံးလုပ်နည်းများကို ကိုင်တွယ်ရမည် ဖြစ်ပါသည်။ ထို့ကြောင့် ၂၃၀ ကေဗွီ လိုင်းလမ်းကြောင်းမှာ ကျွန်းစိုက်ပျိုးခင်းဇုန်အား ရှောင်ရှားသွားမည် ဖြစ်ပါသည်။
- ၂၃၀ ကေဗွီ ဓါတ်အားလိုင်းတစ်လျှောက်တွင် အိမ်များ တည်ရှိပြီး အထူးသဖြင့် သယ်ယူပို့ဆောင်ရေး အဆင်ပြေလွယ်ကူသည့် ဇရိယာနှင့် မြစ်နားရှိ ဇရိယာတွင် ဖြစ်ပါသည်။ ၎င်းအိမ်များမှာ လူနေထိုင်ရာအိမ်များနှင့် လယ်စောင့်အိမ်များ ဖြစ်ပြီး အများအားဖြင့် သစ်သားအိမ်များနှင့် အနည်းငယ်မှာ အုတ်ဖြင့်ဆောက်လုပ်ထားသောအိမ်များ ဖြစ်ပါသည်။ ဓာတ်အားလိုင်းမှာ အဓိကအားဖြင့် အဝေးပြေးလမ်းနှင့် အပြိုင်ဖြစ်ပါသည်။ ဓာတ်အားလိုင်း တစ်လျှောက်တွင် အိမ်များအား လုံးဝ မရှောင်ရှားနိုင်သည့် အခါများတွင် အချို့သော အိမ်များအား ဖယ်ရှားသွားမည် ဖြစ်ပါသည်။
- ဓာတ်အားလိုင်း တစ်လျှောက်တွင် ချုံများနှင့် အပင်မြင့်များကဲ့သို့ ပေါက်ပင်များ သိပ်သည်းစွာ ပျံ့နှံ့ ပေါက်ရောက်လျက် ရှိပါသည်။ အပင်များမှာ အဓိကအားဖြင့် ချုံများ၊ ဝါး၊ ငှက်ပျော၊ ပရုတ်ပင်များနှင့် ရာဘာ၊ ကျွန်း၊ ငှက်ပျော စသည့် စီးပွားရေးဆိုင်ရာ အပင်များ ပါဝင်ပါသည်။ ကျွန်းပင်မှာ မြန်မာနိုင်ငံ၏ အမျိုးသားရေးဆိုင်ရာ အပင်အမျိုးအစားဖြစ်ပြီး မခုတ်လှဲမီ ရှုပ်ထွေးသော လုပ်ထုံးလုပ်နည်းများကို ကိုင်တွယ်ရမည် ဖြစ်ပါသည်။
- အကြိုလေ့လာမှုများအရ ၂၃၀ ကေဗွီ ဓါတ်အားလိုင်းနှင့် ၁၃၂ ကေဗွီ ဓါတ်အားလိုင်းအတွက် စက်ခွံန်အကျယ်မှာ ယာယီအားဖြင့် ၅၀ မီတာနှင့် ၄၀ မီတာ အသီးသီး ရှိပြီး အပင်မြင့်များနှင့် လူနေ အဆောက်အဦးများကို ဓာတ်အားလိုင်းစက်ခွံန် အသစ်မှ ယေျဘုယျအားဖြင့် ဖယ်ရှားသင့်ပါသည်။
- ဓာတ်အားပေးလိုင်းသစ်မှာ ကြီးမားသည့် ကျွန်းသစ်တော ဇရိယာများကို ရှောင်ရှားသွားမည် ဖြစ်ပြီး အခြား အပင်မြင့်များနှင့် ဓာတ်အားလိုင်း တစ်လျှောက် အနည်းပျံ့နှံ့ တည်ရှိနေသည့် ကျွန်းပင်များအား လုပ်ငန်းရှင်နှင့် ဆက်သွယ်ပြီး ရှင်းလင်းသွားမည် ဖြစ်ပါသည်။
- လျှပ်စစ်ဓာတ်အားလိုင်းမှ ရထားလမ်းအသွားအလာကို ဆိုးကျိုးသက်ရောက်မှု မရှိစေကြောင်းနှင့် ပြည်သူလူထုအပေါ် ဘေးအန္တရာယ် မကျရောက်စေကြောင်းကို သေချာစေရန် နိုင်ငံတကာစံချိန်စံညွှန်း၊ လျှပ်စစ်ဥပဒေ၏ လိုအပ်ချက်တို့နှင့်အညီ ရထားလမ်းနှင့် အခြားအဆောက်အဦးများအတွက် လိုအပ်သော ဒေါင်လိုက်၊ အလျားလိုက် ဘေးအန္တရာယ်ကင်းရှင်းရေး ရှင်းလင်းမှုများ ဆောင်ရွက်၍ လိုင်းကို ပုံဖော်ထားပါသည်။

ဓာတ်အားခွဲရုံ၊ ၁၃၂ ကေဗွီ နှင့် ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်း တည်ဆောက်မှုနှင့် သက်ဆိုင်သော သက်ရောက်မှုများမှာ

အသေးစားသက်ရောက်မှု

(၁) ဆူညံသံ (၂) ဖုန် နှင့် လေထု ညစ်ညမ်းခြင်း (၃) လူထုနှင့် အလုပ်သမားတွင် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ၊ ဥပမာ - တာဝါများနှင့် အောက်ခြေများအတွက် မြေတူးခြင်းများ၊ လေးလံသောပစ္စည်း ကိရိယာများနှင့် လုပ်ငန်းဆောင်ရွက်ခြင်း၊ (၄) မြေပေါ်ရေနှင့် မြေအောက်ရေ (၅) အမြင်ပသာဒ နှင့် မြင်ကွင်းဆိုင်ရာ သက်ရောက်မှု

အလတ်စားသက်ရောက်မှု

(၁) မြစ်ရေစီးကြောင်း ပိတ်ဆို့ခြင်းနှင့် နန်းတင်မှုများကို ဖြစ်ပေါ်စေသော မြေဆီလွှာ တိုက်စားခြင်း (၂) အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း နှင့် ဆောက်လုပ်ရေးစွန့်ပစ်ပစ္စည်းများ ထွက်ရှိခြင်း (၃) ဇီဝမျိုးစုံမျိုးကွဲ အပေါ်သက်ရောက်မှုများ

ထို့အပြင် တောင်တန်းနေရာများတွင် သဘာဝသစ်ပင်များ၊ စီးပွားဖြစ်စိုက်ပျိုးပင်များ ရှိနေသော်လည်း ခါတ်အားလိုင်းသွယ်တန်းမည့်လမ်းတစ်လျှောက် ရှင်းလင်းမှုများကို ရှောင်ရှားရန် မဖြစ်နိုင်ပါ။ လုပ်ငန်း ဆောင်ရွက်ရန်အတွက် ဒေသနေပြည်သူများထံမှ ကန့်ကွက်ခြင်းများ၊ စီမံကိန်းလုပ်ဆောင်မှုများကြောင့် စိုက်ပျိုးရေးလုပ်ငန်းအပေါ် သက်ရောက်မှုများနှင့် သီးနှံဆုံးရှုံးမှုများ စသည်တို့ကဲ့သို့ လူမှုစီးပွားရေးဆိုင်ရာ ပြဿနာရပ်များ ထွက်ပေါ်မလာခဲ့သော်လည်း အဆိုပြု လျှပ်စစ်ဓာတ်အားလိုင်း၏ အပိုဆုအနေဖြင့် လျှပ်စစ်ဓာတ်အား ရရှိရန် မျှော်လင့်ချက်များ ရှိနေပါသည်။ ဒေသနေ ပြည်သူများအနေဖြင့် စီမံကိန်း လည်ပတ်နေသည့် ကာလအတွင်း လျှပ်စစ်သံလိုက်စက်ကွင်းများနှင့် ထိတွေ့နိုင်ခြေရှိမှုအပေါ် စိုးရိမ်ပူ ပန်မှုများအပြင် စီမံကိန်းမှ အခြားအခွင့်အလမ်းများနှင့် ဒေသအတွင်း အကျိုးအမြတ်များအတွက် မျှော်လင့် ချက်များ ရှိနေပါသည်။

လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနမှ လျှပ်စစ်ဓာတ်အားလိုင်းတစ်လျှောက် သီးနှံလျော်ကြေးပေးရန် သဘောတူ ညီထားပါသည်။ ရာသီပေါ်သီးနှံများနှင့် နှစ်ရှည်ပင်များအတွက် မြေယာနည်းဥပဒေ (၂၀၁၂) အရ လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနမှ လျော်ကြေးပေးသွားပါမည်။

ယေျဘုယျအားဖြင့် ဆောက်လုပ်ရေး ဆောင်ရွက်ချက်များကြောင့် ဖြစ်ပေါ်သော ပတ်ဝန်းကျင်နှင့် လူမှုဝန်း ကျင်ဆိုင်ရာ သက်ရောက်မှုများမှာ အခိုက်အတန့်သာ ဖြစ်ပါသည်။ ဆောက်လုပ်ရေး ကာလအတွင်း ပစ္စည်းအရွှေ့အပြောင်း နှင့် အလုပ်သမား အသွားအလာများ၊ ဆူညံသံများ၊ ဖုန်မှုန့်များ၊ထုတ်လွှတ်မှုများ နှင့် အခြား ဆောက်လုပ်ရေး ဆက်စပ် လုပ်ငန်းများကြောင့် တိုင်များနှင့် လိုင်းများမှ ခန့်မှန်းဇရိယာ မီတာ ၄၀၊ ၅၀ ခန့် ကို ယာယီအားဖြင့် အနောက်အယှက် ဖြစ်စေမည် ဖြစ်ပါသည်။

ဓာတ်အားခွဲရုံနှင့် လျှပ်စစ်ဓာတ်အားလိုင်း တည်ဆောက်ခြင်းနှင့် လည်ပတ်ခြင်းမှ ကောင်းကျိုးသက်ရောက်မှု များမှာ အောက်ပါအတိုင်းဖြစ်သည်။

လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရန်အတွက် အမျိုးမျိုးသော စွမ်းအင်ရင်းမြစ်များကို သုံးစွဲရပါသည်။ လျှပ်စစ်ဓာတ်အား ထောက်ပံ့ရေးသည် လူတစ်ဦးတစ်ယောက်ချင်းစီကို ဒီဇယ်မီးစက်အသုံးပြုမှုများ နည်းစေခြင်း၊ ရေနံဆီအပေါ်မှီတည်ရမှု နည်းပါးလာစေသည့်အပြင် ပိုမိုကောင်းမွန်ပြီး အသုံးဝင်သော လျှပ်စစ်ပေါင်းအိုး၊ လျှပ်စစ်မီးပူ ကဲ့သို့သော လျှပ်စစ်ပစ္စည်းကိရိယာများကြောင့် ထင်း၊ မီးသွေးလောင်စာနေ ရာတွင် အစားထိုး အသုံးပြုလာနိုင်ပါသည်။ ထို့သို့ဆောင်ရွက်ခြင်းဖြင့် ပတ်ဝန်းကျင်သို့ ကာဗွန်ဒိုင်

အောက်ဆိုဒ်ထွက်ရှိမှုကို လျော့နည်းစေသည့်အပြင် သစ်တောပြုန်းတီးမှုကို လျော့ချစေပြီး ဖန်လုံအိမ်ဓာတ်ငွေ့ထွက်ရှိမှုကို လျော့နည်းစေပါသည်။

အသေးစားစက်မှုလုပ်ငန်းများအတွက် ပြတ်တောင်မှုမရှိဘဲ ယုံကြည် စိတ်ချရသည့် လျှပ်စစ်ဓာတ်အား ထောက်ပံ့ရေးသည် စီပွားရေးအခွင့်အလမ်းများနှင့် ကိုယ်ပိုင်အလုပ်အကိုင် အခွင့်အလမ်းများ၊ တစ်နည်းအား ဖြင့် တစ်ဦးချင်းစီနှင့် အမျိုးသားအဆင့် စီးပွားရေးကို တိုးတက်လာစေပါသည်။

၇။ ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှု လျော့ချရေး နည်းလမ်းများနှင့် အဖွဲ့အစည်းဆိုင်ရာ အစီအစဉ်

၁၃၂ ကေဗွီ ဝါရောင် ၊ ဝိုင်းမော် လျှပ်စစ်ဓာတ်အားလိုင်း၊ ၂၃၀ ကေဗွီ ဝိုင်းမော် ၊ နဘား လျှပ်စစ်ဓာတ်အားလိုင်း နှင့် ၂၃၀ ကေဗွီ လျှပ်ဓာတ်အားခွဲရုံ တိုးချဲ့ခြင်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ်ကို ပြုစုထားပြီး ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ်ကို ယခု ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းတွင် ထည့်သွင်းထားပါသည်။

လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေး ဦးစီးဌာန မှ ထိခိုက်မှု လျော့ချရေးနည်းလမ်းများ အကောင်အထည်ဖော်ဆောင်မှုကို ၎င်းတို့၏ Project Management Unit (PMU) မှ တစ်ဆင့် စောင့်ကြည့်သွားမည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် အကောင်အထည်ဖော်ဆောင်ခြင်း၊ လေ့လာစောင့်ကြည့်ခြင်း နှင့် အစီရင်ခံစာ ပြင်ဆင်ခြင်း စသည့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များနှင့်အညီ ပတ်ဝန်းကျင်၊ ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေး ဌာနကို ချီဖွေငယ်ရေအားလျှပ်စစ် ကုပ္ပဏီလက်အောက်တွင် ဖွဲ့စည်း၍ ပတ်ဝန်းကျင်နှင့် လူမှု ကာကွယ်စောင့်ရှောက်ရေး ဆိုင်ရာ သင်တန်းများကို PMU မှ အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည်။

၈။ လူထုတွေ့ဆုံဆွေးနွေးခြင်းများ

ချီဖွေငယ် ရေအားလျှပ်စစ်စီမံကိန်း တိုးချဲ့ခြင်း၊ ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း နှင့် မြှင့်တင်ရေး စီမံကိန်းအတွက် ဖြစ်နိုင်မှုအခြေအနေ လေ့လာမှု ဒီဇိုင်းဆိုင်ရာ စာရွက်စာတမ်းများနှင့် ပတ်သက်၍ ဆွေးနွေးရန် ချီဖွေငယ်ရေအားလျှပ်စစ် ကုပ္ပဏီ သည် လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေး ဦးစီးဌာန၊ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန တို့နှင့်အတူ နေပြည်တော်ရှိ လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေး ဦးစီးဌာန ရုံး တွင် ၂၀၁၉ ခုနှစ် ဇူလိုင်လ ၁၇ ရက်တွင် အစည်းအဝေးပြုလုပ်ခဲ့ပါသည်။

ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းလပ်ငန်းစဉ်အတွင်း အများပြည်သူနှင့်တွေ့ဆုံဆွေးနွေးသည့် အစည်းအဝေး ၆ ခု ကို ဆောင်ရွက်ခဲ့ပြီး လူဦးရေ စုစုပေါင်း ၂၅၄ ယောက် တက်ရောက်ခဲ့ပါသည်။ အစည်းအဝေးပွဲများကို မြစ်ကြီးနား၊ ဝိုင်းမော်၊ မိုးညှင်း၊ မိုးကောင်း နှင့် အင်းတော် မြို့များတွင် ဆောင်ရွက်ခဲ့ပါသည်။

အစည်းအဝေးပွဲများ ဆောင်ရွက်နေစဉ်အတွင်း ထွက်ပေါ်လာသော ဆွေးနွေးမှုများ၊ စိုးရိမ်ပူပန်မှုများမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်။

- ထိခိုက်ခံရသည် လယ်သမားများနှင့် တိုင်ပင်ဆွေးနွေး၍ ညှိနှိုင်းမှုများကို ပွင်လင်းမြင်သာစွာ ဆောင်ရွက်ခဲ့ပါသည်။
- တာဝါတိုင်စိုက်ထူမည့် အောက်ခြေနေရာအတွက် အမြဲတမ်းမြေနေရာ ရယူခြင်း နှင့် သီးနှံပျက်စီးဆုံးရှုံးမှုများအတွက် လျော်ကြေးပေးချေမည့် အစီအစဉ်ကို သိရှင်းကြပါသည်။
- လျှပ်စစ်ဓာတ်အား သုံးစွဲခများ လျော့ချပေးစေလိုကြောင်း ပြောကြားခဲ့ပါသည်။

- ဒေသနေပြည်သူတို့၏ နေရာကို ဖြတ်သွားမည့် တာဝါတိုင်အရေအတွက်၊ ဆောက်လုပ်ရေးကာလ၊ စီမံကိန်းမှ ရရှိမည့် အကျိုးအမြတ် စသည်တို့ကို သိလိုကြပါသည်။။
- လျှပ်စစ်ဓာတ်အားလိုင်း ဖြတ်သန်းသွားသည့် သစ်တောကြိုးဝိုင်းနေရာရှိ အပင်အမျိုးအစားများကို ခွဲခြားသတ်မှတ်ပေးရန် တောင်းဆိုခဲ့ပါသည်။
- စီမံကိန်း မစတင်မီ မြေယာဆုံးရှုံးမှု မှတ်တမ်းယူခြင်းကို မြေအသုံးချဌာန နှင့် ပူးပေါင်းစေလိုပါသည်။
- စီမံကိန်းအကောင်အထည်ဖော်ဆောင်သည့် ကုမ္ပဏီမှ စီမံကိန်းမစတင်မီ ကျေးရွာများတွင် ကွင်းဆင်းလေ့လာခြင်း နှင့် ဆွေးနွေး တိုင်ပင်ခြင်းကို ဆောင်ရွက်ရပါမည်။ လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာန၏ တာဝန်ရှိသူမှ စီမံကိန်းမစတင်မီ ကွင်းဆင်းလေ့လာခြင်းကို ဆောင်ရွက်ရပါမည်။
- လျော်ကြေးငွေနှုန်းထားသည် သက်ဆိုင်သည့် ဒေသဆိုင်ရာ အစိုးရမှ ဖွဲ့စည်းထားသော ကော်မတီမှ သတ်မှတ်ထားသည့် နှုန်းထားဖြစ်ရမည်။
- လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနသည် သီးနှံပျက်စီး ဆုံးရှုံးမှုများကို သက်ဆိုင်သည့် ဒေသဆိုင်ရာ အစိုးရမှ သတ်မှတ်ထားသော နှုန်းထားအတိုင်း ပေးလျော်သွားပါမည်။
- ကန်ထရိုက်တာများသည် ဆောက်လုပ်ရေးအတွက် လုပ်ငန်းနေရာသို့ မဝင်ရောက်မီ ဒေသအာဏာပိုင်များကို အကြောင်းကြားရန် အကြံပေးထားပါသည်။

သဘောထားမှတ်ချက်များ၊ အကြံပြုချက်များ နှင့် အများပြည်သူ တွေ့ဆုံဆွေးနွေးပွဲများမှ တုံ့ပြန်ချက်များကို ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း အစီရင်ခံစာ၏ နောက်ဆက်တွဲ ၅ တွင် ဖော်ပြထားပါသည်။

၈။ ပတ်ဝန်းကျင် စီမံခန့်ခွဲ အစီအစဉ် နှင့် စောင့်ကြည့်လေ့လာရေး အစီအစဉ်

စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုသည် လျှပ်စစ်ဓာတ်အားလိုင်း နှင့် လျှပ်စစ်ဓာတ်အားခွဲရုံ တည်ဆောက်ခြင်းမှ ဖြစ်ပေါ်လာမည့် ဆိုးကျိုးသက်ရောက်မှုများကို လျော့ချရန် နှင့် တစ်ချိန်တည်းမှာပင် အပြုသဘောဆောင်သည့် အကျိုးရှိသော သက်ရောက်မှုများကို တိုးမြှင့်သွားရန် ရည်ရွယ်ပါသည်။ လျှပ်စစ်ဓာတ်အားလိုင်း နှင့် လျှပ်စစ်ဓာတ်အားခွဲရုံ တည်ဆောက်ခြင်း၏ ထိခိုက်မှုလျော့ချရေး နည်းလမ်းများကို ကနဦး ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း အစီရင်ခံစာထဲရှိ ဇယား ၇.၃-၁ တွင် ဖော်ပြထားပါသည်။

ဤထိခိုက်မှုလျော့ချရေး နည်းလမ်းများမှာ ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်းတွင် သတ်မှတ်ထားသော သက်ရောက်မှု ဖြစ်နိုင်ခြေများအပေါ် အခြေခံထားသည့် ခြုံငုံသုံးသပ်ချက်များသာ ဖြစ်ပါသည်။ ထိခိုက်မှု လျော့ချရေး အစီအစဉ်သည် အကြိုတည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်း နှင့် အကြို တည်ဆောက် - လည်ပတ်ခြင်း အဆင့်များဖြင့် သတ်မှတ်ထားသော ဖွဲ့ဖြိုးတိုးတက်ရေးအဆင့်သုံးခုဖြင့် ပုံဖော်ဆောင်ရွက်ထားခြင်း ဖြစ်ပါသည်။ သက်ဆိုင်သူများနှင့် တွေ့ဆုံပွဲများတွင် ထွက်ပေါ်လာသော ဆွေးနွေးမှုရလဒ်များနှင့် စိုးရိမ်ပူပန်မှုများအပေါ်မူတည်၍ ထိခိုက်မှုလျော့ချရေး အစီအစဉ်ကို ရေးဆွဲဖော်ပြထားပါသည်။

ဆောက်လုပ်ရေး မစတင်မီ ဆောက်လုပ်ရေး ကန်ထရိုက်တာသည် လျှပ်စစ်ဓာတ်အားလိုင်းဖြတ်သန်းသွားရာ သွားရာ လမ်းကြောင်း အပိုင်းအခြားအလိုက် ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ်ကင်းရှင်းရေး စီမံခန့်ခွဲမှု နှင့် စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များကို လုပ်ငန်းနေရာအလိုက် ဆောင်ရွက်သွားရမည်။ (ဥပမာ- ကျေးရွာများ၊ ရေစီးဆင်းရာ လမ်းကြောင်းများ နှင့် သဘာဝနေရင်းဒေသများ)

ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်တွင် (၁) ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ် အကောင်အထည်ဖော်ဆောင်ခြင်းအတွက် ကဏ္ဍများ နှင့် တာဝန်ယူမှုများ (၂) ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု

နည်းလမ်းများ (၃) ပတ်ဝန်းကျင်စောင့်ကြည့်လေ့လာရေး အစီအစဉ် (၄) ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အကောင်အထည်ဖော်ဆောင်ခြင်းအတွက် ရည်မှန်းထားသော ဘဏ္ဍာငွေ စသည်တို့ ပါဝင်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ် အသေးစိတ်ကို ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ၏ အခန်း (၇) တွင် ဖော်ပြထားပါသည်။

၉။ နိဂုံးချုပ်နှင့် အကြံပြုချက်

ချီပွေငယ် ရေအားလျှပ်စစ် တိုးချဲ့ခြင်း၊ ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း နှင့် မြွှင့်တင်ရေး စီမံကိန်းသည် မြန်မာနိုင်ငံမြောက်ပိုင်းရှိ လျှပ်စစ်ဓာတ်အားလိုင်း နှင့် ပင်မ လျှပ်စစ်ဓာတ်အားလိုင်းအား ၂၃၀ ကေဗွီလိုင်းဖြင့် ဆက်သွယ်နိုင်ရန်၊ မြန်မာနိုင်ငံရှိ လျှပ်စစ်ဓာတ်အား မလုံလောက်မှုကို လျှော့ချနိုင်ရန်၊ ဒေသတွင်း စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှုကို အရှိန်မြှင့်တင်နိုင်ရန်၊ ပြည်သူများ၏ လူနေမှု အဆင့်အတန်း တိုးတက်လာစေရန်၊ ချီပွေငယ် လျှပ်စစ်ဓာတ်အားရုံမှ လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးရေး လိုအပ်ချက်များနှင့် ကိုက်ညီရန် အတွက် လုပ်ဆောင်ရန် လိုအပ်ခြင်းဖြစ်ပါသည်။

ယခုတည်ဆောက်မည့် လျှပ်စစ်ဓာတ်အားလိုင်း စီမံကိန်းအပေါ် အကဲဖြတ်မှုအရ ၂၃၀ ကေဗွီ နှင့် ၁၃၂ ကေဗွီ လျှပ်စစ်ဓာတ်အား လိုင်းအသစ် နှင့် ဓာတ်အားခွဲရုံအသစ် တည်ဆောက်ခြင်းကြောင့် ဖြစ်ပေါ်လာမည့် ဖြစ်နိုင်ခြေရှိသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများသည် အကန့်အသတ် အနေဖြင့်သာ ရှိနိုင်ကြောင်း ဖော်ပြနေပါသည်။ ဖုန်ထွက်ရှိမှု၊ ဆူညံသံ အဆင့်များ၊ ယဉ်အသွားအလာ ပိတ်ဆို့မှုများ၊ ဆောက်လုပ်ရေးမှ အစိုင်အခဲနှင့် အရည် စွန့်ပစ်ပစ္စည်းများ၊ မြေများ၊ စမ်းချောင်းများတွင် မြေဆီလွှာ တိုက်စားခြင်းများနှင့် အနည်ထိုင်ခြင်း စသည့် ဆောက်လုပ်ရေးလုပ်ငန်း ဆက်စပ်သက်ရောက်မှုများ၊ အများပြည်သူနှင့် အလုပ်သမားများ၏ ဘေးကင်းလုံခြုံရေး စသည့် ထိခိုက်နိုင်မှုများကို လျှော့နည်းစေရန်အတွက် စံချိန်စံညွှန်းရှိသော ဆောက်လုပ်ရေး အလေ့အကျင့်များအသုံးပြု၍ အကျိုးရှိရှိ စီမံဆောင်ရွက်သွားမည်။

လွယ်ကူအဆင်ပြေသော သယ်ယူပို့ဆောင်ရေး နေရာ နှင့် မြစ်နေရာ အနီးတစ်ဝိုက်တွင် တည်ရှိနေသော ဓာတ်အားလိုင်းဖြတ်သွားမည့် လမ်းကြောင်းအောက်ရှိ မလွတ်သော အိမ်ယာအနည်းငယ်ရွှေ့ပြောင်းရန် အတွက် အိမ်ပိုင်ရှင်များ၏ လိုအပ်ချက်ကို သိရှိနိုင်ရန် ဆောက်လုပ်ရေးအဆင့် မစတင်မီ ထိခိုက်ခံရမည့် လယ်ယာမြေနှင့် လူနေအိမ်ခြေ စုစုပေါင်းကို စာရင်းကောက်ယူရပါမည်။

လျှပ်စစ်ဓာတ်အားလိုင်း မတည်ဆောက်မီ ပို့လွှတ်မည့် လမ်းကြောင်း အသေးစိတ်၊ ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ နှင့် ဆုံးရှုံးမှုများ၊ အဆိုပြုထားသော ထိခိုက်မှုလျှော့ချရေးနည်းလမ်းများနှင့် စီမံခန့်ခွဲမှု အစီအစဉ်များကို တင်ပြရန် နောက်ဆက်တွဲ အများပြည်သူ နှင့် ဆွေးနွေးတိုင်ပင်မည့် အစည်းအဝေးကို လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေး ဦးစီးဌာန၊ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန နှင့် စီမံကိန်း အကောင်အထည်ဖော်ဆောင်သူ ချီဖွေငယ်ရေအားလျှပ်စစ် ကုမ္ပဏီ တို့မှ စီစဉ်ဆောင်ရွက်သွားသင့်ပါသည်။

စီမံကိန်းတည်နေရာနှင့် စီမံကိန်း၏ ရလဒ်ကို သိသိသာသာ သက်ရောက်မှုရှိသည့် နယ်ပယ်တွင် အပြောင်းအလဲများ ရှိလာပါက ၂၃၀ ကေဗွီ ဓာတ်အားလိုင်း၏ အပြီးသတ် အသေးစိတ် ဒီဇိုင်းပုံစံနှင့် အညီ ထပ်မံလျှော့ချရေး နည်းလမ်းများနှင့် မှန်ကန်သော လုပ်ဆောင်ချက် အစီအစဉ်များ လိုအပ်မှု ရှိ မရှိ စစ်ဆေးရန် ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်များအား ထပ်မံပြင်ဆင်သွားပါမည်။ စီမံကိန်း အကောင်အထည် ဖော်ဆောင်နေစဉ်အတွင်း ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်တွင် ဖော်ပြထားသော နည်းလမ်းများ အကောင်အထည်ဖော်ဆောင်မှုကို အတည်ပြုရန် ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာစောင့်ကြည့်ရေး အစီရင်ခံစာများကို သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာနမှ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာနသို့ ၆ လ တစ်ကြိမ် တင်သွင်း သွားပါမည်။

1 Introduction

In order to overcome the current power deficiency crisis, Ministry of Electricity & Energy (MOEE) has been planning to accelerate the development of power generation, transmission and distribution facilities including exploring additional hydropower sources, construction of new power grid and substation, upgrading existing systems, seeking sustainable and renewable energy and other available means of energy sources in consultation with oversea finical institutions and development partners.

As a result, this 132 kV and 230 kV power transmission line project was opted as an essential infrastructure with intention of boosting the capacity of country's power grid facility which will play vital role to meet the substantial needs of electrical power supply in Myanmar.

However, due to the potential impacts of this project which are mainly upon agricultural land use and clearance of trees along the transmission line route, IEE study will be crucially needed to minimize the negative impacts.

At present, the highest voltage level of the transmission line in northern Myanmar is 132kV, and the northern Myanmar is in a "weak" connection with the main power grid. The Kachin Power Grid is connected to the main power grid only via one 66kV single-chain line (Waingmaw – Myitkyina – Mogaung – Mohnyin – Na Bar – Kyaukpahto) of 310km long. The Chipwi Nge HPP 230kV Power Transmission and Transformation Project will strengthen the linkage of the power grid of Kachin State with the main power grid of Myanmar, improve the power supply capacity of the power grid and increase the output of units of Chipwi Nge HPP.

The present IEE report is prepared according to the Annex-1 of EIA Procedure, notification letter, letter no. 616/2015 that dated on 29th December 2015, issued by the Ministry of Environmental Conservation and Forestry. Besides, the IEE report is also prepared based on the reference letter no. (Forestry) 3 (2) 16 (D) (2973/2019) dated 9 July 2019 of Ministry of Natural Resources and Environmental Conservation. The reference letter is attached in Appendix-1. This report intends to assess the Initial Environmental Examination (IEE) and EMP of the proposed power transmission lines and one 230 kV substation (expansion of existing 132 kV substation to 230 kV substation).

The goal of this IEE study is to promote environmentally sustainable livelihoods and development of the country.

The general objectives for long term are:

- Conservation and sustainable use of natural resources,
- Protection and enhancement of the quality of all forms of life,
- Promotion of public awareness on environmental issues,
- Strengthening and building capacities to carry out IEE,
- Integration of environmental considerations in development planning process,
- Generation, storage, and dissemination of environmental information, and
- Linking grassroots development strategies to global and international initiatives.
- The specific objectives for power transmission line are:
- To assess the nature, intensity and duration of impacts, positive and / or negative, to proposed development projects,
- To assist in decision-making with regard to costs and benefits of proposed development projects,
- To promote local community and public participation in the IEE process, and
- To promote social and cultural considerations in project design

The following activities will be implemented to meet the completion of these objectives.

- Examining the existing baseline data that describe all relevant physical, biological, social, cultural and economic characteristics of the potential project affected area through secondary sources such as reviews and field investigation
- Evaluating the initial existing conditions before the Project started and significances of the positive and negative impacts which can affect to the proposed project area by project activities of transmission line construction and operation
- Understanding the past and current history of lands to be acquired and identify the loss of assets by projects activities
- Adopting and applying the effective mitigation measures that could avoid or mitigate the potential impacts to a level deemed as acceptable
- Defining the appropriate environmental and social management and monitoring plans to be implemented throughout the life of project cycle.

1.1 Scope of Work

The scope of work for IEE included the followings:

a) Identification of the legal and policy framework applicable to the Project;

b) Description of the principal project features and technical specifications, including pre construction, testing and commissioning, operation and maintenance (as provided by MOEE);

c) Summary of approach adopted by MOEE for design of the transmission line and assessment of alternatives available for the Project together with an overview of outcome of the key decisions already taken up by the company for the transmission line route;

d) Description of the existing environmental and social baseline of the Project in terms of key sensitivities and potential constraints on the construction and operation and maintenance of the transmission line;

e) Assessment of the land use, air, noise, water, and the natural (biological) environment including parameters of human interest (social issues) based on primary surveys and available secondary data;

f) Identification of potential adverse environmental and social impacts during erection and operation of the transmission line and mitigation measures to be adopted by MOEE and

g) Suggestion to develop Environmental and Social Action Plan (ESAP) outlining preventive and control strategies for minimizing negative impacts during construction and operation (including maintenance) phases of the proposed project along with the cost and time schedules for implementation of the ESAP.

1.2 Approach & Brief Methodology

Resource & Environment Myanmar will adopt the following approaches for the Project:

a) Identification and reviewing of the applicable national and international environmental and social regulatory and institutional framework

b) Establishing environmental and social baseline conditions along the stretch by the followings;

- Reconnaissance survey to observe environmental and social characteristics on either side of the transmission line (primarily within 100m);

- Primary baseline data collection on the route along the transmission line with respect to water, soil, noise quality, and traffic density on roads where the proposed area that the transmission line will cross;
- Socioeconomics survey to assess the socioeconomic status of the route involving cultural heritage issues within the private land 100 m on either side of the route
- Ecological survey of flora and fauna prevailing along the transmission line route through primary and secondary surveys
- Identification of land use of the stretch through satellite imageries of the whole stretch of the transmission line;

c) Consideration of feasible environmentally and socially preferable alternatives (although the options available at this stage was minimum);

d) Identification, prediction and evaluation of environmental and social impacts of the project by using IEE tools, such as matrix analysis, questionnaires, cost-benefit analysis methods;

e) Development of mitigation measures or Environmental Management Plan (EMP) to minimize adverse environmental impacts;

f) Preparation and suggestion to develop Environmental and Social Action Plan (ESAP) and management system. Specific methodology and techniques used will also be discussed in relevant sections of this study.

1.3 Limitations

The guiding principles of this IEE study are:

- Adoption of appropriate policies and legislation to guide the IEE process,
- All development projects to be subjected to the IEE process,
- Equity in allocation of and access to resources, poverty elimination, and promotion of social justice,
- Popular participation of all affected and interested parties including grassroots communities, in the IEE process,
- Accountability of all participating parties to the public,
- Transparency throughout the IEE process,
- The IEE process to take special consideration of the role played by women and children in resource management and any impacts on these groups,
- The IEE process to be a tool in the promotion of sustainable livelihoods and sustainable living.

This IEE study is based upon the application of professional judgment to certain facts with resulted subjective interpretations. However, professional judgments expressed herein are based on the facts currently available within the limits of the scope of work, information provided by the client or its representative, prevailing secondary data, budget and schedule.

To extent that more definitive conclusions are desired by client are warranted by the currently available facts, it is specifically R & E's intention that the conclusions and recommendations stated herein will be proposed as guidance and not necessarily a firm course of action except where explicitly stated as so. We make no warranties, express or implied, including, without

limitation, warranties as to merchantability or fitness for a particular purpose. In addition, the information provided to client in this report is not to be construed as legal advice.

2 Project Description

2.1 Project Background

Chipwi Nge HPP has an installed capacity of 3×33MW. It is located in the upstream of the Ayeyarwady River in Kachin State, Myanmar. It was built as a power supply for the Myitsone and Chipwi Hydropower Stations and was put into operation in 2011. Due to the stagnation of the hydropower project in the upstream of the Ayeyarwady River, the Chipwi Nge HPP has been commercialized. Due to the small surrounding load and the influence of the stable level of the power grid operation, the power station unit can only operate with two units, and the average power generation load of the power station is only about 27MW.

With a weak linkage with the main power grid, Kachin Northern Power Grid is connected to the main power grid of Myanmar only via one 66kV single-chain line (Waingmaw – Myitkyina – Mogaung – Mohnyin – Na Bar – Kyaukpahto) of 310km long. Power grids in some northern areas of Kachin State are currently independent power grids.

The Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project is necessary to enable connection of northern Myanmar grid to main grid via 230kV line, mitigate the power shortage in Myanmar, drive the local economic development, increase the people's living standards and meet the requirements of power distribution from Chipwi Nge Hydropower Station.

2.2 Project Size and Location

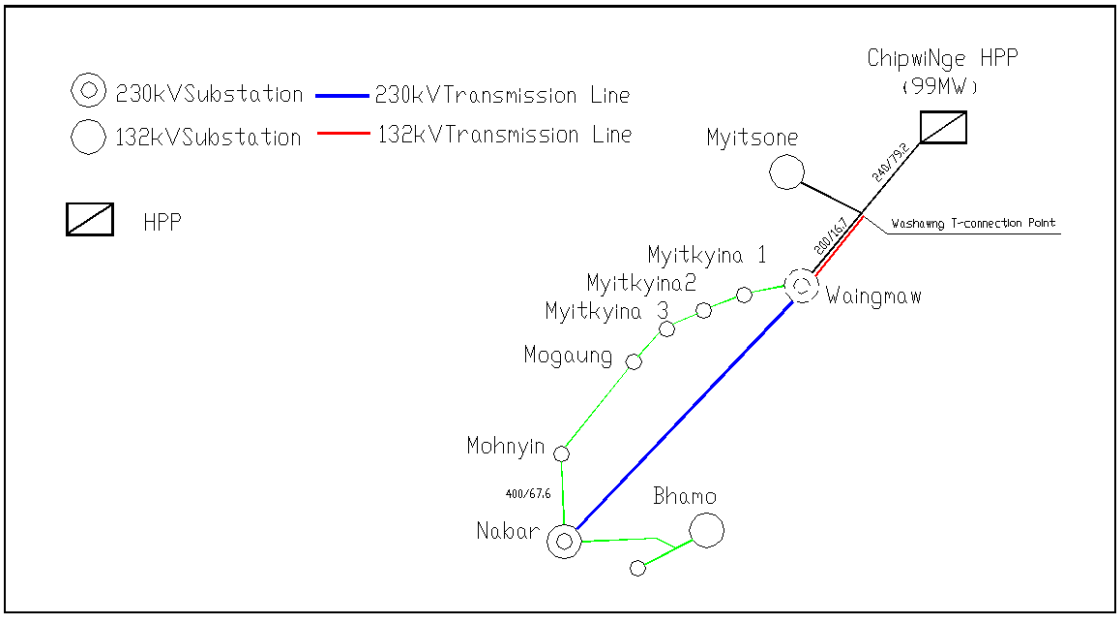


Figure 2.2-1 System Wiring Diagram

Waingmaw Substation is located in the northeast of Myitkyina, Kachin State in the north of Myanmar, with a coordinate of N25°26′1.54″ and E97°26′ 32.52″. The substation site is located about 7.5km northeast of downtown Myitkyina and 1.2km west of Ayeyarwady River.

The new 132 kV line and 230kV line passes through Kachin State and Sagaing Region in Myanmar. The main construction contents are as follows;

1. The expansion of Waingmaw Substation (230kV)

2. New 230kV Waingmaw-Na Bar line: 223 km long, erected in double-circuit on the same tower;
3. New 132kV Waingmaw-War Shawng T-connection line: 17km long, erected in single-circuit.
4. Boost operation of Waingmaw 132kV Substation under 230kV: 2 x 125MVA main transformer (230/132/11kV) and three-side bays; the new 230kV switchgear adopts double bus-bar connection, two 230kV line bays, two reserved line bays; 2 sets of 25Mvar bus shunt reactor connections 230kV bus bar; 2 sets of capacitor is installed on 132kV bus bar.

The Waingmaw Substation is connected to the northern Myanmar grid via 132kV and 230kV lines. Two 132kV outgoing line circuit bays will be constructed, and one circuit will be connected to War Shawng T-connection at this stage. The 230kV outgoing line is connected through two circuits to 230kV Na Bar Substation. The system wiring diagram for the Project is shown in Figure 2.2-1.

According to the site survey and data collection, the route scheme of the Project is shown in Figure 2.2-2.

Figure 2.2-2 Schematic Diagram of Line Route of the Project

2.3 Project Infrastructure

2.3.1 Transmission Line Routes

2.3.1.1 Overview

The selection of transmission line route is important to the line design. The rationality of the line is directly related to the economic and technical indicators of the line, affecting the construction investment of the project, and is closely related to the construction convenience, engineering quality and operational safety of project. Therefore, the first priority shall be given to selection of line route in the Project design, and the most preferable scheme shall be selected.

The lines pass through Kachin State and Sagaing Region in Myanmar. The terrain types along the whole lines are mainly plains, gentle hills, and low mountains. Along the line, dense vegetation, short shrubs and tall trees are spread.

Meanwhile, large pieces of economic trees are spread. The transportation conditions along the whole line are of average level.

2.3.1.2 Description of substation outgoing line at both ends

2.3.1.2.1 Waingmaw 230kV Substation

The 230kV line of Waingmaw Substation runs southeastward. Two new line bays shall be constructed. The new line bays namely Na Bar Substation Line II and Na Bar Substation Line I from north to south are shown in Figure 2.3-1.

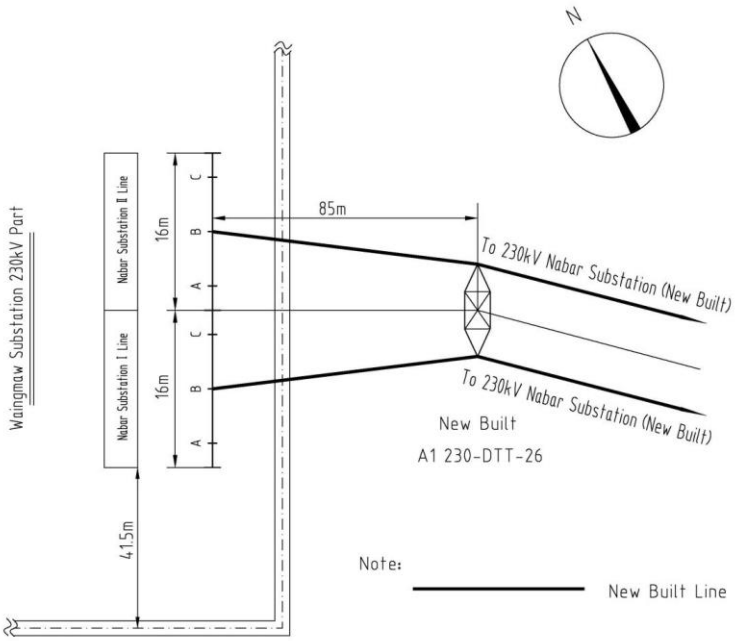


Figure 2.3-1 Schematic Diagram of 230kV Line of Wingman Substation

The 132kV line of Waingmaw Substation runs southeastward. One newline bay shall be expanded. The new line bay namely Chipwi Nge HPP from north to south is shown in Figure 2.3-2.

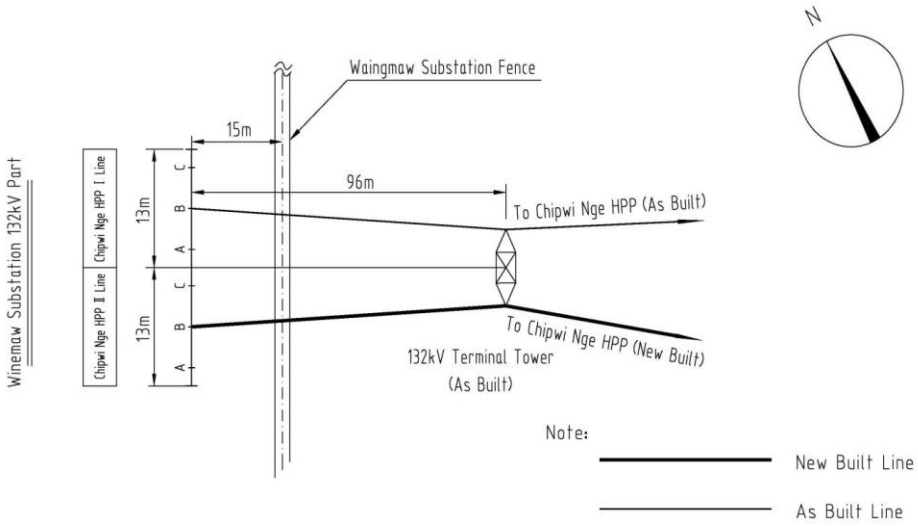


Figure 2.3-2 Schematic Diagram of 132kV Line of Wingman Substation

2.3.1.2.1 Near 230kV Substation

According to the drawings of Na Bar 230 kV Substation collected by company engineers during the preliminary survey, the 230kV outgoing lines run northwestward, and two line bays namely Waingmaw Line I and Waingmaw Line II from north to south shall be occupied. The two line bays are shown in Figure 2.3-3.

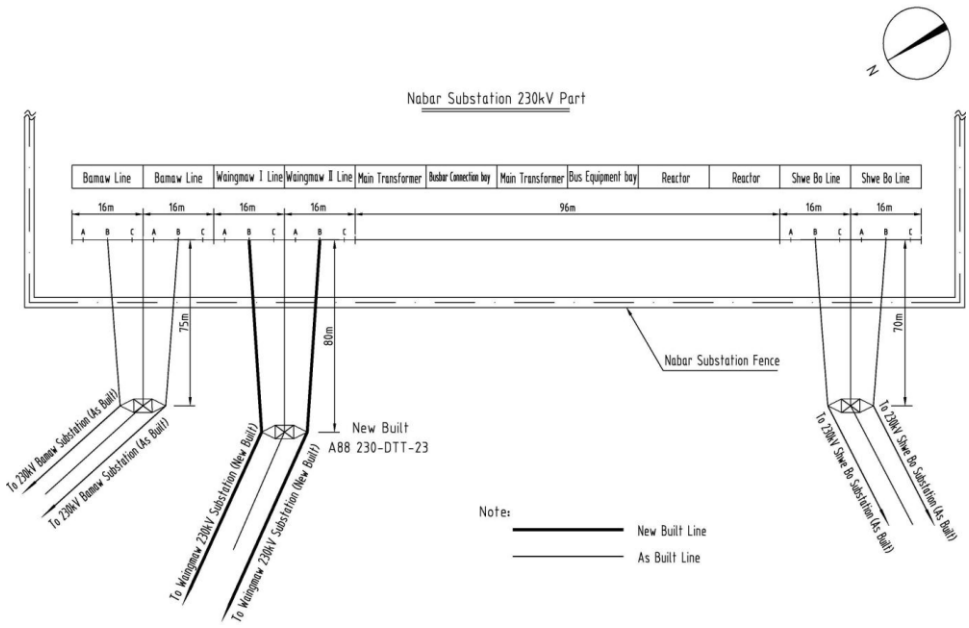


Figure 2.3-3 Schematic Diagrams of 230kV Outgoing Lines of Na Bar Substation

2.3.2 Route selection

2.3.2.1 Principle for route selection

Based on the planning of local power system as well as local economy development and population growing, protection of natural environment, distribution of military facilities, forestry and minerals situation, hydrological and geological conditions, traffic conditions and pollution level conditions along the new 230kV and 132kV lines, the line route scheme will be selected according to the following principles.

(1) The advices from MOEE and local government shall be fully solicited.

Coordinate the contradiction between the new line route and the existing lines, planning lines and other facilities along the line route, the preferable schemes for line route shall be fully considered.

(2) For the selecting the line routes, a comprehensive consideration shall be given to the factors such as line length, topography, geology, traffic, construction, operation, local planning, etc., and a comparison of several schemes, technologies and economy shall be made to ensure that the line routes are safe, reliable, economical and reasonable.

(3) The line routes selected shall be close to the existing main highways and rural roads to facilitate construction and operation conditions.

(4) The line routes selected shall avoid military facilities, industrial and mining enterprises and other important facilities, meet the requirements of government planning, and minimize the impact on local economic development.

(5) The line routes selected shall avoid religious temples, nature reserves and historical relic reserves.

(6) For the selecting the line routes, the awareness of protecting environment shall be fully embodied; large-scale demolition and relocation of residential buildings shall be avoided; large area of centralized economic forest areas shall be avoided and tree felling shall be reduced.

2.3.2.2 Major constraints for line route

According to the preliminary site survey and data collection, the major constraints for the line route of the Project are as follows:

(1) Pass through the military camp

At the east side of Sili Khar Village, about 8 km south of Waingmaw Substation, there is a military camp surrounded by villages with dense houses.

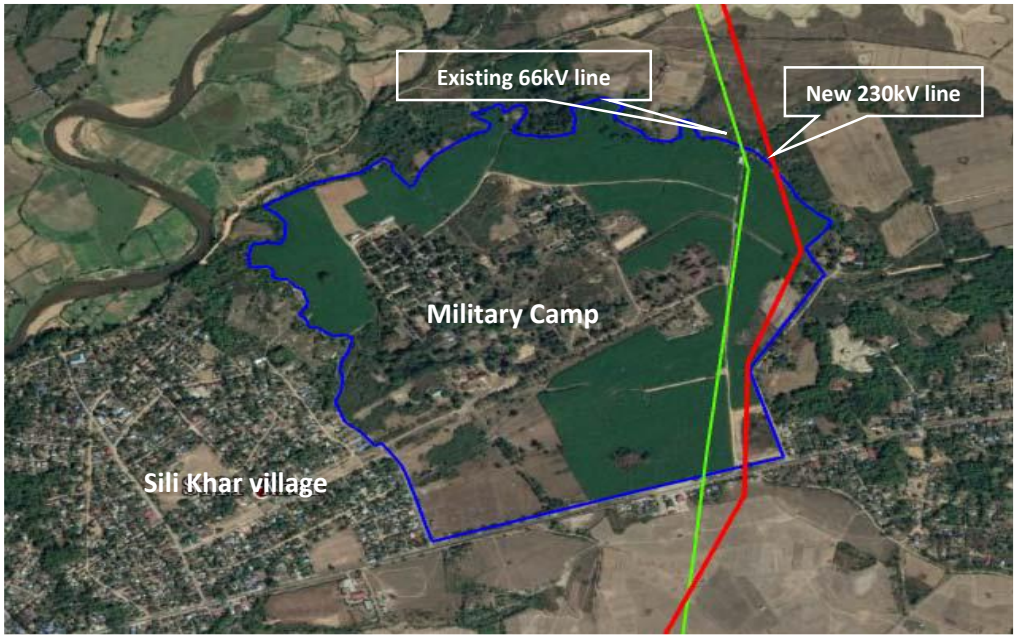


Figure 2.3-4 Schematic Diagram of 230 kV Line Crossing Military Camp

The existing 66 kV line passes through the military camp, and about 6 towers are set up in military camp. In order to avoid large-scale demolition of local people houses, the new 230 kV line shall pass the military camp near the boundary area, and about 2 towers shall be built in military camp.

(2) Myitkyina Airport clearance requirement

Part of the new 230 kV line route of the Project is located within the scope of clearance protection zone of the Myitkyina Airport.

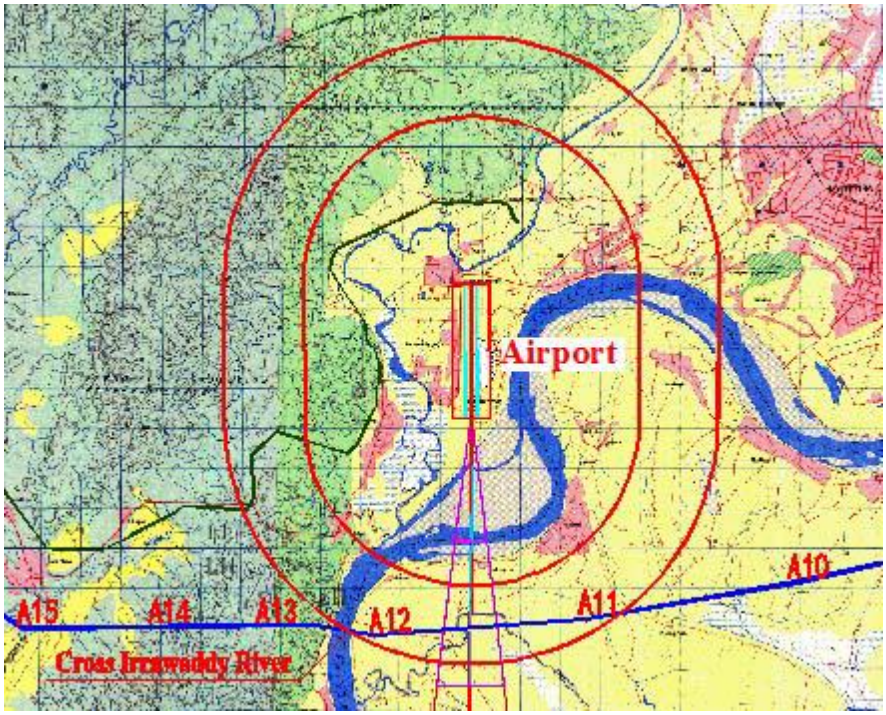


Figure 2.3-5 Diagram of Relative Position of 230 kV Line and Airport

Section A11-A13about 7km of 230 kV line in the Project is located within the scope of clearance protection zone of the airport. According to the data collected, the permit height of the Inner Horizontal Surface is 45m, and the permit height of the Conical Surface is 60m~145m. The slope of the conical surface is 5%, and the Climbing Surface of airplane is 2.5%. The limit height of this section of the 230kV line is 60m~145m. The height of the new towers shall meet the clearance limit of the airport.

(3) Teak seedling cultivation zone at the east side of Maw Han

There is a teak seedling cultivation zone at the east side of Maw Han, with teak seedlings all over the mountains and plains. These trees are about 1m~1.5m high now. Teak is regarded as the national tree of Myanmar and complex procedures shall be handled before cutting. Therefore, the 230kV line route shall avoid the teak seedling cultivation zone.

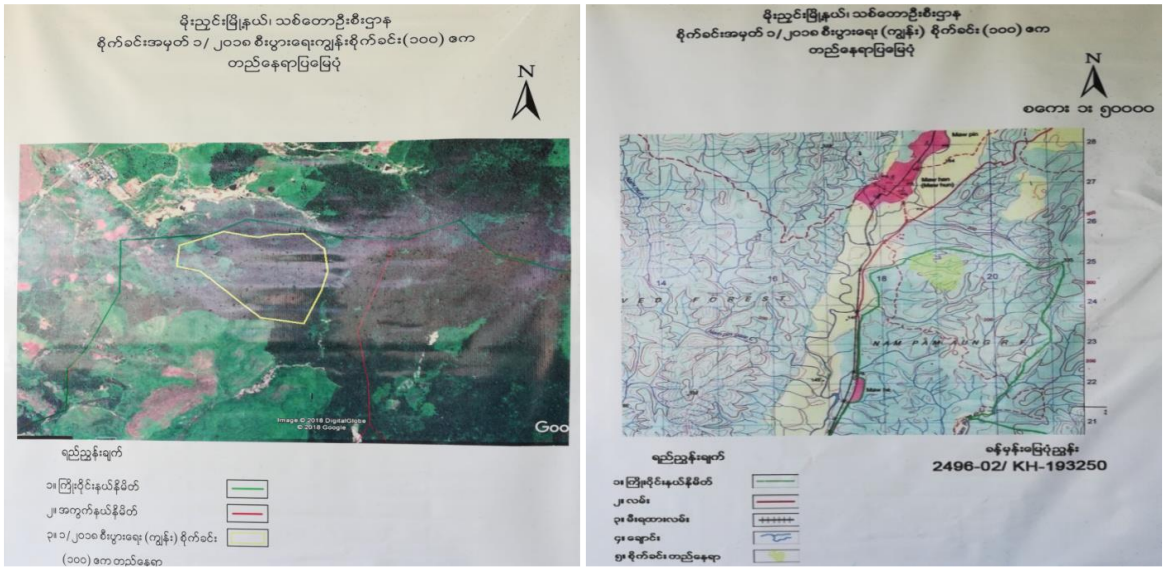


Figure 2.3-6 Scope of Teak Seedling Cultivation Zone

The route schemes of the Project are detailed described as follows:

(1) 230 kV Waingmaw ~ Na Bar line

This 230kV line is southeastward from the 230 kV line bays of Waingmaw Substation, bypasses the city of Myitkyina, and crosses the Ayeyarwady River at the south side of Myitkyina in a westward direction; then the line is mainly parallel with the existing Myitkyina - Mogok - Mohnyin –Na Bar highway and the existing 66 kV line, and then connects to Na Bar 230 kV substation.

1) Waingmaw Substation - East bank of Ayeyarwady River crossing

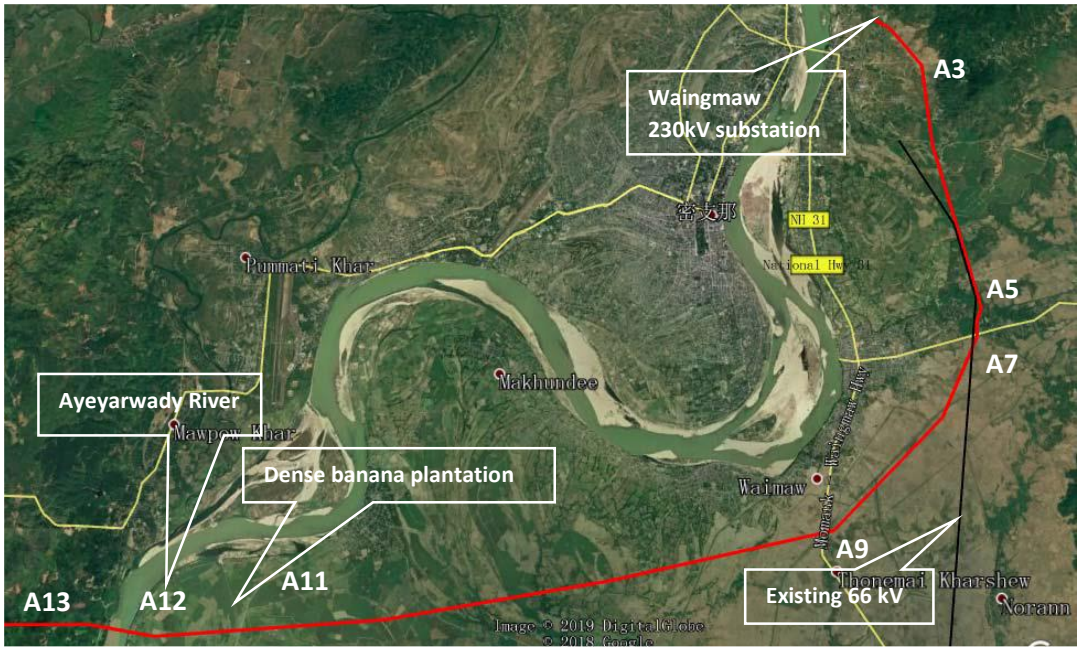


Figure 2.3-7 Line Route of Waingmaw Substation-Ayeyarwady River crossing

This line is southward basically from the outgoing line of Waingmaw Substation, avoids houses and villages at east bank of Ayeyarwady River, crosses large banana planting areas, runs

southward in parallel with a 66 kV line, crosses the military camp at the east side of Sili Khar Village, crosses the 66 kV line and a small river, then crosses large banana planting areas to the east bank of the Ayeyarwady River crossing point (A12).

Figure 2.3-8 Current Situation of Waingmaw Substation

Figure 2.3-9 Dense Banana Planting Areas

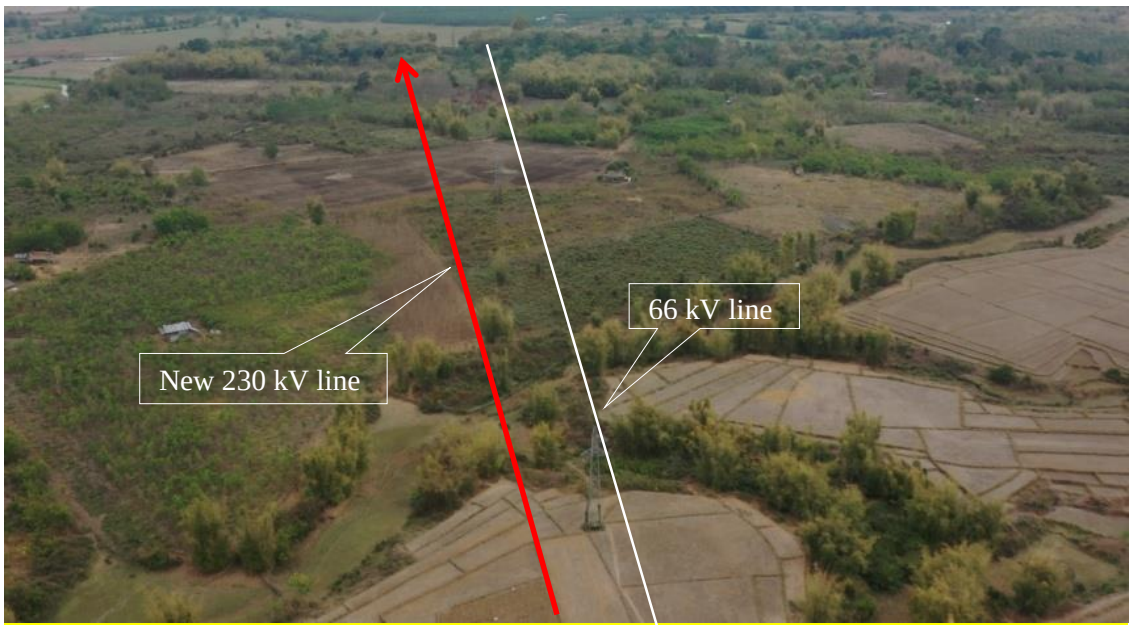


Figure 2.3-10 In parallel with the part of 66 kV Line

Figure 2.3-11 Crossing paddy area

Figure 2.3-12 Crossing Ayeyarawady River

2) Line route from Ayeyarwady River crossing to the north of Mohnyin

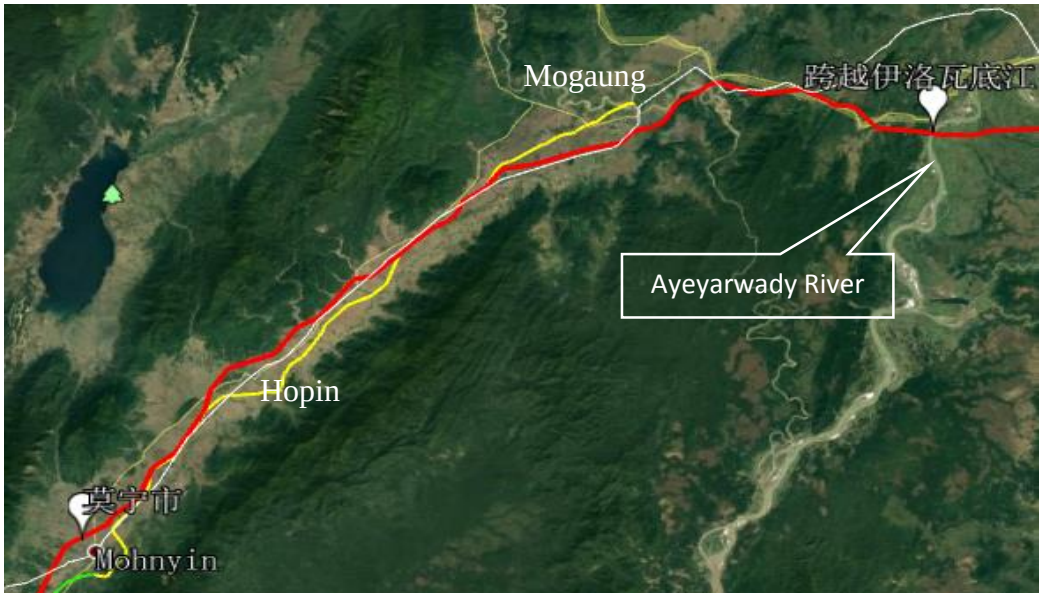


Figure 2.3-13 Line Route from Ayeyarawady River Crossing to North Section of Mohnyin City

The line runs westward for about 7 km after crossing the Ayeyarwady River, then crosses the Myitkyina - Mogok trunk road and the 66 kV Myitkyina - Mogok line, runs basically along the trunk road for about 10 km north-westward, avoids villages, crosses the Myitkyina - Mandalay railway and the Ayeyarwady River branch, runs south-westward for about 10 km to the south side of Mogok City (A32), then runs basically in parallel with the Mogok - Mohnyin trunk road, the Myitkyina - Mandalay railway and the 66 kV Mogok - Mohnyin line southward for about 83 km to the north side of Mohnyin City (A60).

This section of 230kV line intersects and runs parallel with the highway, railway and 66kV line repeatedly.

Figure 2.3-14 Crossing Myitkyina - Mogok - Mohnyin Highway many times

Figure 2.3-15 In Parallel with Existing 66 kV Line

Figure 2.3-16 The Line Crossing Myitkyina - Mandalay Railway

This section of line intersects and runs parallel with the trunk road, railway and 66kV line repeatedly, and there is no need to adopt independent tension sections while crossing the trunk road and railway.

Figure 2.3-17 Crossing Mogaung Chaung

After consulting the personnel of DPTSC, we learned that tall trees are not allowed in the new line corridor, so many tall trees in line corridor shall be cut down.

There are many houses along the new line, especially in convenient transportation area and near rivers area. These houses are mainly residential houses and farmland houses, most of which are made of wooden, and a few are brick houses. The line is mainly in parallel with the highway. When the houses along the line cannot be avoided completely, part of residential houses shall be removed.

Figure 2.3-18 Partial Residential Houses shall be removed along the Line

3) Line route from the north side of Mohnyin to Na Bar 230 kV substation

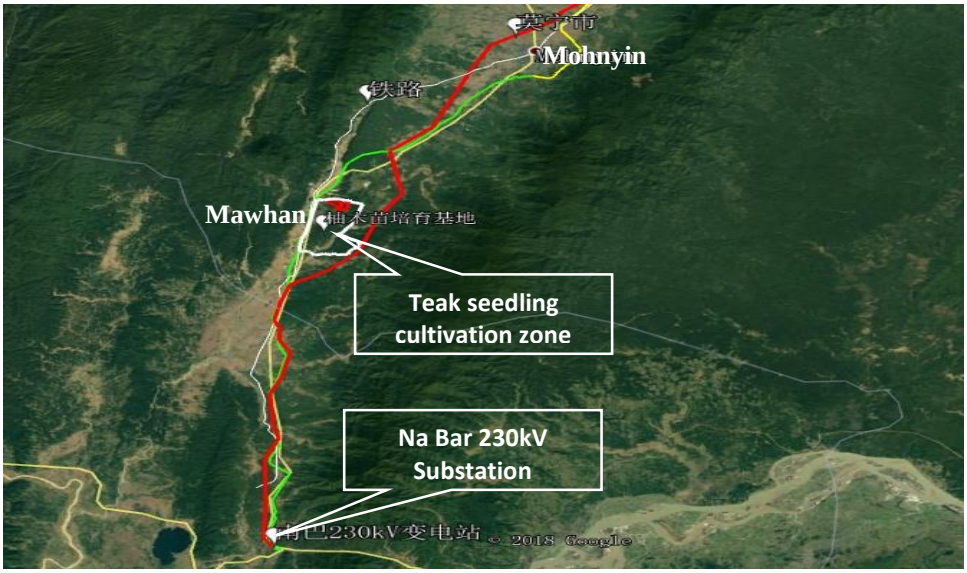


Figure 2.3-19 Line Route from North Side of Mohnyin to Na Bar Substation

The line turns right from the north side of Mohnyin, runs southward at the west side of Mohnyin, crosses railway and runs continuously for about 12 km, then crosses the 66 kV line and avoids teak seedling cultivation zone at the east side of Mawhan, then runs basically in parallel with the 66 kV line and highway, and connects to the Na Bar 230 kV substation.

Figure 2.3-20 Teak Seedling Cultivation Zone

Figure 2.3-21 Large Area of Teak at Both Sides of Highway

Figure 2.3-22 Current Situation of Na Bar 230 kV Substation

The length of 230kV line is 223 km, of which 191 km is in Kachin State and 32 km is in Sagaing Region. Along the line, 50% of the terrain is plain, 40% of that is hilly area and 10% of that is mountainous area. The transportation condition in these areas is of average level.

(2) 132 kV War Shawng "T-point" - Waingmaw line

The 132kV line runs southeastward from the 132V line bay of Waingmaw Substation. The line is basically in parallel with the existing 132kV Waingmaw - Chipwi Nge line, and then connects to the War Shawng "T-point" (No.248 double-circuit tower).

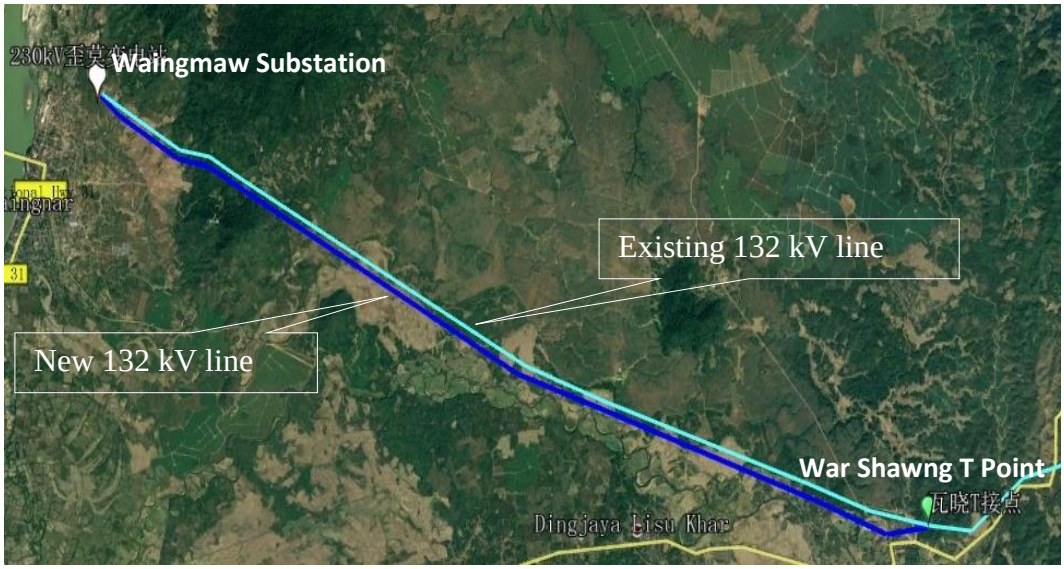


Figure 2.3-23 Schematic Diagram of 132 kV Waingmaw - War Shawng T-connection Line Route

Figure 2.3-24 Current Situation of Waingmaw 132 kV Substation

Figure 2.3-25 132 kV Line in Parallel with the Line

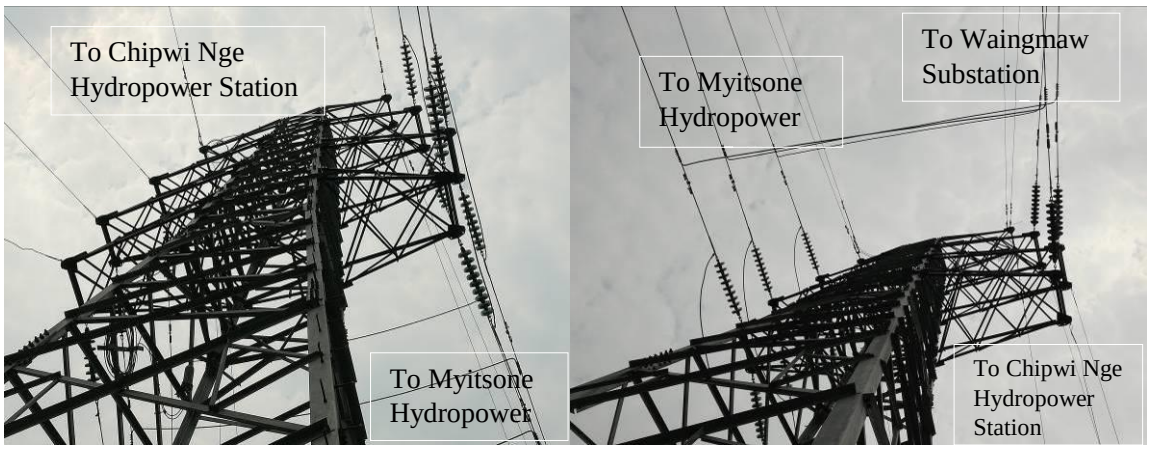


Figure 2.3-26 Current Situation of War Shawng T Point (No. 248 Tower)

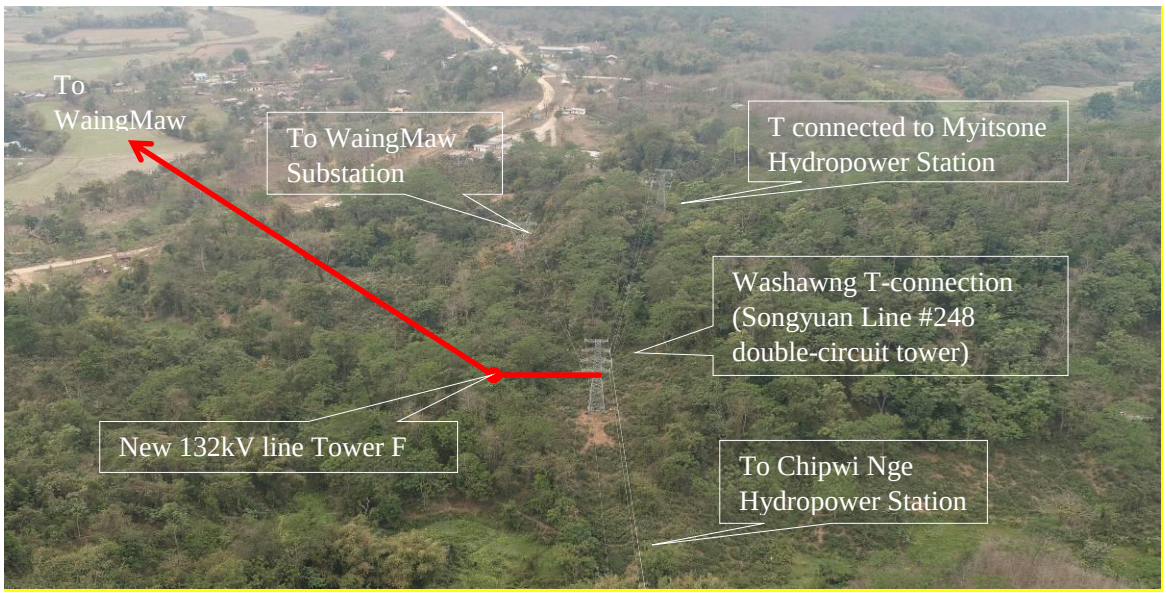


Figure 2.3-27 Line Scheme for New 132 kV Line and War Shawng "T-point"

The overall length of this section of line is 17 km, which is in Kachin State. Along this section of line, 30% of the land is plain, 30% is covered by river network and 40% is hilly area. The transportation conditions in these areas are of average level.

The main overcrossing points along the 230kV and 132kV lines of the Project are shown in the table below.

Table 2.3-1 The main overcrossing points along the 230kV and 132kV lines

S/N	Item through which the line crosses	Qty.	Unit	Remarks
1	66kV power line	12	Times	
2	33kV power line	8	Times	
3	10kV power and communication lines and below	92	Times	
4	Main highway	16	Times	
5	Ordinary road	35	Times	
6	Railway	11	Times	Non-electrified
7	Major rivers	5	Times	Cross navigable river once
8	Ordinary rivers and ponds	37	Times	
9	Ordinary houses (without anyone living inside)	35	Times	
10	Military camps	1	Times	Erect 2 towers in the military camp.

2.3.3 Description of route scheme

(1) Waingmaw ~ Na Bar 230 kV line

The line runs southeastward from the 230 kV gantry of Waingmaw Substation, bypasses the city of Myitkyina, and crosses the Ayeyarwady River at the south side of Myitkyina in a westward direction; then the line is mainly parallel with the existing Myitkyina - Mogok - Mohnyin –Na Bar highway and the existing 66 kV line and connects to the 230 kV gantry of Na Bar substation.

(2) Waingmaw – War Shawng T-off point132 kV line

The line runs southeastward from the 132V gantry of Waingmaw Substation.

It is basically parallel with the existing 132kV line at its south side and connects to the War Shawng T-off point (NO.248 double-circuit tower).

The total length of the above two new lines is 240 km.

2.3.4 Route agreement

The route scheme has preliminarily passed the review of Department of Power Transmission and System Control (DPTSC), and MOEE will complete the confirmation and agreement acquisition of the route scheme.

2.3.5 Investigation and treatment of forests along the line

Along the line, dense vegetation are spread, as well as shrubs and tall trees. The vegetation mainly include shrubs, bamboo, banana trees, camphor trees and large pieces of economic trees, such as rubber trees, teak, banana trees, etc. Teak is regarded as the national tree of Myanmar and complex procedures shall be handled before cutting.

According to the preliminary survey, the width of corridors for 230kV line and 132kV line are temporarily about 50m and 40m respectively, and tall trees and residential buildings should generally be removed from the new line corridor.

Through communication with the Employer, the new lines shall avoid the large area of teak forest, while other tall trees and teaks spread sporadically along the line shall be cleared.

2.4 230kV Waingmaw Substation (Extended)

(1) Location of substation site

Waingmaw Substation is located in the northeast of Myitkyina, Kachin State in the north of Myanmar, with a coordinate of N25°26′1.54″ and E97°26′32.52″. The area expropriated for the substation area is about 40Ha. Now 132kV substation is already put into operation, covering an area of about 1Ha.

The layout plan of the extended Waingmaw Substation is attached in Appendix 2.

Figure 2.4-1 Location of Substation Site

(2) Off-site Transportation and Link to Highway

Figure 2.4-2 and Figure 2.4-3 show the general view of the substation site.

Kachin State is located in the north of Myanmar, where the road conditions are good in condition. The link from the entrance gate at the enclosure of the current site area expropriated to municipal highway in Myitkyina is of a macadam pavement in a length of about 1.9km. It is found out after on-site exploration that this section needs to be locally renovated to meet the requirements on transportation of main transformer.

The gate of the new 230kV substation area faces towards northeast, and the new access road is located in the northeast of the substation area and linked to the existing access roads to substation area. The construction standard of the access road planned meets the requirements on transportation of bulky goods such as main transformer. The access road has a turning radius of 15m while the new access road to substation has a length of 145m.

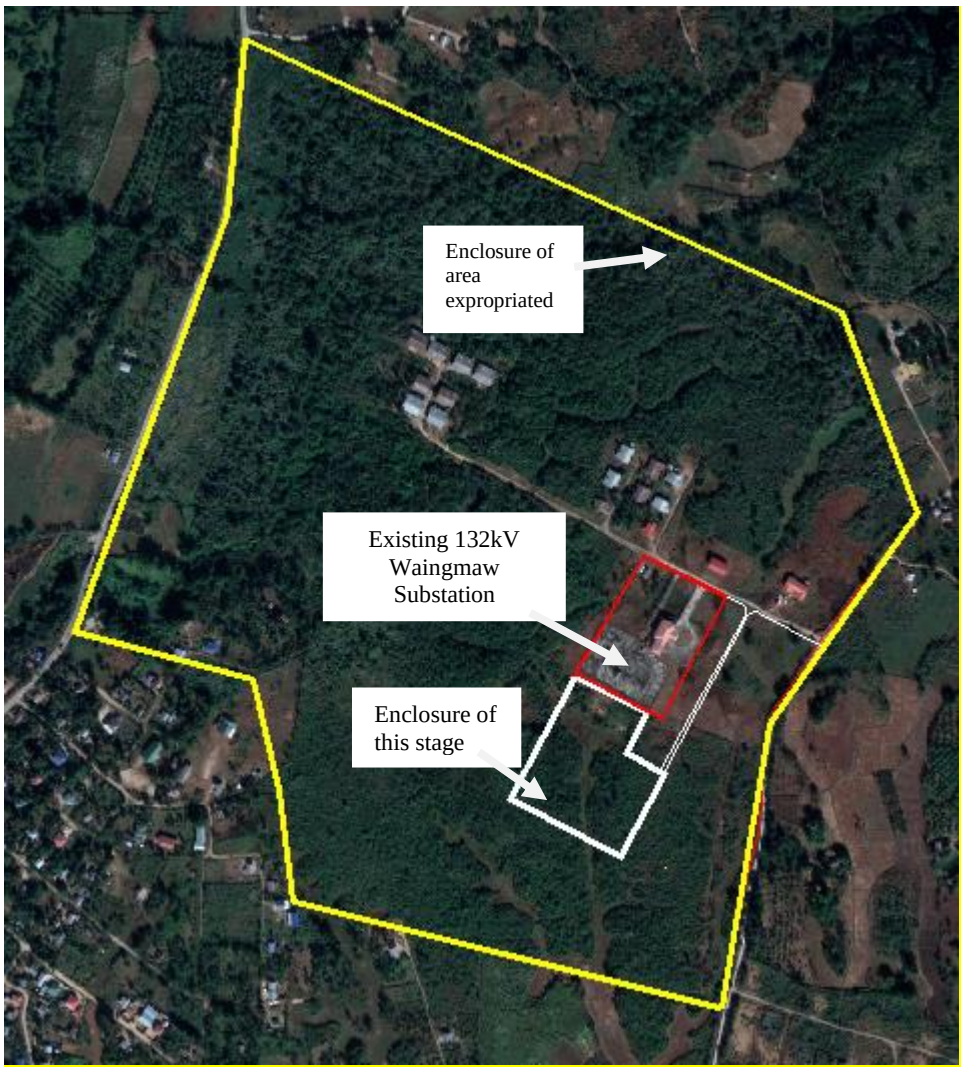


Figure 2.4-2 Scope of Land Acquisition in Substation Area

Figure 2.4-3 General View of Substation Site

Bulky goods such as main transformer can be delivered overland from Tengchong, Yunnan to Myitkyina via Tengchong - Myitkyina Highway.

2.4.1 Engineering Geology, Hydrological Geology and Hydrometeorology

The proposed substation site area has a ground elevation of 99.1~101.9m and the landform is generated from erosion hills, being of a gentle slope.

The overlying strata at the proposed substation site are dominated by Quaternary Holocene fill strata (Q4 ml) and Quaternary Holocene alluvial deposits (Q4al), with lithology represented by plain fill, silty clay, fine sand and pebble. The characteristic value f_{ak} of bearing capacity of foundation soil (rock) is suggested as follows:

② Silty clay: f_{ak}=140~160kPa, Es＝15.8MPa;

③ Fine sand: f_{ak}=140~160kPa, Es＝15.6MPa;

③ -1 Fine sand: f_{ak}=180~200kPa, Es＝22.1MPa;

④ Pebble: f_{ak}=200~250kPa, Es＝50.0MPa;

During the survey, the stable buried depth of groundwater is 4.00~6.00m and perennial maximum buried depth is about 1.00m. Also, the effect of perched water and surface water runoff in rainy season shall be considered.

Groundwater in the proposed site area is considered to be weakly corrosive to the concrete structure and slightly corrosive to the reinforcement in the reinforced concrete structure.

The foundation soil of the proposed station site should be considered as slightly corrosive to the reinforcement in the concrete structure and reinforced concrete structure, and as strongly corrosive to the steel structure.

Soil on proposed substation site is in the type of moderately hard soil and construction site is classified as Class II. The ground motion peak acceleration based on Class II site is 0.20g, the characteristic period of ground motion response spectrum is 0.40s and corresponding basic seismic intensity is of Grade 8, Group II.

Influence of earthquake-induced liquefaction on proposed buildings (structures) does not need to be considered in the proposed substation site area.

The proposed site is generally anti-seismic in terms of buildings on it.

① Plain fill, recommended to be cleared for uneven soil texture.

② Silty clay can be used for bearing strata of natural foundation for ordinary and important buildings (structures) of the substation to be built.

③ Fine sand can be used for bearing strata of natural foundation for ordinary and important buildings (structures) of the substation to be built.

④ Pebble, although with good engineering properties, is not suitable for bearing strata of natural foundation for the buildings (structures) to be built due to its greater buried depth.

Unfavorable geological processes such as landslide, unstable rock, collapse, debris flow, karst, goaf and land subsidence are not found on the proposed site. The perennial minimum temperature in the proposed substation site area is higher than zero, so influence of frozen soil on substation does not need to be considered.

After analysis and statistics of measured data series of many years obtained from Myitkyina Meteorological Station, it is suggested that basic wind pressure in the Project will be taken as

the minimum design wind pressure specified in MNBC, i.e. 0.48kN/m2, and corresponding design wind speed will be 27.9m/s.

After analysis, the substation site will not be influenced by 100-year return flood and water logging from Ayeyarwady River, Makaw Hka and mountain torrent ditch in southeast. It is suggested that the ground elevation on substation site shall not be lower than the ground elevation of the existing 132kV substation area in order to prevent influence of the rainwater on ground of the existing 132kV substation site.

2.4.2 Main Technical Scheme

The 230kV switchgear expansion in Waingmaw 132kV Substation will be designed as AIS substation, double busbar connection will be adopted for the 230kV switchgear; single busbar with section connection will be adopted for the 132kV switchgear. Outdoor single-phase on-load tap changing auto-transformer is to be adopted; outdoor AIS devices are to be adopted for 230kV and 132kV switchgear.

The open hierarchical distributed network structure consisting of substation control layer and bay layer is to be adopted for the entire substation, where communication protocol IEC61850 is to be adopted in the entire substation, and complete interoperation can be realized between different systems. The 230kV line protection and busbar coupler protection shall be configured independently from measuring and controlling systems. The 132kV line shall be configured independently from measuring and controlling systems and laid out in the main control room.

The substation is designed as a manned substation.

The 230kV switchgear is laid out in the southeast of the substation area, with outgoing line towards to the east; single-phase on-load tap changing auto-transformer is adopted , they are located in middle of the substation area; the expanded 132kV switchgear is located in the northwest of the substation area, with outgoing line towards to the west. The new230kVcontrol building is located in the southeast of the existing 132kV control building. Refer to Figure 2.4-4 for general layout design sketch of the substation area.

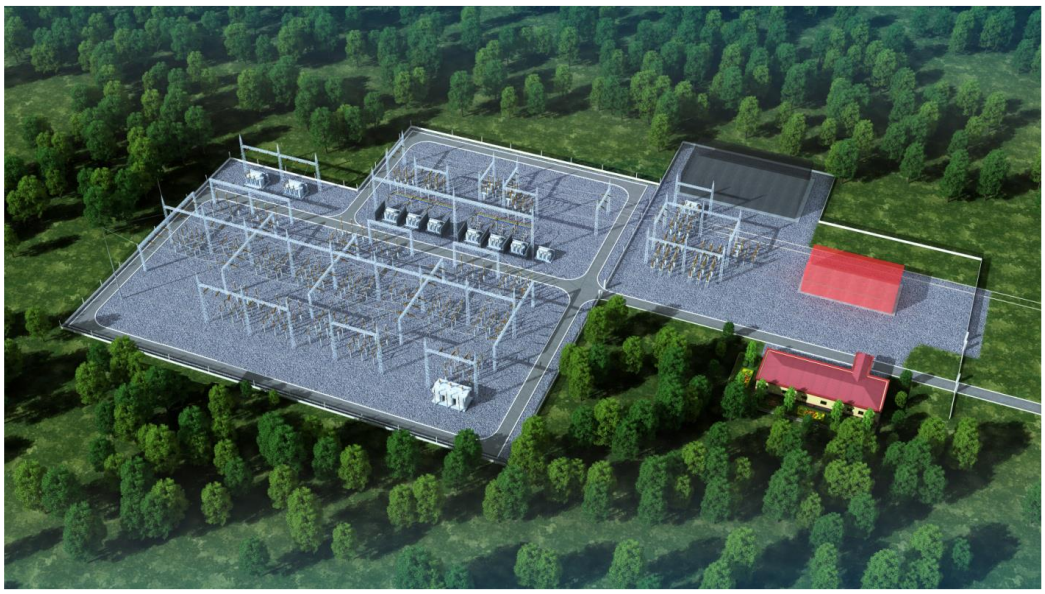


Figure 2.4-4 General Layout of the substation

The substation will be laid out on a gentle slope according to the topography and landform of the substation site and the drainage conditions in the existing 132kV substation, where the center area of 132kV site will be at the same elevation as that of the existing 132kV area, i.e. 101.25m. Decentralized drainage system is to be adopted. The whole expansion area will be divided as two slopes with a gradient of 0.5% from the main transformer road to the northwest side and southeast side. The design elevation at the lowest point in the substation shall be 101.23m.

The new 230kV main control building has two stories, where main control room, battery room, office rooms etc. are planned on the upper story, while the lower story is of a 1.5m high story for laying of cables. Frame structure with reinforced concrete sloping roof and independent foundation will be used for 230kV main control building, in an architectural pattern and color matched with the original 132kV main control building, to highlight the uniformity of buildings.

Natural foundation is to be adopted in this Project. Rubble concrete is to be filled under those foundations which are failing to reach the bearing strata due to site filling.

2.4.3 Construction Scale

Currently, Waingmaw Substation is of a 132kV substation. By now, 1 set of 60MVA main transformer (132/66/11kV) has already been put into operation, where there are two 132kV bays and 1 outgoing line (110kV,to Chipwi Nge HPP) completed subject to single busbar system; one 66kV outgoing line subject to single busbar system; 3Mvar capacitor.

In this project, 2 sets of 125MVA transformers with a rated voltage of 230/132/11 (kV) are to be expanded in this substation.

2.4.4 Parameters of Main Transformer

Model of main transformer: single-phase on-load tap changing auto-transformer

Capacity: 3×41.7MVA

Capacity ratio: 100/100/30

Rated voltage: 230/ □10□1.25%/132/ /11kV

Impedance voltage: Ud%=9;

Group: Iao+io (YNyn0+d11)

2.4.5 Scale of Outgoing Line

(1) There are 2 outgoing lines to be added in this project for 230kV Waingmaw Substation, and conditions for the other 2 outgoing lines will be reserved.

(2) In this project, there is one outgoing line to be added to connect to Chipwi Nge HPP, which takes up the existing 132kV spare bay in Waingmaw Substation.

2.4.6 General Layout of Substation Area and Transportation

The substation site is located in Myitkyina, Kachin State, northern Myanmar, 7.5km northeast of downtown Myitkyina and 1.2km west of Ayeyarwady River. The gate of the substation site faces northeast, and the access road is located on the northeast side of the substation area, leading to the existing access road in the substation area, with a turning radius of 15m and a newly built access road of 145m.

230kV switchgear is located on the southeast side and 230kV lines are outgoing to the southeast. 132kV switchgear is located on the northwest side, connected to the existing132kV busbar and 132kV lines for future are outgoing to the northwest. The new 132kV Chipwi II line bay will occupy the existing spare 132kV line bay.

The expansion substation site is in a gentle slope, with the regional terrain inclining from northwest to southeast and ground elevation of about 99.1~101.9m, currently covered with weeds and shrubs. According to site conditions, electrical layout requirements and plot division requirements, the substation is in a north-south arrangement, and the gate opens to the northeast.

This project covers an area of 2.0 hectares within its fence. The main building and structures to be built In this project include: 230kV control building, 230kV main transformer gantry and main transformer foundation, 230kV Shunt reactor foundation, 230kV & 132kV gantries and equipment supports, 230kV capacitor bank foundation, roads within the substation area, fence, gate and access roads.

According to general layout plan of the substation site and requirements on general electrical layout and under the comprehensive consideration of local environmental factors, the scheme below is applied for the general layout of the substation site:

In the general layout, the substation is divided into 3 functional zones: The 230kV switchgear is arranged on the southeast side and outgoing lines lead to the southeast; the main transformers and 132kV switchgear are arranged on the southwest side, close to the existing 132kV switchyard; 230kVmain control building is located on the northeast side facing to the existing 132kV control building. Ring road system is set up around 230kV switchgear and main transformers and 132kV switchgear. The entrance gate is located at the northeast side of the new fenced substation area and connects to the access road in the existing substation area to the northeast.

The fence is of steel wire fence with the height of 2.4m. The gate is made of iron with the height of 2.4m and width of 6m.

The ground around the 230kV main control building will be hardened and used as parking lot. Gravels will be laid on the surface of exposed switchgear areas.

2.4.6.1 Elevation Layout

The substation will be laid out on a gentle slope according to the topography and landform of the substation site and the drainage conditions in the existing 132kV substation, where the center area of 132kV site will be at the same elevation as that of the existing 132kV area, i.e. 101.25m. Decentralized drainage system is to be adopted. The whole expansion area will be divided as two slopes with a gradient of 0.5% from the main transformer road to the northwest side and southeast side. The design elevation at the lowest point in the substation shall be

101.23m.

As the newly-built substation area cuts off the gully on the west side, it hinders the flood discharge on the slope. In order to prevent the substation site from blocking and storing flood on slope land, a flood intercepting ditch will be excavated on the west side out of the substation site to connect the northwest section of the original gully to the southwest gully for safe flood discharge.

2.4.6.2 Layout of Trenches

Trenches in the substation area are mainly cable trenches and drainage trenches. Drainage trenches are arranged along the inner side of roads in 230kV and 132kV switchgears.

According to electrical requirements, the main sections of cable trench in the substation area are, 1.2m×1.2m, 1.1m×1.0m, 0.8m×0.8m. Cover plate of the cable trench at the site is 150mm above the ground, to prevent muddy water from flowing into the trench. Where cable trenches crossing the road, the cast-in-situ cable tunnel is applied. The top plate of the tunnel is at the same level of the pavement. The bottom of the trench will set a gradient of 0.30% and rain water in trench will discharge to the drainage system.

The cable trench is made of reinforced concrete, and the cover plate is made of prefabricated reinforced concrete with a thickness of 50 mm. Steel supports for cables are used and exposed iron parts are all galvanized for corrosion prevention.

2.4.6.3 Road and switchyard surface

(1) Access road

The access road is located on the northeast side of the substation area, connected to the existing access road to the north. The newly built access road is made of concrete, with length of 145m, width of 4.5m, and the turning radius of 15m.

(2) Road inside the substation

Pavement of the roads inside the substation will be concrete. The road edge elevation is about 150mm higher than the ground surface. The main road inside the substation, i.e. the main transformer transportation road is 4.5m wide with a turning radius of 9m, while the other roads are 4.0mwide with the turning radius of 7m.

The cable trench in the switchyards can also be used as a patrol footway.

(3) Treatment of switchyard surface

All exposed ground surface of switchgear areas in the substation will be covered with 100mm thick gravels.

2.4.6.4 Buildings of the Substation

Table 2.4-1 Table of Building

S/N	Description	Building storey/height (m)	Building area (m^2)
1	230kV main control building	2/6.55	884.1
Total			884.1

1) 230kV Main Control Building

The 230kV main control building is a two-story building with a length of 36.9m and a width of 15.0m. The height of the ground floor is 1.5m, the height of the first floor is 4.0m, and the elevation difference between ground floor and outdoor ground surface is 0.3m. The ground floor is for cables laid. There are main control room, battery room, conference room, office, tool room, washroom and corridor in the first floor.

The building decoration standard of 230kV main control building is referred to the existing 132kV main control building. The building interior decoration standard is as follows:

Table 2.4-2 List of 230kV Main Control Building Decoration

Room name /Fit-out materials	Flooring	Inner wall surface	Ceiling
Main control room	Antistatic removable floor	Emulsion paint for interior wall Aluminum Shielding mesh	Suspended ceiling of gypsum plaster board
Battery room	Acid resistant floor tile ground	Emulsion paint for interior wall	Suspended ceiling of gypsum plaster board
Other rooms	Ordinary tile floor	Emulsion paint for interior wall	Suspended ceiling of gypsum plaster board
Washroom	Ordinary antiskid floor tile	White tiles, high to the top	Aluminum plastic gusset ceiling

Doors and windows: The doors of main control room and battery room are steel fire doors, and doors of other room are wooden doors. The windows are double hollow glass aluminum alloy windows.

Roofing: 3mmSBS flexible double-layer waterproofing will be used.

2) Main Construction Materials

2-1) Cast-in-situ Reinforced Concrete Structure

Concrete: C25, C30 and C35 are used for general cast-in-situ reinforced concrete structures and foundations; C15 is used for plain concrete cushion.

Reinforcement: grade HPB300, grade HRB400E.

2-2) Masonry Structure

Brick: Local type bricks are used, with grades of MU7.5, MU10 and MU15.

Mortar: M7.5, M10.

2-3) Steel Structure

Steel: Q235B, Q355B.

Bolt: 4.8, 6.8, 8.8 grades.

2.4.7 Structures

2.4.7.1 Building

The 230kV main control building is of reinforced concrete frame structure with four slopes reinforced concrete roof. The foundations are reinforced concrete spread foundations.

2.4.7.2 Gantry and Equipment Supports

The outdoor gantry column adopts rectangular section angle steel lattice column, and the joint is connected by bolts. The beam is a rectangular section angle steel lattice beam, the joint is connected by bolts, and all iron parts are galvanized for corrosion protection.

Angle steel of Grade Q355B is adopted for 230kV gantry main members and Q235B is adopted for secondary and auxiliary members. Angle steel of GradeQ235B is adopted for 132kVgantry. The gantry column and foundation are connected by anchor bolts.

The equipment support column adopts rectangular section angle steel lattice column, the joint is connected by bolts, the steel is Q235B, and all steel members are hot galvanized for corrosion prevention. The support column and foundation are connected by anchor bolts.

2.4.7.3 Foundation of All Building and Structures in the Substation

Natural ground foundation is adopted for this project, and rubble concrete will be placed under foundations which cannot reach the bearing ground layer locally. The reinforced concrete spread foundation will be used for foundations of the 230kV main control building. There enforced concrete foundation with oil collection pit will be adopted for main transformer foundation. Reinforced concrete strip foundation shall be adopted for the foundation of main transformer firewall. Reinforced concrete spread foundation will be used for the foundation of gantry and equipment support.

2.4.7.4 Corrosion Prevention for All Building and Structures in Substation

Groundwater in the proposed site area is considered to be weakly corrosive to the concrete structure, and slightly corrosive to the rebars. The foundation soil in the proposed site area is considered to be slightly corrosive to the concrete structure and the reinforcement in the reinforced concrete structure.

Therefore, no anticorrosion treatment is required for the foundation of all building and structures in the substation.

2.4.8 Conditions for Water Supply and Drainage in Substation Area

2.4.8.1 Water Source

According to investigation, there is a well with a diameter of 120mm and a depth of 13m in the substation. The underground water extracted from the well is used for the production and living water of the substation.

Domestic water for the new 230kV control building can be led from the well.

2.4.8.2 Existing Drainage Conditions

There is a gully on the south side of the substation site, with a width of about 20m and a depth of about 1m. Some rainwater in the substation drains into the gully, and the remaining rainwater drains into the newly-built flood intercepting trench on the west side of the substation site.

2.4.9 Water Supply System

2.4.9.1 Calculation of Water Consumption

Water consumption in the substation is mainly domestic water consumption.

The substation is attended, with fewer daily operators and only domestic water will be used, so the domestic water consumption is very small.

2.4.9.2 Water Supply System

Due to small consumption of domestic water in the substation, pipes are arranged in a branch-shaped mode.

2.4.9.3 Pipe Laying Mode

Outdoor pipes for domestic water supply are made of DN50 composite steel pipes with plastics inside and outside and bolts are used for connection. PP-R water supply pipe is adopted for indoor domestic water supply pipe, which is hot melt connected and concealed.

2.4.10 Water Drainage System

2.4.10.1 Drainage Mode

Drainage system in the substation includes domestic drainage system, accident oil discharge system and rainwater drainage system.

Separate flow of rainwater and wastewater is set for water drainage in the substation. Part of the rainwater in the sub-station drains into the gully on the south side of the substation site along the roadside gully, and the remaining rainwater drains into the flood intercepting trench on the west side of the substation site.

2.4.10.2 Drainage of Domestic Sewage

Domestic sewage from the substation is discharged into septic tank and cleaned regularly.

2.4.10.2 Accident Oil Discharge of Oil-Containing Electrical Equipment

An accident oil pool with oil isolation function is adopted for accident oil drainage of the main transformers and shunt reactors. The waste oil is blocked in the accident oil pool and transported to the designated place by a special transport vehicle.

2.5 Design Description for Transmission Line

2.5.1 Normative References

All relevant technical specifications and standards such as IEC, ASTM are to be read in conjunction with this specification. In cases of conflict, the provisions of bid document shall take precedence. Unless otherwise stated, the latest revision, edition and amendments shall apply.

2.5.2 Design wind speed

According to the data of basic wind speeds given by Myanmar National Building Code (MNBC, 2016) PART 3, the gust speed (10m from the ground, 3s and 50-year return) in Myitkyina and Bamaw areas is 70mph (31.29 m/s), which is the basic wind speed adopted in the architectural design.

According to the technical requirement of DPTSC, the maximum wind speed 35m/s (10m from the ground, 3s and 50-year return) shall be used for the new 230kV and 132kV of the Project.

2.5.3 Summary of design meteorological conditions

The design meteorological conditions to be used for the Project are shown in the following table:

Table 2.5-1 Design Meteorological Conditions

Item	Temperature (°C)	Wind speed (m/s)	Icing thickness (mm)
Maximum temperature	45	0	0
Minimum temperature	10	0	0
Average temperature	25	0	0
Basic wind speed	10	35	0
Installation	10	10	0
Maximum conductor temperature	75	-	-
Thunderstorm days (d)	50		

Note: 1. the basic wind speed in the above table is the 3s gust (10m from the ground, with 50-year return).
2. The wind pressure of conductor is 700N/mm2, and the wind pressure of 900N/mm2 is only used for tower loading calculation.

2.5.4 Type selection of conductor

According to the requirements of MOEE, in addition to meeting the transmission capacity requirements of the Project, the conductors of the new 230 kV lines and 132 kV lines in the Project shall be consistent with those of the planned 230 kV and 132 kV power grid in the north of Myanmar, 2x400mm^2 sectional area and 1x240mm2sectional area of ACSR conductor shall be respectively used.

According to the technical requirement of DPTSC, Two TERN-ACSR conductors shall be used for the 230 kV line conductor of the Project. The two subconductors are arranged horizontally with a spacing of 400mm and fixed by spacers in the middle. Single FLICKER-ACSR conductor shall be used for the 132kV conductor of the Project.

2.5.5 Type selection of ground wire/OPGW

According to the communication requirements and the actual conditions of Myanmar National Power Grid, one 48-core OPGWand one 20-SA-19/2.6ACS are used for the new 230 kV line, and one 24-core OPGW and one 20-SA-19/2.6ACS are used for the new 132 kV line.

OPGW will be grounded with special ground wire.

2.5.6 Anti-vibration measure

The new 230kV line of the Project crosses the highway, railway, 66kV line, etc. for many times, so the FR type damper which has strong anti-slip ability shall be used.

The anti-vibration scheme of OPGW shall be supplied by the OPGW Supplier.

2.5.7 Parameters of conductor and ground wire

Table 2.5-2 List of Conductor Parameters

Model	Conductor	
	TERN-ACSR	FLICKER- ACSR
Aluminum section (mm^2)	403.77	241.7
Steel section (mm^2)	27.83	31.67
Total section (mm^2)	431.60	273.1
Outer diameter (mm)	27.0	21.5
Elastic modulus (N/mm^2)	66600	73000
Expansion coefficient (1/°C)	21.12×10^{-6}	19.6×10^{-6}
Calculated weight (kg/m)	1.34	0.915
Rated tensile strength (kN)	98.7	76.5

Table 2.5-3 List of Ground Wire Parameters

Model	Ground Wire
	20-SA-19/2.6ACS
Aluminum section (mm^2)	25.22
Steel section (mm^2)	75.66
Total section (mm^2)	About 108.8
Outer diameter (mm)	13.0
Elastic modulus (N/mm^2)	147200
Expansion coefficient (1/°C)	13.0×10^{-6}
Unit weight (kg/m)	0.674
Rated tensile strength (kN)	121.66

Table 2.5-4 List of OPGW Parameters

Item	Unit	OPGW
Optical cable structure		Loose sleeve structure, layer-stranded
Outer diameter of optical cable	mm	14.25
Unit weight	kg/km	About 485
Nominal cross section area	mm^2	About 115
Rated tensile strength (RTS)	kN	71.2
Elasticity modulus	kN/mm^2	97700
Linear expansion coefficient	$\times10^{-6}/^oC$	17.3×10^{-6}
DC resistance at 20°C	Ω/km	≤0.4
Short-circuit current capacity allowed (40°C~200°C)	$kA^2\cdot s$	≥100
Quantity of fiber cores		230kV:48 132kV:24
Diameter of outermost single wire	mm	≥3.0

Note: the above parameters of OPGW are only design values, and the specific parameters shall be supplied by the OPGW Supplier.

2.5.8 Electrical clearance

The elevation along the entire line route of the Project is below 500m.

Referring to the relevant regulations of IEC standards, the minimum gap between the live part of the strings and jumper and the tower components should not be less than the following values:

Table 2.5-5 Minimum clearance between live part and tower components

Nominal voltage (kV)	230	132
Power frequency overvoltage (m) Max. wind speed case	0.55	0.30
Lightning overvoltage (m) Reduced wind speed case	2.10	1.10

Note: under nil wind case, the minimum clearance between the live part and tower component will be 2.4m.

2.5.9 Insulators

2.5.9.1 Selection of mechanical strength of insulator

According to the relevant calculation of insulator strings and the technical requirements of DPTSC, the mechanical strength of insulators used for the 230 kV line and 132 kV line in the Project are as follows:

Table 2.5-6 Mechanical Strength of Insulator for 230 kV Line

Insulator string	Mechanical strength of 230kV insulator
Conductor suspension insulator string	120 kN porcelain insulator, I-type string
Conductor tension insulator string	2 × 120kN porcelain insulator
Jumper insulator string	120 kN porcelain insulator, I-type string
Ground wire insulator string	70 kN porcelain insulator

Table 2.5-7 Mechanical Strength of Insulator for 132 kV Line

Insulator string	Mechanical strength of insulator
Conductor suspension insulator string	70 kN porcelain insulator, I-type string
Conductor tension insulator string	1 × 100 kN porcelain insulator
Jumper insulator string	70 kN porcelain insulator, I-type string
Ground wire insulator string (just for gantry)	70 kN porcelain insulator

2.5.10 Ground wire insulator

One OPGW and one aluminum clad steel wire are used for the ground wire of the new 230kV and 132kV lines in the Project, and they shall be reliable grounding on each tower and no insulator is needed. UE70CN insulators are used for the ground wire tension string on the substation gantry in order to separate them from the grounding devices of the substation.

Table 2.5-8 Main Mechanical and Electrical Characteristics of Ground Wire Porcelain Insulators

Insulator type	Main dimension			Electromechanical characteristics		Mechanical breaking load (kN)	Weight (kg)
	Height (mm)	Disc diameter (mm)	Creepage distance (mm)	Power frequency wet flashover discharge voltage (kV)	Power frequency breakdown voltage (kV)		
UE70CN	200	160	160	30	110	70	4.2

2.5.11 Lighting protection design

According to the records of the annual thunderstorm days of the meteorological stations along the line, the lightning damage near the high-voltage line of the Project is relatively serious, and the designed annual average thunderstorm day is 50 days/year. Double ground wires shall be used along the whole line for lightning protection, and the ground wires shall be directly grounded.

According to the technical requirements of DPTSC, the main lightning protection measures to be used in the Project are as follows:

(1) Two ground wires shall be installed on the top of 230kV and 132kV towers which the shielding angle should not be larger than 15°.

(2) Under the annual average temperature and nil wind cases, the sag of ground wires should not be larger than sag of conductor

2.5.12 Grounding design

All towers should be reliably grounded.

The galvanized round steel with a diameter of 12mm shall be used for grounding electrode, counterpoises and down lead wire in the Project.

There are some hills and mountains along the line of the Project. In some areas it is necessary to add galvanized round steel with a diameter of 20mm as ground rods.

The type of the grounding device equipped for each steel tower shall be determined in detailed design drawings according to the field soil resistivity.

It is recommended each tower ground resistance within the distance of 3 km from the substation shall be kept below 10Ω; other tower ground resistance shall not be more than 15Ω.

2.5.13 Grounding type of OPGW and ground wire

OPGW is grounded by using dedicated grounding wire on every tower. The ground wire (ACS 20-SA-19/2.6) shall be directly grounded.

2.5.14 Clearance to ground and crossing distance

According to the technical requirement of DPTSC, the distance from the conductor to the ground and other facilities shall comply with the values listed in following table.

Table 2.5-9 Minimum Distance Between Conductor and Railways, Roads, Rivers, Buildings, Overhead Lines, etc.

Description	Unit	230kV	132kV
Normal ground	m	10.0	8.0
Ground in populated areas	m	10.0	8.0
Roads and streets	m	10.0	8.0
Grown trees	m	4.7	4.0
Residential or other buildings	m	7.2	6.0
Power lines (above)	m	4.0	3.5
Telecommunication lines	m	4.0	3.5
Railways	m	12.0	9.0
Horizontal distance to buildings	m	10.0	8.0
Navigable river		20m above the highest flood level	20m above the highest flood level
Non-navigable river		5.0	4.0

2.6 Towers

2.6.1 Types of Towers

The towers of the Project have been planned according to the common practices of local power companies in Myanmar. Tower member and connection design will be according to ASCE 10-97. PLS-tower software will be used in tower design.

Planning of tower

(1) New 230kV Waingmaw-Na Bar line

According to the requirement of this project, double circuit self-support lattice tower will be used and 7 kinds of tower are planned. The line is designed with 3 types of suspension tower, 3 types of tension tower and 1 type of transposition tower are designed.

Service conditions of each type of tower are shown below:

Table 2.6-1 Design Parameters of 230kV Line Towers

Tower type	Nominal height range (m)	Horizontal span (m)	Vertical span (m)	Remarks
230-DS1	23-39	400	600	0°
230-DS2	26-44	550	800	0°
230-DSC	23-74	700	1400	0°
230-DT1	23-44	450	650	0～30°
230-DT2	23-32	450	650	30～65°
230-DTT	23-26	600	1000	（0～40°including terminal）
230-DTP	26	450	650	0~20° (transposition tower)

The application of towers along the 230kV transmission line are shown in Table 2.6-2.

Table 2.6-2 Application of Towers along 230kV Line

Item	Double-circuit suspension tower	Double-circuit tension tower	Total
Qty. (reference)	494	88	582
Percentage (%)	84.9%	15.1%	100%
Indicator per km	2.22	0.39	2.61

Note: The indicator per km mentioned in the table above is calculated with 223km given.

Table 2.6-3 shows the weight of tower.

Table 2.6-3 Tower weight for 230kV Line

No.	Tower Type	Height (m)	Unit Weight (t)
1	230-DS1	23	11.202
		26	11.960
		29	12.809
		32	14.126
		35	15.087
2	230-DS2	26	13.483
		29	14.970
		32	15.930
		35	17.015
		38	17.902
		41	19.012
		44	20.190

3	230-DSC	23	15.473
		44	24.177
		68	60.363
		74	66.925
4	230-DT1	23	18.503
		26	20.528
		29	21.846
		32	23.336
		35	24.571
		44	25.718
5	230-DT2	23	22.154
		26	24.584
		29	26.165
		32	27.954
6	230-DTT	23	26.282
		26	29.140
7	230-DTP	26	35.163

(2) New 132kV War Shawng T-point - Waingmaw Line

The line is designed with the requirement of this project, single circuit self-support lattice tower will be used and 4 kind of tower are planned.

Table 2.6-4 Design Parameters of 132kV Line Towers

Tower type	Nominal height range (m)	Horizontal span (m)	Vertical span (m)	Remarks
132-SS	15-45	500	1000	0°
132-ST1	15-33	550	700	0-20°
132-TT	24	300	450	0-35°（Terminal Tower)
132-FT	24	200	450	60-80°（T-connection tower）

The application of towers along the 132kV transmission line are shown in Table 2.6-5.

Table 2.6-5 Application of Towers along 132kV Line

Item	**Double-circuit suspension tower**	**Double-circuit tension tower**	**Total**
Qty. (reference)	34	11	45
Percentage (%)	75.6%	24.4%	100%
Indicator per km	2.00	0.65	2.65

Note: The indicator per km mentioned in the table above is calculated with 17km given.

The weight of single foundation of each type of tower is shown in the following table:

Table 2.6-6 Tower weight for 132kV Line

No.	**Tower Type**	**Height (m)**	**Unit Weight (t)**
1	132-SS	15	4.320
		18	11.960
		21	5.110
		24	5.490
		27	6.030
		30	6.390
		36	7.500
		39	8.560
		42	9.330
		45	10.400

2	132-ST1	15	5.570
		18	6.400
		21	6.570
		24	7.300
		33	10.030
		41	19.012
		44	20.190
3	132-TT	24	10.200
4	132-FT	24	16.330

2.6.2 Steel

The tower is composed of angle with equal legs and steel plate, and the material for tower is Q420B, Q355Band Q235B.

The properties of the steel types are indicated in Table 2.6-7 below:

Table 2.6-7 The properties of the steel types

No.	Steel Quality	Type	Yield strength (N/mm^2)	Ultimate strength (N/mm^2)
1	Mild steel	Q235B	235	370
2	High tensile steel	Q355B	355	470
3	High tensile steel	Q420B	420	520

2.6.3 Bolts nuts and washers

All bolts will be of grade 5.6 and 8.8 conforming to ISO 898;

All bolts will be with one flat washer conforming to DIN 126 or BS 4320 and one spring lock washer conforming to DIN 127, except for indicated otherwise.

2.6.4 Tower anticorrosive

All steel, will be galvanized at the manufacturer's premises by means of hot dipping minimum thickness grade 85.

All bolts, nuts and washers, will be galvanized at the manufacturer's premises by means of hot dipping minimum thickness grade 55.

2.6.5 Design slenderness ratios

The following slenderness ratios (L/R) of member will not be exceeded, where "L" is the buckling length of member, and "R" is the corresponding radius of gyration of the members:

- Main leg, stub and main compression members in cross arm L/R <120
- All other members having computed stresses L/R <200
- Redundant members without computed stressed L/R <250
- Tension members only L/R <300

2.6.6 Construction

Minimum thickness (t) and size of steel members of towers will be as follows: The minimum member dimension of tower is 45mm x 45mm x 5mm. Main leg, gusset plates, stub and main compression members in cross arm will not be less than 6 mm thick. All other members having computed stresses will not be less than 5 mm thick.

2.6.7 Anti-climbing Devices, Step Bolts and Bird Guards

Each tower will be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device will be fixed at a height of approximately 3 meters above the foundation. It will provide suitable lockable gates adjacent to the step bolt legs.

The step bolts will be provided on one tower leg only for single circuit tower.

They will begin directly above the ant climbing device and continue to the tower top. In the case of double circuit towers, two diagonally opposite legs will be equipped with step bolts and shall extend to the underside of the top cross arm.

They will be spaced at a distance of 400mm from center to center, distributed strictly alternating on the outer sides of the leg angle. The spacing distance of all step bolts will be equal on the entire tower.

Tower members positioned above insulator strings will be fitted with stainless steel needle strips, effectively preventing birds from sitting in these locations. The strips will extend sufficiently, horizontally beyond the protected location and be applied to all surfaces a bird can sit on.

2.7 Foundation

2.7.1 Overview of geological condition

New 230kV Waigmaw – Na Bar Line

The landform along the line, include plains in most parts and river network and low mountains and hills in some parts. The overburden along the line mainly comprises silt, clay, fine sand and sandstone.

During survey the groundwater level is 2.00m-6.00m below the ground in the plain sections, while the perennial maximum water level reaches the surface level. The groundwater level in the hilly sections is 4.00m-10.00m below the ground and the perennial maximum water level is about 3.00m below the ground.

New 132kV War Shawng "T-point" - Waingmaw line

The landform along the line, include plains in most parts and river network and low mountains and hills in some parts. The overburden along the line mainly comprises silt, clay, fine sand and sandstone. During survey the groundwater level along the line is 2.00m-6.00m below the ground, while the perennial maximum water level reaches the surface level.

(3) Seismic parameters

Along the line, the ground motion peak acceleration is 0.20g, with characteristic period of ground motion response spectrum being 0.40s and corresponding basic seismic intensity is 8 degree.

(4) Earthquake-induced liquefaction

In case of earthquake, the foundation soil from Waingmaw 230kV Substation to east side of Ayeyarwady River bank and from east of Mogaung to south of Mohnyin will be liquefied to a minor to moderate extent in a depth of even up to 20.00m.

2.7.2 Geotechnical design parameters

- For hard rock

The maximum bearing or toe pressure at foundation depth will be 2000kPa.

- For soft rock

The maximum bearing or toe pressure at foundation depth will be 800kPa.

- For soil

		Type 1	**Type 2**	**Type 3**	**Type 4**
Maximum soil bearing pressure	kPa	300	150	100	50
Maximum toe bearing pressure	kPa	375	200	125	65
Frustum angle for suspension towers	degrees	30	20	0	0
Frustum angle for tension towers	degrees	25	15	0	0
Density of backfill	kg/m^3	1800	1600	1400	1000
Density of reinforced concrete	kg/m^3	2400	2400	2400	1500

NOTE: For maximum soil bearing pressure and maximum toe bearing pressure, use the tabled pressure or 80% of the ultimate tested bearing pressure determined from appropriate tests.

2.7.3 Overview of hydrological conditions

(1) New 230kV Waingmaw-Na Bar line

The line runs across major rivers such as the Ayeyarwady River, tributaries of the Ayeyarwady River, NamYin Hka Chaung, NamYim Chaung, Sa Hmaw Chaung and Nam Pan Aung Chaung, as well as several small rivers, gullies and large paddy fields.

The width where the line crosses the Ayeyarwady River is about 500m wide. The width where the line crosses the tributaries of the Ayeyarwady River is about

200m wide.

(2) New 132kV War Shawng "T-point" - Waingmaw line

The line crosses only a few small rivers, gullies and paddy fields, and does not cross large rivers.

(3) The areas where the line crosses the paddy fields are wasteland without water in dry season and rice is planted only in rainy season. The paddy field in the rainy season generally has a water depth of about 0.5m to 1m, and the time is the entire rainy season (mid to late May to October), which lasts about 4 month.

2.7.4 Design principles

1) Foundation design loads

The ultimate simultaneous tower design loads will be used for foundation design purposes. The foundation loads thus calculated will be further factored upwards for foundation design purposes by a load factor equal to 1.2 for lattice steel self-supporting type towers.

2）Foundation design standard

The foundation is mainly designed in accordance with (Building Code Requirements for Structural Concrete) ACI 318.

2.7.5 Type selection of foundation

(1) Foundation type

Pad and chimney foundation, dig foundation and cast-in-place pile foundation will be used in the Project.

1) Pad and chimney foundation

The pad and chimney foundation is connected to the tower foot plate by using fire-bent anchor bolts. The inclined slope of main column of the foundation is the same as that of the main material of the tower leg, which minimizes the adverse effect of horizontal force on the foundation, thereby saving materials and reducing cost. This foundation type is widely used for local lines in Myanmar. This foundation type is mainly selected for the Project.

2) Dig foundation

Soil is used instead of formwork during dig foundation construction, and the reinforcement framework and concrete of the foundation are directly poured into the soil mould formed through excavation. Since the disturbance to the original soil is reduced, the bearing capacity of the foundation soil can be fully utilized, thus foundation materials and construction costs can be greatly saved.

This foundation type can be applied to both soil and rock foundations. This foundation type is selected for some towers in mountainous areas of the Project.

3) Cast-in-place pile foundation

Holes are formed by using machineries for this type of foundation. The axial load is supported by the stratum resistance applied to the pile end and the side frictional resistance of soil layer around the pile, while the horizontal load is supported by the lateral resistance of soil layer at the pile side. This foundation type will consume a large amount of steel bars and concrete, thus the cost is high.

It is mainly used for towers with large forces acting on the foundation, poor geological conditions or special requirements, and where ordinary shallowly buried foundations cannot meet the requirements. This foundation type is selected for the towers in river-crossing areas and for part of the tension towers affected by the earthquake-induced liquefaction in the Project.

2.7.6 Tension tower foundation liquefaction treatment measures

The treatment measure that pile foundation penetrates through the liquefied soil layer is adopted for the tension tower foundation liquefaction.

2.7.7 Tower foundation protection measures

Long and short legs of steel towers are used for the Project in combination with main foundation columns with unequal height, such design measure can effectively control the earthwork and stonework quantities of the foundation pit and excavation quantities of foundation surface, but there are inevitably often some natural slopes or original artificial slopes near the tower locations. In addition, the difficulty of disposal of residual soil resulting from foundation pit excavation will also lead to a certain height of spoil slope. If these slopes reach a certain height, they must be protected. Improper treatment will cause slope collapse, landslide and water &

soil erosion, which not only endangers the safe operation of towers, but also affects the environment of a certain areas around the towers. Therefore, reasonable and effective protective measures shall be taken to ensure the safety and stability of the towers and reduce the damage to surrounding natural environment.

In the next stage of the tower location selection process, the designers will determine whether protection measures are to be taken tower by tower according to the specific conditions of the tower position, so as to avoid tower foundation collapse and water & soil erosion. Such protection measures include construction of protective slope, retaining wall, drainage (intercepting) ditches etc.

(1) Slope protection measures

It is planned to use mortar rubble for slope protection. The mortar rubble slope protection method is suitable for the easily weathered slopes with a gradient of less than 1:1 and soil slopes where vegetation is not easy to grow. The slope height should not be more than 8m.

(2) Retaining wall

The reinforcement measure of construction of retaining wall is proposed for the Project at free face of tower locations in mountainous areas and at sections where slope is steep, slope is apt to collapse and soil body is unstable.

(3) Drainage (intercepting) ditch

In order to prevent surface water such as rainwater and mountain torrents collected in catchment area from the upward slope side from scouring the foundation surface, it is proposed to build a ring-shaped drainage (intercepting) ditch at the upward slope side along the mountain for towers located on mountain slopes to intercept and discharge the water in the catchment area of surrounding hillside and eliminate the adverse effects on tower locations. Drainage (intercepting) ditches are built of mortar rubble.

2.7.8 Analysis of adaptability of the foundation to the environment and environmental protection measures.

All design aspects of the Project are in accordance with relevant local laws and regulations in Myanmar. Original and new water & soil erosion will be comprehensively prevented and controlled in combination of comprehensive control with key control with the aim of "prevention foremost, and comprehensive prevention and control". Measures are adjusted according to local conditions, and prevention measures are formulated in accordance with hazards to build a good relationship between development & construction and environmental protection and give full play to the economic and social benefits of the developed and constructed projects.

(1) The principle of “prevention first” is implemented, the concept of pollution prevention & control and protection of ecological environment is implement in engineering design, field work management of design is strengthened, early preparatory work is done earnestly, surveyors with rich design experience are selected and survey accuracy within the protection range of tower foundation is improved.

(2) Foundation type is selected according to local conditions, which not only saves engineering cost, but also reduces the impact on the environment.

Through the joint efforts of all parties, the strict implementation of various environmental protection measures will effectively minimize the impact of project construction and line

operation on the environment along the line, and achieve sustainable development of power construction.

2.7.9 Anchor bolts

Anchor bolts will be used for the connection between tower and foundation.

2.7.10 Foundation materials

2.7.10.1 Reinforcement and anchor bolts

Foundation reinforcement: The yield strength for mild steel is 250 N/mm^2 and the yield strength for high yield steel is 410 N/mm^2;

Anchor bolts: high-quality carbon steel of Grade 35.

2.7.10.2 Concrete

Grade C25 or C30 concrete is adopted for pad and chimney foundation and digged foundation; Grade C35 concrete is used for cast-in-place pile foundation;

Grade C15 for the blinding layer and protection cap.

Grade C25 structure concrete compressive strength at 28 days is 25 N/mm^2 on cube;

Grade C30 structure concrete compressive strength at 28 days is 30 N/mm^2 on cube；

Grade C35 structure concrete compressive strength at 28 days is 35 N/mm^2 on cube；

Grade C15 structure concrete compressive strength at 28 days is 15 N/mm^2 on cube.

2.7.10.3 Cement

Ordinary Portland cement is used.

2.7.11 Corrosion prevention and demolition prevention

2.7.11.1 Corrosion prevention

(1) Corrosion prevention of tower

Tower members, bolts and foot nails shall be hot dip galvanized for corrosion prevention.

(2) Corrosion prevention of foundation

The groundwater along the line is corrosive to concrete structure. Grade C30 concrete is used for the plate foundation and Grade C35 for the cast-in-place pile foundation in the corrosive area.

2.7.12 Anti-theft bolts

Anti-theft bolts are used for towers in its 8m height range.

2.8 Project Implementation Phase

The main activities involved in implementing the project are completion of the detailed design, bidding, evaluation and approval of contract packages, procurement, and the installation of equipment, testing and commissioning. The installation of the transmission lines involves the following activities:

a) Surveying and staking of line and tower locations in coordination with DPTSC, Myanmar Railway, and other authorities

b) Notification of affected landowners, shops, utility owners and other structures in coordination with wards and township authorities

d) Construction of foundations for the towers

e) Erecting the towers

f) Conductor and line stringing

g) Installation of accessories

h) Testing and commissioning.

2.9 Proponent Information

Chipwi Nge Hydropower Company Limited (CNHC) as a JV company, was established for the commercial operation of Chipwi Nge hydropower station on December 4, 2015 in Naypyidaw, with SPIC Yunnan International Power Investment Co., Ltd. (SPICYN) holding 80% shares, Ministry of Electricity and Energy (MOEE) holding 15% (resource shares) and Royal Victory Service Co., Ltd. (RVS) holding 5%. The organization chart is shown below. Currently, CNHC has four departments, owing 70 staffs in total. Of which, 51 staffs are from local.

The major shareholder, SPIC Yunnan International Power Investment Co., Ltd. (SPICYN), is the sub-company solely-funded by China State Power Investment Company, which dedicates in investment and management of power and other sources in Southeast Asia and Southwest China, developing power product, development, manufacturing and selling upstream and downstream. The registered capital is USD 245 million and was founded in 8th, Dec, 2008 and registered place is Kunming, Yunnan Province, China.

At present, SPICYN has 27 hydropower stations, 7 wind power stations and 9 solar power stations. By the end of 2018, the installed capacity of SPICYN reached 2800MW, the annual electricity generation exceeded 8 billion kWh, and the clean energy accounts for 98%.

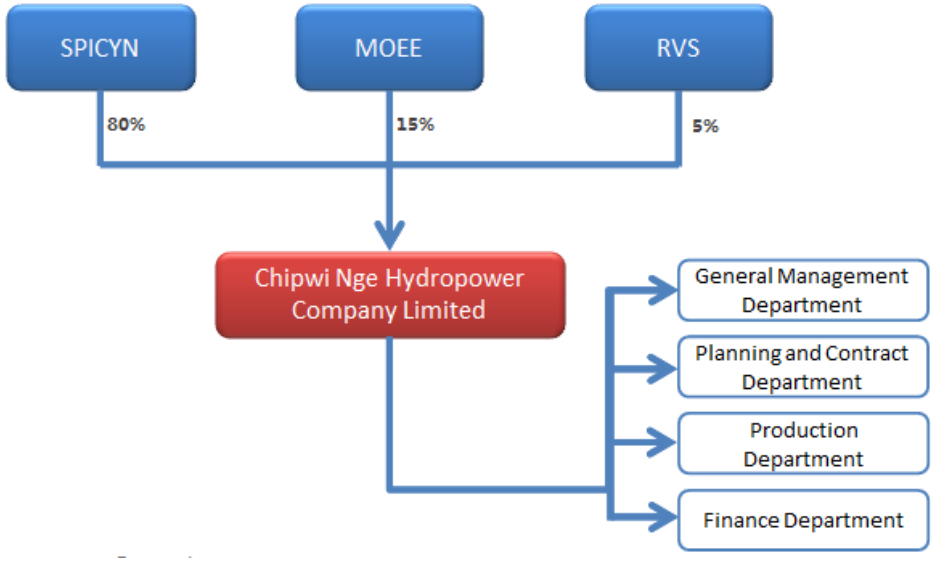


Figure 2.9-1 Organization structure of the Chipwe Nge Hydropower Company Ltd.

2.9.1 Project Cooperation Model

The Chipwi Nge HPP 230kV Power Transmission and Transformation Project (hereinafter refer as 230kV Project) is an expansion project for the Chipwi Nge HPP. The project cooperation model is as follows:

(1) The 230kV Project adopts the BT model, that is, the 230kV Project will be transferred to the Myanmar Government after completion and putting into operation, and operated by the Myanmar Government.

(2) On the basis of following the current JVA of CNHC, however the investment of the 230kV Project and handover procedure will be amended by negotiation of the two parties and the original equity structure of CNHC maintained unchanged.

(3) The investment recovery of the 230kV Project adopts the PPA electricity price recovery method, which is specifically defined in the new PPA.

2.9.2 Construction Organization

SPIC Yunnan International Power Investment Co., Ltd is responsible for construction of proposed project. SPIC Yunnan International Engineering (Myanmar) Co., Ltd is responsible for project site management. Decision-making level of Project Dept. consists of Project Manager, Chief Engineer and Deputy Project Manager. According to the characteristics of different construction periods, a number of construction teams are specifically formed to meet engineering construction needs, with organization and staff composition allocated in the principle of dynamic, efficient and capable per different construction periods.

Engineering Organization

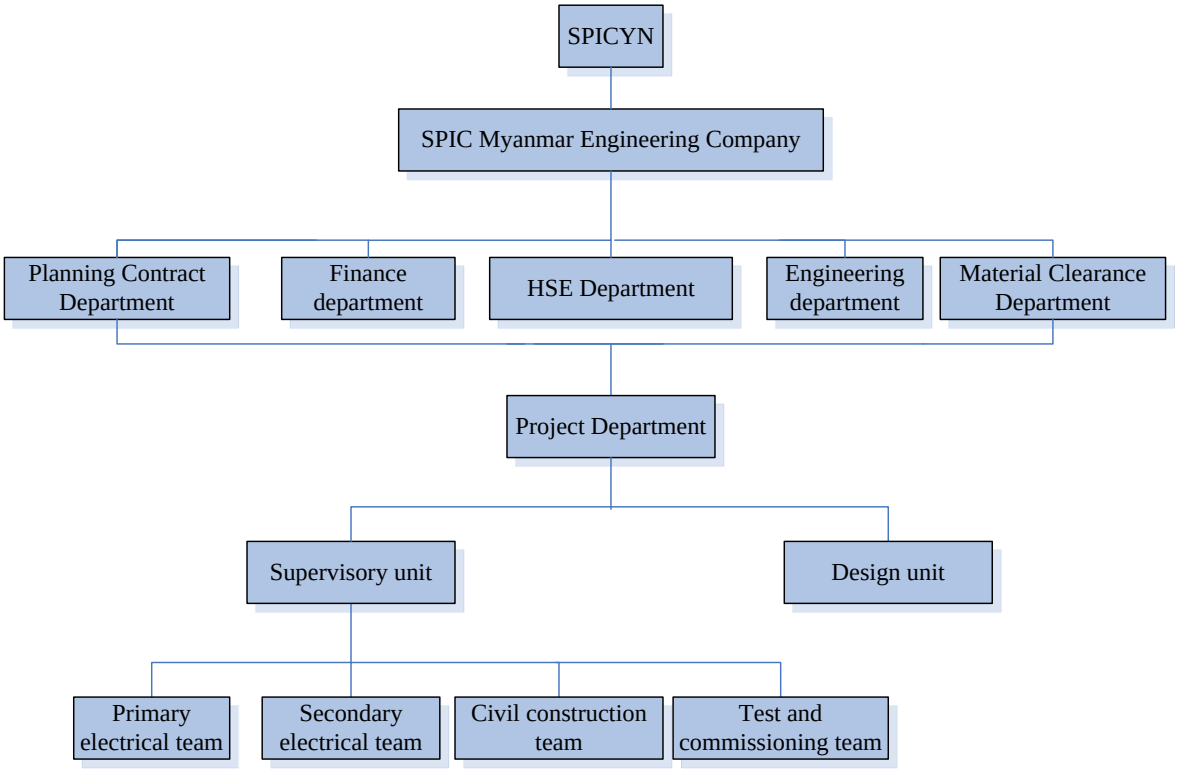


Figure 2.9-2 Block Diagram for Engineering Organization

2.10 IEE Study Team

Leading Organization - Resource & Environment Myanmar Co., Ltd. (REM)

Address: No. 702 B, Delta Plaza, Shwegonedaing Road, Bahan, Yangon.

Telephone: 959-73013448

Facsimile: 01-552901

Email: service@enviromyanmar.net

Contact Person: Mr. Thura Aung

Designation: General Manager

Website: http://www.enviromyanmar.net

The REM is located in the city of Yangon, Myanmar, in the country it is a leading resources and environment consulting firm that composed of geoscientists, engineers, biologist, botanist, socio-economic experts, cultural heritage experts, environmental engineers and physical resources management specialist.

Secondary Organization - Sustainable Environment Myanmar Co., Ltd. (SEM)

Address: B 503 Delta Plaza, Shwegondaing Road, Bahan, Yangon

Telephone: +959 261328891

Email: services@sustainablemyanmar.com

Contact Person: Mr. Than Oo

Designation: General Manager

Website: http://sustainablemyanmarsem.com

The SEM provides Environmental & Social/Health Impact Assessment service for development projects in Myanmar. SEM has resources and capacity to handle environmental management issues as per the provisions of Environmental Conservation Laws 2012 including, EIA, ESMP, environmental monitoring and auditing.

2.10.1 Participants of IEE

The following table shows list of participants involved in the present IEE study of 230 kV Transmission Line and Substation Project.

Table 2.10-1 Resource and Environment Myanmar Project Team Member

No.	Name	Position	Organization	Responsibility
1.	U Thura Aung	GM/Principal Consultant	REM	Physical Environment, Geology and Environmental Baseline Data
2.	Daw Phyu Phyu Shein	Principal Consultant	REM	Socio Economy, Facilitation of Meeting
3.	U Soe Yu Htun	Consultant	REM	Air Pollution Control
4.	U De Hlaing Zaw	Consultant	REM	Noise and Vibration
5.	U Zaw Naing Oo	MD/Principal Consultant	SEM	Environmental Impact Assessment, Risk Assessment & Environmental Management
6.	U Than Oo	GM/Principal consultant	SEM	Hydropower and transmission line Analyst
7.	Daw Swe Wut Hmone	Consultant	SEM	Vegetation (Ecology and Biodiversity)
8.	Daw Naing Naing Win	Senior Consultant	SEM	Wild Life (Ecology and Biodiversity)
9.	Daw Than Than Htay	Senior Consultant	SEM	Entomologist (Ecology and Biodiversity)
10.	Daw Myat Thet Khaing	Consultant	SEM	Aquatic Ecology (Ecology and Biodiversity)

11.	U Chit Myo Lwin	Senior Consultant	SEM	Environmental Geology
12.	U Myat Ko Ko Hein	Consultant	SEM	Forest (Ecology and Biodiversity)
14.	Daw Phyo Khaingzar Wint	Senior Consultant	REM	Water Pollution Control/IEE report compilation
15.	Daw Nan Thazin Oo	Senior Consultant	REM	Socio Economy, Facilitation of Meeting
16.	Daw Myat Thitsar Naing	Senior Consultant	SEM	SIA and Public Consultation
17.	Dr. Nyomie Razak	Principal Consultant	SEM	SIA and Cultural
18.	Dr. Sandar Hlaing	Principal Consultant	SEM	Land Use
19.	Daw Ei Ei Win Myat	Consultant	REM	Legal Analysis

3 Policy, Legal and Administrative Framework

The Republic of the Union of Myanmar established a regime of policies on environmental management. The principal legal instruments that have bearing on environmental management, health and safety of the Power Transmission Improvement Project are the Constitution issued in 2008, the Environmental Conservation Law (ECL) and subsequent rules and regulations, and the Electricity Law.

3.1 Myanmar Regulatory Framework for Environmental Assessment Constitution (2008)

Under Section 45 of the Constitution (2008), the Union has proclaimed that it will protect and conserve the natural environment. National legislature can enact laws on environmental protection and natural resources while legislatures in states and divisions are given the authority to regulate environmental management within the boundaries of national legislation.

3.2 National Environmental Policy

The National Environmental Policy in Myanmar was adopted in 1994 to ensure the integration of environmental concerns in planning for economic development. The policy emphasizes the responsibility of the State and every citizen to preserve the natural resources of the country in the interest of present and future generations. The mandates on environmental management formerly rest on the National Commission on Environmental Affairs (NCEA) as a division under the Ministry of Foreign Affairs. In 2005, the NCEA was transferred under the Ministry of Forestry.

In September 2011, the Ministry of Forestry was reorganized into the Ministry of Environmental Conservation and Forestry (MOECAF) which served as the focal and coordinating agency for the overall environmental management in Myanmar. MOECAF was reorganized again in 2016 to the Ministry of Natural Resources and Environmental Conservation (MONREC) by combining the functions of the Ministry of Mines with the MOECAF.

Under MONREC is the Environmental Conservation Department (ECD) which is responsible for implementing the National Environmental Policy, strategy, framework, planning and action plan for the integration of environmental consideration into the national sustainable development process. Environmental impact assessment (EIA)/ initial environmental examination (IEE) reports are reviewed by the ECD.

On the occasion of the World Environment Day 2019, the Government of Myanmar launched the National Environmental Policy of Myanmar consisting of two new policies that will guide Myanmar's environmental management and climate change strategy. Figure 3.2-1 shows the new Myanmar National Environmental Policy.

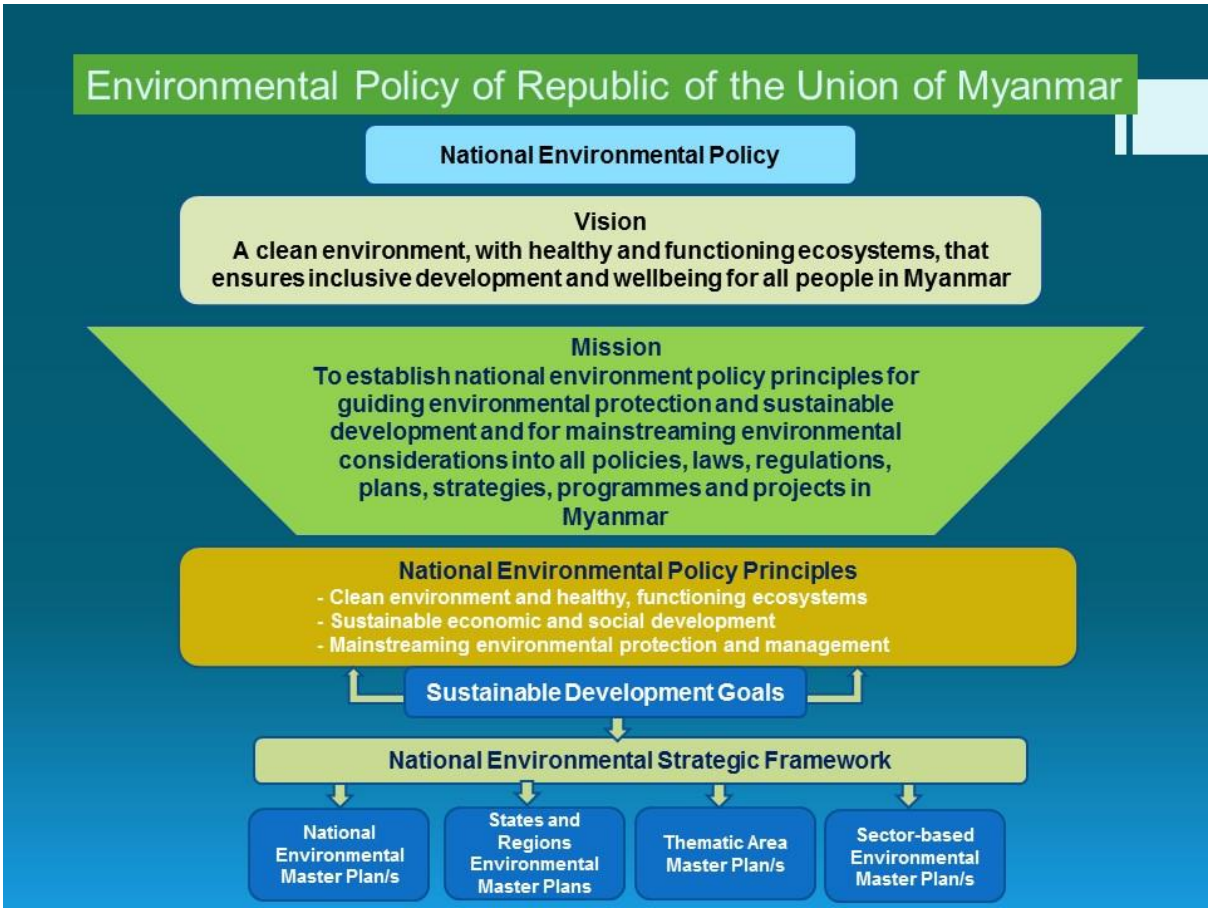


Figure 3.2-1 National Environmental Policy of Myanmar

3.3 Environmental Conservation Law (2012)

Through the MONREC, Myanmar implements the Environmental Conservation Law which was enacted on March 30, 2012. The law prescribes the implementation of the National Environmental Policy and the setting up of basic principles and guidelines for sustainable development. The law also highlights a systematic integration of environmental conservation, natural and cultural heritage and ensures that policies are in-place to prevent the degradation of natural resources.

3.4 Environmental Conservation Rule (2014)

The Ministry shall form the EIA Report Review Body with the experts from the relevant Government departments, organizations and may assign duty to the Department to scrutinize the report of EIA prepared and submitted by any organization or person relating to EIA and report through the EIA Report Review Body, and then may approve and reply on the EIA report or IEE or EMP with the guidance of the Committee.

3.5 Environmental Impact Assessment (EIA) Procedure (2015)

The EIA Procedure was issued on 29 December 2015. All projects undertaken by any ministry, government department, organization, corporation, board, development committee, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual that can cause significant adverse impacts are required to undertake either an IEE or EIA and to obtain an Environmental Compliance Certificate (ECC) form MONREC.

This EIA/IEE Procedures cover the following contents: screening of projects, qualification for conducting the initial environmental examination (IEE)/EIA, categorization of projects for IEE/EIA/ environmental management plan (EMP), preparation of IEE/EIA report and EMP, public involvement, procedure on how to get the approval of IEE/EIA report from the Environmental Conservation Department (ECD) under MONREC, environmental compliance certificate (ECC), and monitoring process after getting the approval of the IEE/EIA report.

3.6 Electricity Law (2014)

The new Electricity Law (2014) repeals the 1984 Electricity Law and the Electricity Act of 1948. The new law establishes the Electricity Regulatory Commission (ERC) and grants regulatory responsibilities to the ERC and authorities of MOEE, region and state governments, and leading bodies of self-administered zones and self-administered divisions the power to grant permits to entities to engage in electricity-related works such as generation, transmission, and distribution according to the Section 10 (A).

Based on Section 2 (N), the right of way means that the land area along the power transmission line prescribed by the Ministry for safe the distance from the electrical hazards.

Even with the promulgation of the new Electricity Law, the Electricity Rules (1985) is still in effect since the new rules have not yet been issued as of this date. There are specific provisions of the Electricity Rules on impact assessment, environment, health and safety. The conduct of the initial environmental examination for power transmission projects is mentioned in the Electricity Rules (1985). Safety clearances are also prescribed as presented in the following Table.

Table 3.6-1 Transmission Line Minimum Safety Clearance based on Electricity Rules (1985)

Location	66 kV	230 kV
Paddy field	19 ft. (5.79 m)	22 ft. (5.79 m)
Parallel to road	22 ft. (5.79 m)	25 ft. (5.79 m)
Passing through a road	22 ft. (5.79 m)	25 ft. (5.79 m)
Building		
Horizontal clearance	13 ft. (5.79 m)	16 ft. (5.79 m)
Vertical clearance	15 ft. (5.79 m)	50 ft. (5.79 m)
Passing through a railway	24 ft. (5.79 m)	25 ft. (5.79 m)

3.7 Other Related Environmental Regulations and Policies

Other laws and policies on environmental management and protection in Myanmar that are applicable to the transmission lines and substations are presented in the following Table.

Table 3.7-1 Other Applicable Related Environmental Laws and Policies in Myanmar

Laws and Regulations	Description
National Environmental Quality (Emission) Guidelines (2015)	MONREC formulated the National Environmental Quality (Emission) Guidelines (NEQG) in coordination with ADB in December 2015. The NEQG determines the guideline values for general emission such as air emissions, wastewater, noise levels, odor, and those for sector-specific emission such as emission from forestry, agribusiness/food production, chemicals, oil and gas, infrastructure, general manufacturing, mining, and power.

Protection the Rights of Ethnic Nationalities Law (2015)	To ensure to disclose to the resident ethnic nationalities about the project fully, moreover, to ensure cooperate with them. Section 5 - The project proponent will disclose to the resident ethnic nationalities about the project fully.
The Law Amending the Workmen' Compensation Act, 1923 (2005)	To ensure the compensations to injured employee while implementing in line with the above law. To abide by the prescribed compensations in various kinds of injury. Section 13 - The project owner will pay the compensation in line with the provisions of said law.
The Minimum Wages Law (2013)	To ensure the project owner pays the wages not less than prescribed wages and notify obviously this wages in work place, moreover to be inspected.
The Motor Vehicles Law (2015) and Rules (1987)	When the construction period and if it is needed in operation and production period for all vehicles the project proponent will promise to abide by the nearly all provisions of said law and rules, especially, the provisions related to air pollution, noise pollution and life safety.
Protection and Preservation of Cultural Heritage Regions Law, 1998	This law was signed on 10 September 1998. It provides for the protection and preservation with respect to perpetuation of cultural heritage that has existed for many years. The law prescribes that protection and preservation of cultural heritage regions should be in conformity with the International Convention approved by the State.
The Conservation of Antique Objects Law (2015)	The antique object is non-valuable for national heritage. So, anybody has to inform if he or she has found any antique object. Section 12 - The project proponent will inform to the village-tract office antique object is found.
Conservation of Water Resources and Rivers Law, 2006	The law was enacted in 2006 to conserve and protect water resources and river systems for the beneficial use of the public. It also aims to protect the environment against abusive use and exploitation of water resources. The law strictly prohibits disposal of engine oil, chemical, poisonous material and other materials which that may cause environmental damage.
The Forestry Law (2018)	The new Forestry Law includes certain objectives to ensure long-lasting forest management and sustainable development. It is directed towards implementation of the forest policy and environmental conservation policy and endeavours to reduce the occurrence of natural disasters in line with international standards.
The protection of wildlife, Wild plant and conservation of natural area Law, 1994	In order to protect and conserve wild life, wild plants and natural area in accordance with international protocol, Union Government Policy. Designates national parks and other protected areas to be: Scientific Reserve; National Park Marine National Park; Nature Reserve; Wildlife Sanctuary;

	Geo- physically Significant Reserve; or Other Nature Reserve designated by the Minister.
Farmland Law, 2012	The Township Farmland Management Body shall issue the Land Certificate to the Township Land Record Department Office passing it through the relevant ward or Village Tract Farmland Management Body.
Farmland Rules,2012	In the farm land is requisitioned under farm land law for the interest of the state or the public the grievance and compensation for improving the farm land without delay farm the concern, the central farm land management committee shall conduct as necessary.
Public Health Law,1972	It is concerned with protection of people's health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics.
Occupational Safety and Health Law,2012	- To support the development of the State's economy through the development of production by causing to enjoy more security in social life and health care by the workers who are major productive force of the State by the collective guaranty of the employer, worker and the State: - To enjoy more security in social life and medical care by the public by effecting their insurance voluntarily To raise public confidence upon the social security scheme by providing benefits which are commensurate with the realities - To have the right to draw back some of the contributions paid by the employers and the workers as savings, in accord with the stipulations; - To obtain the right to continued medical treatment, family assistance benefit, invalidity benefit, superannuation benefit, survivors' benefit, unemployment benefit, the right to residency and ownership of housing after retirement in addition to health care and pecuniary benefit for sickness, maternity, death, employment injury of the workers.
Prevention and Control of communicable Diseases Law (1995) (Revised in 2011), 1995/2011	Describes functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases. It also describes measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those failing to comply. The law also authorizes the Ministry of Health to issue rules and procedures when necessary with approval of the government.

3.8 Environmental Quality Standards

The Environmental Conservation Law (2012) provides the basis for the conservation and protection of the natural environment of Myanmar and provides the common principles of

environmental conservation and for other environmental laws and policies. The Government established the National Environmental Quality (Emissions) Guidelines (NEQEG) in 2015 that includes guidelines for air emissions, wastewater, noise levels, odor, and sector-specific requirements including those for electric power transmission projects.

3.8.1 Discharge Standards

The wastewater effluent limits for electric power transmission is presented in Table. This standard will apply to wastewater that will be generated from the substations.

Table 3.8-1 NEQEG Effluent Limits applicable to electric power transmission

Parameter	Unit	Maximum Concentration
Biochemical oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	Standard unit	6-9
Total coliform bacteria	MPN/100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

The same allowable limits of discharges of site runoff and wastewater during construction phase of the project applies.

3.8.2 Electric and Magnetic Fields

The NEQEG states that exposure limits for general public to electric and magnetic fields should comply with the International Commission on Non-ionized Radiation Protection Guidelines for limiting general public exposure to time- varying electric, magnetic and electromagnetic fields (up to 300 Gigahertz). The electric field and magnetic field limits are provided in Table 2.8-2.

Table 3.8-2 NEQEG Exposure Limits to Electric and Magnetic fields

Frequency	Electric Field (V/m^3)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83

Source: NEQEG (2015)

3.8.3 Standard for Noise

The allowable noise levels should not exceed the levels in Table or result to a maximum increase in background noise of 3 dB at the nearest receptor location. The standard for noise are aligned with the IFC Environment, Health and Safety (EHS) guidelines.

Table 3.8-3 NEQEG Allowable Noise Levels

Receptor	One hour L_{Aeq} (dBA)	
	Daytime 07:00-22:00 (10:00-22:00 for Public holidays)	**Nighttime 22:00-07:00 (22:00-10:00 for Public holidays)**
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Note: L_{Aeq} is the equivalent continuous sound level in decibels
Source: NEQEG (2015)

3.9 International Environmental Conventions and Agreements

The main international and regional treaties concerning the environment to which Myanmar is a party (in chronological order) that related to the present transmission line project can be listed as follows:

- Plant Protection Agreement for the Southeast Asia and Pacific Region;
- Convention Concerning the Protection of the World Cultural and Natural Heritage
- Montreal Protocol on Substances that Deplete the Ozone Layer & all amendments
- Convention on Biological Diversity
- International Tropical Timber Agreement
- Ramsar Convention on Wetlands
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- ASEAN Agreement on the Conservation of Nature and Natural Resources
- United Nations Convention to Combat Desertification
- United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol
- ASEAN Agreement on Transboundary Haze

4 Description of the Environment

4.1 Methodology for Data Collection and Analysis

EIA study team conducted a desktop study and an environmental baseline data collection for environment and social condition along the transmission lines and substation.

The baseline data collection was based on the following methods.

a) Identification and review of the applicable national and international environmental and social regulatory and institutional framework

b) Establishing environmental and social baseline conditions along the stretch by the following;

- Reconnaissance survey using satellite imagery to observe environmental and social characteristics along the transmission line;
- Secondary data collection along the transmission line route with respect to water, soil, noise quality, and Socioeconomic condition
- Ecological survey of flora and fauna using desk study prevailing along the transmission line route through primary and secondary surveys
- Identification of land use of the stretch through satellite imageries of the whole stretch of the transmission line;
- Identification, prediction of environmental and social impacts of the Project.

4.2 Description of the environment

The baseline study was considered Area of Influence (AOI) including the single circuit 230 kV transmission line.

The environmental baseline data such as water, noise quality, and ecological survey was conducted along the transmission line route. The ecological survey was conducted to assess the type of flora and fauna prevailing along the transmission line. Topography, climate and meteorology, geology was collected through literature review and available data from Universities. Topography and geology along the transmission line was studied using available topographic maps and satellite imagery.

The baseline study was considered along the new 230kV Waingmaw - Na Bar, new 132 kV Waingmaw – War Shawng T-connection including the Waingmaw Sub-station (extended).

4.2.1 Geographic Location

The present transmission lines and substation are located within Kachin State and Sagaing Region. The transmission line route passes through 4 districts and 5 townships.

Myityina District

Myitkyina is the capital city of Kachin State in Myanmar located 1,480 kilometers form Yangon and 785 kilometers from Mandalay. It lies within Latitudes 24 and 32 and 27 and 12 North and Longitudes 96 and 40 and 97 and 32 East. The total area is 2425.92 square mile.

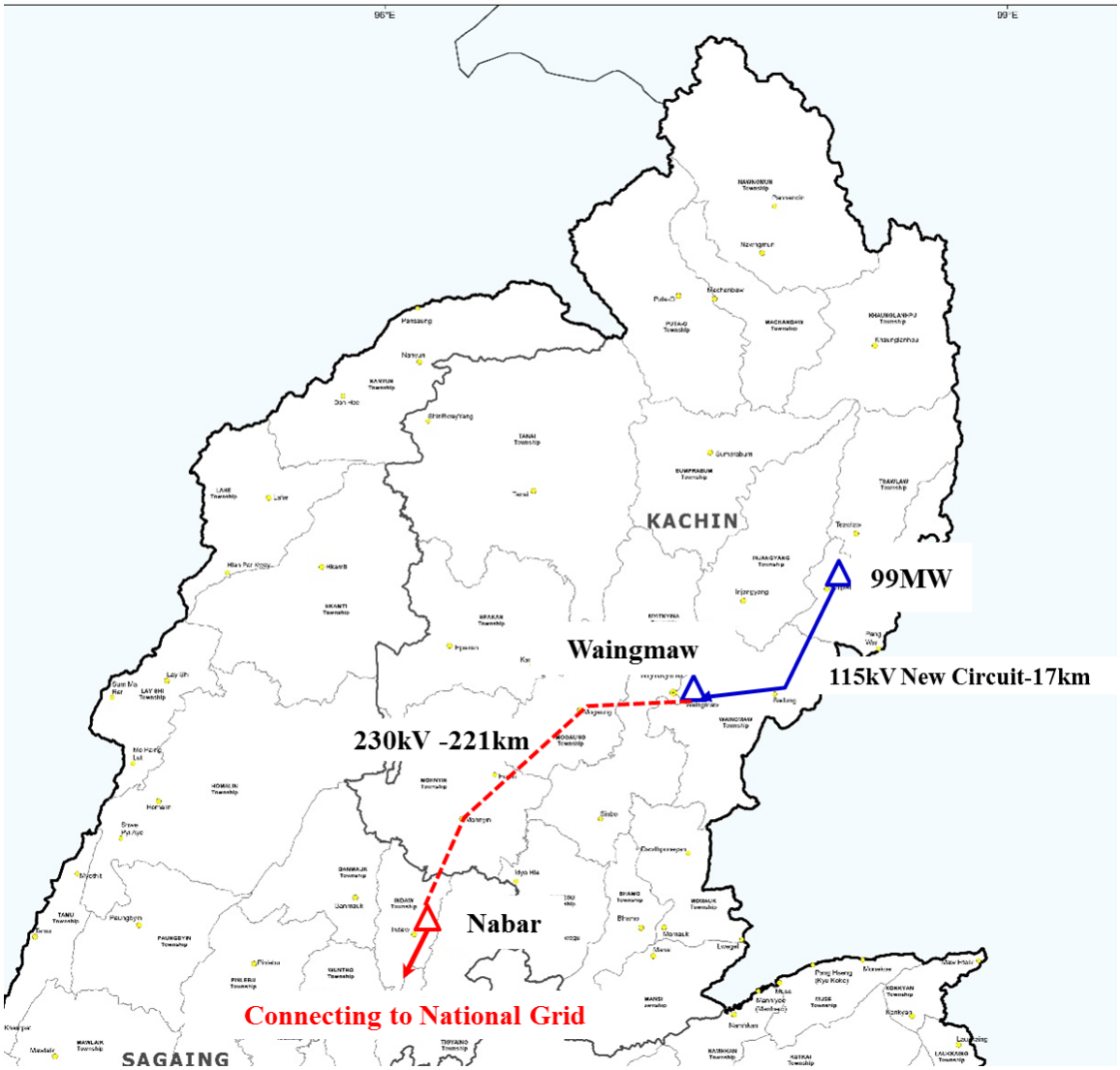


Figure 4.2.1-1 Overview of transmission line

Mohnyin District

The district lies within Latitudes 24 and 30 from 46 and 26’ 59” North and Longitudes 96 and 02’ 12” from 96 and 48’ 03” East and occupies an area of 1578.51 square miles, with maximum distance of 50 mile from south to north and 40 square mile from east to west.

Katha District

Katha district is the northeastern-most district in Sagaing Region of Myanmar. Its administrative center is the town of Katahr. The district consists of the townships of Banmauk, Indaw, Kathar, Kawlain, Pinlebu, Tigyaing, and Wuntho. The area is supported by rice farming, fisheries and timbering. This area has many reserve forest.

The right of way of the 132 kV and 230 kV transmission lines traverse the Waingmaw Township, Myitkyina Township, Mogaung Township, Mohnyin Township and Indaw Township.

The transmission line route and information about the transmission line are shown in the following Figure and Table.

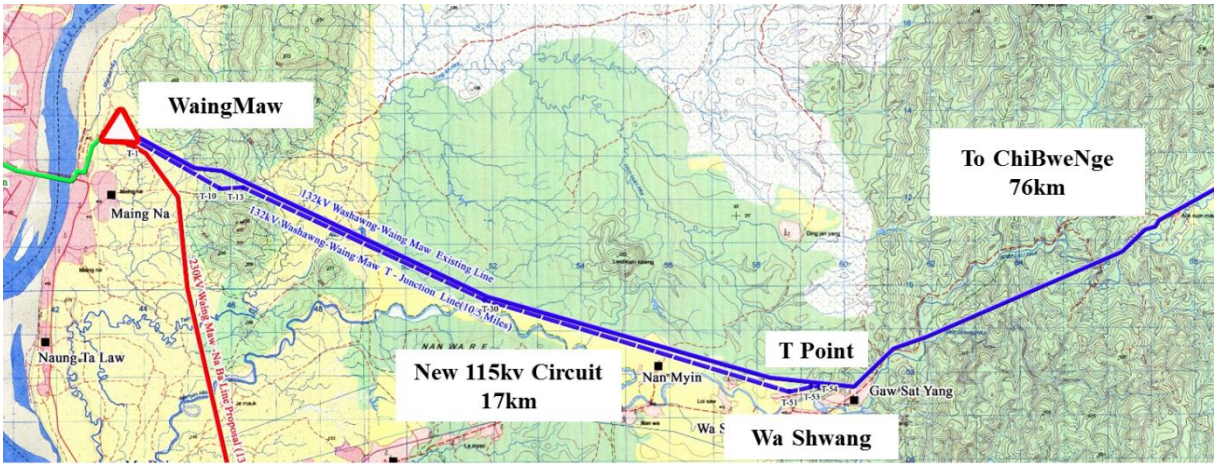


Figure 4.2.1-2 132 kV transmission line route

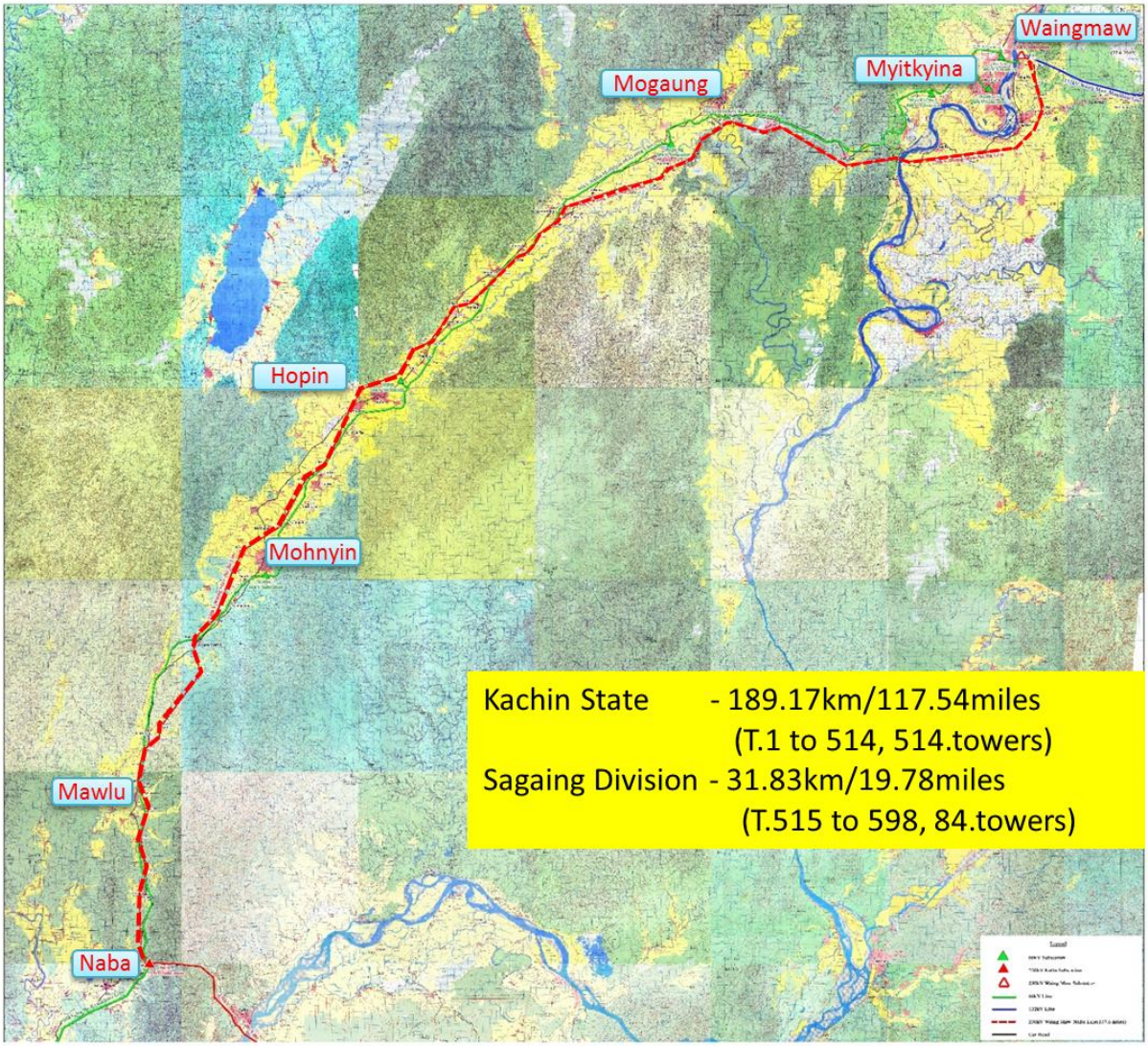


Figure 4.2.1-3 230 kV transmission line route

Table 4.2.1-1 Transmission line information

No.	State	District	Township	Tower No.	Total Tower	Length	
						Km	mile
1.	Kachin State (T.1 to 512, 189.8km/ 117.82miles)	Myitkyina District	Waingmaw Township	T.1 to 86	86 Tower	31.9	19.80
2.			Myitkyina Township	T.87 to 129	43 Tower	15.8	9.82
3.		Mohnyin District	Mogaung Township	T.130 to 312	183 Tower	67.7	42
4.			Mohnyin Township	T.313 to 512	200 Tower	74.4	46.2
5.	Sagaing Division (T.513 to 598, 31.4km/19.5miles)	Katha District	Indaw Township	T.513 to 598	86 Tower	31.4	19.5

The transmission line (132 kV) traverses parallel with the existing 115 kV transmission line and across some part of reserve forest and plantation area. There are no sensitive receptors along the RoW and extended substation area.

Sensitive receptors include nearby schools, temples/monasteries, health centers (clinics), residential houses and shops whose occupants and/or activities may be affected during construction and maintenance of the transmission lines. Other affected structures such as railways, bridges, roads, river, billboards, trees, and utilities were also identified during the environmental survey to determine whether further measures are necessary to protect these.

Some part of the section of line intersects and runs parallel with the trunk road, railway and 66kV line repeatedly, and there is no need to adopt independent tension sections while crossing the trunk road and railway. (See in Figure 2.3.8 to 2.3.11 in Chapter 2)

There are some partial residential houses along the RoW between Ayeyarwady River crossing point to north of Mohnyin city (See in Figure 2.3.14 in Chapter 2).

4.2.2 Topography along the Transmission Line Route

According the feasibility study report, the landform along the 230kV and 132kV transmission line, include plains in most parts and river network and low mountains and hills in some parts.

The new 230kV line passes through Kachin State and Sagaing Region in Myanmar. Along the line route, 50% of the terrain is plain, 40% of that is hilly area and 10% of that is mountainous area. The transportation condition in these areas is of average level. The elevation along the line route ranges from 120m to 350m above the sea level.

The new 132kV line passes through district within Kachin State in Myanmar. Along the route, 60% of the terrain is plain, and 40% of that is hilly area. The transportation conditions in these districts are of average level. The elevation along the route ranges from 130m to 300m above the sea level.

Topography and Landform of Substation Site

The landform in the proposed substation site area is fully generated from erosion hills, where the substation site is located at the slope toe on the extension line of ridge on slope. The landform is of gentle slope. Generally, the substation site is higher in west and lower in east. Gullies formed by mountain torrents in flood seasons are located in southwest, the terrain dips towards the gullies from north to south. Currently, the site area is of a barren land on which weeds and small trees are grown. This area has a ground elevation of about 99.1~101.9m. The topographic maps showing transmission line route is shown in Appendix 3.

The proportion of landform along the transmission lines are shown in the following tables.

Table 4.2.2-1 Terrain along the 230kV line

Item	Plain	Hills	Mountains	Total Length	Nonlinear factor
Legth (km)	111.5	89.2	22.3	223	1.22
Proportion (%)	50%	40%	10%	100%	-

Table 4.2.2-2 Terrain along the 132kV line

Item	**Plain**	**Hills**	**Mountains**	**Total Length**	**Nonlinear factor**
Legth (km)	10.2	6.8	0	17.0	1.03
Proportion (%)	60%	40%	0%	100%	-

4.2.3 Geology along the Transmission Line Route

Geology of the area along the transmission line was studied mainly based on previous literatures, such as Chhibber (1934) and Bender (1983), and technical reports of the geoscientists from the University of Rangoon (Yangon) and Department of Geological Survey and Mineral Exploration.

The route of transmission line is generally occupied by flat topography with Alluvium especially along the line route between War Shawng to Waingmaw sub station and Waingmaw substation to Ayeyarwaddy River crossing.

Between the Ayeyarwaddy River crossing point and Mogaung city, the transmission line route traverses highly undulating with hilly terrains that occupied by Cretaceous clastic and carbonate rocks chiefly consists of sandstone, limestone and shale and Triassic clastic sedimentary rocks and limestone. Between Mogaung and Mohnyin area, the transmission line passes through the Alluvium again. Between Mohnyin and Na Bar Substation, the transmission line passes through the undulating topography with Irrawaddy Formation. (See in Figure 4.2.3-1).

The geological hazards such as landslides and unstable foundation will potentially occur in the areas between Ayeyarwaddy River crossing point and Mogaung city and Mohnyin and Na Bar substation. The terrain along the line, include plains in most parts and river network and low mountains and hills in some parts. The overburden along the line mainly comprises silt, clay, fine sand and sandstone.

During survey the groundwater level is 2.00m-6.00m below the ground in the plain sections (especially in the area between War Shawng and Waingmaw), while the perennial maximum water level reaches the surface level. The groundwater level in the hilly sections is 4.00m-10.00m below the ground andthe perennial maximum water level is about 3.00m below the ground.

Along the line, the ground motion peak acceleration is 0.20g, with characteristic period of ground motion response spectrum being 0.40s and corresponding basic seismic intensity is 8 degree.In case of earthquake, the foundation soil from Waingmaw 230kV Substation to east side of Irrawaddy River bank and from east of Mogaung to south of Mohnyin will be liquefied to a minor to moderate extent in a depth of even up to 20.00m.

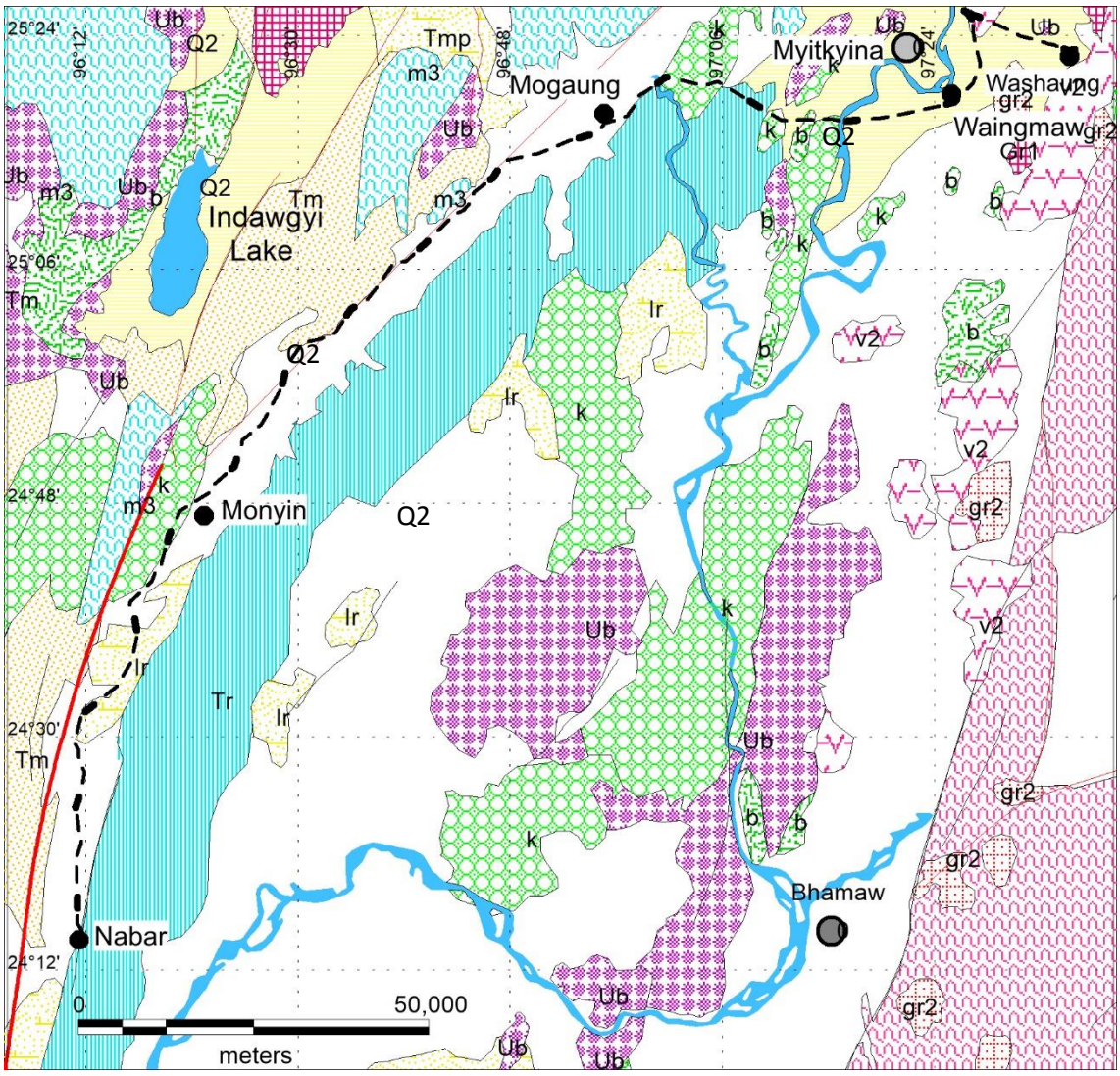
4.2.4 Climate

The meteorology and climate of Myanmar is controlled by the great monsoon circulation system of SE Asia and is influenced in detail by topographic peculiarities. The mountain ranges in Myanmar are generally running N-S, so that they present effective climate barriers for the SW monsoon in the summer and the NE monsoon in the winter. Therefore, the central part of the Inner Myanmar Tertiary Basin (Central Dry Zone) lies in rain shadow during the summer monsoon (June to September) and receives less than 500 mm of precipitation. The considerable differences in relief along the path of the monsoon lead to the formation of the following climatic zones. (DRUMMOND 1958).

Myanmar has three seasons namely summer (March to the middle of May), rainy season (middle of May to the end of October) and winter season (November to the end of February). Some researchers divided part of rainy season and winter into two periods such as the post-monsoon (October to November) and the cold dry season (December to February). Principal approach for meteorology and climate for Myanmar and the Project is collecting secondary data from concerning departments and review of previous available as hard copies and also on the web. Department of Meteorology of the Ministry of Transport and Department of Geography of the University of Yangon are of the important resources.

According to the data statistical year book of 2018, the annual rainfall of Myityina and Mohnyin station are 2,513mm and 1,656mm respectively. The annual mean maximum temperature of two stations are 30.6 ºC and 30.3 ºC while the annual mean minimum temperature are 19.1 ºC and 17.9 ºC respectively See in Table 4.2.4-1.

The monthly average temperature and monthly rainfall (month to month average) recorded in two meteorology stations during 2008 – 2017 are shown in Table 4.2.4-2, 4.2.4-3 and Figure 4.2.4-1, 4.2.4-2.



	Legend
– – – –	Transmission Line Route
Q2	Alluvium of Quaternary age
Tr	Clastic sedimentary rocks and limestone of Triassic age
K	Clastic sedimentary rocks and limestone of Cretaceous age

Figure 4.2.3-1 Geological map between War Shawng and Na Bar substation which 132 kV and 230kV transmission line stretch.

Table 4.2.4-1 Mean annual rainfall and mean temperature of two stations (2008 – 2017)

Station	Annual Rainfall (mm)	Tem. (ºC)		Mean Relative Humidity (%)
		Mean max.	Mean min.	
Myikyina	2,513	30.6	19.1	79
Mohnyin	1,656	30.3	17.9	78

Table 4.2.4-2 Monthly rainfall and temperature of Myikyin station (2008 – 2017)

Myitkyina Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (ºC)	18.6	21.1	24.1	26	28	27.8	27.3	28.5	28.1	27	23	19.1
Rainfall (mm)	16	11	31	59	192	585	565	517	329	177	24	8

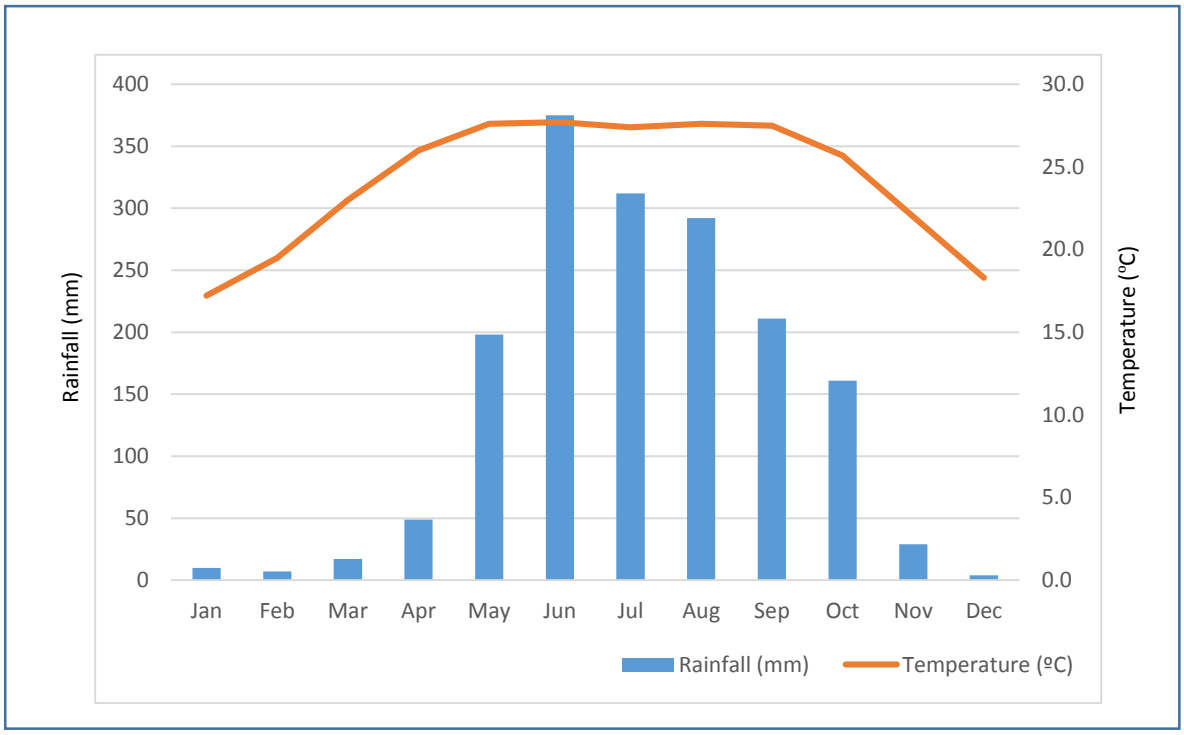


Figure 4.2.4-1 Monthly rainfall and temperature of Myitkyina station (2008 – 2017)

Table 4.2.4-3 Monthly rainfall and temperature of Mohnyin station (2008 – 2017)

Mohnyin Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (ºC)	17.2	19.5	23.0	26.0	27.6	27.7	27.4	27.6	27.5	25.7	22	18.3
Rainfall (mm)	10	7	17	49	198	375	312	292	211	161	29	4

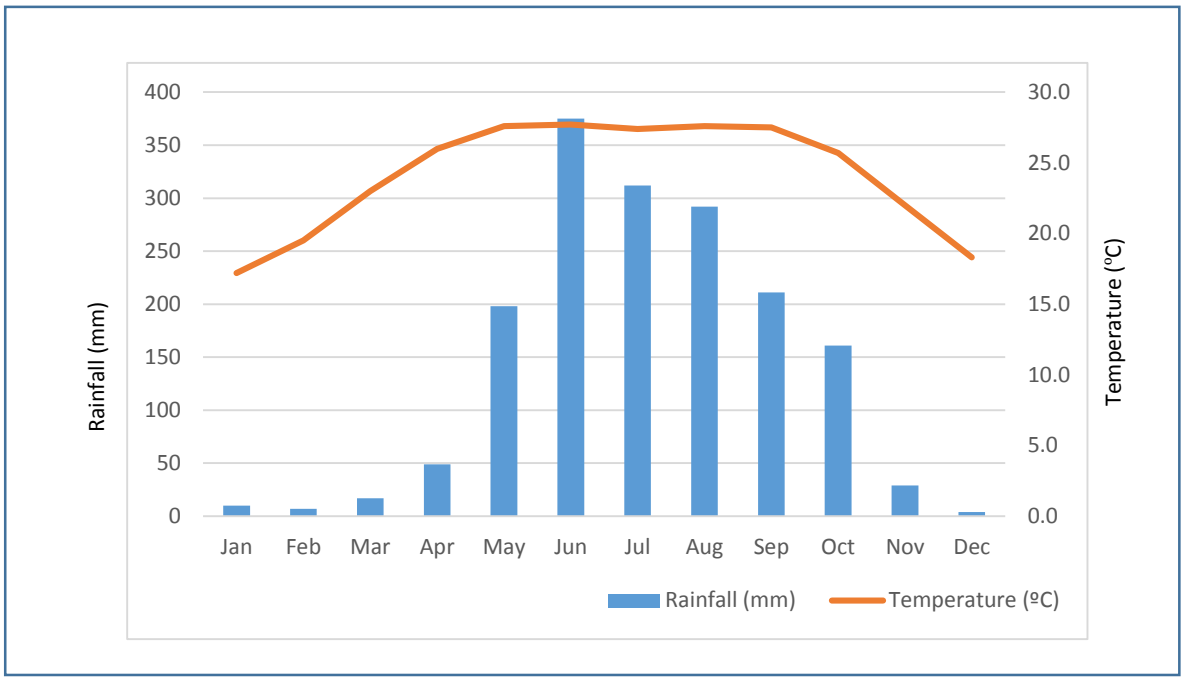


Figure 4.2.4-2 Monthly rainfall and temperature of Monyin station (2008 – 2017)

The average hourly wind speed in Myitkyina does not vary significantly over the course of the year, remaining within *0.5 miles per hour* of *2.3 miles per hour* throughout. Wind directions are generally comes from the west during summer, from the south during rainy season and from the east during winter season[1].

Historical data reveals that the area may be considered as low risk in natural disaster like cyclone and earthquake except flash flood nearby the Ayeyarwaddy River and some big streams. According to the township profiles provided by the officer from township General administration Department, there are no cyclone events till 2017 in three districts except some flood nearby the rivers.

4.2.5 Air Quality

Resource & Environment Myanmar Co. Ltd. (REM) was carried out the existing environmental condition along Waingmaw to Na Bar transmission line area. REM team were conducted two air quality stations, nine noise level stations, three soil quality and two surface water samples were taken and detected by available environmental methods and instruments. Location of air, noise and surface water are shown in Figure 4.2.5-1. The summary of physical environmental survey is shown in Table 4.2.5-1,

[1] https://weatherspark.com/y/112654

Table 4.2.5-1 Summary of Physical Environmental Survey

Air Quality & Meteorology	Parameter	1) Nitrogen dioxide, 2) CO, 3) particulate Matter PM10, 4) Particulate Matter PM 2.5, 5) Sulphur Dioxide, 6) Relative Humidity, 7) Temperature, 8) Wind Speed, and 9) Wind Direction
	Period	2 points for one time within one day
	Location	Waingmaw substation
Noise Level	Parameter	LAeq (A-weighted loudness equivalent)
	Period	One time at 9 location within one day
	Location	Residential area
Surface Water Quality	Parameter	1) Water temperature, 2) Air temperature, 3) pH, 4) Electrical Conductivity, and 5) Dissolved Oxygen, 6) Oxidation reduction potential, 7) Turbidity, 8) Total dissolved solid, 9) Salinity
	Period	One time at 2 location
	Location	Stream
Soil Quality	Instrument	Manural hand Auger
	Location	3 points along the transmission line

Source: Field Survey, May 2019

4.2.5.1 Survey Item

Air Quality monitoring is one of the important part of existing environmental condition to assess the impact of propose project. So, REM team was monitored the ambient air quality along the transmission line route and compared with Myanmar National Environmental Quality (Emission) Guidelines that announced on 29th December, 2015 and guideline values for air pollution level are shown in Table 4.2.5-2.

Table 4.2.5-2 Referred guideline for ambient air quality in Myanmar

No	Parameter	Averaging Period	Guideline Value	Units
1.	Nitrogen dioxide	1-hour	200	µg/m^3
2.	Particulate matter PM_{10} [a]	24-hours	50	µg/m^3
3.	Particulate matter $PM_{2.5}$ [b]	24-hours	25	µg/m^3
4.	Sulphur dioxide	24-hour	20	µg/m^3
5.	Temperature	-	-	°C
6.	Relative Humidity	-	-	%

Remark: PM_{10} [a] = Particulate matter 10 micrometers or less in diameter
$PM_{2.5}$ [b] = Particulate matter 2.5 micrometers or less in diameter

4.2.5.2 Survey Location

The locations of air quality monitoring survey in detail are shown in Figure 4.2.5-1. The detail of sampling points is described as Table 4.2.5-2.

Table 4.2.5-3 Sampling location for air quality survey

Sampling Points	Coordination	Description of Sampling Point
AQ-1	25°25'59.70"N 97°26'33.45"E	Waingmaw substation, Maingnar village, Waingmaw Township, Kachin state
AQ-2	24°14'53.93"N 96°11'52.58"E	Na Bar substation, near Na Bar village, Indaw township, Sagaing Region

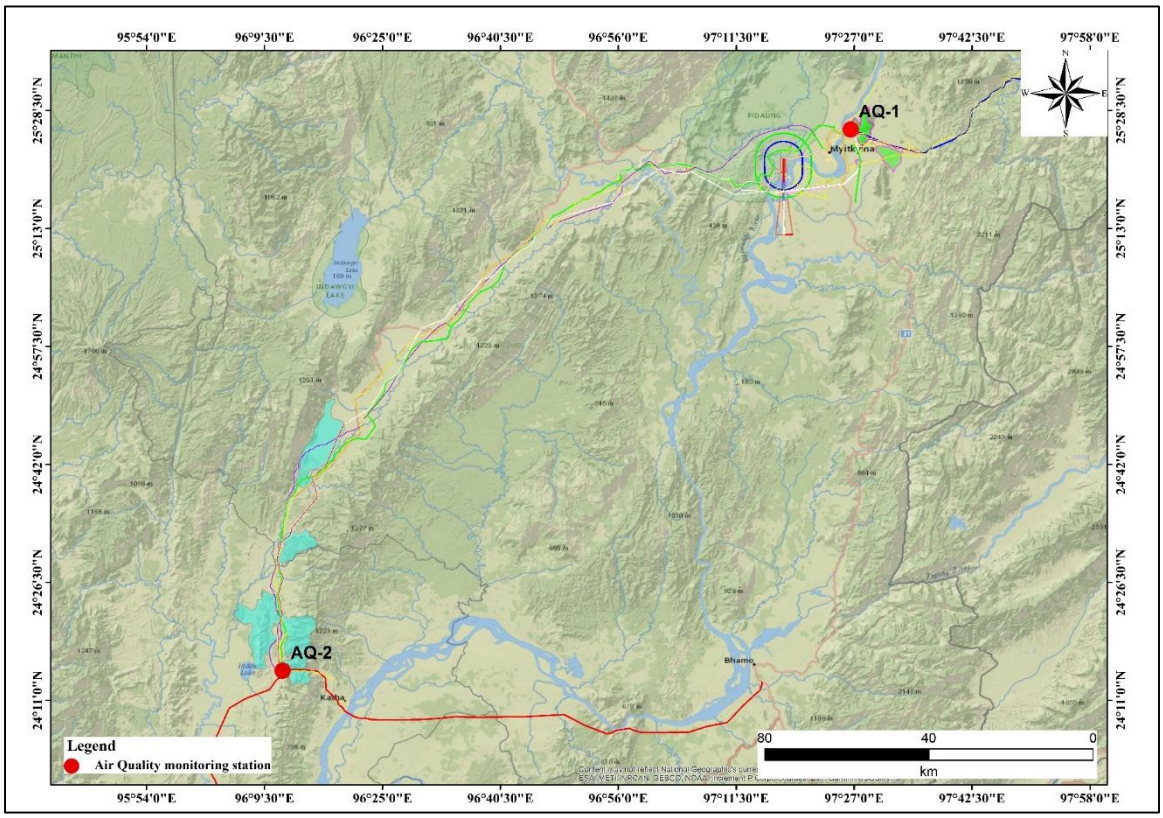


Figure 4.2.5-1 Location map of air and noise quality survey

Air Quality Monitoring station-1 (AQ-1)

AQ-1 is located in the compound of Waingmaw substation, near Maingnar village, Waingmaw Township, Kachin state. AQ-1 is covering by terrain with sparsely vegetation pattern. Possible pollution source may be come from shifting cultivated activities such as burning the cultivated land. The survey activities of AQ-1 is shown in Figure 4.2.5-2.

Figure 4.2.5-2 Air quality monitoring survey atAQ-1

Air Quality Monitoring station-2 (AQ-2)

AQ-2 is situated in the compound of Na Bar substation, Indaw Township, Sagaing Region. Beside of the air quality station has the construction site. The possible emitted pollution source

might be come from construction activities. Sometimes, unusual noises might be come from traffic and construction. The survey activities of AQ-2 is shown in Figure 4.2.5-3.

Figure 4.2.5-3 Air quality monitoring survey at AQ-2

4.2.5.3 Survey Period

Air quality survey was conducted for 24 hours (one day) consecutively for baseline data. The date of sampling duration are shown in Table 4.2.5-4.

Table 4.2.5-4 Sampling Duration for Air Quality Survey

Point	Period
AQ-1	May 29th – 30th, 2019 (24 hours)
AQ-2	June 3rd – 4th, 2019 (24 hours)

Source: Resource & Environment Myanmar Co., Ltd.

4.2.5.4 Survey Method

Methodology

Sampling and analysis of ambient air pollutants were conducted by referring to the recommendation of United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner EPAS Wireless Environmental Perimeter Air Station was used to collect Ambient Air Monitoring data.

Table 4.2.5-5 Sampling and Analysis Method for Air Quality

No.	Parameter	Analysis Method
1	Nitrogen dioxide (NO2)	On site reading
2	Carbon monoxide (CO)	On site reading
3	Particulate matter 10 (PM10)	On site reading
4	Particulate matter 2.5 (PM2.5)	On site reading
5	Sulphur dioxide (SO2)	On site reading
6	Temperature	On site reading
7	Relative Humidity	On site reading
8	Wind Speed	On site reading
9	Wind Direction	On site reading

4.2.5 Survey Result

Average value of ambient gaseous levels at AQ-1 and AQ-2 for one day (24 hours) is presented in following Table 4.2.5-6. CO concentration are not controlled by Myanmar National Emission Quality Guideline. It is obvious that the concentrations of PM2.5 and PM10 are lower than the standard whereas SO_2 concentration is also lower than the applied standard. Generally, covering the all parameter of pollution, all parameters are commonly lower than the guideline standard. So, it indicated the area had some emission sources and it was certainly to say the measured data were baseline level in the area.

Table 4.2.5-6 Daily Ambient air quality results at AQ-1 and AQ-2

Sampling. No	Time	CO	NO_2	NO	PM2.5	PM10	RH	SO_2	Tmp. °C
	hours	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	**%**	µg/m3	Deg. C
AQ-1	24	89.63	29.88	6.91	20.66	30.24	59.80	2.69	30.77
AQ-2	24	42.02	64.89	6.00	22.38	26.72	85.64	0.27	24.65
Guide line values of (NEQG & IFC).		-	200(1 hour)	-	25	50	-	20	-

Source: Resource & Environment Myanmar Co., Ltd.

Wind Speed and Direction

The average wind speed and direction were collected for 24 hours (one day) in each location. According to the wind rose diagram, average wind speed varies from 1.51 to 5.05m/s in all stations. Prevailing wind direction of AQ-1 is northeast and southwest direction and AQ-2 is east- southeast and southwest direction. Average hourly results of wind direction and wind speed show in Table 4.2.5-6.

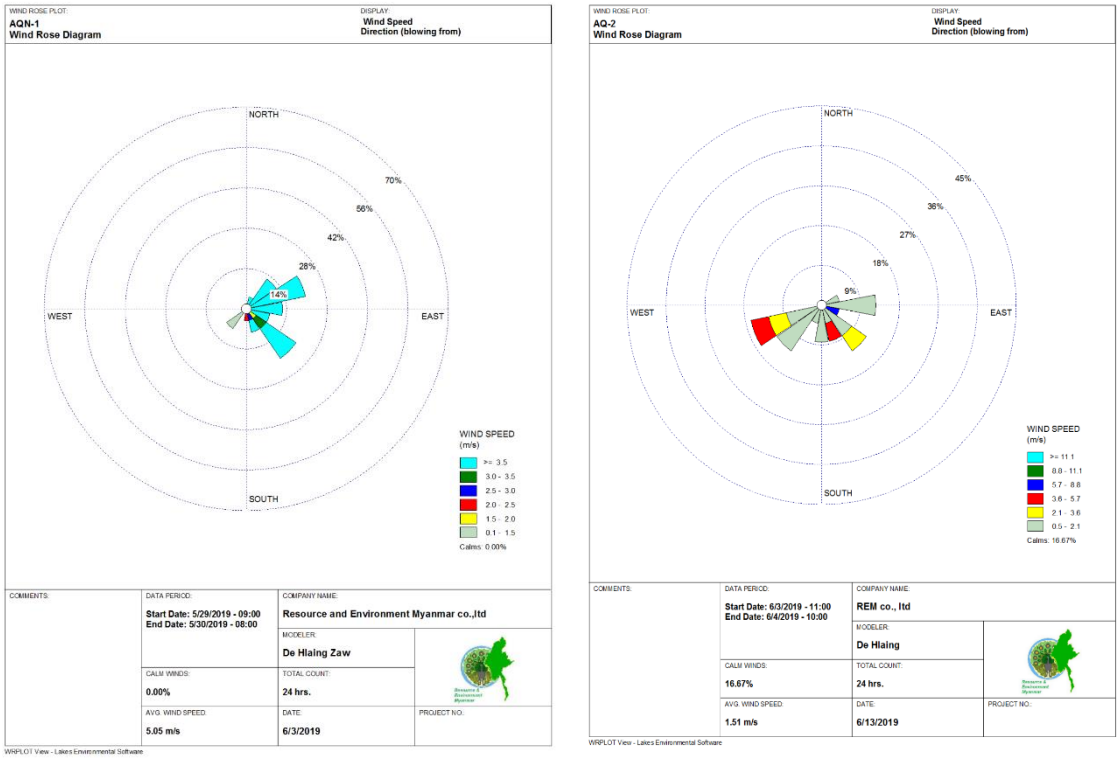


Figure 4.2.5-4 Wind rose diagram of AQ -1 and AQ -2

Table 4.2.5-7 Daily average result of wind speed and direction at AQ-1 and AQ-2

Unit- Wind Direction (Degree), Wind Speed (Kilometre /hour)

Time	Wind Direction	Wind Speed	Time	Wind Direction	Wind Speed
09:00-10:00	146	3.8	11:00-12:00	250	5.0
10:00-11:00	147	5.7	12:00-13:00	107	6.7
11:00-12:00	95	6.8	13:00-14:00	158	4.5
12:00-13:00	87	4.9	14:00-15:00	171	1.4
13:00-14:00	87	6.0	15:00-16:00	245	1.1
14:00-15:00	53	6	16:00-17:00	100	1
15:00-16:00	75	5.3	17:00-18:00	193	1.1
16:00-17:00	30	8.0	18:00-19:00	234	0.1
17:00-18:00	57	7.5	19:00-20:00	243	0.5
18:00-19:00	59	7.4	20:00-21:00	217	0.5
19:00-20:00	67	4.9	21:00-22:00	89	0.3
20:00-21:00	137	1.6	22:00-23:00	191	0.5
21:00-22:00	216	0.5	23:00-00:00	128	1.8
22:00-23:00	124	3.1	00:00-01:00	158	1.3
23:00-00:00	49	10.4	01:00-02:00	132	1.2
00:00-01:00	139	4.2	02:00-03:00	128	2.3
01:00-02:00	149	2.9	03:00-04:00	127	0.2
02:00-03:00	66	6.7	04:00-05:00	83	0.5
03:00-04:00	103	3.5	05:00-06:00	90	1.1
04:00-05:00	127	5.2	06:00-07:00	66	0.7
05:00-06:00	107	7.4	07:00-08:00	221	0.6
06:00-07:00	178	2.4	08:00-09:00	305	0.3
07:00-08:00	229	0.8	09:00-10:00	235	1.2
08:00-09:00	55	6.1	10:00-11:00	245	3.1

4.2.6 Noise Level

4.2.6.1 Survey Item

A-Weighted Loudness Equavalent (LAeq) was monitored along the transmission line. Baseline noise data was referred by Myanmar National Environmental Quality Guideline. Referred standard for noise level is shown in Table 4.2.6-1.

Table 4.2.6-1 Guideline Value of Noise Level

No.	Parameter	Unit	Environmental Standard (Myanmar)		
			Category	Day time 7:00-22:00	Night time 22:00-7:00
1	A-weighted loudness equivalent (L_{Aeq})	dB	Residential, educational, institutional	55	45
			Industrial, commercial	70	70

Source: National Environmental Quality (Emission) Guidelines, 2015
Remark: a LAeq = Equivalent continuous sound level in decibels

4.2.6.2 Survey Location

The locations of noise level monitoring stations are shown in Table 4.2.6-2 and Figure 4.2.6-1.

Table 4.2.6-2 Survey location for noise level stations

Monitoring ID	Coordinates	Description	Unusual noise
N-1	25°25'59.70"N 97°26'33.45"E	Waingmaw substaion	-Mortorbike passage, Running from electrical power substation, Resident
N-2	25°23'1.71"N 97°35'42.17"E	Waybar village, near War Shawng village, Waingmaw Township	- Vehicle passage and resident
N-3	25°21'37.20"N 97°27'52.70"E	Laban village, Waingmaw Township	- Resident's activity
N-4	25°15'44.49"N 96°52'40.46"E	Shwe In village, Mogaung Township	- Resident's activity
N-5	25°10'40.60"N 96°44'6.50"E	Taungni Village, Mogaung Township	-Motorbike passage - Resident's activity
N-6	25° 9'10.41"N 96°41'59.75"E	Namana Village, Mogaung Township	- Motorbike passage - Resident's activity
N-7	25° 6'1.14"N 96°37'54.59"E	Pinbaw village, Hopin Township	- Resident's activity
N-8	24°40'11.30"N 96°15'57.16"E	Selmaing Ywathit, Monyin Township	- Resident's activity
N-9	24°14'53.93"N 96°11'52.58"E	Na Bar Substation	- Running from electrical power substation, Resident

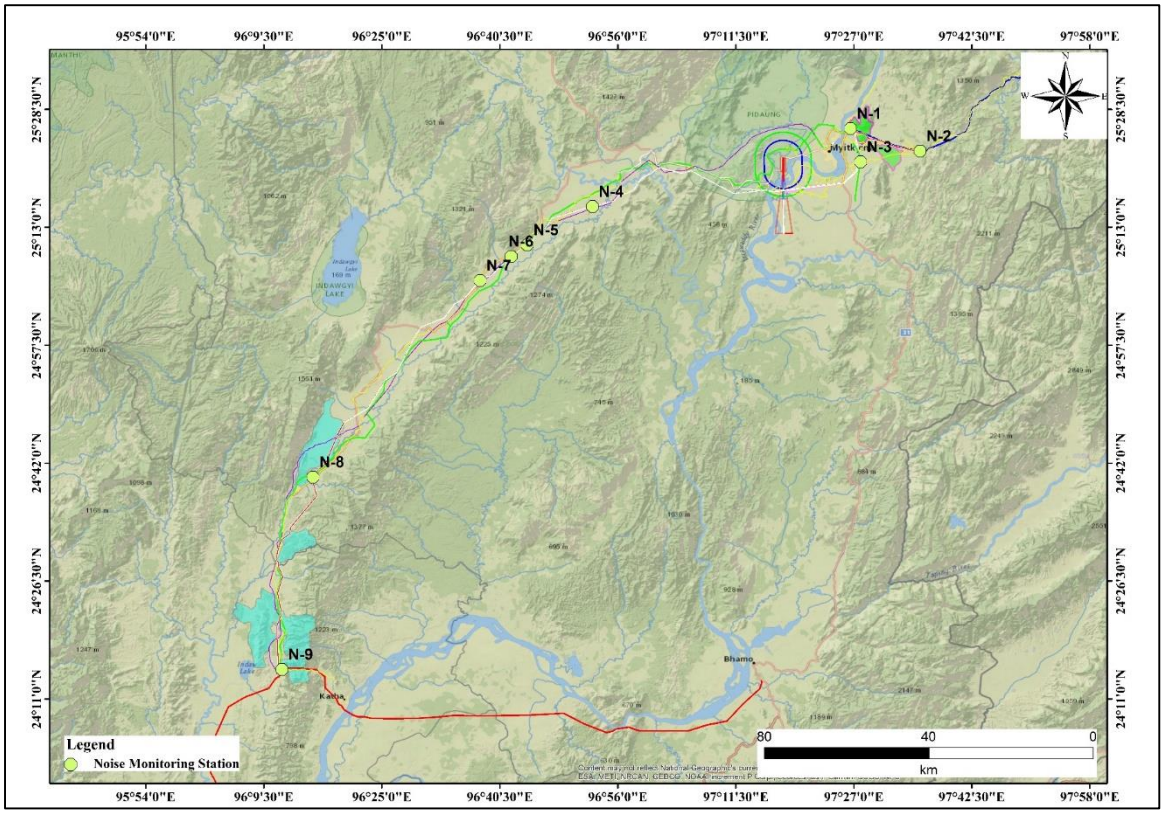


Figure 4.2.6-1 Wind rose diagram of AQ -1 and AQ -2

4.2.6.3 Survey Period

Noise level survey was conducted on 72 hours consecutively. The measurement duration was shown in Table 4.2.6-3.

Table 4.2.6-3 Sampling Duration for Noise Level Survey

Point	Period
N-1	29- 30 May, 2019
N-2	30- 31 May, 2019
N-3	30- 31 May, 2019
N-4	31 May- 1 June, 2019
N-5	1- 2 June, 2019
N-6	1- 2 June, 2019
N-7	1- 2 June, 2019
N-8	2- 3 June, 2019
N-9	3- 4 June, 2019

Source: Resource & Environment Myanmar Co., Ltd.

4.2.6.4 Survey Method

Measurement of environmental sound level was conducted by referring to the recommendation of International Organization for Standardization (ISO), i.e. ISO 1996-1:2003 and ISO 1996-2:2007. The instrumentation used for noise quality survey is shown in the following Table 4.2.6-4.

Noise meter was set up to record the log as ten minutes intervals during an hour for one consecutive day.

Table 4.2.6-4 Instrumentation for noise survey

Instrumentation	*Description*
Sound level meter	*Sound level meter with SD Card, Model SL-4023SD*

Source: Sustainable Environment Myanmar Co., Ltd.

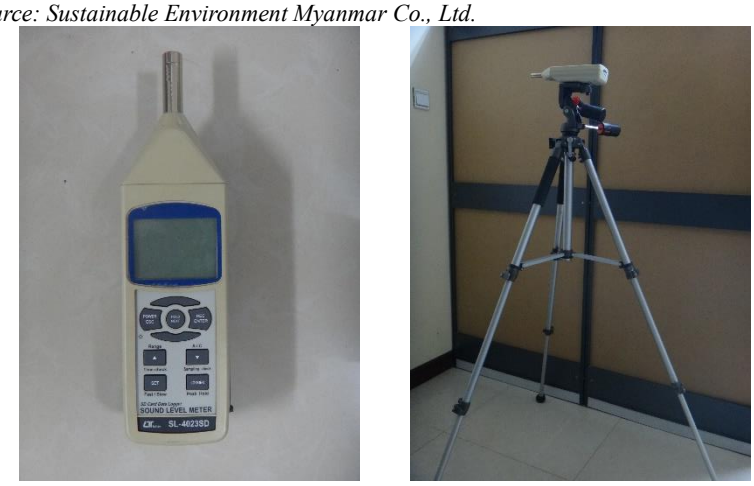


Figure 4.2.6-2 Lutron sound level meter

4.2.6.5 Survey Result

Noise level (LAeq) was presented in Table 1.3-4. One day L_{Aeq} was calculated by using the following array formula in the excel sheet. This formula is firstly used for hourly L_{Aeq} and then for the 24 hours L_{Aeq}. 10*LOG10 (AVERAGE (10^((RANGE)/10)))

According to the calculated results, daytime noise level is lower than the applied standard and night time noise level are fairly higher than the standard. Measurement of environmental sound level was conducted by referring to the recommendation of Myanmar National emission guideline 29th December, 2015.

Table 4.2.6-5 A-weighted loudness Equivalent Daytime and Night time (Laeq) Level

Monitoring Location	Result	
	Day Time Unit: dBA	Night Time Unit: dBA
N1	41	42
N2	47	48
N3	50	49
N4	42	44
N5	54	58
N6	46	54
N7	48	45
N8	44	42
N9	52	49
Standard	55	45

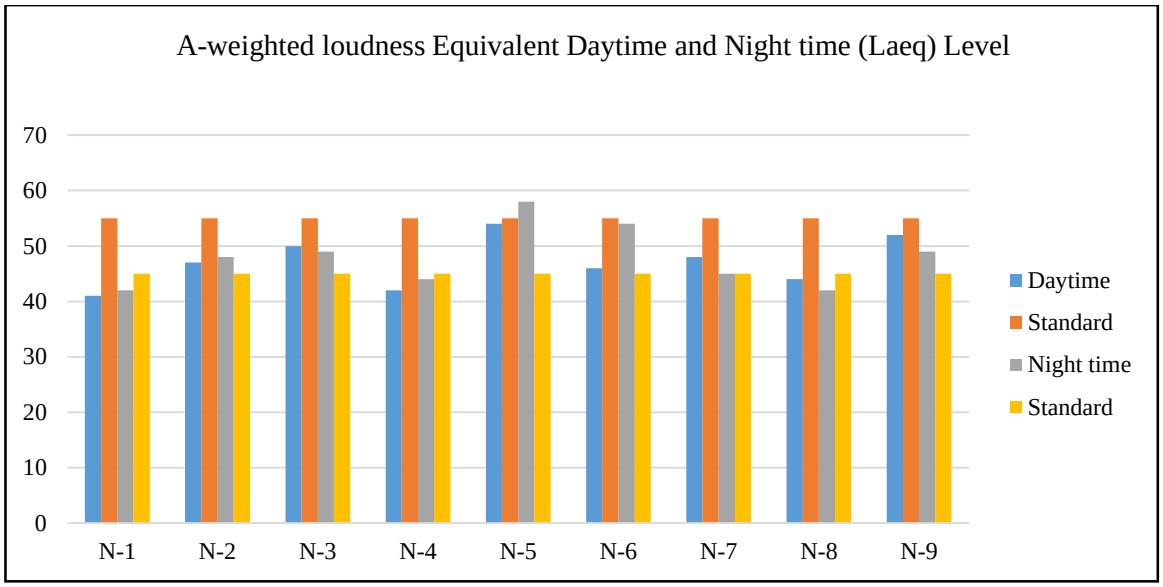
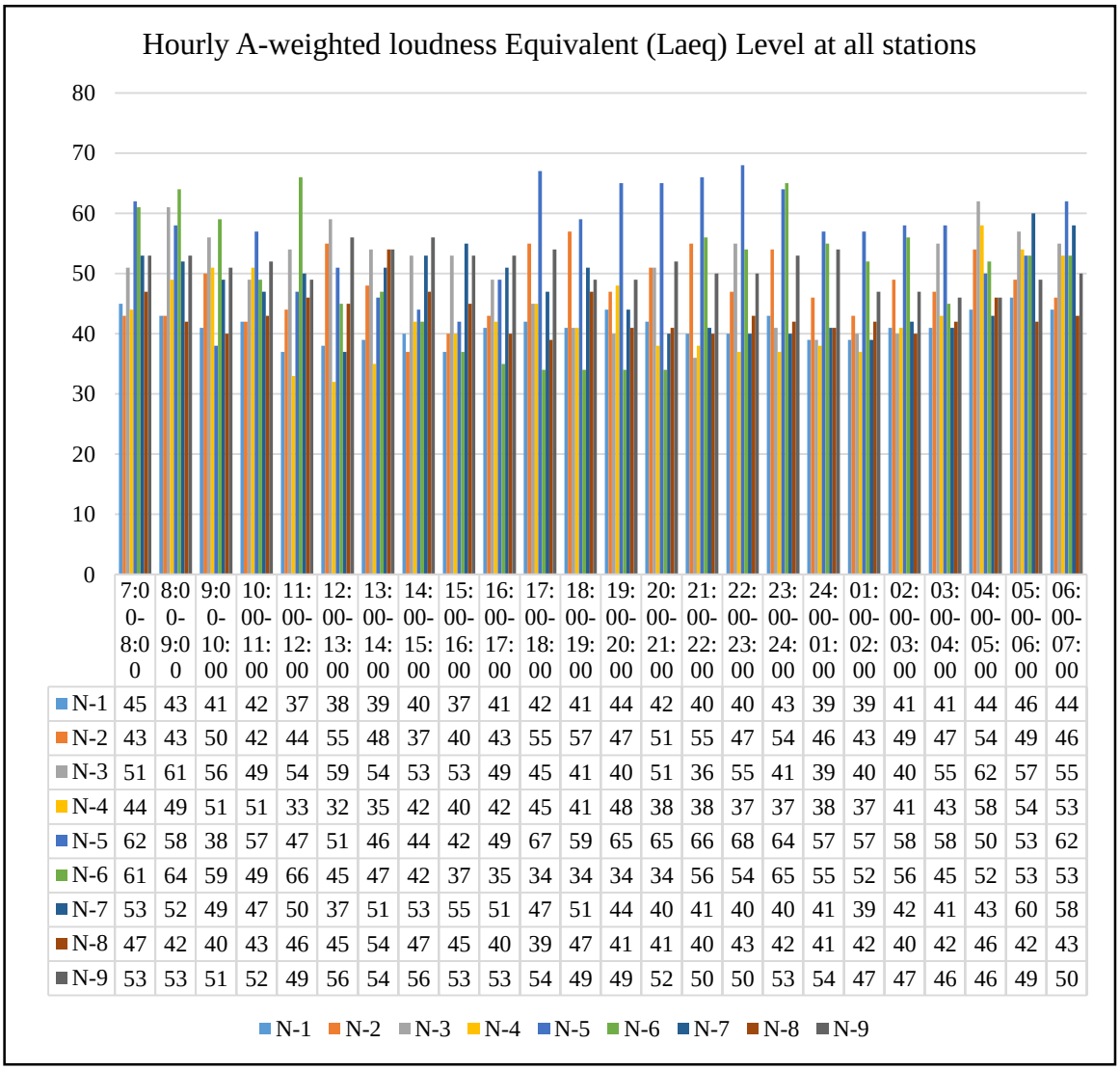


Figure 4.2.6-3 A-weighted loudness Equivalent Daytime and Night time (Laeq) Level at all stations

Table 4.2.6-6 Hourly A-weighted loudness Equivalent (Laeq) Level at all stations

Time	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9
7:00-8:00	45	43	51	44	62	61	53	47	53
8:00-9:00	43	43	61	49	58	64	52	42	53
9:00-10:00	41	50	56	51	38	59	49	40	51
10:00-11:00	42	42	49	51	57	49	47	43	52
11:00-12:00	37	44	54	33	47	66	50	46	49
12:00-13:00	38	55	59	32	51	45	37	45	56
13:00-14:00	39	48	54	35	46	47	51	54	54
14:00-15:00	40	37	53	42	44	42	53	47	56
15:00-16:00	37	40	53	40	42	37	55	45	53
16:00-17:00	41	43	49	42	49	35	51	40	53
17:00-18:00	42	55	45	45	67	34	47	39	54
18:00-19:00	41	57	41	41	59	34	51	47	49
19:00-20:00	44	47	40	48	65	34	44	41	49
20:00-21:00	42	51	51	38	65	34	40	41	52
21:00-22:00	40	55	36	38	66	56	41	40	50
Daytime (Average)	41	47	50	42	54	46	48	44	52
22:00-23:00	40	47	55	37	68	54	40	43	50
23:00-24:00	43	54	41	37	64	65	40	42	53
24:00-01:00	39	46	39	38	57	55	41	41	54
01:00-02:00	39	43	40	37	57	52	39	42	47
02:00-03:00	41	49	40	41	58	56	42	40	47
03:00-04:00	41	47	55	43	58	45	41	42	46
04:00-05:00	44	54	62	58	50	52	43	46	46
05:00-06:00	46	49	57	54	53	53	60	42	49
06:00-07:00	44	46	55	53	62	53	58	43	50
Night Time (Average)	42	48	49	44	58	54	45	42	49



	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	20:00-21:00	21:00-22:00	22:00-23:00	23:00-24:00	24:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00	04:00-05:00	05:00-06:00	06:00-07:00
N-1	45	43	41	42	37	38	39	40	37	41	42	41	44	42	40	40	43	39	39	41	41	44	46	44
N-2	43	43	50	42	44	55	48	37	40	43	55	57	47	51	55	47	54	46	43	49	47	54	49	46
N-3	51	61	56	49	54	59	54	53	53	49	45	41	40	51	36	55	41	39	40	40	55	62	57	55
N-4	44	49	51	51	33	32	35	42	40	42	45	41	48	38	38	37	37	38	37	41	43	58	54	53
N-5	62	58	38	57	47	51	46	44	42	49	67	59	65	65	66	68	64	57	57	58	58	50	53	62
N-6	61	64	59	49	66	45	47	42	37	35	34	34	34	34	56	54	65	55	52	56	45	52	53	53
N-7	53	52	49	47	50	37	51	53	55	51	47	51	44	40	41	40	40	41	39	42	41	43	60	58
N-8	47	42	40	43	46	45	54	47	45	40	39	47	41	41	40	43	42	41	42	40	42	46	42	43
N-9	53	53	51	52	49	56	54	56	53	53	54	49	49	52	50	50	53	54	47	47	46	46	49	50

Figure 4.2.6-4 Hourly A-weighted loudness Equivalent (Laeq) Level at all stations

4.2.7 Water Quality

Parameters for water quality survey are determined so as to cover the parameters of existing environmental standards of Myanmar.

4.2.7.1 Survey Item

Parameters for water quality survey are determined so as to cover the parameters of existing environmental standards. The following parameters will be measured and analyzed insitu as well as laboratory. Survey parameters are shown in Table 4.2.7-1.

Table 4.2.7-1 Parameters

Sr.no	Parameter	Unit
1	pH	
2	Temperature	°C
3	ORP	Mv
4	Conductivity	µs/cm
5	Dissolve oxygen	mg/l
6	BOD	mg/l
7	COD	mg/l
8	TSS	mg/l
9	Total Coliform	MPN/100L
10	Hexavalent Chromium	mg/l
11	Oil and Grease	mg/l
12	Total Nitrogen	mg/l
13	Total Phosphorus	mg/l

4.2.7.2 Survey Locations

The locations of water samples and surveys are shown in Table 4.2.7-2 and Figure 4.2.7-1. The detail of each sampling points are described as below.

Table 4.2.7-2 Sampling and survey points of surface water quality survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Surface Water	SW- 1	25°50'48.79"N 95°50'55.26"E	Nansankyin Chaung, Pinkyaing village, Mogaung Township
Surface Water	SW -2	25°52'21.19"N 95°51'8.00"E	Nanyin stream, near Na Bar substation
Surface Water	SW-3	25°17'41.96"N 97°15'54.08"E	Ayeyarwaddy river, near Lower Mawpaw village, Myintkyina Township

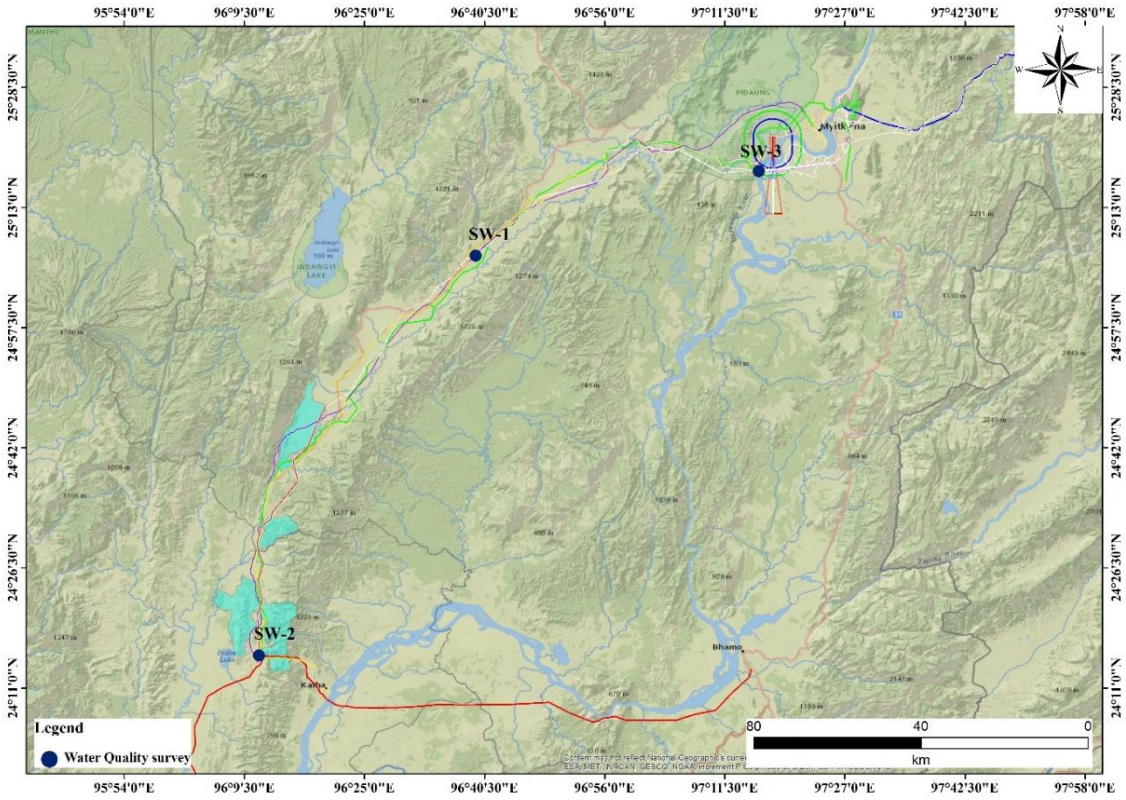


Figure 4.2.7-1 Location map of water quality survey

SW- 1

SW 1 was collected in Nan San Kyin stream, near Pinkyaing village, Mogaung Township, Kachin state. The survey activities of SW 1 are shown in Figure 4.2.7-2.

Figure 4.2.7-2 Water quality survey at NJSW 1

SW- 2

SW -2 was surveyed and collected at the Na Bar Stream near Na Bar Substation. The channel width of SW 2 is about 6meter. The turbidity is also slightly high. The SW-2 is generally mountainous terrain covering with dumping site and tailing site of mine. The survey activities of SW-2 are shown in Figure 4.2.7-3.

SW-3 was surveyed and collected at the Ayeyarwaddy river near lower Mawpaw village, Myintkyina Township where is located about 0.2km south of propose transmission line and 1.7km south lower Mawpaw Village. Visible water quality is high transpancy with low turbudity.

Figure 4.2.7-3 Water quality survey at SW 2

4.2.7.3 Survey Period

The sampling and measuring of the surface water were conducted on 1-3 June, 2019.

4.2.7.4 Survey Method

Water samples were taken by Alpha horizontal water sampler and collected in plastic and sterilized glass sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters as pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), and total dissolved solid including the odor and color in visual analyzing were measured at each site concurrently with sample collection and. According to the Laboratory standard, some samples were preserved using the chemicals. All samples were kept in iced boxes and were transported to the laboratory within 24 hours. Moreover, the river survey; the flow rate, width and depth of river, was also measured using Vale port Flow Meter equipment and depth sounder.

Table 4.2.7-3 Field Equipment for surface water quality survey

No.	*Equipment*	*Manufacturer*	*Originate Country*	*Model/Serial No.*
1	*SMART TROLL@ MP _Multi parameter for water*	*In_Situ Inc.*	*USA*	*SN - 346054*
2	*Multi Parameters for water quality*	*HANNA*	*USA*	H17609823 (Turbidity Sensor)
3	*Alpha Bottle (Water Sampler)*	*Wildlife Supply Company®*	*Indonesia*	*Wildco P/N-1120-G45*
4	*Flow meter*	*GLOBAL WATER 800-876-1172*	*USA*	*FB211 Serial - 1449006336*
5	*Depth Sounder*	*Japan*	*Japan*	*FP211/1136160536*

Table 4.2.7-4 Analysis Method for Water Samples

No.	Item	Analysis Method
1	Temperature	SMART TROLL@MP _Multi parameter for water (pH sensor)
2	pH	*SMART TROLL@MP _Multi parameter for water (DO sensor)*
3	Dissolved Oxygen	*SMART TROLL@MP _Multi parameter for water (EC/TDS sensor)*
4	Electrical Conductivity (EC)	*SMART TROLL@MP _Multi parameter for water (EC/TDS sensor)*
5	Total Dissolved Solid (TDS)	*SMART TROLL@MP _Multi parameter for water (EC/TDS sensor)*
6	Turbidity	*HANNA Multi Parameters (Turbidity sensor)*
8	BOD	*Chemical test*
9	COD	Chemical test
10	TSS	Chemical test
11	Total Coliform	Chemical test
12	Oil and Grease	Chemical test
13	Total Nitrogen	Chemical test
14	Total Phosphorus	Chemical test

4.2.7.5 Survey Result

Water samples were sent to the United Analyst and Engineering Consultant in Thailand (UAE). Insitu water quality result and laboratory result are shown in following Table 4.2.7-5 and Table 4.2.7-6.

Table 4.2.7-5 Insitu water quality result

Item/Sample Name	Unit	SW-1	SW-2	SW3
Location		Nan San Kyin Stream, Pinkyaing village	Nam Yin Stream, Na Bar Village	Ayeyarwaddy river, near Mawpow Village
Weather		Sunny	Sunny	Sunny
Color		Colorless	Light grey	Colorless
Transparency		Medium	Low	Medium
ORP	mv	8	22	116

Water Temperature	℃	28.9	31.6	27.1
Air Temperature	℃	30.2	32.1	30.5
pH	-	8.5	8.59	8.31
DO	mg/L	7.04	6.87	7.27
EC	µs/cm	238	47	120
TDS	ppm	166	23	127
Biochemical Oxygen Demand (BOD)	mg/l	ND	ND	2.5
Chemical Oxygen Demand (COD)	mg/l	28	ND	31
Total Suspended Solids (TSS)	mg/l	51.4	ND	41.4
Total Coliform Bacteria	MPN/100ml	13,000	14,000	14,000
Oil and Grease	mg/l	ND	ND	ND
Total Nitrogen	mg/l	1.35	1.44	1.28
Total Phosphorus	mg/l	0.03	ND	0.01

The water quality monitoring results in the Ayeyarwady River and other two streams indicate that the DO levels are higher than 5mg/l which do not affect the survival of aquatic life in the river. DO below 5 mg/l generally puts aquatic life under stress. The BOD and COD concentration are considered good but the TSS is already high in one stream and Ayeyarwady River is lower than 50 mg/l. The allowable maximum concentration of TSS into the river is 50 mg/l. The pH values ranged between 8.3 and 8.5 which means that water quality is basic. The BOD and COD levels are well within the acceptable limit of 8 mg/l and 50 mg/l for aquatic life.

The laboratory result of water is shown in Appendix 4.

4.2.8 Soil Quality

4.2.8.1 Survey Item

Parameters for soil quality survey are determined so as to cover the parameters of existing available environmental standards. Soil sample was taken by the manual hand auger.

4.2.8.2 Survey Locations

The locations of soil samples and surveys are shown in Table 4.2.8-1 and Figure 4.2.8-1. The detail of sampling points are described as below.

Table 4.2.8-1 Sampling and survey points of surface soil quality survey

Sampling Point	Coordinates	Description of Sampling Point
S-1	25°26'0.28"N, 97°26'34.07"E	Waingmaw Substation
S-2	25°15'48.82"N, 96°53'11.11"E	About 0.63km east of Shwe Inn village, Mogaung Township, Kachin state
S-3	24°14'50.20"N, 96°11'57.50"E	Na Bar Substation

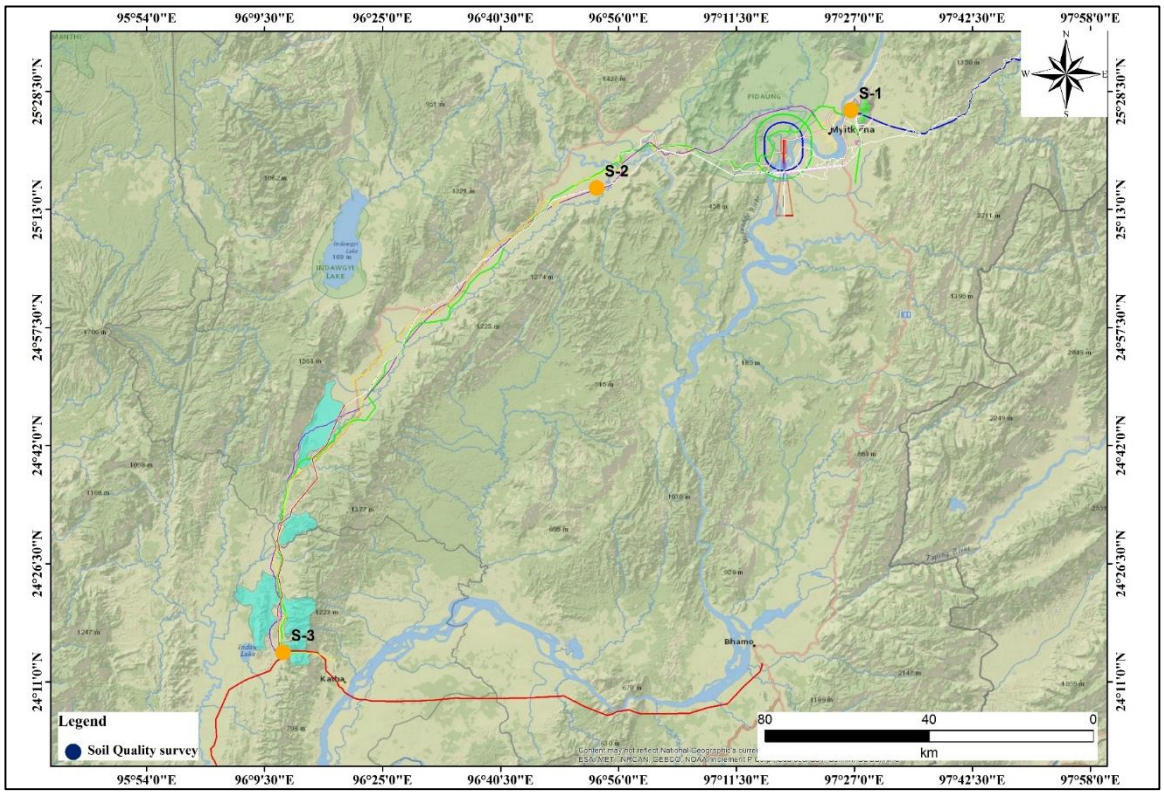


Figure 4.2.8-1 Location map of Soil Quality survey

4.2.8.3 Survey activity

Total three sampling points were collected along the propose transmission line. Survey activities of soil quality as shown in Figure 4.2.8-2.

Figure 4.2.8-2 Survey activities of soil quality

4.2.8.4 Survey Result

Soil quality results are presented in Table 4.2.8-2. The soil samples were analyzed at the laboratory of Land Use Department, Ministery of Agriculture, Livestock and Irrigation.

Table 4.2.8-2 laboratory result for soil Quality

Parameter	Moisture	pH	Organic Carbon	Humus	Total Nitrogen	SO_4	Ca^{++}	Mg^{++}	K^+	Na^+	P	K_2O	NO_{3-} N
S-1	8.26	4.74	0.67	1.15	0.17	0.44	2.91	0.73	0.21	0.31	3.27	9.81	0.07
S-2	2.55	5.54	0.43	0.73	0.09	0.08	4.79	ND	0.08	0.27	1.54	3.70	0.03
S-3	4.48	4.60	0.58	1.00	0.15	0.12	2.79	0.70	0.17	0.23	22.51	8.17	0.03

There is no standard and guidelines for soil in Myanmar so far and therefore the results presented in Table 4.2.8-2 will be used as baseline data for future monitoring task. The laboratory result of water is shown in Appendix 4.

4.2.9 Biological Environment

A biodiversity baseline is part of an EIA study for a designated project which may have an impact on the natural environment including existing flora, fauna and wildlife habitats. The main objective of biodiversity baseline is to provide sufficient and accurate biodiversity data to

allow a complete and objective identification, prediction and evaluation of the potential biodiversity impacts. The methodology used may vary from case to case depending on the natural environment to be affected and the nature and scale of the project.

The Scope and Content

The scope and purpose of the biodiversity baseline study are:

1. To provide comprehensive and accurate information on the biodiversity;
2. To identify and predict potential biodiversity impacts;
3. To evaluate the significance of the impacts identified;
4. To recommend effective and practicable alternatives and mitigation measures; and
5. To recommend the need for and the scope of an appropriate monitoring and audit programme.

Survey Items

Survey items for flora and fauna survey are as follows;

1. Vegetation

2. Inhabitants

3. Important species

4. Biodiversity and Ecosystem

Site Reconnaissance

A targeted site reconnaissance was conducted from 29th May to 3rd June, 2019 to ground-truth information gathered and supplements it with site observations, data and photographs. The site reconnaissance targeted the following specific biodiversity objectives:

- To name, describe and map vegetation communities and habitats present within the Project Area at a suitable scale, using existing community nomenclature where possible;
- To identify, describe and map other ecologically sensitive areas within the Project Area such as springs, watercourses and other water bodies;
- To the extent possible within the survey time frame and season, determine if species of conservation significance known or predicted likely to be present in the Study Area are actually present within the Project Area;
- To identify opportunities for future biodiversity monitoring and enhancement within the framework of the proposed project.

Methodology

The methodologies used in the baseline study were discussed below.

1. Desktop Survey

Publicly available sources of information were analyzed to build an outline of known and likely ecological values for the Study Area. Aerial imagery was used to build a more complete spatial understanding of the pattern of vegetation communities and human uses on the site, and to map access routes and internal tracks. In addition, ecologists with experience of the Study Area were

consulted where possible to obtain information about species known to be present or previously recorded from the site, and other ecological values considered by them to be relevant.

2. Field Observation

(a) Flora

A Global Positioning System was used to navigate and mark coordinates between sample points along the study area of proposed transmission line. Field observation was conducted along and within ROW of transmission line. During the field survey period, plotless sampling method and sampling method was used. Plotless sampling method is based on the random selection of points within a particular survey area. In addition, all trees, shrubs, herbs and cultivated crops were recorded and listed. Identification of plants and animal species was conducted with the assistances of skilled local people and reference book. The identified species and families were translated to scientific name with assistance of a checklist of trees, shrubs, herbs and climbers of Myanmar.

(b) Fauna

(i) Mammal

The data collection for mammal species will conduct in three ways;

(1) Direct Observing of mammals in the field, (2) Observation of track and signs such as footprints, scat and feeding signs in their natural habitats, and (3) Interview survey. Mammal Survey was done by point count and transects count method during day time survey. The direct observation method was used for the species of arboreal mammals such as squirrels and tree shrews. Track and sign observation method was used for some small carnivores. All encountered signs and footprints found by track and sign observation were examined and then took photo record for species identification. The presence or absence of the very well-known mammal species was confirmed by interviewing local people already familiar with the forest.

(ii) Herpetology

Herpeto fauna surveys was conducted through direct observation and active searching in all major representative habitat types along the transmission line route and in potential hiding places such as among leaf litter, inside holes and under stones and logs within the study area. Surveys was conducted during day time periods. Visual observations, documented where possible by photographs, were made of some captured specimens that were not collected for preservation. Wherever possible, herpeto fauna will capture by hand. Photo records were taken by digital camera. Their morphometric characters of each specimen were recorded such as sizes, shapes, patterns, spots, stripes, and color and body length in the data sheet.

(iii) Butterflies and Odonata

Butterflies and Odonata survey was conducted through direct observation and active searching in all different habitats along the transmission line route by using point count method subject to the on-site conditions. Butterflies species and odonata species were collected by taking photo and identify the species with reference book.

(iv) Bird

Random Point count method was used for the bird survey and took the photo for species identification, observed numbers and habitat utilization. Species identification was done by using the field guide books, with help of the binoculars, camera and GPS. Nocturnal birds were

observed when it becomes dusk. Point count and opportunistic methods were used to census the species richness and point counting was used to get the relative measure of bird abundance.

(v) Aquatic

Interviewed with local fisherman from the study area were conducted during the collection of the specimen. Fishermen were interviewed with regard to fishery process including kinds of gear used, number of fishing time per day, target species. The fishing gears are trap, hook and line and gill nets. The water body of the irrigation canal was studied for aquatic fauna. The fishes were collected with the help of the fishermen during the survey period. Traps were also used to get various types of fish like surface dwellers and bottom dwellers. The fishes were photographed soon after the collection and measurements were also taken for key characteristics. During the survey period, indirect observations at a market and interview with fishermen about kind and quality of fishery product were conducted.

Interview survey

In the interview survey, the surveyor visited the residents in and around the survey area and interviewed the name of plants and animals existing in and around the area. Also, the past situation of flora and fauna, and the change on biodiversity and ecosystem in the area was interviewed for examination.

Figure 4.2.9-1 Interview survey with local people

Figure 4.2.9-2 Interview survey with local people

(3) Survey area

The survey area is shown in the following Figure 4.2.9-3.

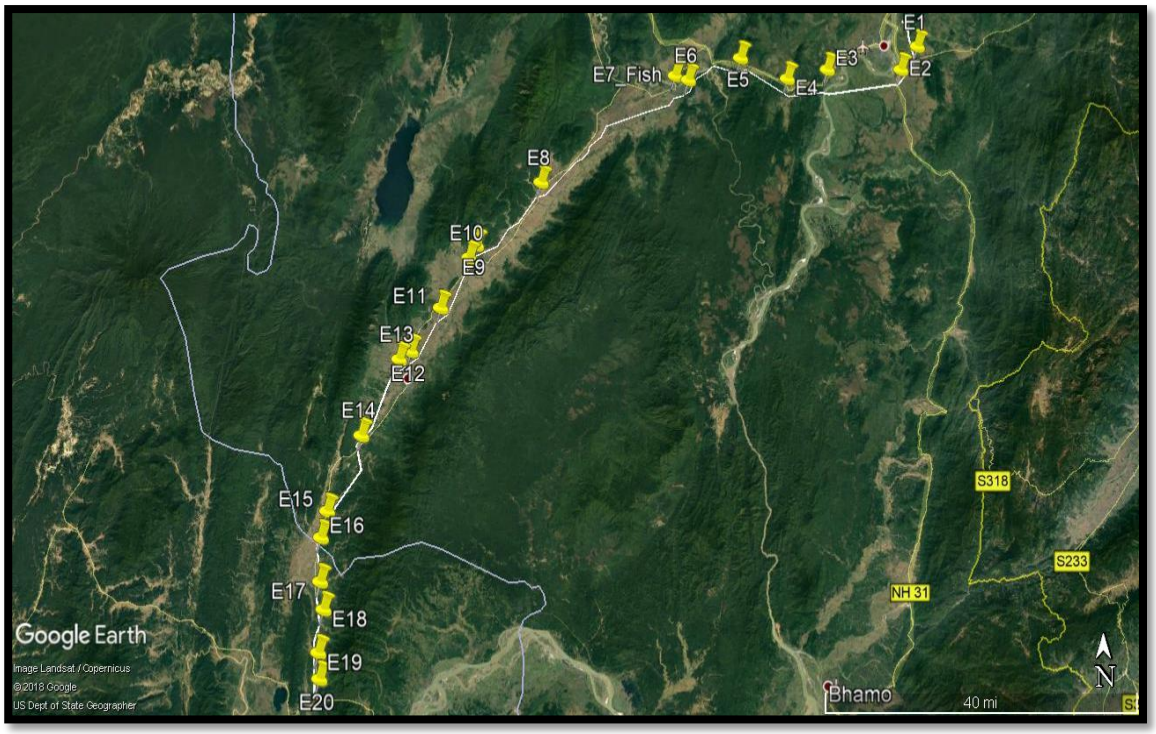


Figure 4.2.9-3 Location of survey area along 230kV Transmission Line

Survey Result

Flora

(1) Habitat

Along the Transmission Line Project, three major habitat types were observed namely (1) open deciduous forest (2) deciduous forest mixed with other woodland and (3) agricultural land. The proposed 230kV T-Line across most part of the agricultural land. Sceneries of the Survey Area are shown in Figure 4.2.9-4 and habitat Map of Transmission Line is shown in Figure 4.2.9-5.

Figure 4.2.9-4 Sceneries of the survey area

(2) Land Use/Land Cover Map

The location of the War Shawng – Waingmaw - Na Bar transmission lines with respect to the Forest Cover Map is shown on Figure 4.2.9-5.

Nearly half of the area of Myanmar is forested, but Myanmar ranks third in the world in annual deforestation. Drivers of deforestation and forest degradation include logging for domestic consumption and export, expansion of agriculture and tree plantations (especially rubber and oil palm plantations), shifting cultivation, infrastructure development, and poverty[2].

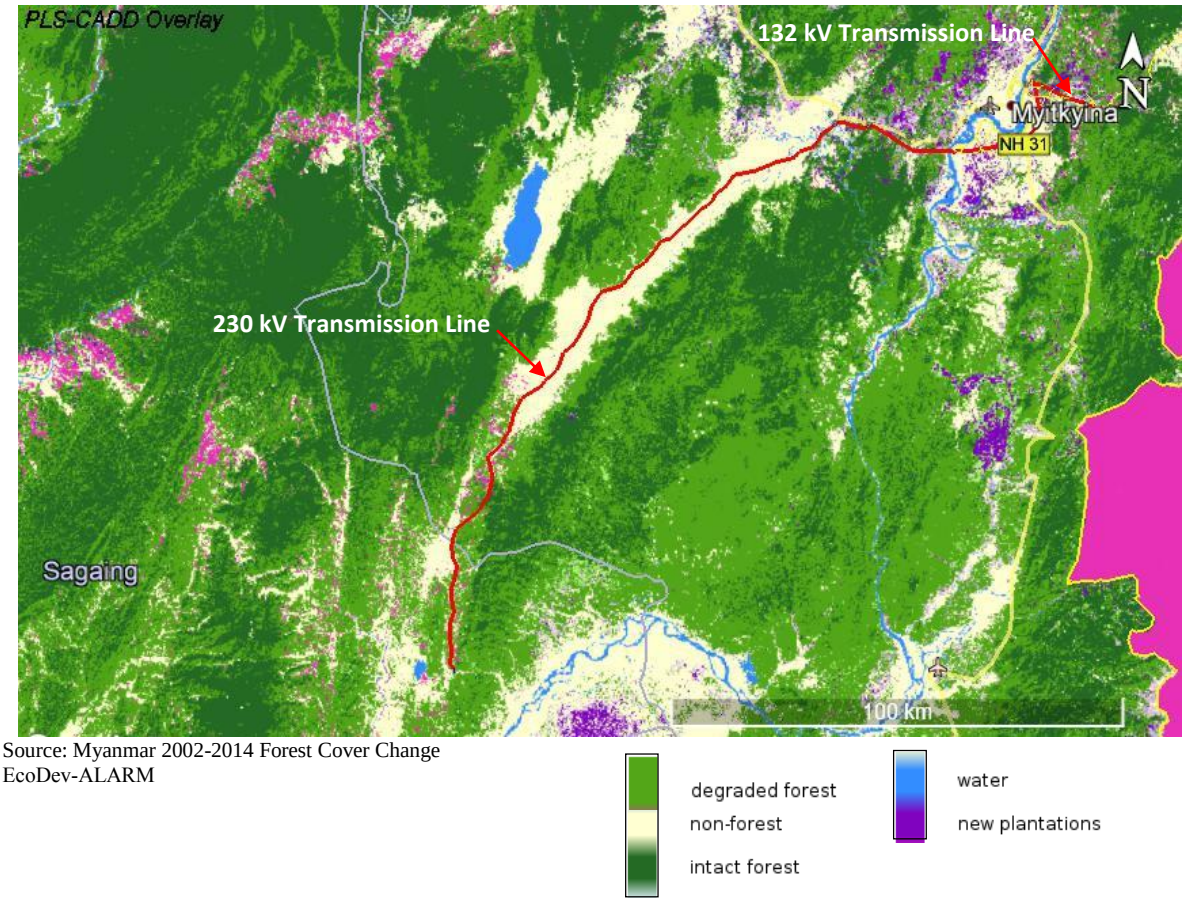
(3) Habitats

Important habitat types represented in Myanmar are forests, wetlands and the marine habitat. Eight different forest types are found in Myanmar: tropical evergreen forest, mixed deciduous forest, dry forest, deciduous dipterocarp forest, hill and temperate evergreen forest, tidal forest or mangrove forest, beach and dune forest, swamp forest[3].

Along the transmission line area, three major forest types were observed namely (1) open deciduous forest (2) Deciduous forest mixed with other woodland and (3) Agricultural land (Figure 4.2.9-6). A description of the vegetation community present in study area is summarized in Table 4.2.9.

[2] Kyaw Thu Moe, Junchang Liu (2016) "Economic Contribution of Non-timber Forest Products (NTFPs) to Rural Livelihoods in the Tharawady District of Myanmar", International Journal of Sciences, Research Article, Volume 5, January 2016

[3] Tint, K. (1995) *Status Report on the Forestry Sector of Myanmar*. Forest Department, Yangon.



Source: Myanmar 2002-2014 Forest Cover Change
EcoDev-ALARM

Figure 4.2.9-5 Land use/ land cover map along the Washaung – Waingmaw -Na Bar transmission line

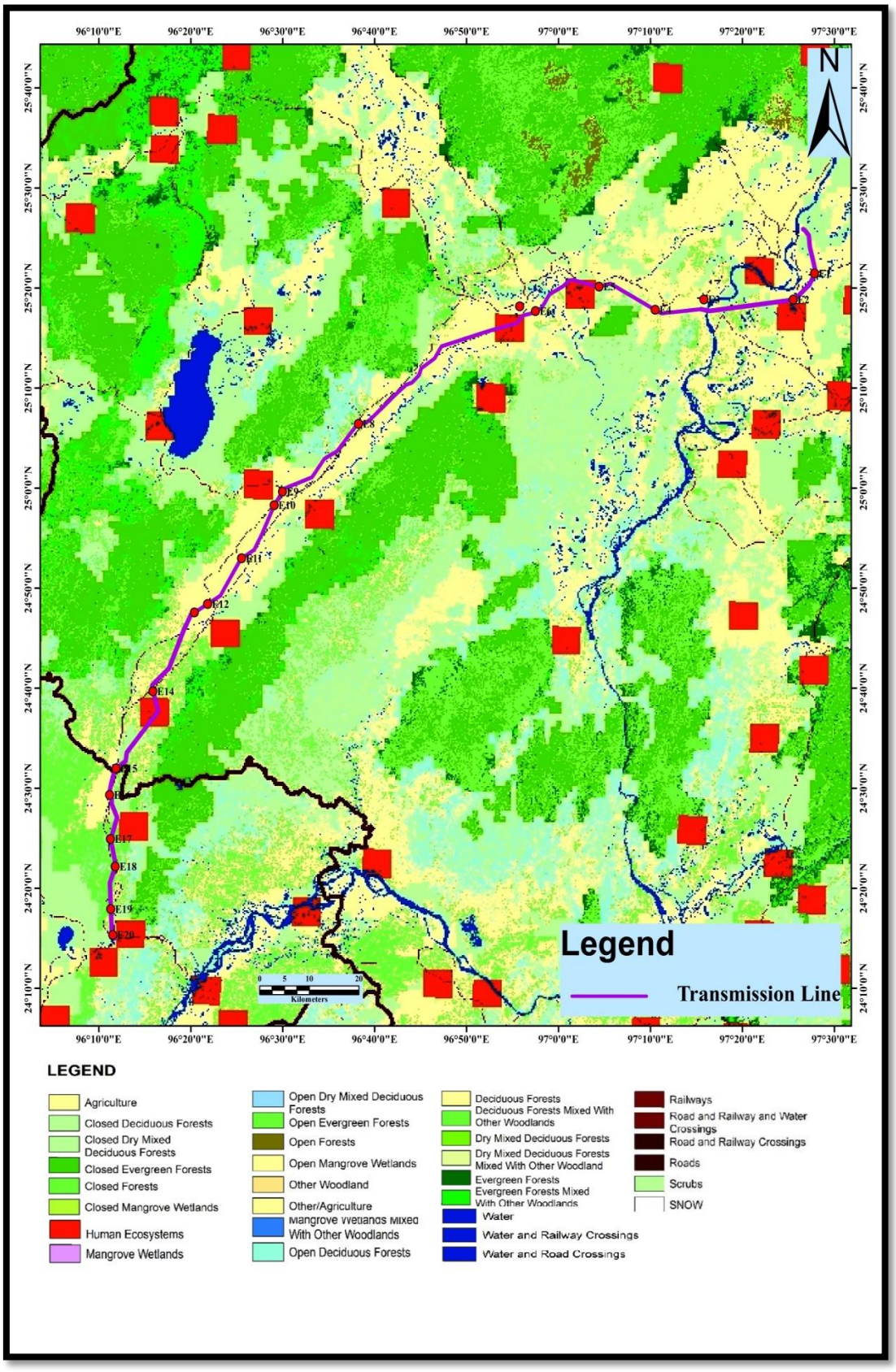


Figure 4.2.9-6 Habitat map along the 230 kV transmission line

(3) Vegetation Communities

Along the transmission line area, three major forest types were observed namely (1) open deciduous forest (2) Deciduous forest mixed with other woodland and (3) Agricultural land. A description of the vegetation community present in study area is summarized in Table 4.2.9-1.

Table 4.2.9-1 Vegetation Community Description

Community name	Land form	Description
Open deciduous Forest	Open deciduous forest, vegetation composed primarily of broad-leaved trees that shed all their leaves during one season. Deciduous forest also extends into more arid regions along stream banks and around bodies of water.	These forests occur in climates that are warm year-round, and may receive several hundred centimetres of rain per year, they have long dry seasons which last several months and vary with geographic location. Deciduous trees predominate in most of these forests, and during the drought a leafless period occurs, which varies with species type. Because trees lose moisture through their leaves, the shedding of leaves allows trees such as teak and mountain ebony to conserve water during dry periods
Mix Deciduous Forest	The mixed deciduous forest is strictly associated with bamboo species, which represent an important source of food for many wildlife species.	The mixed deciduous forest is the major forest type of Myanmar. Mix Deciduous forests primarily consist of deciduous trees, and deciduous trees lose their leaves during cold or very dry seasons, as compared to evergreen trees that keep their leaves year-round, usually for several years at a time.
Agricultural land	Agricultural land includes areas used for the production of adapted crops for harvest particularly the rearing of livestock and production of crops to produce food for humans. It is thus generally synonymous with farmland or cropland, as well as pasture or rangeland.	Agricultural land are typically land devoted to agriculture, the systematic and controlled use of other forms of life-particularly the rearing of livestock and production of crops to produce food for humans. It is thus generally synonymous with farmland or cropland, as well as pasture or rangeland. There are three types of cropland and vegetation land such as arable land, permanent cropland and permanent pasture.

(4) Survey Result

There were 124 plant species identified in the survey area. The identified species were classified into 7 groups; they are tree, small tree, shrub, herb, creeper, climber, bamboo and grass. List of identified plant species in the survey area was presented in Table 4.2.9-2.

Table 4.2.9-2 List of plant species recorded along the transmission line

No	Family Name	Scientific Name	Common Name	Habitat	Distribution	IUCN
1	Amaranthaceae	*Alternanthera nodiflora*	Kanaphaw	Herb	Yangon, Mandalay, Taninthayi	LC
2	Amaranthaceae	*Amaranthus spinosus*	Hin-nu-new-subak	Herb	Cultivated	NE
3	Anacardiaceae	*Mangifera indica*	Thayet	Tree	Wide	DD
4	Anacardiaceae	*Lannea coromandelica*	Nabe	Tree	Bago, Kayin, Mandalay,	NE

					Rakhine, Shan, Taninthayi, Yangon	
5	Anacardiaceae	*Spondias pinnata*	Gwe	Tree	Reported from Myanmar	NE
6	Anacardiaceae	*Dracontomelon duperreanum*	Nga-su	Tree	Kachin, Mandalay, Sagaing, Yangon	NE
7	Annonaceae	*Annona squamosa*	Awzar	Small Tree	Cultivated	NE
8	Annonaceae	*Annona muricata*	Duyin-awza	Small Tree	Cultivated	LC
9	Apocynaceae	*Holarrhena pubescens*	Lettok-gyi	Small Tree	Wide	LC
10	Apocynaceae	*Plumeria obtusa*	Tayok-saga	Small Tree	Cultivated	NE
11	Apocynaceae	*Alstonia scholaris*	Taung-mayo	Tree	Bago, Kachin, Mandalay, Shan, Taninthayi, Yangon	LC
12	Araceae	*Colocasia esculenta*	Pein	Herb	Cultivated	LC
13	Araceae	*Amorphophallus paeoniifolius*	Wa-u-bin	Herb	Ayeyarwady, Bago, Kayah, Kayin, Mandalay, Mon, Rakhine, Taninthayi, Yangon	LC
14	Arecaceae	*Calamus latifolius*	Ya-ma-htar-kyein	Climber/ Creeper	Ayeyarwady, Kayin, Taninthayi	NE
15	Arecaceae	*Cocas nucifera*	Ohn	Tree	Cultivated	NE
16	Arecaceae	*Areca catechu*	Kunthi-pin	Small Tree	Cultivated	NE
17	Arecaceae	*Caryota mitis*	Minbaw	Tree	Ayeyarwady, Bago, Kayah, Mon, Rskhine, Shan, Taninthayi, Yangon	LC
18	Arecaceae	*Calamus guruba*	Kyein-ni	Climber/ Creeper	Kayin, Kachin, Chin, Bago	NE
19	Arecaceae	*Calamus floribundus*	Ye-kyein	Climber/ Creeper	Kachin	NE
20	Asclepiadaceae	*Calotropis procera*	Mayo	Shrub	Magway, Mandalay, Sagaing, Shan	NE
21	Asteraceae	*Chromolaena odorata*	Bizat	Shrub	Wide	NE
22	Bignoniaceae	*Oroxylum indica*	Kyaung-sha	Tree	Wide	NE
23	Bignoniaceae	*Millingtonia hortensis*	Egayit	Tree	Wide	NE
24	Bombacaceae	*Bombax ceiba*	Letpan	Tree	Wide	NE
25	Bombacaceae	*Bombax insigne*	Taung-let-pan	Tree	Wide	NE
26	Boraginaceae	*Cordia dichotoma*	Thanat	Tree	Kachin, Kayah, Mandalay, Shan, Yangon	NE

27	Boraginaceae	*Heliotropium indium*	Sin-hna-maung	Herb	Yangon	NE
28	Caesalpinaceae	*Delonix rigia*	Sein-ban gyi	Tree	Cultivated	NE
29	Caesalpiniaceae	*Bauhinia acuminata*	Swe-daw	Small Tree	Wide	LC
30	Caesalpiniaceae	*Cassia fistula*	Ngu	Tree	Wide	LC
31	Caesalpiniaceae	*Tamarindus indica*	Magyi	Tree	Cultiveted	LC
32	Caesalpiniaceae	*Senna siamea*	Mezali	Tree	Reported from Myanmar	LC
33	Caesalpiniaceae	*Peltophorum pterocarpum*	Thinbaw-mezali	Tree	Cultivated	NE
34	Caesalpiniceae	*Cassia occidentalis*	Dangwe	Shrub	Wide	NE
35	Cannaceae	*Canna indica*	Budatharana	Herb	Cultivated	NE
36	Capparaceae	*Crateva magna*	Kadet	Tree	Wide	NE
37	Caricaceae	*Carica papaya*	Thinbaw	Small Tree	Cultivated	DD
38	Combretaceae	*Terminalia crenulata*	Htauk-kyant	Tree	Bago, Mandalay, Rakhine, Sagaing, Yangon	NE
39	Combretaceae	*Terminalia bellerica*	Thit-seint	Tree	Bago, Magway, Mandalay	NE
40	Combretaceae	*Lumnitzera racemosa*	Dawei-hmaing	Small Tree	Bago, Rakhine	LC
41	Costaceae	*Costus specious*	Phalan taung hmwe	Herb	Yangon, Sagaing, Mandalay, Bago, Shan, Kachin	NE
42	Dioscoreaceae	*Dioscorea sativa*	Kauk-yin-nwe	Climber/ Creeper	Kachin, Rakhine, Shan, Yangon	NE
43	Dipterocarpaceae	*Hopea odorata*	Thingan	Tree	Bago, Mandalay, Yangon	**VU**
44	Dipterocarpaceae	*Shorea assamica*	Kyilan	Tree	Kachin, Sagaing	NE
45	Ebenaceae	*Diospyros ehretioides*	Aukchinsa	Tree	Wide	NE
46	Euphorbiaceae	*Fluegga leucopyrus*	Chin ya	Small Tree	Wide	NE
47	Euphorbiaceae	*Emblica officinalis*	Zi-phyu	Tree	Wide	NE
48	Euphorbiaceae	*Bischofia javanica*	Yepadon	Tree	Kachin, Mandalay, Shan	LC
49	Euphorbiaceae	*Codiaeum variegatum*	Ywet-hla	Shrub	Cultivated	NE
50	Euphorbiaceae	*Jatropha gossypifolia*	Kyetsu-kanako	Shrub	Cultivated	NE
51	Euphorbiaceae	*Baccaurea sapida*	Kanaso	Tree	Ayeyarwady, Bago, Chin, Kachin, Mandalay	NE
52	Euphorbiaceae	*Jatropha pungens*	Kyetsu	Shrub	Magway, Mandalay	NE
53	Euphorbiaceae	*Euphorbia nivulia*	Tazaung-myin-na	Small Tree	Wide	NE
54	Euphorbiaceae	*Phyllanthus acidus*	Thinbaw-zibyu	Small Tree	Reported from Myanmar	NE
55	Euphorbiaceae	*Trewia nudiflora*	Setkadon	Tree	Bago, Kachin, Kayin,	LC

					Mandalay, Sagaing	
56	Euphorbiaceae	*Jatropha podagrica*	Tabin-shwe-hti	Shrub	Cultivated	NE
57	Fabaceae	*Mucuna pruriens*	Khwele-ya	Climber	Bago, Chin, Kayin, Kayin, Mandalay, Mandalay, Sagaing, Sagaing, Shan, Yangon	NE
58	Fabaceae	*Abrus precatorius*	Ywe	Climber/ Creeper	Wide	NE
59	Fabaceae	*Crotalaria sericea*	Taw-pike-san	Shrub	Wide	LC
60	Fabaceae	*Butea frondosa*	Pauk	Tree	Reported from Myanmar	NE
61	Fabaceae	*Pterocarpus macrocarpus*	Padauk	Tree	Bago, Mandalay, Sagaing, Taninthayi	**EN**
62	Fagaceae	*Castanea mollissima*	Thit-e	Tree	Cultivated	LC
63	Hypericaceae	*Mesua ferrea*	Gangaw	Tree	Cultivated	NE
64	Hypericaceae	*Cratoxylum neriifolium*	Bebya	Tree	Reported from Myanmar	NE
65	Lamiaceae	*Leucas cephalotes*	Pin-gu-hteik-peik	Shrub	Ayewarwady, Bago, Chin, Kayah, Mandalay, Sagaing, Shan, Taninthayi, Yangon	NE
66	Lauraceae	*Litsea glutinosa*	Ondon	Tree	Wide	NE
67	Lythraceae	*Duabanga grandiflora*	Ma-u-lettan	Herb	Kachin, Sagaing	NE
68	Lythraceae	*Lagerstroemia speciosa*	Pyinma	Tree	Reported from Myanmar	NE
69	Magnoliaceae	*Michelia champaca*	Sagawa	Tree	Bago, Kachin, Magway, Mandalay, Sagaing, Taninthayi	LC
70	Malvaceae	*Hibiscus rosa-sinensis*	Khaung-yan	Shrub	Cultivated	NE
71	Mimosaceae	*Mimosa pudica*	Htikayon	Herb	Wide	LC
72	Mimosaceae	*Albizia procera*	Sit	Tree	Reported from Myanmar	LC
73	Mimosaceae	*Acacia auriculiformis*	Malaysia-padauk	Small Tree	Cultivated	LC
74	Mimosaceae	*Albizia lebbek*	Kokko	Tree	Reported from Myanmar	NE
75	Mimosaceae	*Archidendron jiringa*	Danyin	Tree	Reported from Myanmar	NE
76	Moraceae	*Ficus glomerata*	Thapan	Tree	Bago, Kachin, Mandalay, Yangon	NE
77	Moraceae	*Streblus asper*	Okhne	Small Tree	Bago, Sagaing, Taninthayi	NE
78	Moraceae	*Artocarpus heterophyllus*	Peinne	Tree	Cultivated	NE

79	Moraceae	*Ficus obtusifolia*	Nyaung-gyat	Tree	Wide	NE
80	Moraceae	*Ficus religiosa*	Bawdi-nyaung	Tree	Cultivated	NE
81	Moraceae	*Ficus auriculata*	Sin-thapan	Small Tree	Reported from Myanmar	NE
82	Moraceae	*Morus indica*	Posa	Tree	Cultivated	NE
83	Musaceae	*Musa sapientum*	Nget-pyaw	Herb	Cultivated	NE
84	Myrtaceae	*Psidium guajava*	Malaka	Small Tree	Cultivated	LC
85	Myrtaceae	*Syzygium fruticosum*	Taung-thabye	Small Tree	Wide	NE
86	Myrtaceae	*Eugenia praetermissa*	Thabye	Tree	Ayeyarwady, Sagaing, Taninthayi	NE
87	Myrtaceae	*Syzgium aromaticum*	Lay-hnyin	Small Tree	Cultivated	NE
88	Nyctaginaceae	*Bougainvillea spectabilis*	Sekku-pan	Climber/ Creeper	Cultivated	NE
89	Oxalidaceae	*Averrhoa carambola*	Zaung-yar	Small Tree	Cultivated	NE
90	Pandanaceae	*Pandanus odoratissimus*	Sat-thapoo	Small Tree	Cultivated	NE
91	Pinaceae	*Pinus insularis*	Htinyu	Tree	Mandalay, Shan	LC
92	Poaceae	*Cynodon dactylon*	Mye-sa-myet	Grass	Wide	NE
93	Poaceae	*Arundo donax*	Kyu	Grass	Reported from Myanmar	LC
94	Poaceae	*Cephalostachyum pergracile*	Tin-wa	Bamboo	Bago, Chin, Kachin, Kayin, Magway, Mandalay, Mon, Shan	NE
95	Poaceae	*Bambusa polymorpha*	Kyathaung-wa	Bamboo	Bago, Chin, Kachin, Mandalay, Mon, Shan	NE
96	Poaceae	*Erianthus ravennae*	Thekke	Grass	Sagaing	LC
97	Poaceae	*Gigantochloa wanet*	Wanet	Bamboo	Kachin, Sagaing	NE
98	Poaceae	*Dendrocalamus hamitonii*	Wabo-myet-sangye	Bamboo	Ayeyarwady, Chin, Kachin, Mandalay, Mon, Sagaing, Shan	NE
99	Poaceae	*Saccharum spontaneum*	Kaing	Grass	Bago, Kachin, Sagaing, Shan, Yangon	NE
100	Poaceae	*Dendrocalamus strictus*	Hmyin-wa	Bamboo	Bago, Chin, Kachin, Mandalay, Shan, Yangon	NE
101	Rhamnaceae	*Ziziphus jujuba*	Zi	Tree	Cultivated	LC
102	Rubiaceae	*Oldenlandia corymbosa*	Hingalar	Herb	Kachin, Mandalay, Yangon	LC
103	Rutaceae	*Murraya koenigii*	Pyindaw-thein	Small Tree	Cultivated	NE
104	Rutaceae	*Citrus aurantiifolia*	Shauk-cho	Shrub	Cultivated	NE

105	Rutaceae	*Limonia acidissima*	Thi	Tree	Magway, Mandalay	NE
106	Rutaceae	*Citrus aurantiifolia*	Thanbaya	Shrub	Cultivated	NE
107	Sapotaceae	*Manikara hexandra*	Khayay	Tree	Cultivated	NE
108	Sapotaceae	*Achras zapota*	Thagya	Tree	Cultivated	NE
109	Sapotaceae	*Chrysophyllum cainito*	Hnin-thagya	Small Tree	Cultivated	NE
110	Smilacaceae	*Smilax perfoliata*	Sein-na-baw	Climber/ Creeper	Reported from Myanmar	NE
111	Solanaceae	*Solanum indicum*	Khayan-kazaw	Shrub	Bago, Mandalay, Shan, Yangon	NE
112	Stemonaceae	*Stemona burkilli*	Thamya	Herb	Bago, Chin, Mandalay, Sagaing, Yangon	NE
113	Sterculiaceae	*Sterculia foetida*	Shaw-byu	Tree	Chin, Kayin, Mandalay, Yangon	NE
114	Sterculiaceae	*Sterculia angustifolia*	Shaw	Tree	Wide	NE
115	Steruliaceae	*Scaphium scaphigerum*	Mohbin	Tree	Mon, Taninthayi	NE
116	Theaceae	*Schima khasiana*	Laukya	Tree	Kachin, Sagaing, Shan	NE
117	Urticaceae	*Oreocnide frutescens*	Obok	Small Tree	Bago, Mon, Taninthayi	LC
118	Verbenaceae	*Lantana aculeata*	SeinNa Barn	Shrub	Reported from Myanmar	NE
119	Verbenaceae	*Tectona grandis*	Kyun	Tree	Wide	NE
120	Verbenaceae	*Clerodendrum nutans*	Ngayan-padu	Shrub	Reported from Myanmar	NE
121	Verbenaceae	*Gmelina arborea*	Yemane	Tree	Bago, Kachin, Mandalay, Shan, Yangon	NE
122	Verbenaceae	*Clerodendrum colebrookianum*	Petka	Shrub	Wide	NE
123	Viscaceae	*Viscum orientale*	Kyibaung	Parasite	Ayeyarwady, Magway, Shan	NE
124	Vrebenaceae	*Duranta repens*	Bo-kadaw-myet-hkone	Shrub	Cultivated	NE

NE = Not Evaluated DD = Data Deficit LC = Least Concerned
VU = Vulnerable EN = Endangered

Fauna

(1) Habitat

The wildlife groups of the study area consist of 5 groups of animals such as mammals, birds, Insects, Herpet and Fish. However, human population and development pressures are increasing and consequently the wildlife population may decline throughout the area. Habitat Map of Transmission Line Package (1) was already shown in Figure 4.2.9-5 and Sceneries of the Survey Area are shown in Figure 4.2.9-4.

(2) Survey Area

The survey area is shown in Figure 4.2.9-6.

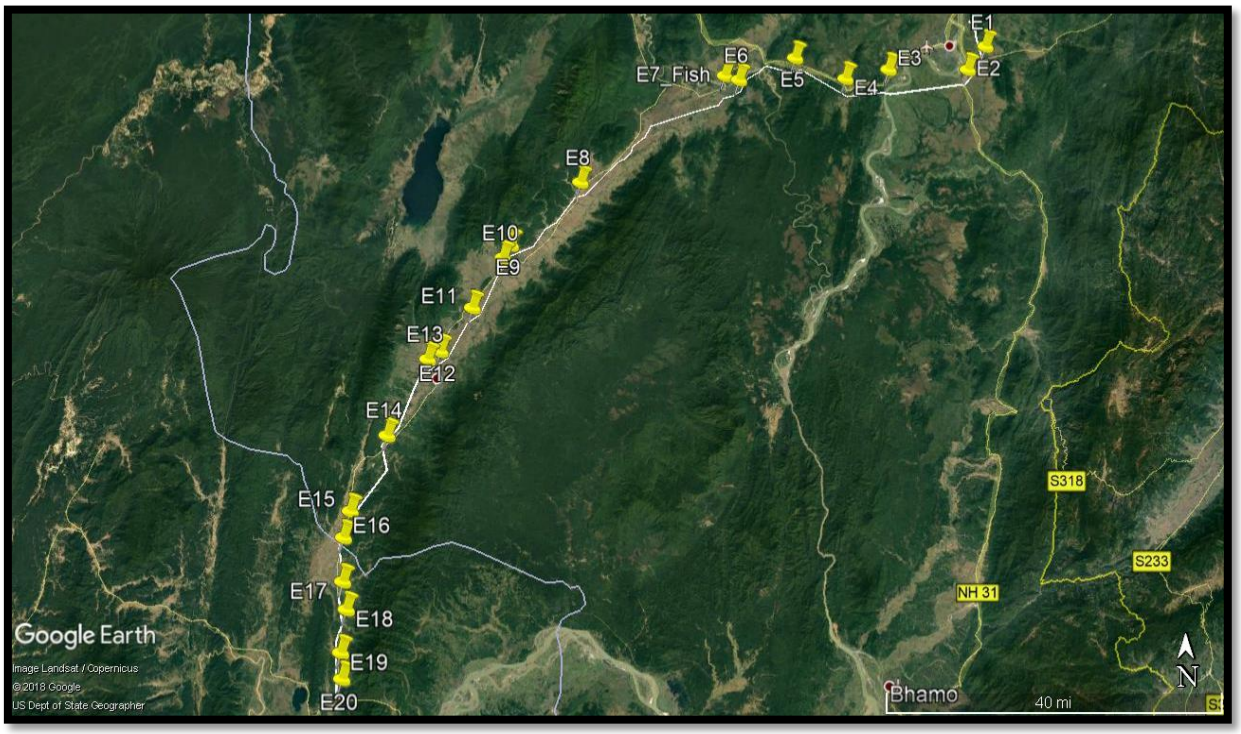


Figure 4.2.9-7 Location of survey area

(3) Survey Result

During the survey period, 5 species of Mammals, 5 species of Herpet, 73 species of Birds, 20 species of Butterflies, 2 species of dragonfly and 11 species of Fish were recorded along the proposed transmission line. Along this survey area, one bird species was recorded as Near-threatened species from this survey area according to the IUCN Global Threatened Status (2019). There were no endemic species. Dragonfly species was found as rare species in this survey area. The secondary data of Mammal, Reptiles and Fish species were also recorded by interviewing the local people and Forest department of Waingmaw, War Shawng and Myitkyina. Some were recorded by direct observation such as sighting.

(i) Mammal

A total of 5 mammal species of 5 genera belonging to 5 families were recorded along the transmission line route. Base on globally threatened status of IUCN Red List, there was no endangered species and endemic species in this area. Two species were observed in field survey area. And then five species were recorded by interviewed information from local people who live in this survey area.

Table 4.2.9-3 Mammal Species List around the survey area

No	Scientific Name	Common Name	Family Name	Observation Status	IUCN Status
1	*Muntiacus muntjac*	Red Muntjac	Cervidae	Observed	LC
2	*Paradoxurus hermaphroditus*	Common Palm Civet	Viverridae	Interviewed	LC
3	*Hystrix brachyura*	Malayan Porcupine	Hystricidae	Interviewed	LC
4	*Sus scrofa*	Eurasian Wild Pig	Suidae	Interviewed	LC
5	*Martes flavigula*	Yellow-throated Marten	Mustelidae	Interviewed	LC

LC = Least Concerned

Footprint of Red Muntjac

Figure 4.2.9-8 Photo of mammal species recorded along the survey area

(ii) Herpetology

A total of 5 species of Herpet of 5 genera belonging to 4 families were recorded along the transmission line route. Base on globally threatened status of IUCN Red List, there was no threatened species and no endangered species in this area.

Table 4.2.9-4 Reptiles species list around the survey area

No	Scientific Name	Common Name	Family Name	IUCN Status
1	*Hylarana macrodactyla*	Three striped grass frogs	Ranidae	LC
2	*Fejervarya limnochoris*	Asian grass frog	Dicroglossidae	LC
3	*Chrysopele omata*	Golden Tree Snake	Colubridae	LC
4	*Calotes versicolor*	Garden Lizard	Agamidae	NE
5	*Calotes mystaceus*	Blue Crested Lizard	Agamidae	NE

NE - Not Evaluated
LC - Least concerned

Golden Tree Snake

Blue Crested Lizard

Three striped grass frogs

Asian grass frog

Figure 4.2.9-9 Reptile species recorded along the transmission line

(iii) Birds

A total of 73 birds species were recorded during the survey period. The Grey-headed Parakeet (*Psittacula finschii*) of near-threatened was observed the project area. Member of the family Phasianidae Chinese Francolin (*Francolinus pintadeanus*), Red Junglefowl (*Gallus gallus*) and family of Turnitidae, Barred Button Quail (*Turnix suscitator*) are found near the survey site and listed as forest birds. A part from the species family Laniidae, Brown Shrike (*Lanius cristatus*) and Long-tailed Shrike (*Lanius schach*) were also noted as forest bird. A part from the species family Dicruridae, Ashy Drongo (*Dicrurus leucophaeus*) and Hair-crested Drongo (*Dicrurus hottentottus*) and Greater Racket-tailed Drongo (*Dicrurus paradiseus*) are found near the survey site and listed as forest bird's species. The bird species of family Pycnontidae, Red-vented Bulbul (*Pyconotus cafer*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Streak-eared Bulbul (*Pyconotus blanfordi*), Black-crested Bulbul (*Pycnonotus melanicterus*), were found near the survey site and listed as forest bird's species. The bird species of Oriental pratincole (*Glareola maldivarum*) are found along the transmission line at common species because of breeding seasons for these species.

Table 4.2.9-5 Status of Bird species in around the survey area

No	Scientific Name	Common Name	Quantity	Family	IUCN Status
1	*Francolinus pintadeanus*	Chinese Francolin	4	Phasianidae	Least Concern
2	*Turnix suscitator*	Barred Button Quail	2	Turnitidae	Least Concern
3	*Gallus gallus*	Red Junglefowl	2	Phasianidae	Least Concern
4	*Dendrocygna javanica*	Lesser Whistling-duck	20	Anatinae	Least Concern
5	*Bubuclus coromandus*	Eastern cattle Egret	8	Ardeidae	Least Concern
6	*Accipiter badius*	Shikra	1	Accipitridae	Least Concern
7	*Spillornis cheela*	Crested serpent-eagle	2	Accipitridae	Least Concern
8	*Amaurornis phoenicurus*	White-breasted waterhen	2	Rallidae	Least Concern
9	*Glareola maldivarum*	Oriental pratincole	28	Glareolidae	Least Concern
10	*Psilopogon virens*	Great Barbet	6	Megalaimidae	Least Concern
11	*Megalaima asiatica*	Blue-throated Barbet	12	Megalaimidae	Least Concern
12	*Megalaima*	Coppersmith Barbet	14	Megalaimidae	Least Concern

	haemacephala				
13	*Megalaima lineata*	Lineated Barbet	14	Megalaimidae	Least Concern
14	*Coracias benghalensis*	Indian Roller	2	Coraciidae	Least Concern
15	*Halcyon smyrnensis*	White-throated Kingfisher	2	Alcedinidae	Least Concern
16	*Merops orientalis*	Little green bee-eater	10	Meropidae	Least Concern
17	*Merops philippinus*	Blue-tailed Bee-eater	6	Meropidae	Least Concern
18	*Phaenicophaeus tristis*	Green-billed Malkoha	2	Cuculidae	Least Concern
19	*Centropus sinensis*	Greater Coucal	4	Cuculidae	Least Concern
20	*Cacomantis merulinnus*	Plaintive cuckoo	2	Cuculidae	Least Concern
21	*Psittacula finschii*	Grey-headed Parakeet	4	Psittadae	Near-Threatened
22	*Ceropis daurica*	Red-rumped swallow	6	Hirundinidae	Least Concern
23	*Cypsiurus balasiensis*	Asian Palm-Swift	12	Apodidae	Least Concern
24	*Glaucidium cuculoides*	Asian Barred Owlet	2	Strigidae	Least Concern
25	*Chalcophaps indica*	Emerald Dove	2	Columbidae	Least Concern
26	*Streptopelia chinensis*	Spotted Dove	6	Columbidae	Least Concern
27	*Columba livia*	Rock Pigeon	10	Columbidae	Least Concern
28	*Streptopelia tranquebarica*	Red collared Dove	6	Columbidae	Least Concern
29	*Treron bicinctus*	Orange-breasted green pegion	2	Columbidae	Least Concern
30	*Vanellus indicus*	Red-wattled Lapwing	12	Charadriidae	Least Concern
31	*Chloropsis aurifrons*	Golden-fronted Leafbird	4	Eurylaimidae	Least Concern
32	*Chloropsis hardwickii*	Orange-bellied Leafbird	6	Eurylaimidae	Least Concern
33	*Lanius cristatus*	Brown Shrike	2	Laniidae	Least Concern
34	*Lanius schach*	Long-tailed Shrike	2	Laniidae	Least Concern
35	*Dendrocitta vagabunda*	Rufous Treepie	5	Corvidae	Least Concern
36	*Corvus splendens*	House Crow	2	Corvidae	Least Concern
37	*Corvus macrorhynchos*	Large-billed Crow	4	Corvidae	Least Concern
38	*Artamus fuscus*	Ashy Woodswallow	5	Artimidae	Least Concern
39	*Oriolus xanthornus*	Black-hooded Oriole	6	Oriolidae	Least Concern
40	*Pericrocotus flammeus*	Scarlet Minivet	4	Campephagidae	Least Concern
41	*Aegithina tiphia*	Common Iora	2	Aegithininae	Least Concern
42	*Dicrurus leucophaeus*	Ashy Drongo	6	Dicruridae	Least Concern
43	*Dicrurus paradiseus*	Greater Racket-tailed Drongo	2	Dicruridae	Least Concern
44	*Dicrurus hottentottus*	Hair-crested Drongo	14	Dicruridae	Least Concern
45	*Copsychus saularis*	Oriental Magpie-robin	2	Muscicapidae	Least Concern
46	*Copsychus malabaricus*	White-rumped shama	2	Muscicapidae	Least Concern
47	*Pyconotus cafer*	Red-vented Bulbul	10	Pycnontidae	Least Concern
48	*Pycnonotus jocosus*	Red-whiskered Bulbul	9	Pycnontidae	Least Concern
49	*Pyconotus blanfordi*	Streak-eared Bulbul	2	Pycnontidae	Least Concern
50	*Pycnonotus melanicterus*	Black-crested Bulbul	14	Pycnontidae	Least Concern

51	*Pellorneum ruficeps*	Puff-throated babbler	4	Pellorneidae	Least Concern
52	*Macronus gularis*	Pin-striped tit-babbler	6	Timaliidae	Least Concern
53	*Acridotheres tristis*	Common Myna	9	Sturnidae	Least Concern
54	*Acridotheres fuscus*	Jungle Myna	14	Sturnidae	Least Concern
55	*Acridotheres albocinctus*	Collared Myna	6	Sturnidae	Least Concern
56	*Acridotheres javanicus*	White-vented Myna	4	Sturnidae	Least Concern
57	*Sturnus burmnnicus*	Venous –breasted Myna	10	Sturnidae	Not Evaluated
58	*Sturnia malabarica*	Chestnut-tailed starling	16	Sturnidae	Least Concern
59	*Gracupica contra*	Asian pied Starling		Sturnidae	Least Concern
60	*Gracupica nigricollis*	Black-collared starling	4	Sturnidae	Least Concern
61	*Saxicola caprata*	Pied Bushchat	2	Muscicapidae	Least Concern
62	*Saxicola maurus*	Siberian stonechat	6	Muscicapidae	Not Evaluated
63	*Prinia flaxiventris*	Plain prinia	2	Cisticiolidae	Least Concern
64	*Zosterops palpebrosus*	Oriental white-eye	2	Zosteropidae	Least Concern
65	*Orthotomus sutorius*	Common Tailorbird	2	Sylviidae	Least Concern
66	*Abroscopus superciliaris*	Yellow-bellied Warbler	2	Sylviidae	Least Concern
67	*Garrulax leucolophus*	White-crested Laughingthrush	4	Timaliidae	Least Concern
68	*Garrulax pectoralis*	Greater Necklaced Laughingthrush	4	Timaliidae	Least Concern
69	*Dicaeum cruentatum*	Scarlet-backed Flowerpecker	2	Dicaeidae	Least Concern
70	*Aethopyga saturata*	Black-Throated Sunbird	6	Nectariniidae	Least Concern
71	*Motacilla alba*	White Wagtail	2	Motacillidae	Least Concern
72	*Lonchura striata*	White-rump Munia	10	Estrildidae	Least Concern
73	*Lonchura punctulata*	Scaly-breasted Munia	16	Estrildidae	Least Concern

Ashy Woodswallow (*Artamus fuscus*)

Red collared Dove (*Streptopelia tranquebarica*)

Little green bee-eater (*Merops orientalis*)

Red-wattled Lapwing (*Vanellus indicus*)

Oriental pratincole (*Glareola maldivarum*)

Lesser Whistling-duck (*Dendrocygna javanica*)

Figure 4.2.9-10 Photo of bird species recorded along the 230 kV transmission line

Grey-headed Parakeet *(Psittacula finschii)*

Photo of grey-headed parakeet sitting on the tree

Source: Internet

Grey-headed parakeet is reported to be common in Myanmar but according to the IUCN red list of that species is Near-threatened species. The habitat for Grey-headed parakeet is mainly found in higher elevations of forests consisting of oak, teak and cedar trees. It also resides on

deciduous forest hillsides, farmland with scattered trees.

For the ecology status of the grey-headed parakeet has a widely varied diet different species of seed, fruit and flowers. It is usually a resident bird, with some seasonal movement in response to food availability. The grey-headed parakeet for the main threats are illegal of bird trade and many are locally kept as pets. Deforestation and logging of the bird's natural forest habitat is making a negative impact on the parakeet's population. If we need the protected for grey-headed parakeet and their species for making the small forests and forest hills to be consider.

The transmission line project and electric line are not dangerous for grey-headed parakeet because of their behaviors have not stay and do not making their nest on the electrical line and tower.

(iv) Butterfly

A total of 20 butterfly species of 6 genera belonging to 5 families were recorded along the transmission line route. Among the recorded butterfly species, 3 species of Family Papilionidae, 5 species of Family Pieridae and 7 species of Nymphalidae, 4 species of Lycaenidae and at least 1species of Hesperiidae. According to the IUCN Red List (2019), there were no any threatened species.

Table 4.2.9-6 List of Butterfly species recorded in the project area

No.	Scientific Name	Common Name	Family Name	IUCN Status
1	*Papilio polytes*	Common Mormon	Papilionidae	NE
2	*Papilio demoleus*	Lime Butterfly	Papilionidae	NE
3	*Graphium sarpedon*	Common Bluebottle	Papilionidae	NE
4	*Catopsilia pomona*	Lemon Emigrant	Pieridae	NE
5	*Catopsilia pyranthe*	Mottled Emigrant	Pieridae	NE
6	*Appias lyncida*	Chocolate Albatross	Pieridae	NE
7	*Hebomoia glaucippe*	Great Orange Tip	Pieridae	NE
8	*Eurema hecabe*	Common Grass Yellow	Pieridae	NE
9	*Danaus chrysippus*	Plain Tiger	Nymphalidae	NE
10	*Acraea violae*	Tawny Coster	Nymphalidae	NE
11	*Melanitis leda*	Common evening brown	Nymphalidae	NE
12	*Parthenos sylvia*	Bengal Clipper	Nymphalidae	NE
13	*Tirumala limniace*	Blue Tiger	Nymphalidae	NE
14	*Junonia orithya*	Blue Pansy	Nymphalidae	NE
15	*Junonia lemonias*	Lemon Pansy	Nymphalidae	NE
16	*Loxura atymnus*	Yamfly	Lycaenidae	NE
17	*Rapala jarbus*	Red Flash	Lycaenidae	NE
18	*Surendra quercetorum*	Common Acacia Blue	Lycaenidae	NE
19	*Castalius rosimon*	Common Pierrot	Lycaenidae	NE
20	*Borbo cinnara*	Rice Swift	Hesperiidae	NE

NE = Not Evaluated

Papilio polytes **(Common Mormon)**

Papilio demoleus **(Lime butterfly)**

Appias lyncida **(Chocolate Albatross)**

Hebomoia glaucippe **(Great Orange Tip)**

Melanitis leda **(Common Evening Brown)**

Junonia lemonias **(Lemon Pansy)**

***Tirumala limniace* (Blue Tiger)**

***Surendra quercetorum* (Common Acacea Blue)**

***Loxura atymnus* (Yamfly)**

***Borbo cinnara* (Rice Swift)**

Figure 4.2.9-11 Photo of butterfly species recorded along the 230 kV transmission line

(v) Dragonfly

A total of 2 species of dragonfly species were recorded along the transmission line route. All species are the same Libellulidae family. According to the IUCN Red List of (2019-1), there were no threatened species and no endemic species.

Table 4.2.9-7 List of dragonfly species recorded along the transmission line route

No	Scientific Name	Common Name	Family Name	IUCN Status
1	*Trithemis aurora*	Marsh Glider	Libellulidae	LC
2	*Neurothemis fluctuans*	Grasshawk Skimmer	Libellulidae	LC

LC = Least Concerned

***Neurothemis fluctuans* (Grasshawk Skimmer)** ***Trithemis aurora* (Marsh Glider)**

Figure 4.2.9-12 Some photo of some recorded dragonfly species recorded along the transmission line route

(vi) Fish

Field surveys and interviews with local fishermen who lived near the Ayeyawady River were conducted during the collection of the specimens. Fishing activities are mostly traditional method. Fishermen were interviewed with regard to fishery process. A total of 11 species distributed in 8 Families were identified and recorded from and near the project area. The most occurrence species were *Monopterus albus*, *ANa Bars testudineus*. The dominant Family is Cyprinidae. According to the IUCN Red List of threatened species, all species were least concern, there was no threaten species in the study area.

Table 4.2.9-8 Fish Species List of around the survey area

No	Scientific Name	Common Name	Family	IUCN Status
1	*Puntius chola*	Chola barb	Cyprinidae	LC
2	*Puntius ticto*	Ticto barb	Cyprinidae	LC
3	*Aspidoparia morar*	Morar	Cyprinidae	LC
4	*Labeo boga*	Boga labeo	Cyprinidae	LC
5	*Acanthocobitis rubidipinnis*	Nil	Balitoridae	LC
6	*Lepidocephalus thermalis*	Malabar loach	Cobitidae	LC
7	*Heteropneustes fossilis*	Stinging catfish	Heteropneustidae	LC
8	*Clarias batrachus*	Magur	Clariidae	LC
9	*Channa marulius*	Giant snakehead	Channidae	LC
10	*Monopterus albus*	Rice swampeel	Synbranchidae	LC
11	*ANa Bars testudineus*	Climbing perch	ANa Barntidae	LC

LC = Least Concerned

Conclusion

A total of 124 plant species, 5 species of Mammals, 5 species of Herpet, 73 species of Birds, 20 species of Butterflies, 2 species of dragonfly and 11 species of Fish were recorded during the survey period. The Dipterocarpaceae *Hopea odorata (Thingan) and* Fabaceae *Pterocarpus macrocarpus (Padauk)* are vulnerable and endangered plant species defined by IUCN. But, these tree species are found in the reserved forest and not observed in the RoW of transmission line.

In this survey, one bird species was recorded as Threatened species (NT) in accordance with IUCN Red List. During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species.

(3) Survey area (132 kV transmission line)

The survey area is shown in the following Figure 4.2.9-12.

Figure 4.2.9-13 Location of 132 kV Transmission Line

Survey Result

Flora

(1) Habitat

Along the 132 KV Transmission Line, four major habitat types were observed namely (1) forest area (2) Mix forest area (3) Shrubland and (4) Crop or vegetation land. Sceneries of the Survey Area are shown in Figure 4.2.9-13 and habitat Map of Transmission Line is shown in Figure 4.2.9-14.

Figure 4.2.9-14 Sceneries of the survey area

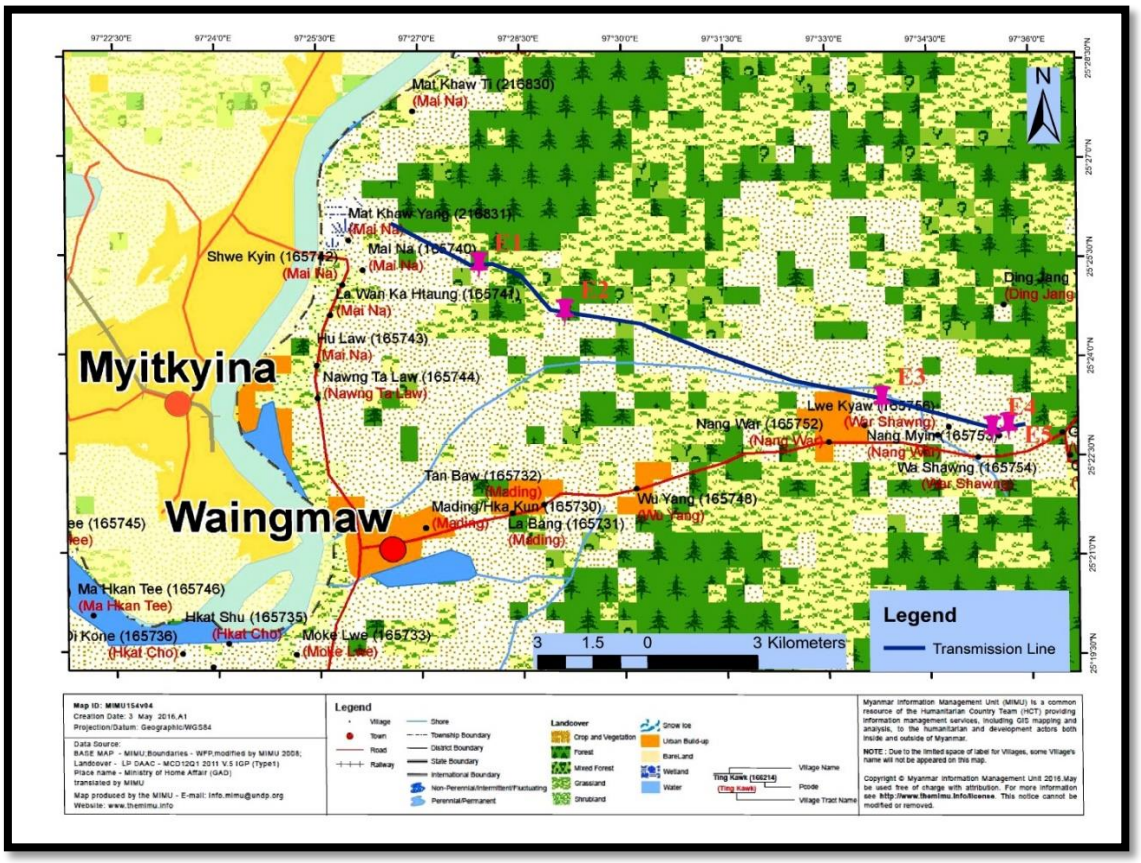


Figure 4.2.9-15 Habitat map along the transmission line

(3) Vegetation Communities

Along the transmission line area, six major forest types were observed namely (1) Forest area (2) Mix forest area (3) Shrub land and (4) Crop and vegetation area. A description of the vegetation community present in study area is summarized in Table 4.2.9-9.

Table 4.2.9-9 Vegetation Community Description

Community name	Land form	Description
Forest	A forest is a large area dominated by trees. Forests at different latitudes and elevations form distinctly different Eco zones: boreal forests around the poles, tropical forests around the Equator, and temperate forests at the middle latitudes. Higher elevation areas tend to support forests similar to those at higher latitudes, and amount of precipitation also affects forest composition.	A forest is a large area dominated by trees. Forests are the dominant terrestrial ecosystem of Earth, and are distributed around the globe. Forests provide ecosystem services to humans.
Mix Forest	Vegetation formation composed principally of trees; including shrub and bush understorey, where broad-leaved species is predominate.	A forest with two or more predominant kinds of trees and with at least 20 percent of the stand consisting of other than the most common tree. Mixed forests with a crown cover of > 30 % density for plantation structure. The share and

		broad-leaved species exceeds 25 % within the canopy closure. The minimum tree height is 5 m.
Shrub Land	Shrub land is a subpart in forest vegetation, mainly characterized by shrubs, often also including grasses, herbs, and geophytes.	Shrub land is a subpart in forest vegetation, mainly characterized by shrubs, often also including grasses, herbs, and geophytes. Shrub land habitats contain thickets of shrubs and young trees mixed with scattered grasses and wildflowers.
Crop and vegetation	Cropland and agricultural land include areas used for the production of adapted crops for harvest particularly the rearing of livestock and production of crops to produce food for humans. It is thus generally synonymous with farmland or cropland, as well as pasture or rangeland.	Agricultural and crop land are typically land devoted to agriculture, the systematic and controlled use of other forms of life-particularly the rearing of livestock and production of crops to produce food for humans. It is thus generally synonymous with farmland or cropland, as well as pasture or rangeland. There are three types of cropland and vegetation land such as arable land, permanent cropland and permanent pasture.

(4) Survey Result

There were 113 plant species identified along the transmission line route. The identified species were classified into 7 groups; they are tree, small tree, shrub, herb, creeper, climber, bamboo and grass. List of identified plant species in the survey area was presented in Table 4.2.9-10.

Table 4.2.9-10 List of plant species recorded along the 132kVtransmission line

No	Family Name	Scientific Name	Common Name	Habitat	Distribution	IUCN
1	Anacardiaceae	*Mangifera indica*	Thayet	Tree	Wide	DD
2	Anacardiaceae	*Lannea coromandelica*	Nabe	Tree	Bago, Kayin, Mandalay, Rakhine, Shan, Taninthayi, Yangon	NE
3	Anacardiaceae	*Spondias pinnata*	Gwe	Tree	Reported from Myanmar	NE
4	Anacardiaceae	*Dracontomelon duperreanum*	Nga-su	Tree	Kachin, Mandalay, Sagaing, Yangon	NE
5	Annonaceae	*Annona muricata*	Duyin-awza	Small Tree	Cultivated	LC
6	Apocynaceae	*Holarrhena pubescens*	Lettok-gyi	Small Tree	Wide	LC
7	Apocynaceae	*Alstonia scholaris*	Taung-mayo	Tree	Bago, Kachin, Mandalay, Shan, Taninthayi, Yangon	LC
8	Apocynaceae	*Plumeria obtusa*	Tayok-saga	Small Tree	Cultivated	NE
9	Araceae	*Colocasia esculenta*	Pein	Herb	Cultivated	LC
10	Araceae	*Amorphophallus paeoniifolius*	Wa-u-bin	Herb	Ayeyarwady, Bago, Kayah, Kayin, Mandalay, Mon, Rakhine, Taninthayi, Yangon	LC
11	Arecaceae	*Calamus guruba*	Kyein-ni	Climber/ Creeper	Kayin, Kachin, Chin, Bago	NE
12	Arecaceae	*Calamus latifolius*	Ya-ma-htar-	Climber/	Ayeyarwady,	NE

			kyein	Creeper	Kayin, Taninthayi	
13	Arecaceae	*Cocas nucifera*	Ohn	Tree	Cultivated	NE
14	Arecaceae	*Areca catechu*	Kunthi-pin	Small Tree	Cultivated	NE
15	Arecaceae	*Caryota mitis*	Minbaw	Tree	Ayeyarwady, Bago, Kayah, Mon, Rskhine, Shan, Taninthayi, Yangon	LC
16	Arecaceae	*Calamus floribundus*	Ye-kyein	Climber/ Creeper	Kachin	NE
17	Asclepiadaceae	*Calotropis procera*	Mayo	Shrub	Magway, Mandalay, Sagaing, Shan	NE
18	Asteraceae	*Chromolaena odorata*	Bizat	Shrub	Wide	NE
19	Bignoniaceae	*Oroxylum indica*	Kyaung-sha	Tree	Wide	NE
20	Bignoniaceae	*Millingtonia hortensis*	Egayit	Tree	Wide	NE
21	Bombacaceae	*Bombax ceiba*	Letpan	Tree	Wide	NE
22	Bombacaceae	*Bombax insigne*	Taung-let-pan	Tree	Wide	NE
23	Boraginaceae	*Cordia dichotoma*	Thanat	Tree	Kachin, Kayah, Mandalay, Shan, Yangon	NE
24	Boraginaceae	*Heliotropium indium*	Sin-hna-maung	Herb	Yangon	NE
25	Caesalpinaceae	*Delonix rigia*	Sein-ban gyi	Tree	Cultivated	NE
26	Caesalpiniaceae	*Bauhinia acuminata*	Swe-daw	Small Tree	Wide	LC
27	Caesalpiniaceae	*Cassia fistula*	Ngu	Tree	Wide	LC
28	Caesalpiniaceae	*Tamarindus indica*	Magyi	Tree	Cultiveted	LC
29	Caesalpiniaceae	*Senna siamea*	Mezali	Tree	Reported from Myanmar	LC
30	Caesalpiniaceae	*Peltophorum pterocarpum*	Thinbaw-mezali	Tree	Cultivated	NE
31	Caesalpiniceae	*Cassia occidentalis*	Dangwe	Shrub	Wide	NE
32	Capparaceae	*Crateva magna*	Kadet	Tree	Wide	NE
33	Caricaceae	*Carica papaya*	Thinbaw	Small Tree	Cultivated	DD
34	Combretaceae	*Terminalia crenulata*	Htauk-kyant	Tree	Bago, Mandalay, Rakhine, Sagaing, Yangon	NE
35	Combretaceae	*Terminalia bellerica*	Thit-seint	Tree	Bago, Magway, Mandalay	NE
36	Combretaceae	*Lumnitzera racemosa*	Dawei-hmaing	Small Tree	Bago, Rakhine	LC
37	Costaceae	*Costus specious*	Phalan taung hmwe	Herb	Yangon, Sagaing, Mandalay, Bago, Shan, Kachin	NE
38	Dioscoreaceae	*Dioscorea sativa*	Kauk-yin-nwe	Climber/ Creeper	Kachin, Rakhine, Shan, Yangon	NE
39	Dipterocarpaceae	*Shorea assamica*	Kyilan	Tree	Kachin, Sagaing	NE
40	Ebenaceae	*Diospyros ehretioides*	Aukchinsa	Tree	Wide	NE
41	Euphorbiaceae	*Fluegga leucopyrus*	Chin ya	Small Tree	Wide	NE

42	Euphorbiaceae	*Emblica officinalis*	Zi-phyu	Tree	Wide	NE
43	Euphorbiaceae	*Bischofia javanica*	Yepadon	Tree	Kachin, Mandalay, Shan	LC
44	Euphorbiaceae	*Codiaeum variegatum*	Ywet-hla	Shrub	Cultivated	NE
45	Euphorbiaceae	*Jatropha gossypifolia*	Kyetsu-kanako	Shrub	Cultivated	NE
46	Euphorbiaceae	*Baccaurea sapida*	Kanaso	Tree	Ayeyarwady, Bago, Chin, Kachin, Mandalay	NE
47	Euphorbiaceae	*Jatropha pungens*	Kyetsu	Shrub	Magway, Mandalay	NE
48	Euphorbiaceae	*Euphorbia nivulia*	Tazaung-myin-na	Small Tree	Wide	NE
49	Euphorbiaceae	*Phyllanthus acidus*	Thinbaw-zibyu	Small Tree	Reported from Myanmar	NE
50	Euphorbiaceae	*Trewia nudiflora*	Setkadon	Tree	Bago, Kachin, Kayin, Mandalay, Sagaing	LC
51	Euphorbiaceae	*Jatropha podagrica*	Tabin-shwe-hti	Shrub	Cultivated	NE
52	Fabaceae	*Mucuna pruriens*	Khwele-ya	Climber	Bago, Chin, Kayin, Kayin, Mandalay, Mandalay, Sagaing, Sagaing, Shan, Yangon	NE
53	Fabaceae	*Abrus precatorius*	Ywe	Climber/ Creeper	Wide	NE
54	Fabaceae	*Butea frondosa*	Pauk	Tree	Reported from Myanmar	NE
55	Fagaceae	*Castanea mollissima*	Thit-e	Tree	Cultivated	LC
56	Hypericaceae	*Mesua ferrea*	Gangaw	Tree	Cultivated	NE
57	Hypericaceae	*Cratoxylum neriifolium*	Bebya	Tree	Reported from Myanmar	NE
58	Lamiaceae	*Leucas cephalotes*	Pin-gu-hteik-peik	Shrub	Ayewarwady, Bago, Chin, Kayah, Mandalay, Sagaing, Shan, Taninthayi, Yangon	NE
59	Lauraceae	*Litsea glutinosa*	Ondon	Tree	Wide	NE
60	Lythraceae	*Duabanga grandiflora*	Ma-u-lettan	Herb	Kachin, Sagaing	NE
61	Lythraceae	*Lagerstroemia speciosa*	Pyinma	Tree	Reported from Myanmar	NE
62	Magnoliaceae	*Michelia champaca*	Sagawa	Tree	Bago, Kachin, Magway, Mandalay, Sagaing, Taninthayi	LC
63	Malvaceae	*Hibiscus rosa-sinensis*	Khaung-yan	Shrub	Cultivated	NE
64	Mimosaceae	*Mimosa pudica*	Htikayon	Herb	Wide	LC
65	Mimosaceae	*Acacia auriculiformis*	Malaysia-padauk	Small Tree	Cultivated	LC
66	Mimosaceae	*Albizia lebbek*	Kokko	Tree	Reported from Myanmar	NE
67	Mimosaceae	*Archidendron jiringa*	Danyin	Tree	Reported from Myanmar	NE
68	Moraceae	*Ficus glomerata*	Thapan	Tree	Bago, Kachin,	NE

					Mandalay, Yangon	
69	Moraceae	*Streblus asper*	Okhne	Small Tree	Bago, Sagaing, Taninthayi	NE
70	Moraceae	*Artocarpus heterophyllus*	Peinne	Tree	Cultivated	NE
71	Moraceae	*Ficus obtusifolia*	Nyaung-gyat	Tree	Wide	NE
72	Moraceae	*Ficus religiosa*	Bawdi-nyaung	Tree	Cultivated	NE
73	Moraceae	*Ficus auriculata*	Sin-thapan	Small Tree	Reported from Myanmar	NE
74	Moraceae	*Morus indica*	Posa	Tree	Cultivated	NE
75	Musaceae	*Musa sapientum*	Nget-pyaw	Herb	Cultivated	NE
76	Myrtaceae	*Psidium guajava*	Malaka	Small Tree	Cultivated	LC
77	Myrtaceae	*Syzygium fruticosum*	Taung-thabye	Small Tree	Wide	NE
78	Myrtaceae	*Eugenia praetermissa*	Thabye	Tree	Ayeyarwady, Sagaing, Taninthayi	NE
79	Nyctaginaceae	*Bougainvillea spectabilis*	Sekku-pan	Climber/ Creeper	Cultivated	NE
80	Oxalidaceae	*Averrhoa carambola*	Zaung-yar	Small Tree	Cultivated	NE
81	Pandanaceae	*Pandanus odoratissimus*	Sat-thapoo	Small Tree	Cultivated	NE
82	Pinaceae	*Pinus insularis*	Htinyu	Tree	Mandalay, Shan	LC
83	Poaceae	*Cynodon dactylon*	Mye-sa-myet	Grass	Wide	NE
84	Poaceae	*Arundo donax*	Kyu	Grass	Reported from Myanmar	LC
85	Poaceae	*Cephalostachyum pergracile*	Tin-wa	Bamboo	Bago, Chin, Kachin, Kayin, Magway, Mandalay, Mon, Shan	NE
86	Poaceae	*Bambusa polymorpha*	Kyathaung-wa	Bamboo	Bago, Chin, Kachin, Mandalay, Mon, Shan	NE
87	Poaceae	*Dendrocalamus strictus*	Hmyin-wa	Bamboo	Bago, Chin, Kachin, Mandalay, Shan, Yangon	NE
88	Poaceae	*Saccharum spontaneum*	Kaing	Grass	Bago, Kachin, Sagaing, Shan, Yangon	NE
89	Poaceae	*Erianthus ravennae*	Thekke	Grass	Sagaing	LC
90	Poaceae	*Gigantochloa wanet*	Wanet	Bamboo	Kachin, Sagaing	NE
91	Poaceae	*Dendrocalamus hamitonii*	Wabo-myet-sangye	Bamboo	Ayeyarwady, Chin, Kachin, Mandalay, Mon, Sagaing, Shan	NE
92	Rhamnaceae	*Ziziphus jujuba*	Zi	Tree	Cultivated	LC
93	Rubiaceae	*Oldenlandia corymbosa*	Hingalar	Herb	Kachin, Mandalay, Yangon	LC
94	Rutaceae	*Murraya koenigii*	Pyindaw-thein	Small Tree	Cultivated	NE
95	Rutaceae	*Citrus aurantiifolia*	Shauk-cho	Shrub	Cultivated	NE
96	Rutaceae	*Citrus aurantiifolia*	Thanbaya	Shrub	Cultivated	NE
97	Sapotaceae	*Manikara hexandra*	Khayay	Tree	Cultivated	NE

98	Sapotaceae	*Achras zapota*	Thagya	Tree	Cultivated	NE
99	Sapotaceae	*Chrysophyllum cainito*	Hnin-thagya	Small Tree	Cultivated	NE
100	Smilacaceae	*Smilax perfoliata*	Sein-na-baw	Climber/ Creeper	Reported from Myanmar	NE
101	Solanaceae	*Solanum indicum*	Khayan-kazaw	Shrub	Bago, Mandalay, Shan, Yangon	NE
102	Stemonaceae	*Stemona burkilli*	Thamya	Herb	Bago, Chin, Mandalay, Sagaing, Yangon	NE
103	Sterculiaceae	*Sterculia foetida*	Shaw-byu	Tree	Chin, Kayin, Mandalay, Yangon	NE
104	Sterculiaceae	*Sterculia angustifolia*	Shaw	Tree	Wide	NE
105	Steruliaceae	*Scaphium scaphigerum*	Mohbin	Tree	Mon, Taninthayi	NE
106	Theaceae	*Schima khasiana*	Laukya	Tree	Kachin, Sagaing, Shan	NE
107	Urticaceae	*Oreocnide frutescens*	Obok	Small Tree	Bago, Mon, Taninthayi	LC
108	Verbenaceae	*Lantana aculeata*	SeinNa Barn	Shrub	Reported from Myanmar	NE
109	Verbenaceae	*Tectona grandis*	Kyun	Tree	Wide	NE
110	Verbenaceae	*Clerodendrum nutans*	Ngayan-padu	Shrub	Reported from Myanmar	NE
111	Verbenaceae	*Gmelina arborea*	Yemane	Tree	Bago, Kachin, Mandalay, Shan, Yangon	NE
112	Verbenaceae	*Clerodendrum colebrookianum*	Petka	Shrub	Wide	NE
113	Vrebenaceae	*Duranta repens*	Bo-kadaw-myet-hkone	Shrub	Cultivated	NE

NE = Not Evaluated DD = Data Deficit LC = Least Concerned
VU = Vulnerable EN = Endangered

Fauna

(1) Habitat

The wildlife groups of the study area consist of 5 groups of animals such as mammals, birds, Insects, Herpet and Fish. Fauna habitats along transmission line route were the potential hiding places such as among leaf litter, inside holes, under stones and logs, on the tree, rice or paddy field. However, human population and development pressures are increasing and consequently the wildlife population may decline throughout the area.

(2) Survey Area

The survey area is shown in Figure 4.2.9-15.

Figure 4.2.9-16 Location of survey area

(3) Survey Result

During the survey period, 4 species of Mammals, 2 species of Herpet, 49 species of Birds, 13 species of Butterflies, 2 species of dragonfly were recorded along the proposed transmission line. There were no endemic species. Dragonfly species was found as rare species in this survey area. The secondary data of Mammal, Reptiles and Fish species were also recorded by interviewing the local people and Forest department. Some were recorded by direct observation such as sighting.

(i) Mammal

A total of 4 mammal species of 4 genera belonging to 4 families were recorded along the transmission line route. Base on globally threatened status of IUCN Red List, there was no endangered species and endemic species in this area. Two species were recorded by direct observation in survey area. And then two species were recorded by interviewed information from local people who live in this survey area.

Table 4.2.9-11 Mammal Species List around the survey area

No	Scientific Name	Common Name	Family Name	Observation Status	IUCN Status
1	*Muntiacus muntjac*	Red Muntjac	Cervidae	Interviewed	LC
2	*Viverricula indica*	Small Indian Civet	Viverridae	Observed	LC
3	*Callosciurus erythraeus*	Pallas's Squirrel	Sciuridae	Observed	LC
4	*Sus scrofa*	Eurasian Wild Pig	Suidae	Interviwed	LC

LC = Least Concerned

(ii) Herpetology

A total of 2 herpet species of 2 genera belonging to 2 families were recorded along the transmission line route. Base on globally threatened status of IUCN Red List, there was no threatened species and no endangered species in this area.

Table 4.2.9-12 Reptiles species list around the survey area

No	Scientific Name	Common Name	Family Name	IUCN Status
1	*Calotes versicolor*	Garden Lizard	Agamidae	NE
2	*Hemidactylus frenatus*	Asian House Gecko	Agamidae	NE

NE - Not Evaluated

(iii) Birds

A total of 49 birds species were recorded during the survey period. Member of the family Phasianidae Chinese Francolin (*Francolinus pintadeanus*) was found near the survey site and listed as forest birds. A part from the species family Laniidae: Brown Shrike (*Lanius cristatus*) and family: Dicruridae, Ashy Drongo (*Dicrurus leucophaeus*), Hair-crested Drongo were also noted as forest bird. A part from the species family Dicruridae: Ashy Drongo (*Dicrurus leucophaeus*) and Hair-crested Drongo (*Dicrurus hottentottus*) and Greater Racket-tailed Drongo (*Dicrurus paradiseus*) are found near the survey site and listed as forest bird's species. Family Pycnontidae, bird species of Red-vented Bulbul (*Pyconotus cafer*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Streak-eared Bulbul (*Pyconotus blanfordi*), and Black-crested Bulbul (*Pycnonotus melanicterus*) were found near the survey site and also note as forest bird's species.

Table 4.2.9-13 Status of Bird species in around the survey area

No	Scientific Name	Common Name	Quantity	Family	IUCN Status
1	*Francolinus pintadeanus*	Chinese Francolin	2	Phasianidae	Least Concern
2	*Bubuclus coromandus*	Eastern cattle Egret	12	Ardeidae	Least Concern
3	*Accipiter badius*	Shikra	1	Accipitridae	Least Concern
4	*Spillornis cheela*	Crested serpent-eagle	2	Accipitridae	Least Concern
5	*Psilopogon virens*	Great Barbet	6	Megalaimidae	Least Concern
6	*Megalaima asiatica*	Blue-throated Barbet	6	Megalaimidae	Least Concern
7	*Megalaima haemacephala*	Coppersmith Barbet	4	Megalaimidae	Least Concern
8	*Megalaima lineata*	Lineated Barbet	8	Megalaimidae	Least Concern
9	*Coracias benghalensis*	Indian Roller	2	Coraciidae	Least Concern
10	*Halcyon smyrnensis*	White-throated Kingfisher	2	Alcedinidae	Least Concern
11	*Merops orientalis*	Little green bee-eater	10	Meropidae	Least Concern
12	*Phaenicophaeus tristis*	Green-billed Malkoha	2	Cuculidae	Least Concern
13	*Centropus sinensis*	Greater Coucal	4	Cuculidae	Least Concern
14	*Cypsiurus balasiensis*	Asian Palm-Swift	12	Apodidae	Least Concern

15	*Chalcophaps indica*	Emerald Dove	2	Columbidae	Least Concern
16	*Streptopelia chinensis*	Spotted Dove	6	Columbidae	Least Concern
17	*Columba livia*	Rock Pigeon	10	Columbidae	Least Concern
18	*Chloropsis aurifrons*	Golden-fronted Leafbird	4	Eurylaimidae	Least Concern
19	*Chloropsis hardwickii*	Orange-bellied Leafbird	6	Eurylaimidae	Least Concern
20	*Lanius cristatus*	Brown Shrike	2	Laniidae	Least Concern
21	*Dendrocitta vagabunda*	Rufous Treepie	5	Corvidae	Least Concern
22	*Corvus splendens*	House Crow	2	Corvidae	Least Concern
23	*Corvus macrorhynchos*	Large-billed Crow	4	Corvidae	Least Concern
24	*Artamus fuscus*	Ashy Woodswallow	5	Artimidae	Least Concern
25	*Aegithina tiphia*	Common Iora	2	Aegithininae	Least Concern
26	*Dicrurus leucophaeus*	Ashy Drongo	6	Dicruridae	Least Concern
27	*Dicrurus paradiseus*	Greater Racket-tailed Drongo	2	Dicruridae	Least Concern
28	*Dicrurus hottentottus*	Hair-crested Drongo	6	Dicruridae	Least Concern
29	*Copsychus saularis*	Oriental Magpie-robin	2	Muscicapidae	Least Concern
30	*Pyconotus cafer*	Red-vented Bulbul	8	Pycnontidae	Least Concern
31	*Pycnonotus jocosus*	Red-whiskered Bulbul	9	Pycnontidae	Least Concern
32	*Pyconotus blanfordi*	Streak-eared Bulbul	2	Pycnontidae	Least Concern
33	*Pycnonotus melanicterus*	Black-crested Bulbul	10	Pycnontidae	Least Concern
34	*Acridotheres tristis*	Common Myna	9	Sturnidae	Least Concern
35	*Acridotheres fuscus*	Jungle Myna	10	Sturnidae	Least Concern
36	*Acridotheres albocinctus*	Collared Myna	6	Sturnidae	Least Concern
37	*Acridotheres javanicus*	White-vented Myna	4	Sturnidae	Least Concern
38	*Sturnus burmnnicus*	Venous –breasted Myna	10	Sturnidae	Not Evaluated
39	*Sturnia malabarica*	Chestnut-tailed starling	9	Sturnidae	Least Concern
40	*Gracupica contra*	Asian pied Starling	6	Sturnidae	Least Concern

41	*Saxicola caprata*	Pied Bushchat	2	Muscicapidae	Least Concern
42	*Saxicola maurus*	Siberian stonechat	6	Muscicapidae	Not Evaluated
43	*Prinia flaxiventris*	Plain prinia	2	Cisticiolidae	Least Concern
44	*Orthotomus sutorius*	Common Tailorbird	2	Sylviidae	Least Concern
45	*Garrulax leucolophus*	White-crested Laughingthrush	4	Timaliidae	Least Concern
46	*Garrulax pectoralis*	Greater Necklaced Laughingthrush	4	Timaliidae	Least Concern
47	*Motacilla alba*	White Wagtail	2	Motacillidae	Least Concern
48	*Lonchura striata*	White-rump Munia	6	Estrildidae	Least Concern
49	*Lonchura punctulata*	Scaly-breasted Munia	8	Estrildidae	Least Concern

Hair-crested Drongo (*Dicrurus hottentottus*)

Blue-throated Barbet (*Megalaima asiatica*)

Red-vented Bulbul (*Pyconotus cafer*)

Collared Myna (*Acridotheres albocinctus*)

Lineated Barbet (*Megalaima lineata*)

Venous –breasted Myna (*Sturnus burmnnicus*)

Figure 4.2.9-17 Photo of bird species recorded along the transmission line

(iv) Butterfly

A total of 13 butterfly species belonging to 5 families were recorded from the project area. Among the recorded butterfly species, 1 species in Family Papilionidae, 4 species in Family Pieridae and Nymphalidae and 2 species in Lycaenidae and Hesperidae. According to the IUCN Red List (2019-1), *Junonia hierta* was listed as least concern and other species were not listed under threatened status.

Table 4.2.9-14 List of Butterfly species recorded in the project area

No	Species Name	Common Name	Family Name	IUCN Status
1	*Papilio polytes*	Common Mormon	Papilionidae	NE
2	*Catopsilia pomona*	Lemon Emigrant	Pieridae	NE
3	*Catopsilia pyranthe*	Mottled Emigrant	Pieridae	NE
4	*Eurema hecabe*	Common Grass Yellow	Pieridae	NE
5	*Eurema andersonii*	One-spot grass yellow	Pieridae	NE
6	*Danaus chrysippus*	Plain Tiger	Nymphalidae	NE
7	*Melanitis leda*	Common evening brown	Nymphalidae	NE
8	*Junonia hierta*	Yellow Pansy	Nymphalidae	LC
9	*Junonia lemonias*	Lemon Pansy	Nymphalidae	NE
10	*Loxura atymnus*	Yamfly	Lycaenidae	NE
11	*Castalius rosimon*	Common Pierrot	Lycaenidae	NE
12	*Sarangesa dasahara*	Common Small Flat	Hesperiidae	NE
13	*Pseudocoladenia fatih*	West Himalaya Pied Flat	Hesperiidae	NE

NE = Not Evaluated **LC = Least Concerned**

***Eurema hecabe* (Common Grass Yellow)**

***Catopsilia pomona* (Lemon Emigrant)**

***Junonia lemonias* (Lemon Pansy)**

***Junonia hierta* (Yellow Pansy)**

***Sarangesa dasahara* (Common Small Flat)**

***Pseudocoladenia fatih* (West Himalayan Piedflat)**

Figure 4.2.9-18 Photo of butterfly species recorded along the transmission line

(v) Dragonfly

A total of 2 species of dragonfly were recorded in survey area. All species are in same family Libellulidae. According to the IUCN Red List of (2019-1), there was no threatened species and no endemic species.

Table 4.2.9-15 List of dragonfly species recorded along the transmission line route

No	Family Name	Species Name	Common Name	IUCN List
1	Libellulidae	*Orithetrum pruinosum*	Tailed Marsh Hawk	NE
2	Libellulidae	*Neurothemis fluctuans*	Grasshawk Skimmer	LC

NE = Not Evaluated
LC = Least Concerned

Neurothemis fluctuans **(Grasshawk Skimmer)** ***Orithetrum pruinosum*** **(Tailed Marsh Hawk)**

Figure 4.2.9-19 Some photo of recorded dragonfly species along the transmission line route

(vi) Fish

Transmission line that will run from Waing Maw to Wa Shaung substation acrossed over rice or field and most of the local resident along the transmission line only worked hill-side cultivation and no finishing operation were not observed so that we didn't get any related data for fish.

Conclusion

A total of 4 species of Mammals, 2 species of Herpet, 50 species of Birds, 13 species of Butterflies, 2 species of dragonfly were recorded during the survey period. During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species.

5.2.9.1 Protected Areas in Myanmar

According to the World Database on Protected Areas (WDPA, http://www.protectedplanet.net/country/MM) the Country hosts 57 Protected Areas including as reported in the following Table.

Table 4.2.9-16 World database on protected areas – Myanmar

Type	Number
National Park	4
Nature Reserve	3
Wildlife Sanctuary	23
National Park and ASEAN Heritage Park	3
Not Reported	4
Bird Sanctuary	4
Other Area	3
Protected Area	2
Reserved Forest	1

Type	Number
Game Sanctuary	1
Wildlife Park	1
Wildlife Sanctuary and ASEAN Heritage Park	2
Bird Sanctuary and ASEAN Heritage Park	1
Tiger Reserve	1
Mountain Park	1
Elephant Range	1
Botanical Garden	1
Ramsar Site, Wetland of International Importance	1

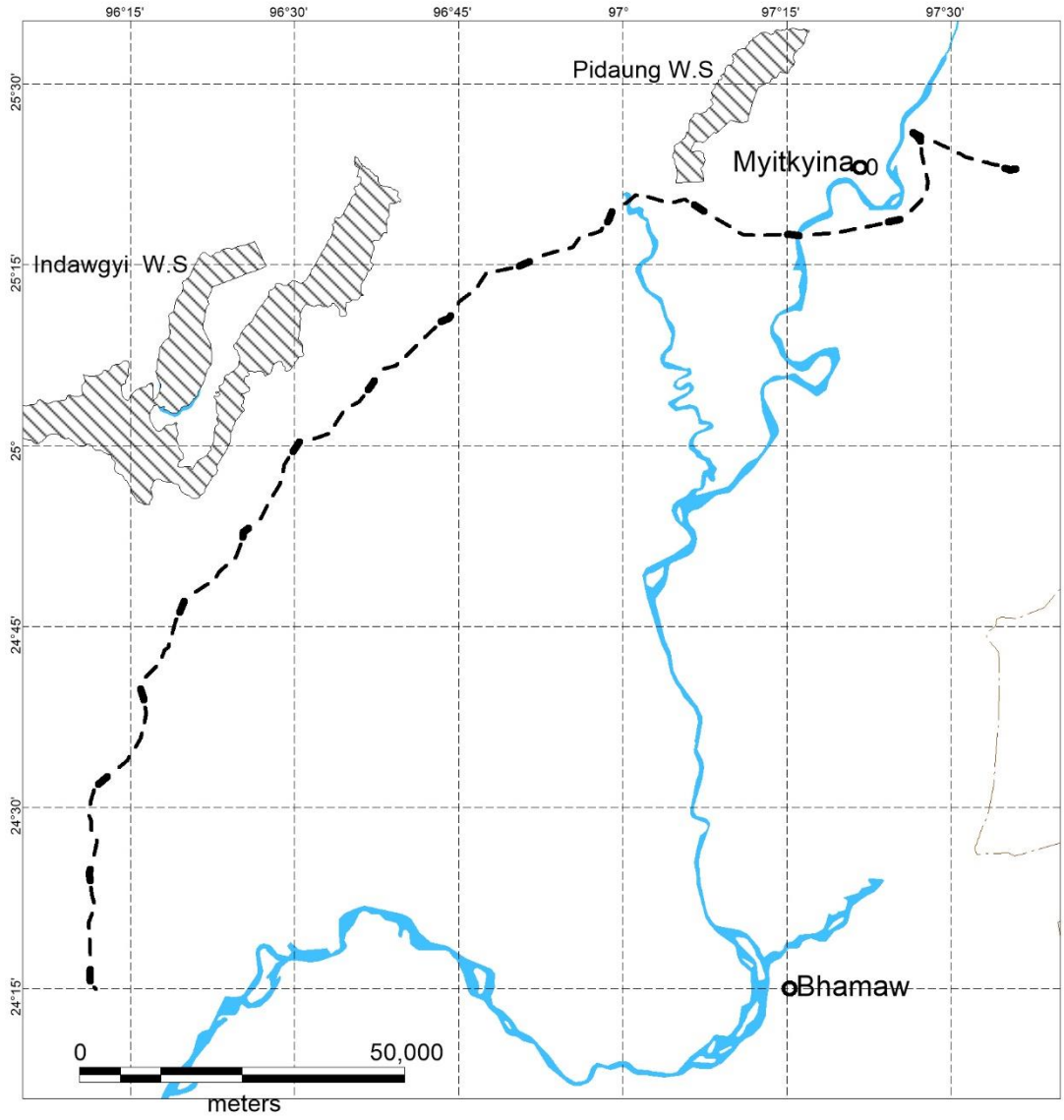


Figure 4.2.9-20 The protected Areas nearby the transmission line.

The transmission line route is located about 10 km far from the "Indawgyi Wildlife Sanctuary" to the northwest and "Pidaung Wildlife Sanctuary" to the north.

4.2.10 Social Environment

4.2.10.1 Social Setting

The proposed transmission line will pass through five townships namely Waingmaw, Myitkyina, Mogaung, Mohnyin and Indaw which occupy one state and one region, namely Kachin and Sagaing.

1. Kachin State

Population of Myanmar and Kachin State

Kachin has Myanmar's highest mountain ranges. Whereas the south-western parts of the State (Myitkyina, Bhamo and Mohnyin districts and parts of Putao District) extend to flatter hills and river plains (Hukawng basin, Myitkyina plain, Bhamo basin and the Putao basin), its northern and eastern limits (most of Putao District) reach up to 5,889 metres.

Hkakabo Razi features as Myanmar's highest mountain, belonging to the eastern stretches of the Himalaya range and the greater Tibetan plateau. The Myanmar Population and Housing Cencus (MPHC) 2014 shows that Myanmar had a total population of 51,486,253 persons as of 29 March 2014. Of these, 24,824,586 were males and 26,661,667 were females. Kachin's capital Myitkyina lies on the west bank of the Ayeyarwady River. It is the northernmost river port and railway terminus in Myanmar. Other main towns are Bamaw (Bhamo), Mogaung, Mohnyin, Putao and Shwegu. The people living in Kachin State belong to various ethnic groups, primarily Kachins, Bamars and Shans.

The total population for Kachin State as of 29 March 2014 was 1,689,441 persons. Of these, 1,642,841 were enumerated in the census, while 46,600 were estimated not to have been counted during the census. Of the total population of Kachin State, 878,384 were males and 811,057 were females. The total population of Kachin State represents 3.3 percent of the total population of Myanmar.

Size and Change of Population in Kachin State

Since 1973, the population of Kachin State has increased from 737,939 to 904,794 in the 1983 census and to 1,689,441 in the Census of 2014. This means the population of Kachin State has increased by about 86 percent between the 1983 and the 2014 Censuses. The population of Kachin State ranks tenth in size when compared with other States and Regions in the country. It is only higher than the population sizes of Kayin, Tanintharyi, Nay Pyi Taw, Chin and Kayah. In terms of the proportion of the total population, the population of Kachin State has increased from 2.6 percent in 1983 to 3.3 percent in 2014. Figure 5.2.10-1 shows the proportion of each state and region to the total population in the country.

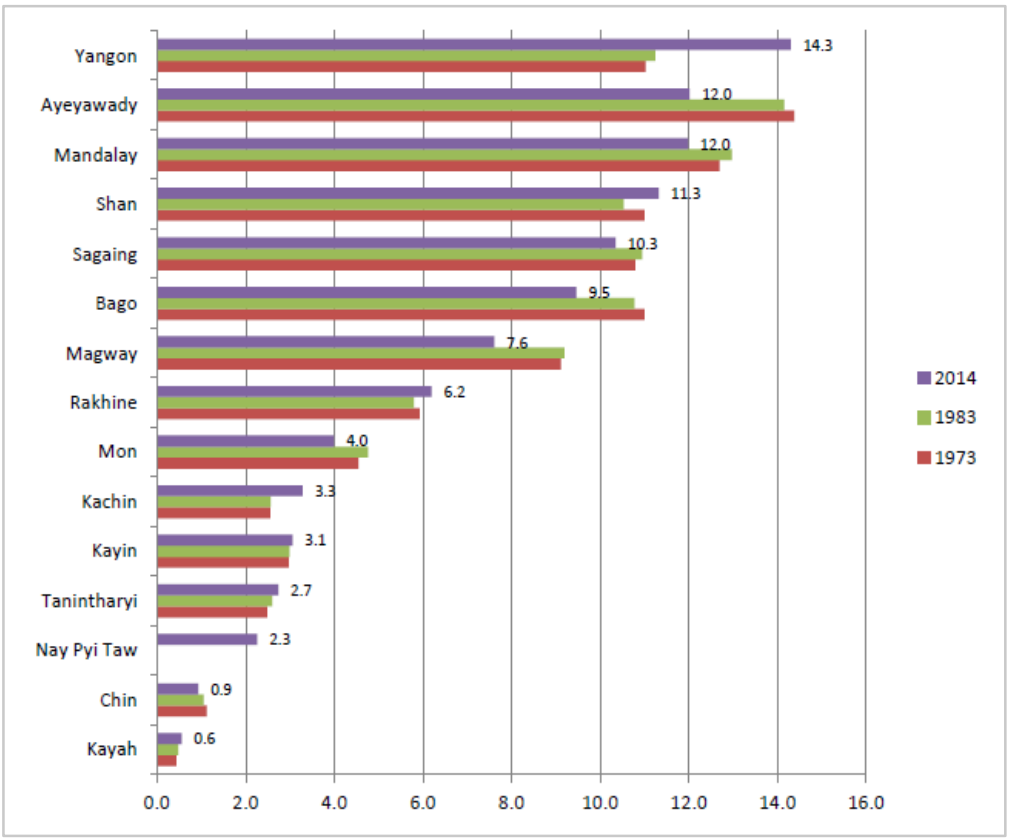


Figure 4.2.10-1 Proportion of the population of each State/Region as a percent of the country

Population Density

The population density of Kachin State in March 2014 was 19 persons per square kilometre. This is much less than the Union level population density of 76 persons per square kilometre, and it is the second least densely populated State/Region in the country, surpassing only Chin State which has 13 persons per square kilometre. The population density of Kachin State has increased from 8 persons per square kilometre in 1973 to 10 persons per square kilometre in 1983 and to 19 persons per square kilometre in 2014.

Population by Urban and Rural area

The Census results show that for every 100 persons in Kachin State, 64 persons live in rural areas while 36 persons live in areas that are classified as urban by GAD. At the Union level, 70 percent live in rural areas while 30 percent live in urban areas. Kachin State has the second highest proportion of urban population compared to other States/Regions, surpassed only by Yangon Region with 70 percent of the population living in urban areas. Kachin State is closely followed by Mandalay Region, where 35 percent of the population lives in urban areas.

Total population of the Bhamo is about 135,877 and male is about 66,718 and female is about 69,159. Total population of Shwegu is about 90,691 and male is 45,062 and female is about 45,629.

Economy

The economy of Kachin State is predominantly agricultural. Kachin's agriculture is much less intensively developed than in the Regions of the Ayeyarwady basin to its South. Nevertheless, Kachin produces considerable quantities of rice, corn, groundnuts, pulses and beans, sugarcane

and vegetables. A number of eradication programmes has helped to replace opium-poppy as an important crop. There are also good conditions for freshwater fisheries and livestock, common in many areas. The forests produce teak and hardwood, as well as charcoal, bamboo and resin. A number of industries are associated with these products, such as sugar mills and rice mills. Weaving and blacksmithing are important cottage industries.

Transportation

Kachin State is served by the following airports:

- Bamaw Airport
- Myitkyina Airport
- Putao Airport

There is a railroad between Myitkyina and Mandalay (through Sagaing). The train will takes 24–30 hours from Mandalay to Myitkyina.

Education

The Education system in Myanmar does not emphasis learning but rather memorization facts. in 1990's the Education minister asked all the states and division Education Chiefs to pass all the students who failed the mathematics examination with a score of at least 30 points though the normal passing score was actually 40. Educational opportunities in Myanmar are extremely limited outside the main cities of Yangon and Mandalay. It is especially a problem in Kachin State where over 60 years of fighting between the government and insurgents has displaced thousands of people. The following is a summary of the education system in the state.

AY 2002-2003	Primary	Middle	High
Schools	1183	86	41
Teachers	3700	1500	600
Students	168,000	80,000	24,100

Health

The general state of health care in Myanmar is poor. The military government spends anywhere from 0.5% to 3% of the country's GDP on health care, consistently ranking among the lowest in the world. Although health care is nominally free, in reality, patients have to pay for medicine and treatment, even in public clinics and hospitals. Public hospitals lack many of the basic facilities and equipment. In general, the health care infrastructure outside of Yangon and Mandalay is extremely poor but is especially worse in remote areas like Kachin State. The following is a summary of the public health care system in the state.

2002–2003	# Hospitals	# Beds
Specialist hospitals	2	125
General hospitals with specialist services	2	500
General hospitals	17	553
Health clinics	22	352
Total	**43**	**1530**

2. Sagaing Region

Population of Myanmar and Sagaing Region

The 2014 MPHC shows that Myanmar had a total population of 51,486,253 persons as of 29 March 2014. Of these, 24,824,586 were males and 26,661,667 were females.

The total population for Sagaing Region as of 29 March 2014 was 5,325,347 persons. Of these, 2,516,949 were males and 2,808,398 were females. The total population of Sagaing Region represents 10.3 percent of the total population of Myanmar.

Size and Change of Population in Sagaing Region

Since the 1973 census, the population of Sagaing Region has increased from 3,119,054 to 3,862,172 in the 1983 census and to 5,325,347 in the census of 2014. This means that the population of Sagaing Region has increased by about 38 percent between the 1983 and the 2014 censuses. It ranks fifth in size when compared with other States and Regions in the country, behind Yangon Region, Ayeyawady Region, Mandalay Region and Shan State. However, in terms of the proportion of the total population, the population of Sagaing Region has slightly declined from 10.9 percent in 1983 to 10.3 percent in 2014. Figure 4.2.10-2 shows the proportion of each State and Region to the total population in the country.

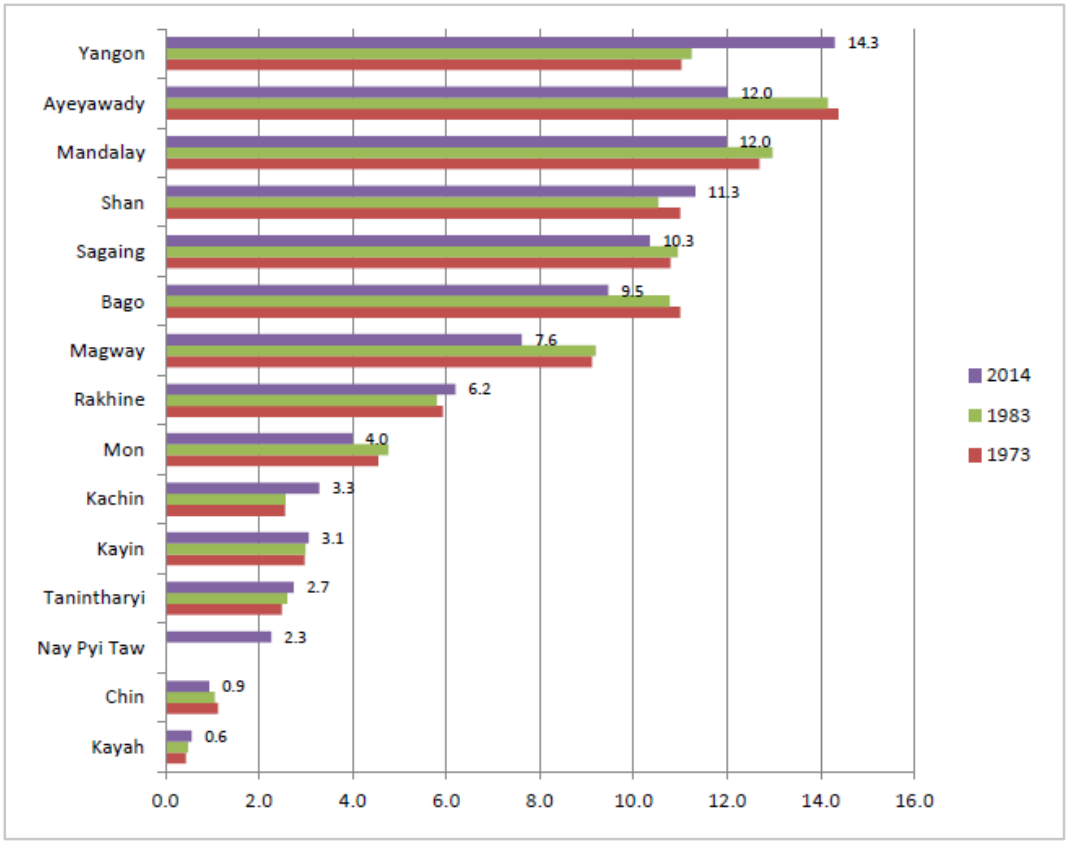


Figure 4.2.10-2 Proportion of the population of each State/Region as a percent of the country

Population Density

The population density of Sagaing Region in March 2014 was 56.8 persons per square kilometre. This is lower than the Union level population density of 76 persons per square kilometre, and it means Sagaing ranks ninth in population density when compared with other States/Regions. The population density has increased from 33 persons per square kilometre in 1973 to 41 persons per square kilometre in 1983, to 56.8 persons per square kilometre in 2014.

Population by Urban and Rural Area

The Census results show that for every 100 persons in Sagaing Region, 83 persons live in rural areas while 17 persons live in areas that are classified as urban by GAD. At the Union level, 70% of the total populations live in rural areas while 30 % live in urban areas.

There are total population of 167,734 in Kathar Township including about 82,325 of male and 85,409 of female. In Indaw Township, total population is 120,266 including 56,814 of male and 63,452 of female.

4.2.10.2 Demography and Religion

There are about 59 villages around the transmission line (see in Table 4.2.10-1). The installation of towers along the RoW will affect some farmland and agricultural land that owned by the 59 villages in five townships. Farmland, plantation, forest and reserved forests are involved along the proposed transmission line route.

Table 4.2.10-1 Number of villages that situated nearby the transmission line route

State/Region	District	Township	Total Village
Kachin	Myitkyina	Waingmaw	13
		Myitkyina	3
		Mogaung	17
		Mohnyin	19
Sagaing	Kathar	Indaw	7

Table 4.2.10-2 The population of 5 townships

Township	Male	Female	Population
Waingmaw	52,698	53,668	106,366
Myitkyina	148,485	158,465	306,949
Mogaung	63,501	69,107	132,608
Mohnyin	78,795	81,803	160,598
Indaw	56,814	63,452	120,266

Source: Department of Population, 2017

In Waingmaw Township, there are more females than males with 98 males per 100 females. The majority of the people in the Township live in rural areas with only (20.7%) living in urban areas. The population density of Waingmaw Township is 29 persons per square kilometre. There are 5.1 persons living in each household in Waingmaw Township. This is higher than to the Union average (4.4 persons).

In Myitkyina Township, there are more females than males with 94 males per 100 females. The majority of the people in the Township live in urban areas (79.2%). The population density of Myitkyina Township is 64 persons per square kilometre. There are 5.4 persons living in each household in Myitkyina Township. This is higher than the Union average.

In Mogaung Township, there are more females than males with 92 males per 100 females. The majority of the people in the Township live in rural areas with only (18.9%) living in urban areas. The population density of Mogaung Township is 51 persons per square kilometre. There

are 5.1 persons living in each household in Mogaung Township. This is slightly higher than the Union average.

In Mohnyin Township, there are more females than males with 96 males per 100 females. The majority of the people in the Township live in rural areas with only (20.7%) living in urban areas. The population density of Mohnyin Township is 27 persons per square kilometre. There are 4.9 persons living in each household in Mohnyin Township. This is slightly higher than the Union average.

In Indaw Township, there are more females than males with 90 males per 100 females. The majority of the people in the Township live in rural areas with only (7.1%) living in urban areas. The population density of Indaw Township is 63 persons per square kilometre. There are 5.0 persons living in each household in Indaw Township. This is more than the Union average.

In Kachin State, it is 64.0% Buddhist, 33.8% Christian, 1.6% Islam, 0.4% Hindu, 0.2% Animist, and less than 0.1% each for other religion and those with No religion. In Sagaing Region, it is 92.2% Buddhist, 6.5% Christian, 1.1% Islam, 0.1% Hindu, 0.1% other religion, and less than 0.1% each for Animist and those with No religion respectively.

4.2.10.3 Economy

In Kachin State, 46.4 per cent are skilled agricultural, forestry and fishery workers and 13.8 per cent are in craft and related trades workers.there are 48.7 per cent of employed population working in "Agriculture, forestry and fishing" industry while 12.3 per cent in "Wholesale and retail; repair of motor vehicles and motorcycles" industry. In Sagaing Region, 52.4 per cent are skilled agricultural, forestry and fishery workers and 9.1 per cent are in services and sales workers. In Sagaing Region, there are 61.6 per cent of employed population working in "Agriculture, forestry and fishing" industry.

4.2.10.4 Electricity Supply

In Waingmaw Township, 12.8 per cent of the households use electricity for lighting. This proportion belongs to the (4-32) group in electricity usage compared to other townships in Kachin State. The percentage of households that use electricity in Kachin State is 30.3 per cent. The use of candle for lighting is the highest in the township with 42.9 per cent. In rural areas, 48.1 per cent of the households use candle for lighting.

In Myitkyina Township, 52.3 per cent of the households use electricity for lighting. Compared to other townships in Kachin State, this proportion belongs to the (33-61) group. The percentage of households that use electricity in Kachin State is 30.3 per cent. In rural areas, 46.6 per cent of the households use candle for lighting.

In Mogaung Township, 43.4 per cent of the households use electricity for lighting and is the highest in electricity usage. Compared to other townships in Kachin State, Mogaung belongs to the range of (33-61) per cent group. The percentage of households that use electricity in Kachin State is 30.3 per cent. In rural areas, 36.1 per cent of the households mainly use electricity for lighting.

In Mohnyin Township, 25.7 per cent of the households use electricity for lighting. This proportion belongs to the (4-32) per cent group in electricity usage compared to other townships in Kachin State. The percentage of households that use electricity in Kachin State is 30.3 per cent. The use of candle for lighting is the highest in the township with 26.3 per cent. In rural areas, 30.8 per cent of the households mainly use candle for lighting. In Indaw Township, households mainly use wood-related fuels for cooking with 85.0 per cent using

firewood and 9.1 per cent using charcoal. Only 5.6 per cent of households use electricity for cooking. Some 89.9 per cent of households in rural areas mainly use firewood and 5.9 per cent use charcoal

4.2.10.5 Education

The Education helps children to fulfil their potential and is critical to all aspects of socio-economic development. However, it is estimated that over one million children are still out of school in Myanmar due to poverty, geographical remoteness, disability, language, conflict and other barriers. Myanmar's Government is leading the process of national education reform. A Comprehensive Education Sector Review has been informing new policy and planning, and a National Education Sector Plan is being developed to define the strategic directions of the reform process and to guide its implementation.

Attendance to pre-school education in an organized learning or child education programme is important for the readiness of children to school. Overall, 22.9 per cent of Myanmar children aged 36-59 months attend early childhood education. Pre-school attendance in urban areas (39.1 per cent) is more than double that of rural areas (15.9 per cent). Universal access to basic education and the achievement of primary education by the world's children is one of the most important goals of the Millennium Development Goals. In Myanmar, 74.4 per cent of five-year-olds attend school, with no difference between girls and boys. Whereas there is only a slight difference between urban and rural areas, it is notable that while 80.7 per cent of children aged five from the richest households are in school, only 63.5 per cent of children from the poorest households have entered primary school[4].

Compared to the Union, the school attendance of males and females in Indaw Township is higher at starting age of school attendance to age 13. The literacy rate of those aged 15 and over in Indaw Township is 96.4 per cent. It is higher than the literacy rate of Sagaing Region (93.7%) and the Union (89.5%). Female literacy rate is 94.6 per cent and for the males it is 98.5 per cent.

School attendance in Waingmaw Township drops after age 13 for both males and females. Compared to the Union, the school attendance of males and females in Waingmaw Township is higher. The literacy rate of those aged 15 and over in Waingmaw Township is 83.2 per cent. It is lower than the literacy rate of (91.7%) for Kachin State and (89.5%) for the Union. Female literacy rate is 79.4 per cent and for the males it is 87.4 per cent. In Waingmaw Township, the literacy rate for youth aged 15-24 is 96.7 per cent with 97.3 per cent for females and 96.1 per cent for males[5].

The literacy rate of those aged 15 and over in Myitkyina Township is 94.2 per cent. It is higher than the literacy rate of (91.7%) for Kachin State and (89.5%) for the Union. Female literacy rate is 92.3 per cent and for the males it is 96.5 per cent. The literacy rate for youth aged 15-24 is 98.7 per cent with 98.7 per cent for both females and males[6].

The literacy rate of those aged 15 and over in Mohnyin Township is 95.4 per cent. It is higher than the literacy rate of Kachin State (91.7%) and the Union (89.5%). Female literacy rate is 93.7 per cent and for the males it is 97.5 per cent.

[4] Myanmar Multiple indicator cluster survey, 2009-2010, Ministry of National Planning and Economic Development, Ministry of Health, UNICEF and United Nations Children's Fund

[5] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Waingmaw Township

[6] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Myitkyina Township

Compared to the Union, the school attendance of males and females in Mogaung Township is higher at school going age. The literacy rate of those aged 15 and over in Mogaung Township is 93.4 per cent. It is higher than the literacy rate of Kachin State (91.7%) and the Union (89.5%). Female literacy rate is 91.5 per cent and for the males it is 95.7 per cent.

4.2.10.6 Health Facility

Health facilities in Kachin State are provided by both public and private hospitals and clinics. Urban areas like Myitkyina, Waingmaw, Mohnyin, Mogaung and Indaw have specialty hospitals, general hospitals, state/regional hospital, district hospitals, and township hospitals. There are also rural health centers (RHC) that provide health services at the village level. The RHCs are staffed by a health assistant, public health supervisor, lady health visitor, and a midwife who are trained in primary health care and public health.

The overall condition of the health facilities major disease, are defined as following table.

Hospitals

No	Name of Township	Hospital	Clinic	Rural Health Care
1	Waing Maw	5	5	8
2	Myitkyinar	11	8	6
3	Moe Kaung	4	-	5
4	Mohnyin	9	2	9
5	Indaw	3	-	22

Source: Townships General Administration Department

Major Diseases

No	Township	Kind Of Disease									
		Malaria		Diarrhea		Tuberculosis		Dysentery		Hepatitis	
		Happen	Death	Happen	Death	Happen	Death	Happen	Death	Happen	Death
1	Waing Maw	9	-	688	-	180	6	122	-	-	-
2	Myitkyina	62	-	2224	-	1227	9	430	-	-	-
3	Moe Kaung	38	-	992	-	169	4	92	-	29	-
4	Mohnyin	123	1	1904	1	262	1	312	-	60	-
5	Indaw	735	-	933	-	123	16	98	-	6	1

Source: Townships General Administration Department

4.2.10.7 Water Supply

The major sources of water supply in those five townships are river water, streams, springs, tube wells, lake, pond and rain water.

In Myitkyina Township, 92.2 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier)[7].

- Compared to other townships in Kachin State, this proportion of households use improved sources of drinking water belongs to (66-97) per cent group and it is also higher than the Union average (69.5%).
- About 51.3 per cent of the households use water from tube well, borehole and 26.4 per cent use water from protected well/spring.

[7] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Myitkyina Township

- In rural areas, 24.6 per cent of the households use water from unimproved sources for drinking wat

In Waingmaw Township, 67.9 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier)[8].

- Compared to other townships in Kachin State, Waingmaw household belongs to the (66-97) group proportion in use improved sources for drinking water and it is slightly lower than the Union average (69.5%).
- About 50.1 per cent of the households use water from protected well/spring and 23.6 per cent use water from unprotected well/spring.
- In rural areas, 34.3 per cent of the households use water from unimproved sources for drinking water.

In Mohnyin Township, 81.2 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier)[9].

- Compared to other townships in Kachin State, it is in the (66-97) per cent group and is higher than the Union average (69.5%).
- Some 38.0 per cent of the households use water from protected well/spring and 35.3 per cent use water from tube well/borehole.
- In rural areas, 17.0 per cent of the households use water from unimproved sources for drinking water.

In Mogaung Township, 81.1 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier)[10].

- Compared to other townships in Kachin state, the proportion of households using improved sources of drinking water belongs to the range of (66-97) per cent group and it is higher than the Union average (69.5%).
- Some 38.2 per cent of the households use water from tube well, borehole and 34.0 per cent use water from protected well/spring.
- In rural areas, 22.5 per cent of the households use water from unimproved sources for drinking water.

In Indaw Township, 84.8 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier)[11].

- Compared to other townships in Sagaing Region, this proportion of households use improved sources of drinking water belongs to (68-97) per cent group and it is higher than the Union average (69.5%).
- Some 36.8 per cent of the households use water from tube well, borehole and 32.8 per cent use water from protected well/spring.
- In rural areas, 15.2 per cent of the households use water from unimproved sources for drinking water.

4.2.10.8 Transportation

[8] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Waingmaw Township
[9] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Mohnyin Township
[10] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Mogaung Township
[11] The 2014 Myanmar population and housing census, Kachin State, Myitkyina District, Indaw Township

Myintkyina has two airports and MogaungTownship has one air port. The detailed information of respective township road are shown is Table

In Myitkyina Township, 78.7 per cent of the households have motorcycle/moped as a means of transport and it is the highest proportion, followed by 45.3 per cent of households having bicycle.

In Waingmaw Township, 63.5 per cent of the households have motorcycle/moped as a means of transport and it is the highest proportion, followed by 33.6 per cent of households having bicycle.

In Mohnyin Township, 72.6 per cent of the households have motorcycle/moped as a means of transport and it is the highest proportion, followed by 55.5 per cent of households having bicycle.

In Mogaung Township, 68.2 per cent of the households have motorcycle/moped as a means of transport and it is the highest proportion, followed by 57.6 per cent of households having bicycle.

In Indaw Township, 67.3 per cent of the households have motorcycle/moped as a means of transport and it is the highest proportion, followed by 61.6 per cent of households having cart (bullock).
Analysis by urban/rural residence, the majority of the households mainly use motorcycle/ moped as a means of transport.

4.2.10.9 Cultural Hreitage

The substation areas are located in the existing stations and owned by Government. The transmission line alignment has avoided cultural heritage such as pagodas and temples directly below the transmission lines.

4.2.10.10 Land Use

Existing land uses along the transmission line alignment consists of residential, village land, Forest Land and Agriculture Land. Figure 4.2.9-5 and 4.2.9-14 present the general land use map along the transmission line route and substations.

5 Anticipated Environmental Impacts and Mitigation Measures

The project aims to provide stable electricity supply in the Kachin State and Sagaing Region where electricity demand will be very high in near future. The project is expected to strengthen the linkage of the power grid of Kachin State with the main power grid of Myanmar, improve the power supply capacity of the power grid and increase the output of units of Chipwi Nge HPP.

5.1 Methodology of Impact Assessment

The scientific and technical reliability of an Initial Environmental Examination (IEE) study depends on the skills of the IEE practitioners/reviewers, who estimate and review the nature and magnitude of the environmental change that the proposed project may entail. Impact prediction and evaluation is a vital exercise for assessing impacts, deciding alternatives, setting down mitigation measures and developing an environmental management plan. Predicting the magnitude of impacts and evaluating their significance is the core exercise of impact assessment. This process is also known as impact analysis and can be broadly broken down into three overlapping phases:

- **Identification:** To specify the impacts associated with each phase of the project and the activities undertaken
- **Prediction:** To forecast the nature, magnitude, extent and duration of the main impacts; and
- **Evaluation:** To determine the significance of residual impacts after taking into account how mitigation will reduce a predicted impact.

In assessing environmental impacts and their significance, some key concerns have to be kept in mind:

- Identity who or what is affected
- Description of how they are affected
- Evaluation against a set of consistent assessment criteria

5.1.1 Impact Identification

The present transmission line project does not normally require extensive impact identification.

There are various tools that can be used for impact identification, such as questionnaires, checklists, network method, comparison with other similar projects, matrix and ad-hoc methods.

The potential impacts on environmental, socio- economic, demographic and cultural context will be present in this section. While identifying the above key features, the section also discusses the type and range of impacts likely to result from the different project activities, measuring its extent and severity.

The specific purpose of this section is to;

- Identify and assess the range of potential impacts and extent of their severity;
- Explain the ways in which the project might affect environment, ecology, socio-economic resources, demographics, livelihoods, cultural patterns, as well as access and infrastructure issues;
- Suggest viable mitigation measures for the identified impacts;
- Develop a management plan based on the proposed mitigation measures.

The DPTSC under MOEE discussed and evaluated the Feasibility study design documents for Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project. According to the requirements and comments of DPTSC, the final version of design specification has been modified. During IEE study, the consultations, focus group discussions, and key informant interviews with national level government, townships, villages and households and communities were organized and conducted to gather views of the stakeholders about the project and to identify measures to be undertaken in the next phases of project implementation.

The environmental and social impacts have been identified through field surveys, onsite measuring, and enquire with the village community. Discussions with project proponents, district officials, and village representatives were undertaken along the study area. A mix of quantitative and qualitative methods i.e. sampling, questionnaires, interviews, oral histories, have been used to derive these impacts. Potential impacts have also been predicted based on experience of working in past similar assignments.

The assessment process is based on available information, including the project description (as provided by Client), and social and environmental baseline data. The assessment considers all relevant social and environmental impact/risks, including issues identified in IFC Performance Standards 2 through 8, and those who will be affected by such risks and impacts.

Although the route for the transmission line has been selected to minimize social or environmental impacts, there will, nevertheless, be some impact along the corridor due to construction, erection of transmission line towers and stringing of overhead transmission line and in setting up associated utilities.

This section presents a summary of the environmental impacts from the activities related to construction and operation of the transmission line and two substations. The impacts are based on the project description provided by the client, existing available data and similar past projects.

The new 230kV line passes through Kachin State and Sagaing Region in Myanmar. Along the line route, 50% of the terrain is plain, 40% of that is hilly area and 10% of that is mountainous area. The transportation condition in these areas is of average level. The elevation along the line route ranges from 120m to 350m above the sea level. The new 132kV line passes through district within Kachin State in Myanmar. Along the route, 60% of the terrain is plain, and 40% of that is hilly area. The transportation conditions in these districts are of average level. The elevation along the route ranges from 130m to 300m above the sea level.

The transmission line design will involve approximately 45 towers for 132kV and 582 towers for 230kV, based on proposed transmission line route by Department of Power Transmission and System Control, Ministry of Electricity and Energy.

The components of the present project will include the Right of Way (RoW), the transmission line, transmission towers, access roads and worker camps. No spoil areas are required as excavated material will be used for back fill and embankments at tower sites.

According to the preliminary survey, the width of corridors for 230kV line and 132kV line are temporarily about 50m and 40m respectively.

The construction area of each tower is occupied by 60 ft. x 60 ft. and only used for foundation work for tower and four concrete blocks (L=2.5 ft. x W=2.5 ft. x H=2 ft.) will be remained on the ground after completion of foundation work.

Vegetation below 3m will be retained within the RoW where land is not required for tower footprints or access. The consideration and selection of the transmission line route was based on engineering principles and environmental factors, such as slope, geological condition for foundations and other obstructions. The important principles for line route selection have already described in the Chapter 2.

The main construction contents in the present transmission line are as follows:

- 132 kV Waingmaw – War Shawng T-connection
- 230kV Waingmaw Sub-station to Na Bar
- 230kV Waingmaw Sub-station (Extended)

In summary, project activities will include;

Construction Phase

- Clearing of vegetation for the RoW
- Earthworks for the installation of the transmission towers
- Construction of towers and stringing
- Rehabilitation of RoW areas not required to be permanently cleared and
- Construction of worker camp

Operation

- Maintenance of RoW, including repairs to transmission lines and trimming vegetation
- Road maintenance.

In general, the following things will be avoided in detailed line route survey and detailed engineering design.

- The proposed alignment will not pass through any environmentally critical area and avoids all known cultural heritage locations in the Kachin State and Sagaing Region.
- The potential human health and public safety effects on people living near the transmission lines will be minimized because the prescribed height of the towers are above the minimum safety requirement.
- There are five Major Rivers crossing along the proposed line route and need to protect river against sedimentation is necessary during piling activities.

5.1.2 Impact Prediction

The impact prediction was generally done through qualitative assessment.

5.1.3 Impact Evaluation

The criteria for evaluating the significance should be based on local standards wherever possible. Where local standards are not available, acceptable international standards should be used (e.g. IFC, WHO or USEPA standards and guidelines of others countries, etc.). In all cases, the choice of the appropriate standard must be robust, defensible and relevant to the local situation. If there are no appropriate existing standards available, then the criteria should be developed and their use must be clearly explained in the IEE. As a good practice in impact evaluation, it is better to use established procedures or guidelines, or relevant criteria which are comparable. While doing impact evaluation, it is equally important to understand the nature and characteristics of impacts on potential target areas, such as air, water, land, human beings, etc. to understand the significance, importance and intensity.

The criterion that has been used to evaluate impacts on various environmental and social aspects is as following:

Context

The context refers to spatial or geographical extent of impact due to proposed linear project. In this study, impacts were classified as per the following context:

- Local (low spread), when an impact is restricted within 17.5 m of either side of the project foot print i.e. within the corridor defined for the project;
- Medium (medium spread) when an impact is spread from 17.5 m to 50 m either side of the project foot print i.e. beyond 17.5 m but within 50m either side of the corridor defined for the project; and
- Regional (high spread) when impact is spread beyond 50m either side of the project foot print i.e. beyond 50 m either side from the corridor defined for the project.

The above context has been selected based on the understanding of the linear project and prevailing environmental and social baseline conditions. The baseline conditions show that the project is free from settlements along the corridor route and no large displacement is expected from the project. The project, however, is passing through forest land and will also require periodic maintenance during operation phase when access to forestland as well will require pruning of twigs of trees to restrict it to specific height for safe transmission as well for protection.

Duration

The duration of impact considers whether the impact would be short-term, medium-term or long-term and has been assessed based on the time taken to recover back to its pre-project state. For the transmission line project, impacts were classified based on their existence in temporal scale as follows:

- Short term (low duration) when impacting for a duration of six months (other than for ecology); this will result in the recovery of the effected environmental component (other than for ecology) within a year;
- Medium (medium duration) when impacting between six months and three years; this will result in the recovery of the effected environmental component (other than for ecology) within 1 to 10 years; and
- Long term (high duration) when impacting beyond three years (other than for ecology); and will result in recovery of prevailing conditions within 10 years or beyond.

For ecology [faunal species or floral species of ecological significance and trees(of girth size 30 cm or more)], impacts will be short term if limited to less than one generation, while impacts will be medium if limited to one generation and long term if limited to more than one generation.

Intensity

Indicators of the intensity of an impact, whether it is low, moderate, high, was based on the following criteria for impact intensity:

- Low intensity when resulting in changes in the environmental baseline of less than 20% in regional context or 20 to 30% in medium context or up to 30% in local context but for short duration;

- Moderate intensity when resulting in changes in the baseline for up to 30% in regional context or more than 30% in medium context or for ecology changes are expected to be recoverable in terms of medium duration; and
- High intensity when resulting change in the baseline beyond 30% in regional context or for ecology changes serious impairment to species, productivity or their habitat.

Type

The type of impact refers to whether the effect is considered beneficial or adverse. Beneficial impacts would improve resource conditions. Adverse impacts would deplete or negatively alter resources.

The significance assessment matrix is provided in Table 5.1-2.

Table 5.1-2 Impact Significance Criteria for Environmental and Social Components (other than for Ecology)

Significance	Context	Duration	Intensity
Insignificant	Local	Short	Low
Minor	Local	Short	Moderate
	Local	Medium	Low
	Local	Medium	Moderate
	Medium	Short	Low
	Local	Long	Low
Moderate	Local	Medium	High
	Local	Long	Moderate
	Medium	Short	Moderate
	Medium	Medium	Low
	Medium	Medium	Moderate
	Medium	Long	Low
	Medium	Long	Moderate
	Regional	Short	Low
	Regional	Short	Moderate
	Regional	Medium	Low
	Regional	Medium	Moderate
Major	Local	Short	High
	Local	Long	High
	Medium	Short	High
	Medium	Medium	High
	Medium	Long	High
	Regional	Short	High
	Regional	Medium	High
	Regional	Long	Low
	Regional	Long	High
	Regional	Long	High

Note: Positive impacts are termed as beneficial while negative ones are adverse
Source: International Association for Impact Assessment

5.2 Construction Phase Impacts (Transmission Lines)

The construction activities of the transmission lines will be in the right of way prescribed by the MOEE according to the Electricity Law (2014) (See in Figure 5.2-1). The assessment of impacts of the proposed alignment of the transmission lines are described in the succeeding discussions.

5.2.1 Soil and Geology (Erosion)

a) Activities

Digging of foundation pits for the towers and the cutting of vegetation (for foundation purposes) are the main two activities, which are likely to affect the soil structure and quality. Foundations will be dug up to a depth of 3 m (at least) depending upon the tower type and soil characteristics. At the tower sites, all vegetation within the footprint of the tower base and for a distance of approximately 2 m beyond the base in all directions will be cleared to ground level. There will be some damage to crops and vegetation during stringing operation due dragging and pulling of conductors.

Some loss of vegetation/crop will occur due to movement of construction material and manpower through cultivated areas.

b) Potential Impacts

The most significant potential impacts will be due to change to soil structure and soil quality as a result of excavation or compaction. The magnitude and extent of the impacts are likely to vary according to the characteristics of the soil and the types of construction activity. Compaction of soil during backfilling might lead to temporary effects on natural infiltration of rainwater, but these impacts are temporary, localized and marginal.

Removal of vegetation and trees during construction of foundation, especially on the slopes would render soil vulnerable to erosion. Also, stringing activities can cause larger damage to crop if carried out during flowering/fruit bearing season.

Movement of workers through adjoining fields during construction can damage fresh crops. Loose soils and construction material if placed in adjoining fields will lead to damage of existing crop and contamination of soil. The excavated if kept uncovered and unprotected will be rendered vulnerable to loss from erosion.

c) Mitigations

The suggested mitigations to minimize impact on vegetation and soil include means to protect excavated soil material from erosion and contamination by placing them away from streams of water along the slope or in direct line of local drainage. Loose soil should be kept covered till the time of backfill and the excess soil should be removed after casting activities are completed. The construction activities shall be planned in non-monsoon months which will minimize any rainwater run-off or any loss due to infiltration.

Silt traps or temporary barriers and trenches around excavation areas and stockpiles of materials will be necessary during the construction of the lattice towers near Ayeyarwaddy River as well as other large streams. Site clearing, earthworks and other civil works should be scheduled during the dry season to prevent erosion and runoff of sediments. Likewise, the areas will be barricaded and provided with channels that will block silt from draining into streams.

Construction materials will be stored within the footprint of the site to avoid any kind of damage or contamination of soil/crop of adjoining fields. Movement of material and manpower shall be

restricted to existing roads/tracks or as agreed upon with the stakeholders to avoid creation of new roads/tracks.

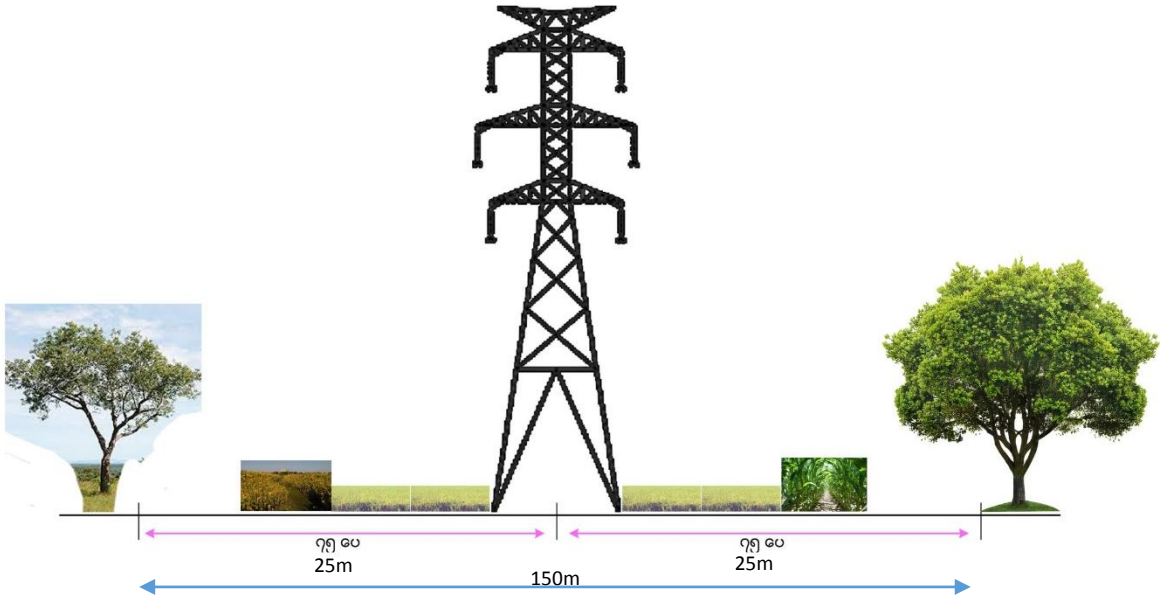


Figure 5.2-1 The right of way of the War Shawng – Waingmaw and Waingmaw – Na Bar 25m (75ft. x 25m (75 ft.) total 50m (150 ft.)
Source: DPTSC

d) Impact Significance

The construction area is only occupied by 20m (60 ft.) x 20m (60 ft.) and only used for foundation work for tower and four concrete blocks (L= 0.8m (2.5 ft.) x W= 0.8m (2.5 ft.) x H=) 0.7m (2 ft.)) will be remained on the ground after completion of foundation work.

The potential affected area due to activity of foundation work is shown in Figure 5.2-2. Foundation pits will be backfilled by the excavated soils which will resemble the order of the original soil layers. The activity of foundation work is shown in in Figure 6.2-3. The line route which occupied volcanic rocks and younger alluvium especially river crossing area can cause soil erosion and need to protect river against sedimentation is necessary during piling activities.

Due to short term nature of the activities, localized and moderate size of the nature of impacts, together with proposed mitigation measure, the impacts predicted to occur on soils is minor. The significance of impacts on soil and its reduction with mitigation measures during construction is summarized in Table 5.2-1.

Table 5.2-1 Impact Significance on Soil for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
Soil and Geology (Erosion)	Without mitigation		☑		☑				☑		☑				☑	
	With mitigation		☑		☑			☑			☑			☑		

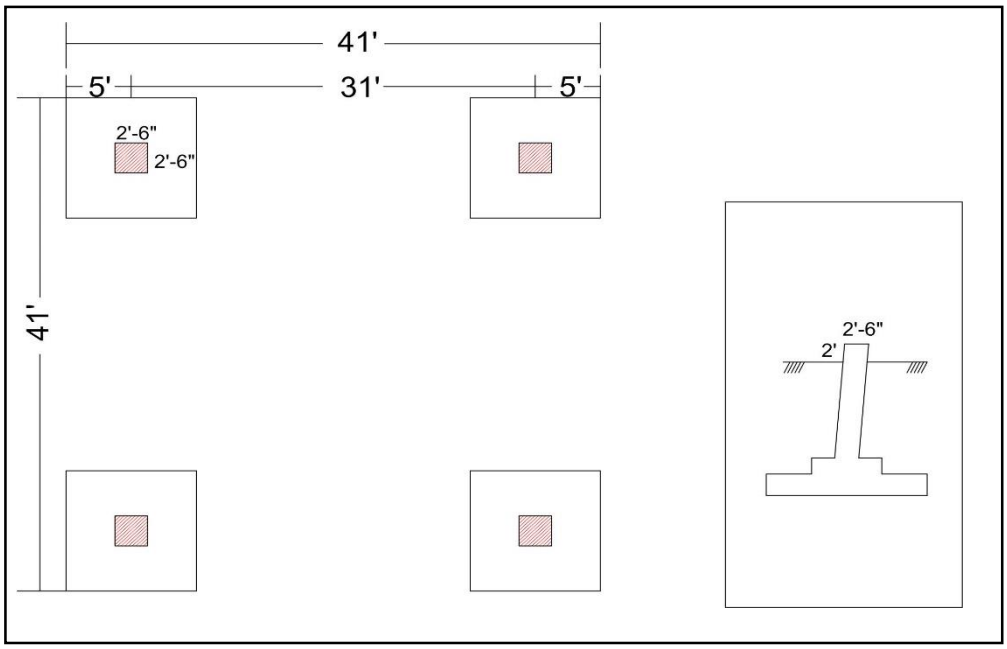


Figure 5.2-2 The area affected by the foundation of tower
Source: DPTSC

Figure 5.2-3 The construction activities of the tower (Source: DPTSC)

5.2.2 Waste Disposal (Construction wastes and Hazardous Waste)

a) Activity

The main type of waste likely to be generated during construction activities is the construction debris resulting from casting for foundations and some steels scrap from tower construction. Other wastes that will be generated include scrap wood, metal, cement bags, hazardous wastes from used oil, empty paint containers, busted batteries, spill cleanup materials, waste food/packaging material, domestic solid wastes and sewage from workers camp.

b) Potential Impacts

There is potential for spread of construction debris to areas outside that marked for construction. The debris generated from construction activities can be carried along with small springs, rivulets and rivers flowing in proximity of the tower. Construction debris can also contaminate wells, canals etc. in proximity of the activity.

c) Mitigations

Any construction debris generated at the site will be removed from the site immediately after the completion of construction activities and the site will be leveled as original. Workers will be strictly instructed about random disposal of any waste generated from the construction activity. Arrangements will be made to collect and prevent littering by workers on site.

The contractor will be required to implement a waste management plan that includes onsite sanitation facilities and solid and construction waste collection and disposal system.

d) Impact Significance

The construction period is short term within 1 to 2 years. Given the mitigations in place, anticipated impact intensity is low due to waste generation from the construction activities if good management and engineering practices are followed and the impact significant will be minor. The significance of impacts due to waste disposal and its control with proper mitigation measures is summarized in Table 5.2-2.

Table 5.2-2 Impact Significance on waste disposal for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
Waste Disposal (Construction wastes)	Without mitigation		☑		☑				☑		☑				☑	
	With mitigation		☑		☑			☑			☑			☑		

5.2.3 Aesthetics and Visual Impact

a) Activity

The visual amenity will be disturbed mainly during casting of foundation and leaving the site with stubs of tower. The erection of towers and conductors across the terrain will be an extrinsic element to the existing ambience.

b) Potential Impacts

The long-term visual impacts could occur because of the presence of high transmission lines and clearing of trees along roads. The visual impacts and change of landscape due to construction activity will be for a short period of 15-30 days. However route of towers and transmission line are expected to cross highways/roads, and other transmission line which may

lead to change of landscape resource and character due to introduction of manmade features leading to visual intrusion and loss of visual amenity.

The cumulative impact due to already existing towers can hamper the aesthetic value of the area.

c) Mitigations

The route is planned after a series of survey to avoid habitation and forest areas. The clearing of trees will be kept to minimum and wherever possible, trimming of trees will be adopted *vis-à-vis* felling of trees. The lattice structure of towers provide sufficient see through effect which diminish the visual impact on the aesthetics of the area. The area being hilly terrain with undulations restrict the view of many towers in a single view, moreover the height of tower do not appear to be significant with reference the terrain.

To improve the landscape along the roads, trees will be preserved on the road easements so long as the vertical safety clearance is complied. Regular trimming of trees within the RoW of transmission lines will be implemented to maintain vertical and lateral safety clearance.

d) Impact Significance

Short-term aesthetic impacts during construction would be temporary and any adverse visual impacts are expected to be restored to pre-existing conditions upon completion of construction. The overall landscape and visual impacts of the transmission line is expected to be insignificant after mitigation. The impact is summarized in Table 5.2.3-1.

Table 5.2.3-1 Impact significance on Aesthetics and Visual for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
Aesthetics and Visual		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
	Without mitigation		☑		☑				☑		☑			☑		
	With mitigation		☑		☑			☑			☑		☑			

5.2.4 Surface Water and Groundwater Quality

a) Activity

There are five major rivers crossing along the new 230kV double circuit line such as Ayeyarwady River, Mogaung Chang (Stream) and Nam Yim Chaung (Stream). Lattice towers are designed on the banks of these River and streams. The digging of foundation pits for the towers which are likely to affect the groundwater quality. Foundations will be dug up to a depth of 0.7 meter (about 2 feet) depending upon the tower type and soil characteristics.

b) Potential Impacts

There is potential for contamination of surface water bodies due to runoff from construction activities close to them. Also, construction along the slopes can affect small changes in the surface drainage pattern of the area. The groundwater quality can be affected by foundation purposes.

Impacts to surface water quality can occur from erosion and sediment run off, discharge of inadequately treated sewage and domestic waste and release of hazardous materials.

The pollution sources are stated as follows:

1. ***Erosion and Sediment***

Sources of erosion and sediment run off include:

- Erosion and sediment run off from construction activities that expose or move soil (including clearing of vegetation and earthworks)
- Release of sediment laden effluent during construction, for example soil waste from drilling activities
- Erosion and sediment released from stream bed and river bank disturbance at river course crossings

Erosion has the potential to lead to deposition of sediment and increased turbidity of water which can limit photosynthesis, suffocate benthic fauna and more broadly degrade aquatic habitat.

2. ***Hazardous Materials***

Hazardous materials that may be used in the construction work:

- Paints and solvents
- Petroleum products such as oils, fuels and grease
- Concrete curing and repair compounds and
- Contaminated waste material.

There is potential for hazardous materials to be released to the environment, particularly during storage and handling and equipment/vehicle maintenance.

c) Mitigations

River and streams will be protected against clogging. Mitigation measures will be required in the EMP. Construction activities in proximity of water bodies will ensure prevention of runoffs. At the river crossing the horizontal clearance (the distance between the towers) will be greater than the maximum river width at high flood levels and the vertical clearances will be according to the statutory requirements.

The rivers crossings along the route are small in number and will not affect any change to the span of towers.

d) Impact Significance

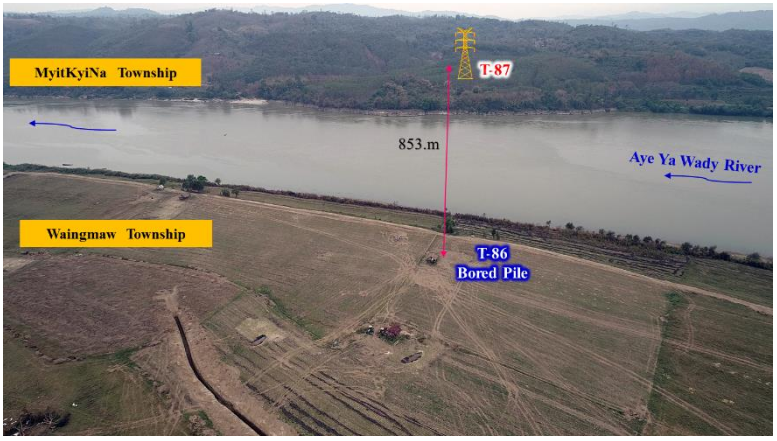
During survey period the groundwater level is 2.00m-6.00m below the ground in the plain sections, while the perennial maximum water level reaches the surface level. The groundwater level in the hilly sections is 4.00m-10.00m below the ground and the perennial maximum water level is about 3.00m below the ground. The foundation depth of towers will be of 0.7 meter (about 2 feet) therefore, there is no potential impact on groundwater quality.

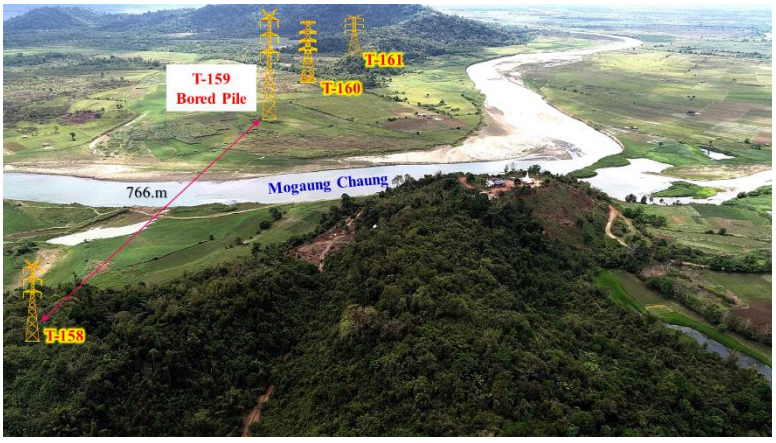
The construction activity will perform 50m to over 100m from the river and streams. The location and condition of towers near the river and streams are shown in Figure 5.2-1. Appropriate measures will be applied to control runoff of sediments and oil-containing wastes into the nearby river and streams. Sediments and other wastes generated during construction

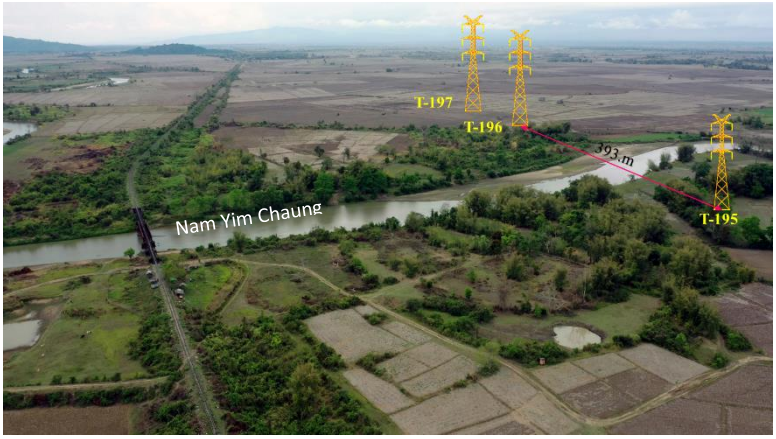
should not be disposed on the river and streams. The impacts during the construction activities will be short-lived, the intensity of impacts will be low and appropriate mitigation measures is feasible. The construction activities of transmission line will have insignificant impact on the surface water after mitigation. The impact evaluation is summarized in Table 5.2-4.

Table 5.2-4 Impact Significance on Surface Water and Groundwater Quality for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
Surface Water Quality		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
	Without mitigation		☑		☑			☑			☑			☑		
	With mitigation	☑			☑			☑			☑		☑			







Source: DPTSC

Figure 5.2-4 The location and condition of towers near the river and streams

5.2.5 Biodiversity (Flora and Fauna)

a) Potential Impacts

The new 132kV transmission line from War Shawng T connection to Waingmaw sub-station is parallel to the existing 132 kV line. The new 132 kV line passes through part of forest, teak plantation, rubber plantation, banana plantation and paddy fields.

The new 230 kV transmission line passes through part of Maing Na forest, banana plantation and paddy fields in Waingmaw Township, part of Pidaung extension forest, rubber plantation and paddy fields in Mogaung Township, part of Nanma Forest, private teak plantation, rubber plantation, paddy fields, Mohnyin forest and Nan Si Aung forest in Mohnyin Township.

Power transmission line rights-of-way often reduce and fragment forests; indirectly, they occasionally facilitate further deforestation by improving physical access.

Anticipated impacts to biodiversity due to construction include:

- Temporary disturbance of habitat in areas required to facilitate construction. Temporary disturbance will mainly be associated with construction areas surrounding tower pads, any required access tracks to tower locations and temporary stockyards, workers camps and mobile offices.
- Disturbance and displacement of resident fauna due to noise, light and /or vibration as a result of construction activities (excavation, drilling, clearing, and vehicle movement).
- Fauna mortality due to vehicle/machinery strike, hunting, poaching and collection for trade due to the creation of access roads within and outside of the RoW.

  The trees, rubber, banana and crops within the RoW will be cut down or trimmed during construction of monopoles and during line stringing. Coordination between DPTSC and Forest Department and private owner are essential for tree removal and subsequent mitigation by tree replacement at site or elsewhere in the townships.

b) Mitigations

- Follow the law and rules against logging outside the approve construction areas and against wildlife hunting and poaching will be imposed on project staff, workers and all contractors and personnel engaged in or associated with the Project, with penalties levied for anyone caught carrying and using animal snares and traps, including fines

and dismissal and prosecution under the Forest Law, 1992 and Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law 1994.

- The contractor shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning these restrictions as well as the punishment that can expected if any staff or workers or other person associated with the Project violate rules and regulations.
- The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing;
- Disturbed areas shall be rehabilitated as soon as possible following construction activities.
- Construction vehicles and machinery will be maintained in accordance with industry standard to minimize unnecessary noise generation.
- Commitment will be made to raise awareness of values of natural habitat areas to construction work force and make arrangements for restriction of poaching.
- Speed limit to maximum of 40 km/hr for construction vehicles will be enforced to minimize potential for fauna strike.
- Minimizing vegetation clearance of RoW as much as possible and ensuring the clearance not beyond designated area.
- Leaving ground vegetation and shrub within RoW unless disturbance to access.
- Carrying out all vegetation clearance in consultation with Department of Forest.
- Disposing of chopped trees in accordance with guidance of Department of Forest.
- Prohibiting forest extraction by contractor employees.
- Prohibit using herbicide for clearing vegetation.
- Hunting wild animals will be strictly prohibited to apply all staff.
- In areas with concentrations of vulnerable bird species, the top (grounding) wire should be made more visible with plastic devices. Electrocution (mainly of large birds of prey) should be avoided through bird-friendly tower design.
- Avoid construction activities during bird and wildlife breeding season and other sensitive seasons or times of day.

All construction activities will be undertaken within the right of way for the safe operation of the transmission line, considering minimum clearances indicated in the standard.

c) Impact Significance

In new 132 kV transmission line route, a total of 4 species of Mammals, 2 species of Herpet, 50 species of Birds, 13 species of Butterflies, 2 species of dragonfly were recorded during the survey period. In this survey, one bird species was recorded as Threatened species (NT) in accordance with IUCN Red List. During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species. The plant species that listed and recorded in recently study were checked with IUCN red list of threaten species. Two endangered plant species were found in IUCN red list but these plant species are observed only in the reserve forest. There are no record of any IUCN red list plat species within the RoW therefore impact on IUCN listed flora are not expected. Forest fragmentation can occur if proper mitigation measures are not taken.

Along the new 230 kV transmission line route, a total of 124 plant species, 5 species of Mammals, 5 species of Herpet, 73 species of Birds, 20 species of Butterflies, 2 species of dragonfly and 11 species of Fish were recorded during the survey period. In this survey, one bird species was recorded as Threatened species (NT) in accordance with IUCN Red List.

During the survey period, species of dragonfly, herpet and mammal were observed fewer than bird, butterfly and fish species.

The impacts during the construction activities will be short-lived. The transmission line towers and electrical line will not cause any danger for grey-headed parakeet because they typically inhabits open agricultural land and crop land with scattered native trees.

They built their nests only in the cavities of the tree. Their breeding season is mostly in January to March in Myanmar. towers The nest is used as sleeping quarters all year round and is added to from year to year until at times it breaks the supporting branches. The near threatened bird species of birds are mobile animal and they can easily move to nearest suitable habitat and the potential impacts on biodiversity will be minor after mitigation measures. The construction of transmission line will have minor impact on the biodiversity. The impact significance is summarized in Table 5.2-6.

Table 5.2-6 Impact Significance on Biodiversity for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignifica	Minor	Moderate	Major
Biodiversity (Flora and Fauna)	Without mitigation		☑		☑				☑		☑				☑	
	With mitigation		☑		☑			☑			☑			☑		

5.2.7 Atmospheric Emissions/ Dusts

a) Activity

The activities that are likely to form part of atmospheric emissions are exhausted gas and dust coming out from construction vehicles on the unpaved road, diesel power -driven earth movers, clearance of RoW, working area, access road construction, conductor string equipment such as crane, and operation of stationary plants such as generator.

b) Potential Impact

As the construction of transmission line involves limited groundwork, the potential for dust generation is low and short lived. The increase in traffic volumes during the construction of the transmission line is expected to be occasional and negligible. Hence, it is considered that the contribution to pollutant concentrations arising from the construction activities and traffic is small and insufficient to cause any increase in the stipulated air standards or existing concentrations.

c) Mitigations

Notwithstanding the potential of atmospheric emissions from construction and related activities the environmental impact of the Project is low; the following mitigation measures will further reduce the impact of emissions, leading to insignificant impacts:

- Sprinkling of water on dust generating areas;
- Restricting the speed limits of vehicles during movement on unpaved roads; and
- Covering of vehicles carrying loose soil/construction material.
- Applying preventive maintenance system
- Checking vehicle and equipment inspection daily
- Stopping dust generating activities in high wind

- Applying good site practice and house keeping
- Turning off the engine while not in use
- Optimizing construction schedule to minimize time that vehicles are in operation
- Covering load-carrying platform properly when carrying earth/sand

d) Impact Significance

The construction activities would generate pollutant emission which would be localized to the area where construction activities will take place. This will occur in the short-term time frame of construction. The overall impact is expected to be insignificant. The impact is summarized in Table 5.2-7.

Table 5.2-7 Impact Significance due to Atmospheric Emissions for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
Atmospheric emissions		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
	Without mitigation	☑			☑				☑		☑			☑		
	With mitigation	☑			☑			☑			☑		☑			

5.2.8 Noise

a) Activity

The sources of noise during construction activities include:

- Construction traffic; and
- Construction activities such as excavation, concreting, tower erection, backfilling, use of pumps (for pumping excess water) and compressors, etc.;

b) Potential Impacts

Based on the baseline ambient noise level monitoring in existing sub-stations and villages nearby the proposed transmission line route, the daytime noise level is under the limit of National Environmental Quality Emission Guideline value of 55dB and the night time noise level value of 5 stations are higher than the guideline value of 45 dB out of 9 stations.

Short-term impacts of noise during construction of the transmission line will occur from installation of the tower foundation and operation of trucks and heavy equipment. The attenuation of noise with distance results in a decrease in intensity with distance.

There is potential for disturbance to habitations, schools, temples in proximity of the towers due to construction related activities. During erection of tower there can be disturbance from noise of workers.

c) Mitigations

Construction activities will be concentrated and done sequentially so that no area is prone to extensive duration of noise impacts. For example though it might take anywhere between 3 to 6 months to complete tower erection and stringing exercise, the actual construction only happens for about 15-30 days.

There will be minimum lag period between lying of foundations and erection of the tower. Most of the work is done manually instead of cranes and other heavy equipment, which will reduce the potential for noise impacts.

Construction activity will be undertaken only during daytime. There will be some noise generated from the movement of tractors and trailers transporting the materials and equipment but the traffic volumes are expected to be occasional and insignificant. The followings are the additional mitigation measures.

- Ensuring all noise emitting activities to be kept distance from the residential area
- Inspecting all noise emitting equipment on a daily basis
- Shutting down all engines while not in use
- As much as possible, restrict working time between 07:00 and 17:00.
- Limiting night work including transportation of material
- Maintaining ambient noise level below 55 dBA in daytime
- Considering a schedule of on-site activities for reducing the potential for the simultaneous occurrence/overlap of especially noisy activities.

The process of stringing of cables will produce only human voices, which might be audible to residents in very close proximity of the operations. However, again these impacts will be localized and short lived.

d) Impact Significance

The construction areas are located anywhere within the right-of-way and the maximum noise could be experienced from the monopole foundation. The monopoles will be located away from sensitive receptors. Line stringing is not expected to significantly contribute to noise that will affect sensitive receptors along the lines.

It can be concluded that the noise impacts from construction activity will below and short-lived. No significant noise impacts from construction activities are predicted and any noise, if generated, will be well within the stipulated standards. The impact significance is summarized in Table 5.2-8.

Table 5.2-8 Impact Significance due to Noise for Construction Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
Noise		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
	Without mitigation		☑		☑			☑			☑			☑		
	With mitigation	☑			☑			☑			☑		☑			

5.2.9 Community Health and Safety

Commit to meet Electricity Law and other Myanmar regulation requirements as well as international conventions on labour, especially on issues of child and forced labour, working conditions, collective bargaining, non-discrimination and equal opportunity, complaint and grievance mechanism.

The adverse impacts to communities in proximity to the transmission line alignment mainly occur during the construction phase. The sensitive receptors in the direct areas of influence may experience safety hazards, temporary nuisance e.g. noise, traffic, and emissions brought about construction and maintenance works, influx of construction labor, and restriction of access which require suitable mitigation measures to minimize impacts. Sensitive receptors such as schools, temples/monasteries, residential areas, and shops along the corridor of impact shall be informed about the schedule of activities prior to implementation. Mitigation measures to address construction-related impacts are defined in the EMP.

Traffic Accident

The proposed 230 kV transmission line outgoing bay of Waingmaw Substation, bypasses the city of Myitkyina, and crosses the Irrawaddy River at the south side of Myitkyina in a westward direction; then the line is mainly parallel with the existing Myitkyina - Mogok - Mohnyin - Mawlu – Na Bar trunk road and the existing 66 kV line and connected to the new 230 kV outgoing bay of the proposed Na Bar 230 kV substation.

The proposed 132V transmission line runs basically in parallel with the existing 132kV Waingmaw- Chipwi Nge line at its south side and is connected to the War Shawng T-connection. There are 16 times main car road crossing along the proposed 230 kV transmission line. At present, the traffic volume in Myitkyina – Na Bar highway is very low.

So impact on traffic system and traffic accident by the Project would be low. Moreover, there can be traffic problems in on local roads while vehicles of the construction work move around.

Access can be disrupted during construction, at individual land owner level, and at the community level when village/ link roads are damaged/used beyond capacity for transportation and construction related activities.

(Developer or its subcontractor has wherever possible tried to avoid any access routes to avoid any disruption or inconvenience to the individual/community. Wherever such access is mandatory the negotiations have been done with the affected landowner by the construction contractor).

5.2.10 Occupational Health and Safety

Construction activities present health and safety risks to personnel, including:

- Accident and injury while working
- Spread of transmissible diseases between worker and
- Contraction of disease due to poor sanitation and environmental conditions in work and accommodation areas.

During construction physical injury can result from workers slipping along the slopes; road accidents, accident to workers during erecting of towers and other occupational hazards.
Stringing activity around low tension/ high tension wires and other electrical units can be a potential hazard if proper planning is not followed. Workers at times are not accustomed to use of Personal Protection Equipment, their attitude to avoid PPE may result in accident/hazard.
Pits dug along roads /tracks close to habitations can lead to potential accidents for people and domestic animals in the proximity.

The staff of contractors involved in the construction activities will be trained about the mandatory precaution and safety practices prior to commencement of construction activity.

All required Personal Protection Equipment will be used by the workers at site and their use will be supervised. Safety harness will be ensured for workers while erection of tower. Vehicle movements to follow the traffic norms and maintain a safe speed while moving through the hilly tracts.

Stringing activities near low tension wires/high tension wires and other electrical utilities will be done after proper shutdown of the line/utilities with prior information and permission.

All excavation activities will be conducted in supervision of the site contractor with prior information to the nearby inhabitants. Proper signage will be provided in places where excavated pits are close to road or hilly tracts.

The design of the towers will adhere to the Proper Standards (i.e. IFC standard and Indian Standard), which will ensure sufficient safety margins to reduce the risk from wind and seismic activities. Extreme weather conditions could affect the transmission line though the very high wind speed is rare. Hence the risk of natural impacts is low.

Mitigation Measures

The following measures will be implemented:

- Health Awareness Training will be mandatory for all personnel and will address both on-the-job safety and health awareness
- Clean drinking water will be provided to all camps and work areas
- Use of fall protection measures
- Provide portable toilets and garbage cans at work sites. Under no circumstances shall disposal of domestic sewage on grassland and surrounding premises be permitted.
- HIV/AIDS education should be given to workers.
- First aid kits will be readily accessible by workers and first aid teams will be specifically trained and assigned in groups of two to three persons to the different sites and
- Vector control of mosquitoes and other pests will be managed including by minimizing mosquito breeding habitat and providing mosquito nets and other barriers.

5.2.11 Impact on Railway, Car Road, Existing Transmission Line and Airport

There are 16 times main highway crossing, 11 times railway road crossing and 12 times over 66 kV line along the 230 kV transmission line. The 132 kV line is parallel with the existing 132 KV transmission line from War Shawng T connection to Waingmaw substation.

The design of the transmission lines should take particular attention to the vertical line clearance when the line crosses the railway at11 locations, car road at 16 locations and 66 kV line at 12 locations. The followings are the minimum vertical and horizontal clearance for these facilities.

Table 5.2-9 Vertical and horizontal clearance of tower relevant to the facilities

Facility	Vertical	Horizontal	Other transmission line	Car road	Rail road
132 kV					
230 kV			5 meter	12 meter	12 meter
66 kV	3.9 meter	4.5 meter			
Building					
	Vertical	Horizontal			
132 kV	4.2 meter	15 meter			
230 kV	4.8 meter	15 meter			

Figure 5.2-5 Car road and railway line crossing

Myitkyina airport is located about 5km away from the transmission line route. Section A11-A13about 7km of 230 kV line in the Project is located within the scope of clearance protection zone of the airport (See in Figure 2.3-5). According to the data collected, the permit height of the Inner Horizontal Surface is 45m, and the permit height of the Conical Surface is 60m~145m. The slope of the conical surface is 5%, and the Climbing Surface of airplane is 2.5%. The limit height of this section of the 230kV line is 60m~145m. The height of the new towers shall meet the clearance limit of the airport.

Power transmission towers, if located near an airport or known flight paths, can impact aircraft safety directly through collision or indirectly through radar interference[1].

IFC recommended that aircraft collision impacts may be mitigated by:

- Avoiding the siting of transmission lines and towers close to airports and outside of known flight path envelopes;
- Consultation with regulatory air traffic authorities prior to installation;
- Adherence to regional or national air traffic safety regulations;
- Use of buried lines when installation is required in flight sensitive areas.

Therefore, MOEE will be responsible for consultation with Department of Civil Aviation under Ministry of Transport and Communication before finalization of transmission line route.

5.2.12 Social Issues and Management

The area in which transmission line location is carefully selected with the principle of avoiding relocation as possible as it can be. There are many houses along the new line between Ayeyarwady River crossing point to north of Mohnyin, especially in convenient transportation area and near rivers area. These houses are mainly residential houses and farmland houses, most of which are made of wooden, and a few are brick houses. The line is mainly in parallel with the highway. When the houses along the line cannot be avoided completely, part of residential houses shall be removed. In addition, it is impossible to avoid the use of tower base in private land mainly agricultural land.

In addition, it is impossible to avoid ROW clearance which affected natural and commercial trees where the alignment locates in mountainous area. Though the community did not raise social economic issues such as objection to access, loss of crop and impacts on agriculture due to project activities, there are expectations to receive power as a side product of the proposed transmission line. Community also had expectations for local benefits and other opportunities from project besides apprehension on potential exposure to electromagnetic fields during operation phase of the project.

Even until the power providence to local settlement along the project is absence, the developer (MOEE) should consider other appropriate compensation like maintaining construction road to be applicable for local people.

Land will be used for permanent facilities like foundation, pylons etc. The project will alter land use by:

- Permanently converting a small area of land to use for lattice towers

[1] IFC. 2007. Environmental, Health, and Safety Guidelines, Electric Power Transmission and Distribution, International Finance Corporation, April 2007.

- Permanently limiting the types of land uses allowable within the RoW to those compatible with the transmission line, including:
    - Prohibiting dwellings
    - Prohibiting growth of vegetation greater than 4.5m
    - Allowing growth of low growing crops, except in areas previously consisting of natural habitat and
    - Opening access to additional land through the creation of new roads.

MOEE agreed to pay the crop compensation along the ROW of transmission line. For seasonal crops and perennials tree, MOEE will give compensation according to the Farm Land Rules (2012). The procedure for crop compensation is presented as follows:

- First, the damage of crops caused by the construction of transmission towers will be collected by the township level committee formed by Township General Administration Department.
- The compensation price will be calculated based on the local market price.
- Then, the calculated price will be submitted to District level authority.
- After checking by district level, the calculated price will be approved by State or Region Government.
- After approval by the relevant government the compensation price will be paid to the land owner in front of local authorities.

The land acquisition and compensation cost are not directly related to the construction company, but the company will assist DPTSC to settle out.

Suggested Mitigation

- Ensure that negotiations for compensation are free and fair. Also ensure that the compensation rates are at par with the market rates.
- It also needs to be ensured that the opportunity cost of such land is considered when deciding the compensation amount.

5.2.12 Cultural Features

The International Finance Cooperation and existing Myanmar Law, require that in constructing of Power Transmission Line, Ministry of Electricity and Energy, avoid or minimize of mitigating adverse impacts that the construction may have on cultural heritage in particular with regard to architectural structures, shrines, stupas, temples, monasteries, palaces, excavated buildings, sculpture and paintings along the proposed power transmission line, primarily within 100 meters on either side.

Preliminary to the field investigation, the team undertook a desk-study employing documentary materials and resource persons specializing in the history, archaeology and culture of the region.

5.2.12.1 Important Cultural/Historical/Archaeological Sites

The Ministry of Religious Affairs and Culture (MoRAC) had designated 46 Cultural Heritage Zones which are classified into three zones, Ancient Monument Zone, Ancient Site Zone, Protected and Preserved Zone, as shown in the following table. The boundaries of zones are delineated by concrete piles. The MORAC has not made maps of the Cultural Heritage Zones, but it is going to prepare those maps.

Three zones are stipulated in "The Protection and Preservation of Cultural Heritage Regions Law (1998)" as follows:

1. Ancient Monumental Zone means the zone where the ancient monument is situated and which is prescribed under this law.
2. Ancient Site Zone means the zone where the ancient site is situated and which is prescribed under this law.
3. Protected and Preserved Zone means the zone prescribed under this law for the protection and preservation of the view of the cultural heritage, ancient monument and ancient sites in order that they may not be destroyed.

According to the explanation of Department of Archaeology, National Museum and Library (DANML), "Ancient Monumental Zone" and "Ancient Site Zone" mean core zones that development activities are strictly restricted, and "Protected and Preserved Zone" means the so-called buffer zone where some development activities can be allowed with prior permission from the MORAC after the DANML has scrutinized the application submitted by the proponent. (e.g**.,** Hotels and commercial facilities can be built in single story. The proponent submits an application with plan including layout designs to the DANML for prior permission.)

The DANML also explained about land acquisition for the development activities. The lands of cultural monuments are under the jurisdiction of MORAC. However, some lands may be owned by other persons even in the Cultural Heritage Zones, In this case, the proponent negotiates with the landowner under the procedures of townships, the Ministry of Home Affairs or the Ministry of Agriculture and Irrigation in case of agricultural lands. Besides, the DANML explained that they have a policy not to relocate the existing residents in the Cultural Heritage Zones and to restrict encroachment into the zones.

Table 5.2.10 Notified Zones of Cultural Heritage Regions and Buildings

Sr. No.	Heritage Region	Classification of Zone	Order Record	Issue Date
1	Bagan, Nyaung U	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	1/99	11.2.1999
2	Kanbawzathadi Palace	Ancient Monument Zone Protection and Preserve Zone	2/99	11.2.1999
3	Mahawaiyan bonthar Bargayar kyaung taw gyi (Aungmyaetharzan) Maha atula waiyan atumashi kyaung taw gyi Shwe Nan Taw Kyaung Sandar Muni Phaya Khu tho daw Phaya	Ancient Monument Zone Ancient Site Zone Protection and Preserve Zone	3/99	6.8.1999
4	Kyaik Htee Yoe Phaya	Protection and Preserve Zone	4/99	11.2.1999
5	Sri Ksetra and environment	Ancient Monument Zone Ancient Site Zone	1/01	31.1.2001
6	Mya Thein Tan Minn Konn bell Phahtoe Taw Gyi Two Lion Sattawyar Phaya Pontaw Stupa	Ancient Monument Zone	2/01	18.5.2001
7	Beikthano	Ancient Monument Zone	1/02	29.5.2002
8	Tagung	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	1/07	5.6.2007

9	Khayone Cave	Ancient Monument Zone Protection and Preservation Zone	1/08	13.6.2008
10	Hanlin	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	1/08	13.6.2008
11	Innwa	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	2/08	13.6.2008
12	Yathae Pyan Cave	Ancient Monument Zone Protection and Preservation Zone	2/08	16.6.2008
13	Kawgue Cave	Ancient Monument Zone Protection and Preservation Zone	2/08	16.6.2008
14	Sulay Stupa	Ancient Monument Zone	3/08	4.7.2008
15	Maung Tee Stupa	Ancient Monument Zone	4/08	4.7.2008
16	Bo Ta Htaung (Kyaik Day Up) Stupa	Ancient Monument Zone	5/08	4.7.2008
17	Shwe Bone Pwint Stupa	Ancient Monument Zone	6/08	4.7.2008
18	Koe Htut Kyi Pagoda	Ancient Monument Zone	7/08	4.7.2008
19	Kyaik Ca Loet Stupa	Ancient Monument Zone	8/08	4.7.2008
20	Myin Zaing	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	9/08	25.8.2008
21	Pinnya	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	10/08	25.8.2008
22	Palate tana Larba Muni Sutaungpyi (Snake goda) maw Kyaung Kyake Kone Kyaung Partali Kyaung Bawdi Kyaung Lay Htat Kyaung Naught Taw Per Kyaung	Ancient Monument Zone Ancient Site Zone Protection and Preservation Zone	11/08	25.8.2008
23	Myauk Oo	Ancient Monument Zone	1/09	5.11.2009
24	Salay	Ancient Monument Zone	2/09	5.11.2009
25	Shwe Dagon	Ancient Monument Zone Protection and Preservation Zone	3/09	5.11.2009
26	Kyaik Mhaw Won Stupa	Ancient Monument Zone	4/09	5.11.2009
27	Ngar Htat Kyi Pagoda	Ancient Monument Zone	5/09	5.11.2009
28	Chauk Htat Kyi Pagoda	Ancient Monument Zone	6/09	5.11.2009
29	Kyaik Ka Lat Stupa	Ancient Monument Zone	7/09	5.11.2009
30	Kyaik Wine Stupa	Ancient Monument Zone	8/09	5.11.2009
31	Kyaik Ka San Stupa	Ancient Monument Zone	9/09	5.11.2009
32	Shwe San Taw Stupa	Ancient Monument Zone	10/09	5.11.2009
33	aik ParDaKyi San Tae Shin Stupa	Ancient Monument Zone	11/09	5.11.2009
34	Kyaik Khauk Stupa	Ancient Monument Zone	12/09	5.11.2009
35	Pale (Kyit Chaung 7)	Ancient Monument Zone	1/10	24.3.2010
36	mate Region (Kyit Chaung 25)	Ancient Monument Zone	2/10	24.3.2010
37	Maing Maw	Ancient Site Zone	3/10	5.4.2010
38	Thargaya	Ancient Site Zone Protection and Preserve Zone	1/2012	2.2.2012
39	Myaung Mya	Ancient Site Zone Protection and Preserve Zone	1/2012	2.2.2012
40	Wai Tha Li	Ancient Site Zone	3/2012	9.3.2012

		Protection and Preserve Zone		
41	Danyawadi	Ancient Site Zone Protection and Preserve Zone	4/2012	9.3.2012
42	Myint village and thone pan hla (a int) village	Protection and Preserve Zone	5/2012	2.4.2012
43	Pyadalin Cave (1) Pyadalin Cave (2)	Ancient Monument Zone Protection and Preserve Zone	6/2012	3.9.2012
44	Myae Htoo	Protection and Preserve Zone	7/2012	3.9.2012
45	Wadi	Ancient Monument Zone Protection and Preserve Zone	8/2012	3.9.2012
46	Pinle (Maing Maw)	Ancient Monument Zone Protection and Preserve Zone	9/2012	3.9.2012

Source: Department of Archaeology, National Museum and Library, Ministry of Culture

5.2.12.2 Sites under Protection of International Treaty

The Myanmar Government has applied to UNESCO regarding the classification of the following eight (8) cultural heritage regions and natural heritages as World Heritage Sites. In the applied cultural heritage regions, the MORAC considers Pyu Ancient Cities including Beikthano, Hanlin and Sriksetra as priority sites to be designated as World Heritage Sites.

1. Bagan Archaeological Area and Monuments (Mandalay)
2. Phy Ancient Cities including Beikthano, Hanlin, and Sriksetra
3. Wooden Monasteries of Konbaung Period: Ohn Don, Sala, Pakhangyi, Pakhannage, Legaing, Sagu, Shwe-Kyaung (Mandalay)
4. Badah-lin and associated caves (Shan State)
5. Ancient cities of Upper Myanmar: Innwa, Amarapura, Sagaing, Mingun (Mandalay)
6. Myauk-U Arcahaeological Areas and Monuments (Rakhine Sate)
7. Inle Lake
8. Mon cities: Bago, Hanthawaddy (Bago Region)

5.2.12.3 Assessment

In this assessment, the potential impact of the power transmission line on the cultural heritage, the team focused on the following features of the tangible cultural heritage (a) archaeological sites (2) historic structures (3) historic districts.

There is no archaeological site identified or excavated by the Department of Archaeology line is to be instructed. The main archaeological sites identified, excavated and marked for preservation are in the central Myanmar plain, in Rakhine State in the west, and the Mon State in the southeast where high civilizations developed in historical times. There are a number of limestone caves in Shan State which are of archaeological interest, most notably Byadalin cave which in identified as a site of Hoabihian culture. However, there are no such sites in the region of the construction of the power transmission line and substation.

The main historic structures in Myanmar are religious structures which are usually built of more durable material than secular structures. Both Buddhist and Christian religious structures, that is, pagodas, monasteries, churches, etc., are of cultural significance in the region of the construction of the power transmission line. Religion plays an important part in the life of local communities and religious structures are the local centres of social as well as religious life. There is a variation in the size and antiquity of these religious structures, but even the smallest village structure has significance in establishing the identity and sustaining the life of the

community. Since these religious structures are located within or in close proximity to human settlements, the construction of the power transmission line in open areas will have no effect on them.

5.3 Potential Environmental and Social Impacts during Operation Phase (Transmission Line ad Substation)

5.3.1 Soils

No impacts of any significance are predicted on vegetation and soil due to operation of the transmission line and substation. Any spillage of Aluminium oxide paint during operation and maintenance of the transmission line towers may impact soil quality. Low frequency of painting as well as involving experienced personnel with mitigations like prior spread of sheets underneath the tower structure while painting.

5.3.2 Waste Disposal

There is no solid waste to be generated during operation of the transmission line and substation.

5.3.3 Aesthetics and Visual Impact

There will be no additional visual impact due to operation of transmission line as the will only involve transmission of electricity through the established network.

5.3.4 Surface Water Quality

There is no impact on surface water quality during operation period.

5.3.5 Biodiversity

a) Potential Impacts

Anticipated impacts to biodiversity during operation include:

- The RoW may interrupt the continuity of forest habitat (mostly degraded deciduous forest), as vegetation heights will be limited to below 3 meter, however the maintenance of vegetation in the understorey and midstorey is likely to continue to allow arboreal species to move through the landscape.
- Disturbance and displacement of resident fauna due to noise as a result of electricity transmission and noise and light as a result of maintenance activities.
- During operation, mortality of avifauna (birds and bats) may occur due to collision with the transmission line and electrocution. Avian collisions could occur in large numbers if lines are located in daily flyers, or if avifauna are travelling during low light conditions.

b) Mitigation Measures

- Within the RoW, vegetation trimming will be restricted to that required to safely operate the transmission line. Groundcover and midstorey vegetation will be retained wherever practicable.
- The Project shall implement landscaping and re-vegetation after completion of construction in suitable areas and
- Vegetation management will be made to raise awareness of values of natural habitat areas to personnel work force and arrangements will be made for restriction of poaching and forest product collection.

- Commitment will be made to raise awareness of values of natural habitat areas to personnel work force and arrangements will be made for restriction of poaching and forest product collection.
- Hunting wild animal will be strictly prohibited and
- Transmission line will be designed to minimize risk of electrocution, including maintain a 1.5 meter spacing between energized components and grounded hardware, or covering energized parts.

c) Impact Significance

- It can be concluded that the biodiversity impacts during operation phase will moderate and long-lived. The impact significant on biodiversity will be moderate and the impacts will be mitigated with suitable mitigation measures so the impacts will be minor after doing mitigation. The impact significance is summarized in Table 5.3-1.

Table 5.3-1 Impact Significance due to Biodiversity for Operation Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
Biodiversity	Without mitigation		☑				☑	☑			☑				☑	
	With mitigation	☑					☑	☑			☑			☑		

5.3.6 Air Quality (Climate Change)

a) Potential Impacts

Operation and maintenance can affect air quality by:

- The emission of ozone from transmission lines when in active corona, however ozone emitted from transmission lines not known to carry any health risk and
- Air pollution due to burning of vegetation for RoW management.
- The operation of the transmission line will not contribute to any atmospheric emissions directly and hence the predicted impacts are negligible. Green House Gas emissions from the transmission line operation will be limited to fuel consumption in vehicle used for the maintenance activities. The Project on the whole being a hydroelectric power project will potentially prevent the emission of GHG which would have otherwise been generated for power generation of similar capacity. The GHGs generated from the Project will be negligible.

b) Mitigation Measures

Vegetation will not be burnt for maintenance. Mechanical method will be used to trim tall and encroaching vegetation.

c) Impact Significance

- It can be concluded that the impacts on ambient air quality during operation phase will local, long-lived and intensity is low. The impact significant on air quality will be minor and the impacts will be mitigated with suitable mitigation measures so the impacts will

be insignificant after doing mitigation. The impact significance is summarized in Table 5.3-2.

Table 5.3-2 Impact Significance on Air Quality for Operation Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Medium	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
Air Quality	Without mitigation	☑					☑	☑			☑			☑		
	With mitigation	☑					☑	☑			☑		☑			

5.3.7 Noise

a) Activity

The likely noise impacts from operation of the transmission line will be due to:

- Maintenance and repair activities;
- 'Corona discharge' from the overhead lines;

b) Potential Impacts

Once operational, noise from energized overhead lines can be produced by a phenomenon known as 'Corona Discharge' (a limited electrical breakdown of the air). Conductors are designed and constructed to minimize corona effects, although, under certain conditions this can be audible as a '*hissing*' sound, sometimes accompanied by a low frequency hum. However, noise due to Corona Discharge is negligible for transmission line up to 230 kV grade.

Another noise source could be generated during maintenance of the towers, though it will be infrequent and extremely low.

c) Mitigations

Conductors designed and constructed to minimize corona effects will be chosen for transmission.

It is highly unlikely that the corona discharge noise will exceed the normal background noise levels in the area and furthermore, such noises are restricted to certain weather conditions.

a) Impact Significance

The noise generation from operational phase will be low but consistent for the entire life of transmission line. The impact of noise is considered to be minor.

Table 5.3-3 Impact Significance due to Noise from Operation Phase

Aspect	Scenario	Context			Duration			Intensity			Type		Significance			
		Local	Moderate	Regional	Short	Medium	Long	Low	Moderate	High	Adverse	Beneficial	Insignificant	Minor	Moderate	Major
Noise	Without mitigation	☑				☑			☑		☑			☑		
	With mitigation	☑				☑		☑			☑		☑			

5.3.8 Community Health and Safety (Transmission lines and substation)

Community will have concerns about its safety and possibility of any accidents like electrocution, skin diseases etc. Electrocution is caused by accidental contact with high voltage electricity or items such as tools, vehicles or ladders.

(The Project proponents through select consultations with relevant stakeholders have tried to allay all fears related to health impact.)

a) Suggested Mitigation

- Evaluate possible risks and ensure that these are addressed and minimized.
- Communicate about the technical aspects of the transmission line construction and operations, and allay fears about accidents or any other health concerns.
- Use simple diagrams and pamphlets in local language for this purpose.
- Train land owners about safety issues and action to be taken in case of risks.
- Demonstrate that CNHC and its contractors are very concerned about health and safety of workers as well as the community.
- Signs and barriers will be installed to prevent access to high voltage areas.
- Grounding conducting objects will be installed near transmission lines.

b) Monitoring and Awareness

- Ensure communication of health and safety risks to villagers near to settlements in batches and explain the various health and safety measures being undertaken.

c) Management Responsibility

- Safety Officer

5.3.8.1 Anxieties of Risks

The community could be concerned about the risk of overhead wires and pylons located in the agricultural fields. Misgivings and unsubstantiated fears linked to electrocution would be reported by the community at different places. Similarly unfounded rumors of overhead transmission line leading to several health impacts like skin diseases, disability and infertility were expressed especially in the hilly regions of the Project area.

These fears mostly arose from the lack of information and proper understanding of the Project and its activities and reportedly at times by the activities of vested groups trying to gain mileage and benefits from the Project.

5.3.8.2 Managing Community Perception on Health

The perceptions of the community with regard to the perceived health impact of the Project needs to be managed to allay any fears and apprehensions of the community. Proper dissemination of information and consultations with the community and relevant stakeholders will need to be carried out to dispel individual and community concerns regarding health and safety.

The field consultations carried out in connection revealed that the affected communities possess mixed information about the transmission line.

Generally along the transmission line route the awareness with regard to location of towers, overhead lines is high but low with regards to potential community and health impacts such

lines do not have. However, select consultations with informed stakeholders revealed that the overall support to the Project remains high, providing that

- The Project proponents address the health and safety concerns if any associated with the electricity lines
- Compensation including specific investment in community development programmes.

In some area, flooding that can increase incident of electrocution often occur. Water channels should be cleaned to drain fluently. By this procedure, can not only prevent flood but also against many other infections associate flooding (e.g. gestroentritis, leptospirosis) so the community will be appreciated the project components.

5.3.9 Occupational Health and Safety (Transmission lines and substation)

The electric and magnetic field (EMF) levels within the fenced area of a substation can be much higher than the surrounding area, especially at larger substations containing several transformers. However, these EMF levels decrease rapidly with distance from the transformers and other electrical equipment. Most of the time, EMF levels drop to the same as surrounding background levels at a distance of 100 to 200 feet from the fenced area.

Hazards relevant to project personnel include:

- Exposure to EMF at levels higher than those experienced by the general public.
- Electrocution due to contact with high voltage electricity or items in contact with high voltage electricity (such as tools, vehicles or ladders).
- Working at height on towers.

Mitigation Measures

1. Electromagnetic fields

- An EMF safety program will be developed prior to operation which: identifies potential levels of exposure; provides training for all workers; delineates zones appropriate for public access and those restricted to appropriately trained workers; defines measures to limit exposure time, such as through work rotation; and provides personal monitoring equipment for workers.
- Ensure compliance of safe practices and implementation of safety manual
- Provide and ensure use of personal protective equipment (PPEs) like, safety goggles, gloves, safety harness, helmets, gumboots etc.
- Securing the workplace, wherein all lines are shut down prior to maintenance work, use of PPE and procedures for emergencies and compensation procedures in case of accidents.
- Prior training of the workers regarding health and safety procedures is essential.

2. Electrocution

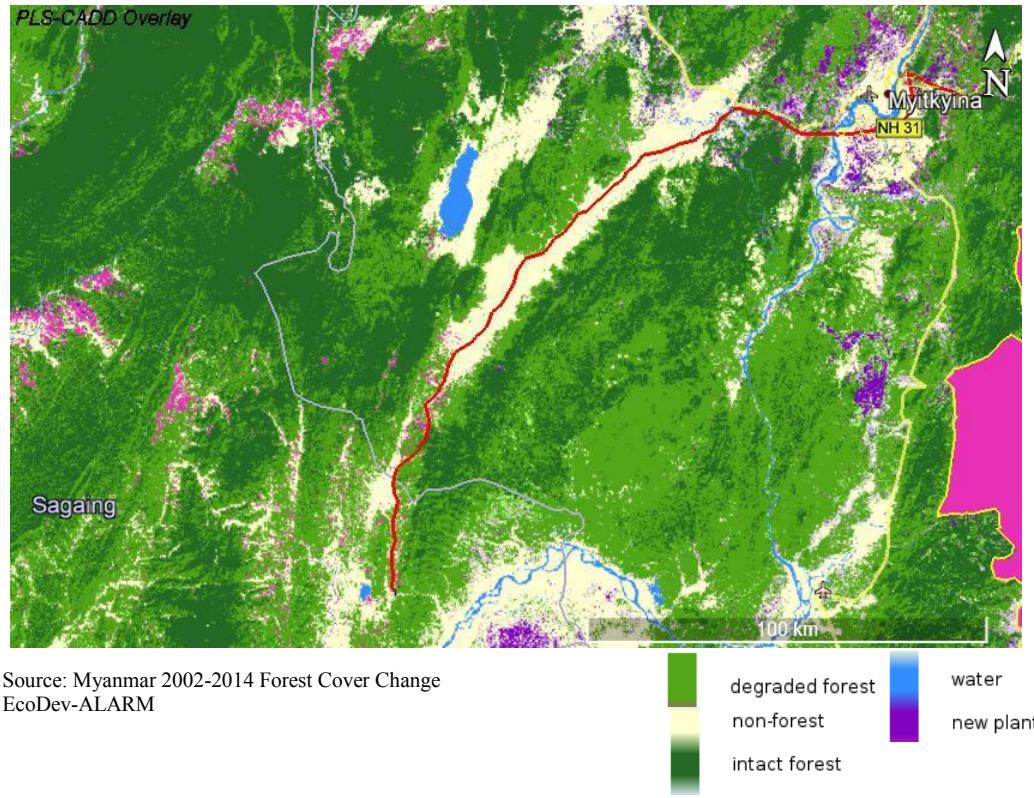
- Transmission lines will be deactivated and grounded prior to work on, or near, transmission lines.
- Live work will only be conducted by trained workers.

3. Working at heights

- Fall protection measures will be implemented including provision of appropriate fall protection equipment, training in use of equipment, training in climbing techniques, and rescue of fall-arrested workers.
- All equipment, including hoisting equipment, power tools and tool bags, will be properly rated and maintained.

5.3.10 Electricity Hazard caused by forest fire (During Operation)

The location of the Myitkyina - Waingmaw – Na Bar transmission line with respect to the Land Use/Land Cover Map is shown on Figure 5.3-1. The transmission line passes through the degraded forest, non-forest area, and new plantation areas. There is no intact forest was observed along the transmission line.



Source: Myanmar 2002-2014 Forest Cover Change
EcoDev-ALARM

Figure 5.3-1 Land use/ land cover map along the Waingmaw - Myitkyina- -Na Bar 230kV transmission line.

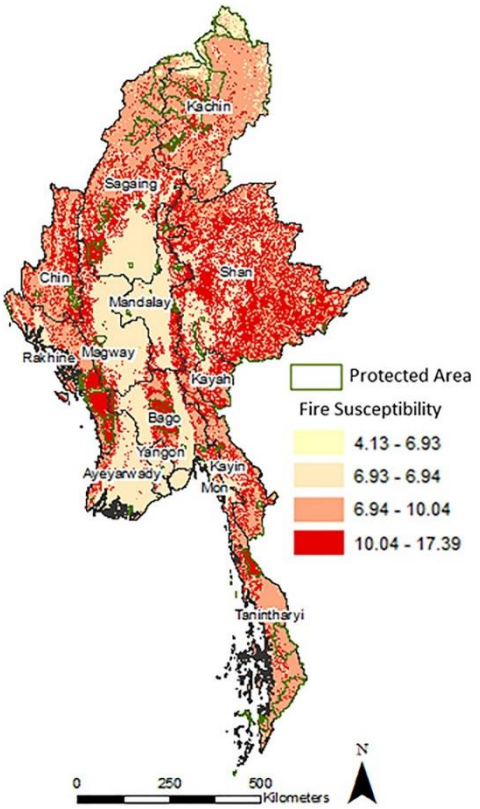


Figure 5.3-2 Susceptibility of forest fires in Myanmar (Biswas, et al, 2015[2]**)**

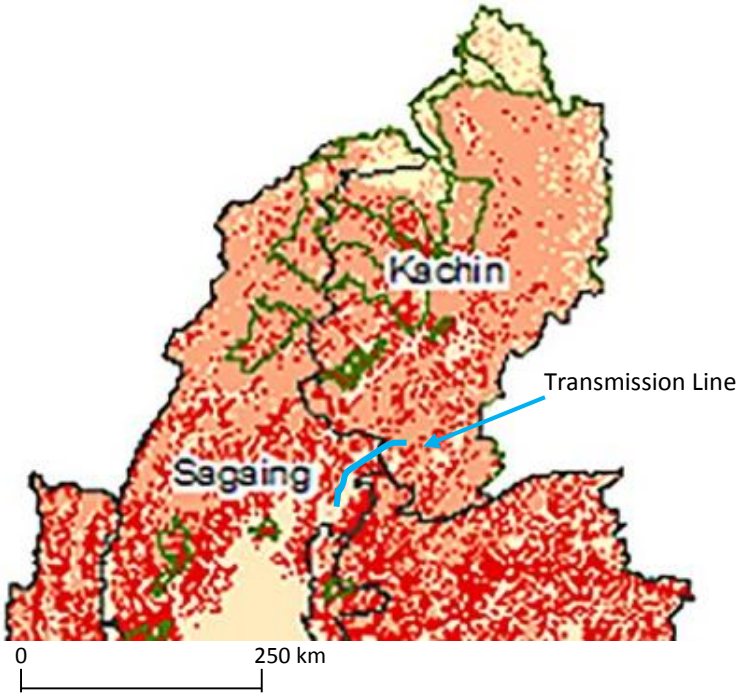


Figure 5.3-3 Susceptibility of forest fires along Waingmaw – Myitkyina – Na Bar 230 kV Power Transmission Line

In Myanmar, highest fire susceptibility is observed for Shan, Kayah, Kayin, Mon, central Bago,

[2] Biswas S, Vadrevu KP, Lwin ZM, Lasko K, Justice CO (2015) "Factors Controlling Vegetation Fires in Protected and Non-Protected Areas of Myanmar". PLoS ONE 10(4): e0124346. doi:10.1371/ journal. pone.0124346

southern Rakhine, southern Kachin, southwestern Sagaing, the borders of Chin, Magway and Sagaing, northern and central Tanintharyi. Distinct clusters of fires with highest frequencies were observed in the following districts; a). Thandwe in Rakhine; b). Bago, Taungoo and Thayarwady in Bago; c). Lashio, Kyaukme, Loiken and d). Taunggyi in Shan[3].

If underlying growth is left unchecked, or slash from routine maintenance of the transmission lines is left to accumulate, sufficient fuel can accumulate that may promote forest fires[4].

Fire susceptibility along the Waingmaw - Myitkyina – Na Bar line is shown on Figure 5.3-3. It can be seen that there is low to moderate susceptibility of forest fires along the Bamaw – Na Bar line.

In Kachin, Sagaing and Tanintharyi fires mostly occurred in cropland-vegetation mosaics and evergreen broadleaf forest classes. In general, the forest fires occurred between March and April in Myanmar. The past occurrences of forest fire along the present transmission line were observed in new plantation areas only. Forest fire is common in some locations (new replantation areas) associated with distribution and/or transmission components of the project. Forest fire could damage distribution poles, overhead lines, and other infrastructure. Conversely, the transmission and distribution components of the project could increase the occurrences of wild fire (e.g. if sparks or other failure occurs in dry areas/seasons and acts as a trigger for forest fire in addition to natural triggers (e.g. lightning) and human triggers (e.g. burn the bush, burn in the paddy field etc.).

The recommendation for mitigation measures were made based on International Finance Corporation's EHS Guidelines for Electric Power Transmission and Distribution, April 30, 2007.

- Monitoring right-of-way vegetation according to fire risk;
- Removing blowdown and other high-hazard fuel accumulations;
- Time thinning, slashing, and other maintenance activities to avoid forest fire seasons;
- Disposal of maintenance slash by truck or controlled burning. Controlled burning should adhere to applicable burning regulations, fire suppression equipment requirements, and typically must be monitored by a fire watcher;
- Planting and managing fire resistant species (e.g. hardwoods) within, and adjacent to, rights-of-way;
- Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access.
- cutting gaps in vegetation to act as fire breaks (especially near transmission or distribution components of the project)

5.4 Construction Phase Impacts (Substation)

Upgrading of existing 132 kV Waingmaw Substation to 230 kV Substation

The environmental condition of existing 132 kV Waingmaw Substation

[3] Biswas S, Vadrevu KP, Lwin ZM, Lasko K, Justice CO (2015) "Factors Controlling Vegetation Fires in Protected and Non-Protected Areas of Myanmar". PLoS ONE 10(4): e0124346. doi:10.1371/ journal. pone.0124346

[4] IFC. "Environmental, Health, and Safety Guidelines, Electric Power Transmission and Distribution" April 30, 2007

Waingmaw Substation is located in the northeast of Myitkyina, Kachin State in the north of Myanmar, with a coordinate of N25°26′1.54″ and E97°26′32.52″. The area expropriated for the substation area is about 40Ha. Now 132kV substation is already put into operation, covering an area of about 1Ha. The general topography of the substation area is flat and the ground elevation is about 99.1~101.9m.

The average wind speed of the substation area varies from 1.51 to 5.05m/s and the prevailing wind direction is northeast and southwest direction. Currently, the site area is of a barren land on which shrubs and small trees are grown. The current site condition of the Waingmaw Substation is shown in Figure 5.4-1.

Figure 5.4-1 Site condition of existing Waingmaw substation

Figure 5.4-2 Site condition of existing Waingmaw substation

5.4.1 Soil erosion and contamination

The construction activities of the new 230 kV substation can potentially exacerbate soil erosion and storm water runoff. During excavation loose soil may be blown away by the washed off in case of heavy rains. The project site has small portions with grass and little vegetation clearance will take place.

The potential sources of soil contamination during construction phase are oil /fuel leaks or spills from machinery used in site preparation such as trucks used in transporting construction materials. Depending on the size and source of the spill, liquid and gaseous state, petroleum hydrocarbons may remain mobile for long periods of time, threatening to pollute groundwater.

During operation phase soil contamination is not anticipated because of the presence of the concrete paved surface which will prevent any potential contaminant from reaching the subsurface layers and is thus not assessed.

The impact is temporary nature and the technically feasible mitigation measures will be applied. Site clearing, earthworks and other civil works should be scheduled during the dry season to prevent erosion and runoff of sediments.

Mitigation Measures

- Proper drainage channels and leveling especially of the access road to reduce run-off velocity and increase infiltration of rain water into the soil. Proper compaction will also be done along the access road.
- Loose soil should be kept covered till the time of backfill and the excess soil should be removed after casting activities are complete.
- The construction activities shall be planned in non-monsoon months which will minimize any rainwater run-off or any loss due to infiltration.
- Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff.
- Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
- Areas compacted by vehicles during site preparation and construction should be scarified (ripped) by the contractor in order to allow penetration of plant roots and the re growth of the natural vegetation.

5.4.2 Construction wastes

The construction activities of the project will result in solid waste although of different amounts. Solid waste is anticipated to be produced during site preparation, electromechanical and civil works such as spoil from excavations, scrap metal, mortar, wood, paper, masonry chips and left over food stuff. Effects of mismanaged waste include:

- Creation of breeding grounds for vermin like rats and cockroaches
- Public nuisance due to littering or smell from rotting
- Contamination of soils and water courses

Construction material waste will include:

- Earthworks
- Waste paper
- Cuttings from vegetation
- Redundant sections of pre stressed concrete

- Excavated soil

During operation phase, waste to be generated includes domestic and paper waste generated by staff, components/parts of the facility's infrastructure being removed during replacement.

Mitigation Measures

- The project company and contractor should ensure that spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and the rehabilitation, in the correct order which they were removed that is top soil last;
- All foundation excavations shall be kept covered or barricaded to prevent injury to people.
- Failure to maintain proper protection of excavations may result in the suspension of excavation work until proper protection has been restored.
- Local workers should be used as much as possible to prevent or minimize influx of migrant workers, and incidence of social disease and community unrest.
- Separation of hazardous waste from non- hazardous. Hazardous wastes included waste contaminated with petroleum product.
- Effectively remove food packaging to appropriate disposal points.
- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time

5.4.3 Impacts on Water Quality and Water Resources

Construction activities will result in soil exposure which can be easily eroded through the action of storm water which in turn can lead to siltation / sedimentation of down slope watercourses. Waste from cement can also result in the pollution of watercourses. Seepage from spilled fuels and oils and leaking machinery can also negatively impact on adjacent surface water courses which could lead to the potential contamination of groundwater.

According to investigation, there is a well with a diameter of 120mm and a depth of 13m in the substation. The underground water extracted from the well is used for the production and living water of the substation. There is a gully on the south side of the substation site, with a width of about 20m and a depth of about 1m. Some rainwater in the substation drains into the gully, and the remaining rainwater drains into the newly-built flood intercepting trench on the west side of the substation site. Water consumption in the substation is mainly domestic water consumption. The substation is attended, with fewer daily operators and only domestic water will be used, so the domestic water consumption is very small. Drainage system in the substation includes domestic drainage system, accident oil discharge system and rainwater drainage system. Separate flow of rainwater and wastewater is set for water drainage in the substation. Part of the rainwater in the sub-station drains into the gully on the south side of the substation site along the roadside gully, and the remaining rainwater drains into the flood intercepting trench on the west side of the substation site. An accident oil pool with oil isolation function is adopted for accident oil drainage of the main transformers and shunt reactors. The waste oil is blocked in the accident oil pool and transported to the designated place by a special transport vehicle.

Impacts on water quality during construction and operation of the project are not anticipated because waste water will be channel appropriately. As the construction activities are small-scale and will occur on a once-off basis over a short duration, and due to the localized area of impact, the overall significance of the construction related impacts on water quality is considered to be low, provided the necessary mitigation / management measures are implemented.

Mitigation Measures

- Appropriate measures shall be instituted to minimize erosion and sediment transport, especially during construction activities. These measures should include:
- Limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass.
- Appropriate remedial measures shall be implemented by the contractor in the event of erosion resulting in the sedimentation of surrounding areas after due consideration of the costs and benefits of such removal activity.
- Infrastructure shall be designed to ensure that contaminated run-off does not reach watercourses. In the event of an oil spill the procedures contained in the emergency response plan will come into effect.
- Vehicle maintenance and service should be done within the project site in suitable garages or service stations to avoid any possible oil and fuel spills that could contaminate soils and possibly ground water quality
- Construction materials containing fine particles e.g. aggregates will be stored in an enclosure away from water bodies to ensure that sediment laden water does not drain into water courses.
- Ensure that potential sources of petro-chemical pollution are handled in such a way to reduce chances of spills and leaks.
- Contractor to make suitable arrangements for water requirements and to provide alternative supply to any users affected by contractor's abstraction of local water source.
- The excavation and use of rubbish pits during construction should be strictly prohibited. A waste disposal area should be designated within the active construction area and this should be equipped with suitable containers i.e. skips or bins of sufficient capacity and designed to contain and prevent refuse from being blown by wind, thereby preventing the potential pollution of surface water and surrounding areas by litter;
- Care should be taken during concrete pouring activities to ensure there is no pollution of surface water and the surrounding areas during the undertaking of this activity;
- Areas contaminated by spilled concrete and / or fuels and oils leaking from vehicles and machinery should be cleaned immediately.

5.4.4 Noise

Construction activities will definitely result in noise pollution and may be a nuisance and a disturbance to neighboring communities. This impact will be temporary and can be minimized by adopting appropriate mitigation measures including maintaining equipment and vehicles to manufacturer's standards and limiting operating times to daylight hours.

In addition, machineries and construction vehicles will generate noise of varying magnitudes. From the prediction of the specialist study on ambient noise quality measurements, the traffic noise that will be emitted by traffic accessing the proposed project site during construction, operational and decommissioning phases is expected to have an adverse impact on ambient noise. The level of traffic noise will increase depending on the traffic volume. General guide indicates that an increase of 20% in traffic volume approximates to a noise level increase of around 1 dB, while a doubling of traffic volume results in a noise level increase of about 3 dB. It is however, worth noting that the level of noise is attenuated with increase in distance from the source and thus the sites/objects in close proximity to the source will receive more noise in comparison to those at remote location.

During operation phase noise generation will be minimal or negligible.

Mitigation Measures

Proposed mitigation measures aims to ensure that noise generated by construction and operation activities is kept to minimum and adheres to relevant noise standards. The noise management plan includes the following:

- Install portable barriers to shield compactors and other small stationary equipment where necessary (Especially near the sensitive receptor).
- Use of noise-suppression techniques to minimize the impact of temporary construction noise at the project site.
- Use equipment designed with noise control elements.
- Co-ordinate with relevant agencies regarding all construction.
- Limit vehicles to minimum idling time and observe a common-sense approach to vehicle use, and encourage drivers to switch off vehicle engines whenever possible.
- Set and observe speed limits and avoid raving of Engines
- The Contractor shall ensure that construction activities are limited to working hours (i.e. day time only).
- Ensuring all noise emitting activities to be kept distance from the residential area
- Inspecting all noise emitting equipment on a daily basis
- Shutting down all engines while not in use
- Limiting night work including transportation of material
- Maintaining ambient noise level below 55 dBA
- Considering a schedule of on-site activities for reducing the potential for the simultaneous occurrence/overlap of especially noisy activities.

5.4.5 Air quality (Dust Emission)

The construction activities would generate pollutant emission which would be localized to the area where construction activities will take place. This will occur in the short-term time frame of construction.

During construction phase, potential dust pollution will emanate from site preparation activities such as excavation particularly if it takes place during dry weather conditions. Dust emissions might impact on the visibility of the nearby roads consequently impacting on traffic safety. Air emission from construction machinery, including dust, is regarded as a nuisance when it reduces visibility and is aesthetically displeasing. This is expected during construction works. Dust will be generated from construction earthworks, transportation activities and aggregate mixing.

Dust emission is not anticipated during operation phase because the site surface will be concrete paved and hence limited or no generation of dust.

Mitigation Measures

Dust Emissions

- During construction, the debris and stockpiles of earth should be enclosed /covered/watered during dry or windy conditions to reduce dust emissions. The debris should be disposed in appropriate areas consult with Township Development committee.
- Construction trucks moving materials to site, delivering sand and cement to the site should be covered to prevent material dust emissions into the surrounding areas;

- During construction, where necessary, sprinkle loose surface earth areas with water to keep dust levels down especially in dry and hot condition.
- Scarf folding should be done to minimize dust emissions
- Masks should be provided to all personnel in areas prone to dust emissions during construction.
- Drivers of construction vehicles must be sensitized so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO_2, SO_2 and suspended particulate matter;
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- It is the responsibility of the contractor to ensure that the construction machinery and equipment are appropriate and fit to prevent fugitive emissions, as per national standards or international practices. The contractor shall ensure the regular maintenance of this equipment.
- A maintenance plan for the construction machinery and vehicles shall be implemented to prevent excessive emissions during the construction phase of the project.
- Vehicle idling time shall be minimized
- Equipment shall be properly serviced and maintained

This will also be achieved through proper planning of transportation of materials to be used during construction of the project to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

5.4.6 Impact on road traffic

The new 230 kV substation site is located within the existing 132 kV substation and well served with road network. Therefore, the existing roads will be used to gain access to the proposed site. The existing roads are not in very good condition and are frequently utilized by public services and private vehicles. However, the frequent passage of light and heavy vehicles accessing the site while construction is in progress may generate noise as well as cause damage to existing roads, traffic congestion and potential injury to vehicles and pedestrians.

The primary impacts related to traffic during construction are:

Increased Traffic

Temporary and minor disruptions to traffic movement and increased safety concerns of local inhabitants and workers during construction of the substation as a result of increased traffic movements, particularly from large construction/transport trucks.

Accidents as a result of increased traffic

At construction phase, construction vehicles used in transportation of materials and workers will contribute to increase in traffic on the nearby roads. But, the traffic is very low nearby the project site and villages are far away from the project site. While during operation phase, no traffic impacts are anticipated.

Damage to roads and transport infrastructure

Damage to the nearby roads is likely during construction phase due to movement of heavy machinery, equipment and components into the project site.

Such impacts are associated with construction of the proposed project and will not be anticipated during the operational phase.

Proposed Mitigation Measures

- Proponent and contractor should choose traffic routes to reduce the impact in the neighborhood avoiding, as far as practical any sensitive areas
- Ensure due regard of drivers to traffic regulations and insist at all times that courtesy be shown to other road users

Where traffic is anticipated, the contractor in close consultation with proponent should ensure:

- Effecting of traffic routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood.
- Choice of routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood
- Employment of a road safety officer to oversee implementation of the traffic controls
- Regular maintenance of delivery and dispatch trucks.

5.5 Positive impacts during construction phase (Both transmission line and substation)

Creation of employment opportunities

During construction, both skilled and unskilled job opportunities will be generated. Majority of the unskilled and semi-skilled jobs will be taken up by the local community. Though the approximate number of workers to be employed by the proposed project is not yet known, it will contribute to easing unemployment level in the area. There will be a trickledown effect to the economy at large resulting from new income revenues and as well as services provided through this project.

Provision of Market for Supply of Building Materials

The project will require supply of building materials most of which will be sourced locally in the districts and its environs. This provides ready market for local enterprises with such materials and boosts the economy at large.

Boosting of the informal sector

It is expected that other businesses in the informal sector will flourish. These include activities such as hotel, shops, artisan industries and food vending who will be benefiting directly from the construction, as people working there will need commodities from them. This will promote the informal sector in securing some temporary revenues and hence improved livelihoods.

Quality, reliable power supply

The areas, living communities along power transmission line will benefit from reliable quality power supply. Frequent blackouts will be a thing of the past and the increased power demands will be met. The area close to the substation will benefit from reduced impacts of lightening due to installation of lightening arrestors.

Employment creation

Employment opportunities will also be created during the operation phase of the project. Opportunities to be created range from semi-skilled to skilled jobs. These will involve security personnel, and staff in case the substation will be manned. Others include fire alarm and first aid box service providers.

Reduction of pollution associated with thermal Power Generation, kerosene and wood fuel:

Different sources of energy are used for generation of electricity. Electricity supply will ensure less individuals us diesel generators, less reliance on kerosene, and will be an alternative to wood fuel and charcoal because of better and effective electrical appliances like cookers and electric irons. This would mean less carbon dioxide is released to the environment and destruction of forests will be reduced hence decreasing greenhouse gases.

Improvement of local and national economy

Stable and reliable power supply to small scale industries will increase business opportunities and self-employment opportunities etc. this implies improvement at the individual level and for the national economy.

Education

Stabilized power will facilitate development and equipping of laboratories in schools and Hospitals. Increased lighting creates an enabling environment for studies at school and at homes. It will also enable setting up of Information and Communication Technology opportunities within the area.

Improved Security Lighting

With the establishment of the proposed sub-station, the level of security will be improved around the project areas. This is as a result of more security lights and security personnel being employed to guard the sub-station.

The improvement of the power transmission system is also expected to significantly reduce the risks of technical failures and power outages, and improve safety in the vicinity of the transmission lines and substations. The current supply suffers from frequent power interruption due to overloaded system.

6 Information Disclosure, Public Consultation and Participation

6.1 Objectives of PCM and PD for IEE

According to EIA procedures, 2015, during IEE process, the Project Proponent shall undertake the following public consultation process in regard to an IEE Type Project:

a) Immediately upon commencement of the IEE, disclose relevant information about the proposed Project to the public and civil society through the Project or Project Proponent's website(s) and local media, including by means of the prominent posting of legible sign boards at the Project site which are visible to the public, and comply with technical guidelines issued by the Ministry; and

b) Arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews.

Public consultation has played a key role in development of the project and will continue to play an important in its implementation.

The goal has been to ensure opportunities exist for stakeholders to be involved in project design, including potentially affected people. More specifically, the objectives are to:

- Ensure that stakeholders concerns are incorporated in the project design and implementation
- Increase stakeholder awareness and familiarity with the project
- Ensure transparency in the decision-making process and
- Ensure the potential benefits by directly involving relevant stakeholders.

These objectives are being met through a comprehensive public consultation and disclosure process, which has been ongoing for a number of years. This has included:

- Sharing relevant project information at the earliest stages of the project
- Providing on-going opportunities to input to the project; receiving feedback from project stakeholders and
- Utilizing outputs from the consultation process to inform the project design, including proposed management measures and corresponding management plans.

6.2 Stakeholder Identification and Stakeholders' Capacity Analysis

An integral component of assessing a project's potential impacts is to identify and prioritize the project's stakeholders. Stakeholders are defined as those people, or groups, who are potentially impacted by or interested in the project. It is important to also include in the stakeholder analysis those groups or organizations that are not adversely affected, but whose interests determine them as stakeholders.

6.2.1 Project Stakeholders

Project stakeholders are identified in order to understand the individuals or organizations that will be affected by or may influence the Project or related activities either positively or negatively. For the purposes of this SEP, a stakeholder is defined as any individual or group who is potentially affected by the proposed Project, or who has an interest in the proposed Project and its potential impacts. It is therefore important to establish which organizations,

groups and individuals may be directly or indirectly affected (positively and negatively) by the proposed Project and which might have an interest in the proposed Project. It should be noted that stakeholder identification is an on-going process, requiring regular review and updating as the IEE progresses.

The proposed project is the construction of 132 kV transmission line between War Shawng T-connection and Waingmaw and 230kv transmission line between Waingmaw and Na Bar with the length of about 18 km and 223 km respectively, and one extended substation at Waingmaw. Two transmission line route pass through total of 41 villages in five townships and will affect some crop and land properties of these villages. Farmland, plantation, forest and reserved forests are involved at the land use of towers construction. The following table describes the villages by the transverse of transmission line.

Table 6.2.1-1 132 kV transmission line

District	Myitkyina District
Township	Waingmaw Township
Villages nearby the TL	Maing Na, Wu Yang, Nant Wa, and War Shawng (4 villages)

Table 6.2.1-2 230 kV Transmission Line

District	Myitkyina, Monyin and Katha
Township	Waingmaw, Myitkyina, Mogaung, Monyin and Indaw
Villages nearby the TL Waingmaw	Maing Na, Silikhar, Madain, Waingmaw, Thargaya, Khashi, Khat Cho, Sankar, Auk Sankar, Panpar
Myitkyina	Ahkyal, Lwi Khaw
Mogaung	La Phan, Mayan, Namti, Mogaung, Pinkha, Lwi Law, Hto Pu, Inn Pawng, Has Maw, Nant Khwin, Pwint Phyu, Pin Baw, Nammana, Theik Wa Kone, Taung Ni, Inn Gyin Kone, Hti Chinte
Mohnyin	Kyar Kyee Kwin, Hopin, Ta Kwin, Myothit Kalay, Nam Khang, Nyaung Kone, Ma Yin Kone,Monyin, Nyaung Kine, 10 mile, Maw Han, Nan Si Aung
Indaw	Maw Lue, Si Maw, Se Pain, Hpa Pan, Pinwel, Pintin, Naba

Stakeholder Groups

Government Department	**Five Townships**
1) Department of Power Transmission and System Control, MOEE Project Director, Project of Power Transmission (Northern Myanmar) 2) Project Manager, Project of Power Transmission (Northern Myanmar) 3) Project Manager (Civil), Project of Power Transmission (Northern Myanmar) 4) EE (Civil), Project of Power Transmission (Northern Myanmar) 5) Representative of General Administrative Department, Myitkyina 6) Representative of General Administrative Department, Waingmaw 7) Representative of General Administrative Department, Mogaung 8) Representative of General Administrative Department, Mohnyin 9) ECD, Myitkyina Office 10) Forest Department, Myitkyina, Waingmaw, Mogaung, Monyin 11) Representatives of Electric Power Enterprises 12) Representatives of Agricultural Land Management & Statistics Department 13) Representatives of Township Development Committee Myitkyina	• Village Leaders • Religious Leaders • Elders • Youth Group • Women Group • Farmers • Gardeners • Other associations if there is (NGO, Civil Society. etc.)

Waingmaw Mogaung Mohnyin Indaw 14) Representatives of Post and Telecommunication Department 15) Representatives of Road Transport Administration Department 16) Representatives of Planning and Land Administration Department 17) Representatives of Rural Development Department 18) Representative of Department of Water Resources Improvement of River System (DWIR) 19) Representatives of Pyithu Hluttaw (Four Townships) 20) Representatives of Amyotha Hluttaw	

6.2.3 Stakeholder Engagement Plan

In order to ensure effective engagement and open, frequent and honest dialogue with local communities and other key stakeholders, a stakeholder engagement plan is designed for both construction phase and operation & maintenance phase. This plan is to be developed and implemented in order to identify stakeholder and their issues of concern, establishes the methods for consultation, and provides a specific action plan for stakeholder engagement throughout the life of the Project.

Before PCM, announcement of public consultation activities will notice in the newspapers.

Stakeholder Engagement Plan

Stakeholder Groups	Stakeholders	Approaches and Methods	Material	Issue
The regulatory authorities	- Waingmaw, Myitkyina, Mohnyin, Mogaung and Indaw (GAD officers) - DPTSC - Department of Forestry - Environmental Conservation Department - Department of Agriculture, Livestock and Irrigation - Land Use Department - Associated Departments - City/ Town Authorities	Informal meeting	Leaflets	- Consult on public participation, attitude survey
Potentially impacted group	-Headman/ community leaders of 41 villages -Key informants (monks, teachers, gardener, farmers, etc.) and affected persons in 41 villages	- Public Consultation Meeting at each township -Questionnaire attitude survey - Focus Group Meeting with farmers/women	- Power point presentation -For attitude survey = questionnaires/ information folders	-Project schedule/ Scope of IEE/ Collect concerns about the project -Attitude Survey = Socio-Economic data/ attitude towards the project - Impact and mitigation measures/ Feedback on mitigation measures

6.2.4 Public Consultations Meeting at IEE Investigation Stage

The project proponent prepared the invitation letter together with the notice of the meeting in Myanmar language and announced to the invitees, who are villagers along the transmission line

route and relevant governmental organizations, non-governmental organizations (NGOs), community-based organizations (CBOs), and anyone who are interested.

Basically, information on the meeting was announced to the invitees one week in advance before the meeting by sending invitation letters to the respective invitees. Especially for the villagers, the information on the meeting was announced based on the administrative procedure and local practice. Firstly, the invitation letter was sent to the township offices in order to ask them to provide instructions to each village-tract office under their jurisdiction. And then it was sent from the township offices to each village-tract office one week in advance. Afterwards, the information on the meeting under the village level was requested to be disseminated by 100 household head leaders of the respective villages in accordance with local practice. The 100 household head leaders were informed about the meeting in a convenient way and timing such as verbal announcement or displaying the notice somewhere. Moreover, the dissemination of the information on the meeting below the village level was followed up and reminded over phone.

The presentation and handouts were prepared and explained in Myanmar language. The opinions from the participants were received in the question and answer session. Additionally, feedback forms were provided to the participants so that those who are hesitant to speak out in public could share their views and comments. Special arrangement for the vulnerable group was given; assistant staff were available to fill out the form in case the participant needs help in writing/reading. Furthermore, female assistants were also available for the female participants who need any help.

Six public consultation meetings were organized and a total of 254 participants attended these consultations. The meetings were held at the townships of Myitkyina, Waingmaw, Mohnyin, Mogaung and Indaw. Details on the venue, dates and number of participants of the public consultations held in five Townships is shown in Table 6.2.4-1.

Meeting Agenda

1) Announcement of the commencement of the meeting
2) Explanation about the project description and IEE by Daw Phyu Phyu Shein, Social Consultant, (REM Co. Ltd.)
3) Questions and Suggestions from the participants
4) Answers by

   U Hla Aung, Staff Officer, (Department of Power Transmission and System Control)

   U San Min Oo, Staff Officer, (Department of Electric Power and Planning)

   U Tun Min Latt, Deputy Staff Officer, (Department of Power Transmission and System Control)

   Daw Phyu Phyu Shein, Social Consultant, (REM Co. Ltd.)

5) Conclusion of the meeting

Table 6.2.4-1 Summary of Public Consultations Meetings

Location	Date of Consultations	Time of Consultations	Number of Attendance		Consultation Activity
			Government	NGOs/ Local	
Myitkyina	22-8-2019 (Thursday)	10:00am-11:30 am	8	20	Consultation and discussion at Meeting Hall, Township GAD Office
Waingmaw	22-8-2019 (Thursday)	02:00pm – 03:30 pm	8	27	Consultation and discussion at Meeting Hall, Township GAD Office
Mogaung	26-8-2019 (Monday)	10:30pm – 12:00 pm	12	36	Consultation and discussion at Meeting Hall, Township GAD Office
Inndaw	27-8-2019 (Tuesday)	10:00am – 11:30 pm	26	18	Consultation and discussion at Meeting Hall, Township GAD Office
Mawlu	27-8-2019 (Tuesday)	02:00pm – 03:30 pm	5	28	Consultation and discussion at Meeting Hall, Township GAD Office
Mohnyin	30-8-2019 (Friday)	10:00am – 11:00 am	6	60	Consultation and discussion at Meeting Hall, Township GAD Office

The issues and concerns that were raised during the consultation meetings, minutes and attendance of the consultation meetings are found in Appendix B.

6.2.5 Public Suggestion and Comments at IEE Investigation Stage

The meetings have been organized in order to present to the stakeholders the Project, the outcomes of the IEE and collect feedback. The following topics and concerns have been discussed and collected during the meetings:

The team leader explained about the objectives of the project, detailed information on the project, plan map of the project, construction system and potential impact. The team Leader requested to question about the project and suggestions from attendees, Head of Village and villagers. The related department, media, parliament member, NGO, Heads of Villages and villagers gave their suggestions and requested to fulfill the various needs as mentioned below:

- Consulted with the affected farmers and negotiated transparently.
- Compensation plan for damage crops and permanent land occupation for tower base
- Reduce the electricity charges because of the project.
- Numbers of tower pass through their region, construction period and benefits from the project
- Classified the kinds of plant that the transmission line pass through the reserve forest area.
- Cooperate with the land use department to record the lost before the start of the project.
- Consultant team goes to survey and held public consultation in the villages before the project start. In charged person from Ministry of Electricity and Energy will also perform surveying before the project starts.

- Compensation price should be the price fixed by relevant committee of regional government.
- MOEE will compensate for crops damage according to the fixed price defined by regional government.
- Suggest to contractors to inform local authority before entering into the project site for construction

The comments, suggestions and response of public consultation meetings are presented in Appendix 5.

6.3 Grievance Redress Mechanism

The purpose of the grievance mechanism is to ensure that all requests and complaints from individuals, groups and local communities throughout the Project life, from planning and design through construction and operations, are dealt with systematically in a timely manner with appropriate corrective actions being implemented and the complainant being informed of the outcomes.

All complaints will be logged and processed and addressed within a fixed time, communicated to the complainant, as shown in Figure 6.3-1 by the processing grievances flowchart.

6.3.1 Grievance Redress System (GRS)

Grievance Redress System is an effective instrument to tackle the various complaints receiving from the PAP and community in such a way that elevate the process of finding solution to reach the satisfaction and mutual agreement in a timely fashion and transparent manner.

The framework for grievance redress mechanism for the projects has been established to address the complaints and concerns that must be raised by PAP about project activities or performance during the construction and operation period .That shall act as a tool for execution within a set time period, purpose and detail out a systematic process against several documents.

The site specific procedure shall be developed for receiving complaints, logging in the GRS log book for recording and registering purpose, investigation, analysis and responding to the PAP.

6.3.1.1 Grievance Focal Person (GFP)

Grievance focal person shall be appointed from project Management Unit by MOEE to implement the GRS procedure effectively. The nominated person for role should have sound and broad experience within the social region and acting within such a role previous.

He will receive the complaints in verbal or with letter from the PAP through site construction team or village head or PAP himself. The complaint shall be recorded and registered accordingly and deliver the message to Site Grievance Redress Team promptly.

6.3.1.2 Village Grievance Management Committee

Village based grievance redress team shall be established and headed by village administrator, contractor representative and authorities concerns in local and village level. Village Grievance Committee will review the any complaint and concerns and find a solution to cease the degree of complaints which will be agreed and accepted by the PAP. Village Grievance Committee shall address the issue within (14) days. In this stage, many issues shall be resolved as possible locally.

The grievance focal person of the PMU, contractor and grievance committee shall coordinate all actions with the complainant and village head. The PMU should immediately carry out a review and assessment of the validity of the complaint and seek measures to redress valid

grievances. If it is determined that the complaint is not connected to a project activity or that the project is being carried out in full compliance with applicable national and international standards, the PMU and contractor should explain the circumstances to the complainant and the village head.

If the case is not addressed to the satisfaction of PAP within the given time frame, Site /Village Grievance Committee shall proceed to submit the issue to Grievance Redress Committee for further review.

6.3.1.3 Township Grievance Management Committee

Township Grievance Management Committee is the highest authority to make final decision within project specific Grievance Redress System on the received issues which Site /Village Grievance Committee cannot sort it out alone. Township Grievance Management Committee headed by Township General Administrator with the members of relevant government bodies.

6.3.1.4 Unsolved Issue

If the case is still not resolved by Township Grievance Management Committee, PAP can proceed through juridical system such as appealing on court for final resolution starting from township level jurisdiction.

A Public Grievance Sample Form is presented in Appendix- 6.The GRM will address all grievances raised by PAPs across the Project, including a grievances raised by stakeholders located along the transmission line corridor.

The GRM, in the first instance, seeks to resolve disagreements or stakeholder concerns before they evolve into grievances. This is done through ongoing engagement with stakeholders throughout the Project, particularly the PAPs.

The resulting informal negotiations and discussions will be conducted in a transparent manner and will be appropriately documented. This includes agreements that are reached, which will be voluntarily signed by all parties involved in the negotiation.

In cases where concerns or conflicts cannot be resolved through consultation and / or discussions, the GRM has established a hierarchy of grievance committees and procedures to receive and resolve grievances. These committees and procedures are summarized below.

Table 6.3.1-1 Grievance Redress Committee Members

Committee	Committee Members
Village Grievance Management Committee	- The village administrator (Chairperson) - Member of village administration office - Representative from the Project Team - Village elders and - Representatives from community organizations
Township Grievance Management Committee	-Township Administrator (Chairperson) - Township Land Record Department - Representative from Township Development Committee - Village Leaders - Representatives from the PAPs - Village elders and local community organization - Representative from the Project Team

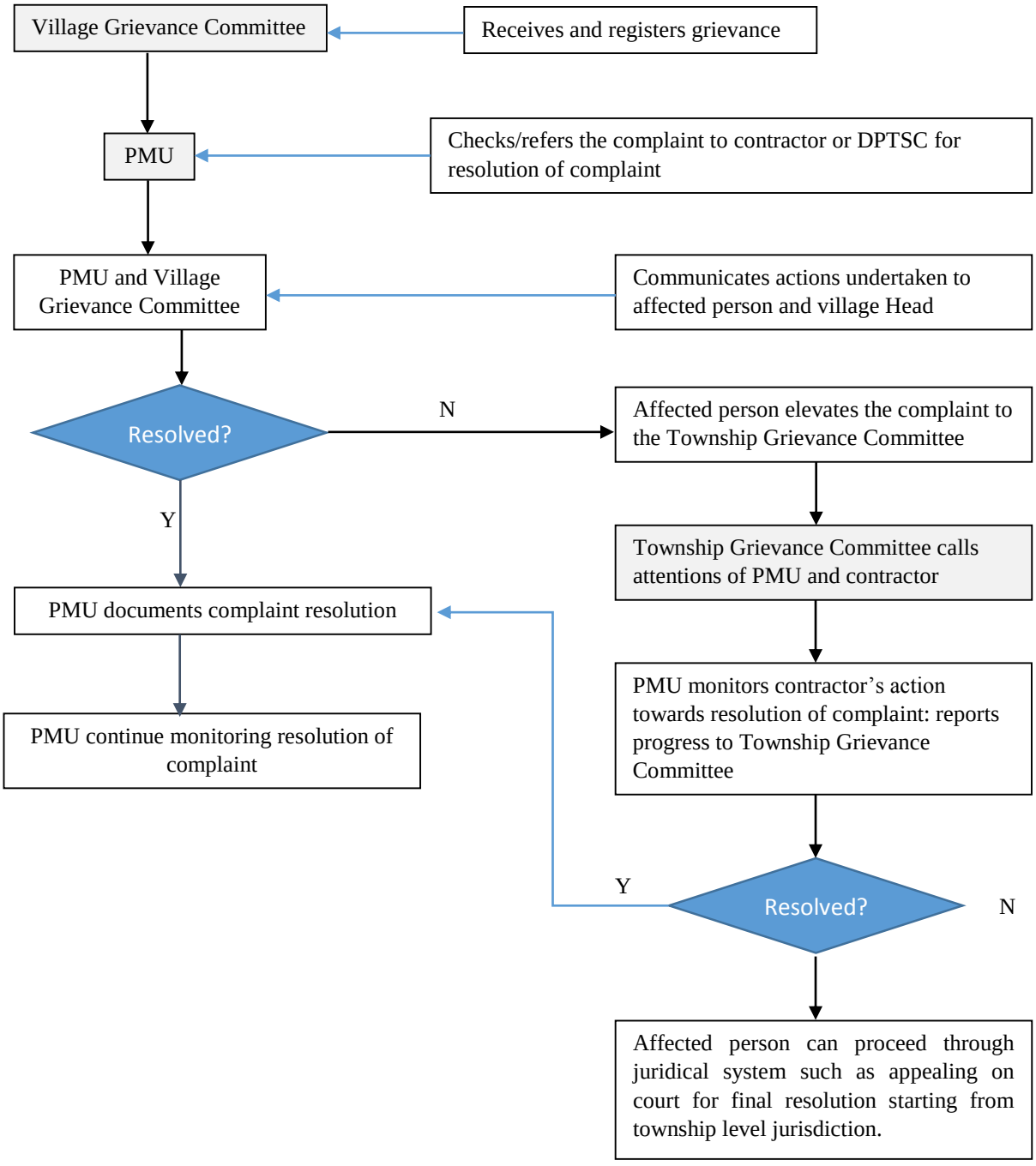


Figure 6.3-1 Flowchart for Processing Grievances

7 ENVIRONMRNTAL MANAGEMENT PLAN

7.1 Introduction

An environmental management plan (EMP) has been prepared for the implementation of the 132 kV War Shawng-Waingmaw transmission line, 230 kV Waingmaw – Na Bar transmission line and extension of 230 kV substation. The purpose of the EMP is to integrate the results of the IEE into a formal management plan that is implemented in parallel with the 230 kV transmission lines and substations to prevent or minimize the potential environmental impacts and issues that were identified by the IEE. The EMP addresses the results of the public consultations on the project that were convened as part of the IEE.

7.2 Institutional Arrangement

7.2.1 Project Institutional Arrangement

During the construction phase of the transmission line, health, safety and environment division (HSE) will be established under CNHC. It is obligated to entail the appointment of new staffs and responsibilities as follows:

- Environmental Management Officer (EMO) and
- Social Management Officer (SMO)

HSE department will be established under production Department (See in Figure 7.2-1), managed by the HSE Manager who is responsible for the environmental and social implementation of Environmental Management Plan (EMP) on the site during construction phase.

Figure 7.2-1 shows the project institutional structure of Chipwi Nge Hydropower Company Ltd. (CNHC) who will be responsible for construction of transmission lines and substation. The management responsibilities of the HSE Division are shown in the Table 7.2-1.

Table 7.2-1 Roles and Responsibilities for Implementation of EMP

Role	Responsibilities
HSE Manager	• Guide the development of an Environment and Social Management and Monitoring Plan for the Construction Phase (ESMMP-CP) based on the impacts and mitigation measures defined in the IEE. • Implement the ESMMP-CP. • Confine the construction site to the demarcated area • Provide adequate resources and capabilities to implement and maintain the ESMMP-CP • Verify that sufficient funds are available to properly implement the ESMMP-CP • Submit periodic monitoring reports to MOEE and ECD • Receive and manage complaints from the public in accordance with the Grievance Redress Mechanism;
Environmental and Social Management Officers (EMO)	• Develop the project ESMMP-CP based on the impacts and mitigation measures defined in the IEE report • Have a working knowledge of the environmental impacts, mitigation measures and recommendations of the ESMMP-CP

	• Review and improve method statements for environmental aspects prior to work starting • Verify that tender documents and civil works contracts include the project ESMMP-CP and specify requirement for preparation and implementation of construction ESMMP-CP • Identify environmental and health and safety competence requirements for all staff, including contractor personnel, working on the project and facilitate delivery of environmental training • Monitor construction performance to verify that appropriate control measures are implemented to comply with ESMMP-CP • Recommend corrective action for any environmental non-compliance incidents on the construction site, and provide advice and liaison with the construction teams to ensure that environmental risks are identified and appropriate controls are developed; • Compile a regular report addressing environmental performance progress and any non-compliance issues to relevant parties, including submitting semi-annual monitoring reports to ECD through the MOEE; • Inform affected parties of any changes to the construction program. The contact numbers of the Environmental Officer shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims; • Establish an environmental grievance redress mechanism that is acceptable to ECD, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance; and • Liaise and cooperate with Local authorities responsible in arranging for adequate meeting and reporting to Local authorities on a regular basis.
Construction Contractor	• Recruit a qualified Environmental Expert on a full-time basis to manage compliance with contractual environmental obligations and implementation of the ESMMP-CP; • Develop and implement the Construction Contractor's Environmental Management Plan (Construction Contractor's EMP) to comply with Project commitments (i.e. Owner's EMP and ESMMP-CP); • Plan and direct construction activities to minimize environmental impacts and comply with environmental management procedures, license and approval requirements; • Verify the implementation of all applicable mitigation measures defined in the ESMMP-CP during construction phase; • Liaise with EMO to facilitate implementation of environmental mitigation measures; • Implement routine inspection and monitoring program, including undertaking the contractor's weekly environmental monitoring; • Implement a process of corrective and preventive action for noncompliance identified through internal and external inspections and audits; • Implement additional environmental mitigation measures where monitoring or other observations indicate opportunities for improved environmental management; • Submit monthly reports to ESD/EMO on the implementation of environmental mitigation measures and environmental monitoring results; • Maintain an environmental register which keeps a record of all incidents which occur on the site during construction and report environmental incidents to Owner; • Manage safety of construction workers and local people during construction; • Prepare and submit monthly reports on mitigation and monitoring activities of EMP any environmental issues at construction sites to the PIC and PIU.

	• Prepare and submit monthly reports to HSE Division on the results of the monitoring activities. • Immediately act and resolve complaints received from the community and through GRM; and • Implement any corrective actions recommended by PMU.
All project personnel	• Protecting the environment by implementing relevant aspects of the EMP and ESMMP-CP

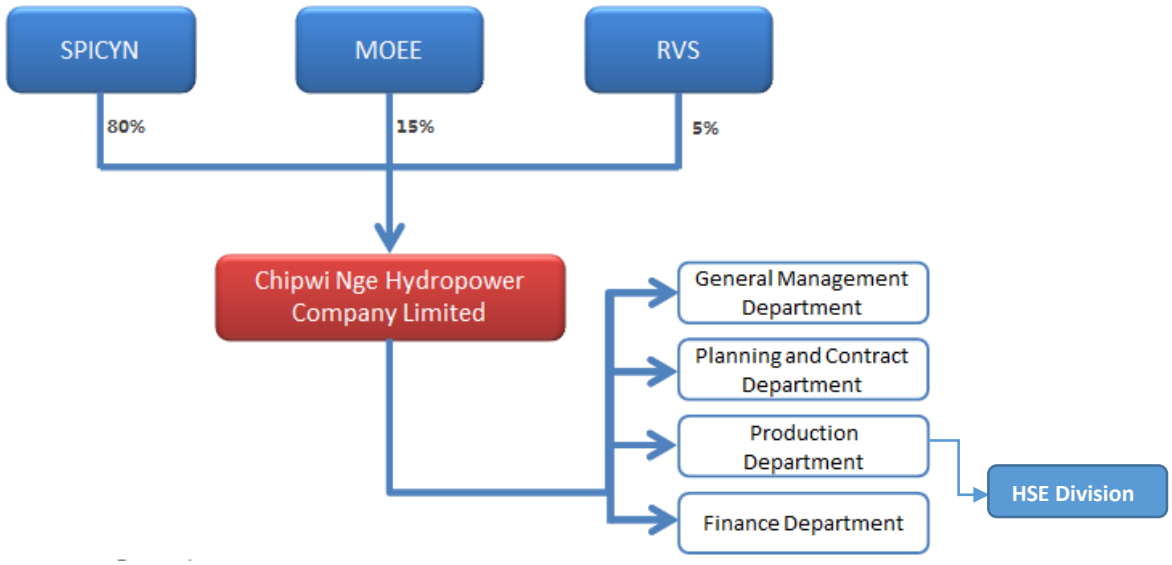


Figure 7.2-1 Project Institutional Structure (CNHC)

7.2.2 Institutional Arrangement (Government of Myanmar)

The Department of Power Transmission and System Control (DPTSC), under Ministry of Electricity and Energy is the major responsibility for coordination of EMP and the primary supervisory and monitoring body.

A Project Management Unit (PMU) will be established under DPTSC in MOEE to oversee monitoring of the Project.

A Project Management Unit (PMU) and Administration Department (AD) will coordinate the work of the government in resettling the most severely affected people in the project area, together with the technical assistance, financial support, and related work of the Project developers through the Project's Environment and Social Division.

Figure 7.2-2 shows the relationship between the Project institutional structure and the relevant departments of the concerned ministries.

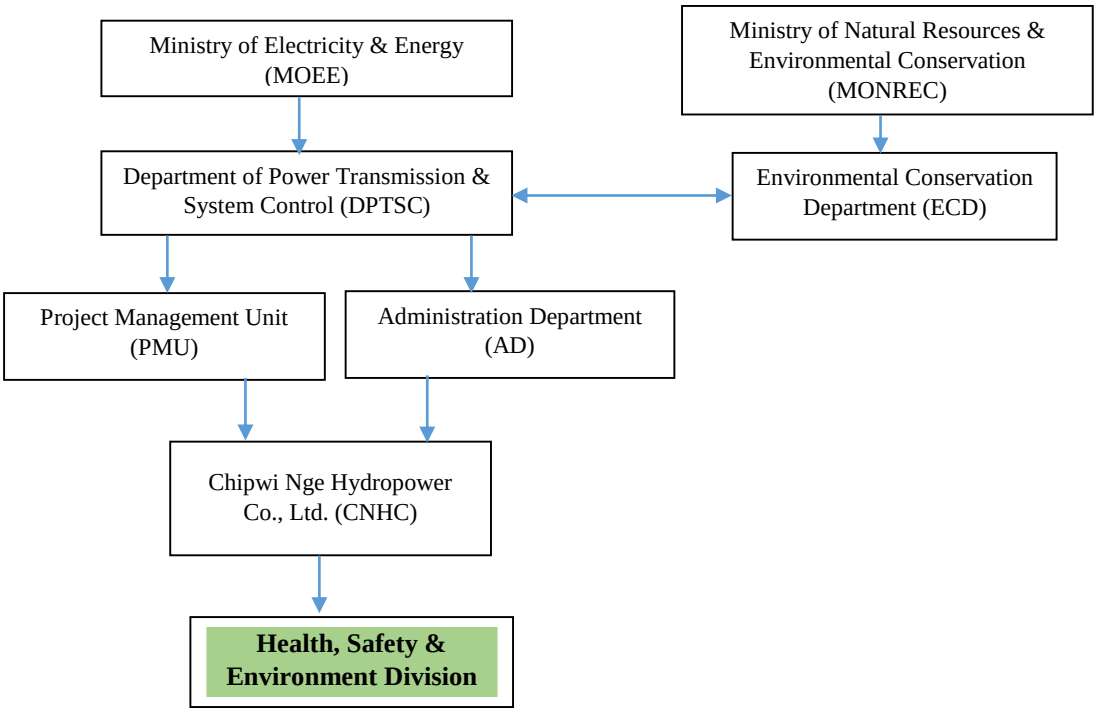


Figure 7.2-2 The relationship between the Project institutional structure and the relevant departments of the concerned ministries

The roles and responsibilities of institutions concerned for the Project's environmental management in a construction and operation phases are summarized in Table 7.2-2.

Table 7.2-2 Role and Responsibility for Institutions Concerned

Institution	Roles and Responsibilities
Pre-Construction/Construction Phase	
Department of Power Transmission &System Control (DPTSC) in MOEE (DEPP)	• Supervise tasks implemented by the Project Management Unit (PMU) • Assign a staff dealing with environmental and social issues in Project Management Unit (PMU)
Project Management Unit (PMU), DPTSC	• Support the environmental staff assigned by the MOEE (DEPP) as appropriate • Notify MONREC to confirm approvals of 230 kV transmission lines and substations are met;
Administration Department in MOEE (DEPP)	• Finalize compensation price with affected people and disburse compensation/assistance to project affected peoples
Compensation Committee (SLRD, Police officer, Agriculture and Irrigation Department and General Administrated Department at the relevant township and project owner: MOEE)	• Set compensation standards / assistances

Environmental and Social Staff in PMU (Assigned from DPTSC to work for PMU)	• Develop the Construction Environmental Management Plan (CEMP) for project contractors. • Supervise the mitigation measured implemented by the construction contractor addressed in the Environmental and Social Management Plan (EMP) • Open windows for project affected peoples
Operation Phase	
Department of Power Transmission & System Control (DPTSC) in MOEE (DEPP)	• Implement operation and maintenance of transmission and substation including environmental management
ECD	• Review and update EMP in every six months. Review EMMP report and Environmental Audit will be conducted in every year.

7.3 Environmental Measures

Environmental management for the Project aims to minimize the negative impacts of the construction of transmission line and substation and at the same time, enhance the positive and beneficial impacts. Table 7.3-1 presents the mitigation measures of construction of transmission line and substation.

These mitigation measures are an overview only, based on the potential impacts identified in this IEE. The mitigation plan is structured by the three development phases defined by the pre-construction, construction, and post construction-operation phases. Environmental issues and concerns raised at the stakeholder meetings are addressed in the mitigation plans.

Prior to construction, the construction contractor will develop a suite of Site- Specific ESMMPs which address specific segments of the RoW, based on site conditions (e.g. proximity to villages, waterways and natural habitats).

If there are changes to the project locations and scope which would significantly affect the outcome of the project, the updated IEE and EMP will be prepared again to check whether additional mitigation plans and corrective action plans are necessary to meet the final detailed designs of the 230 kV lines.

Table 7.3-1 Environmental Management Measures (Mitigation Plan)

Project Activity/Potential Environmental Impact	Mitigation Measures	Location	Time Frame	Cost (USD)	Responsibility to Implement	In- charge of Supervision
Pre-construction Phase						
Project disclosure	- Conduct project information disclosure and grievance redress process at townships	- Waingmaw, Myitkyina, Mogaung, Mohnyin and Indaw Township	Prior to the start of the actual construction	2,500	HSE division of CNHC	PMU
Detailed design of transmission lines and substation	- Conduct detailed survey along the transmission line route after approval of MOEE and Kachin State Government - Work with PMU and EA to complete the detailed designs of the 132 kV and 230 kV transmission lines and substation. Ensure the following measures are included: a) Compliance of electrical safety standards b) to select the shortest line route c) no disturbance or damage to cultural buildings, ancient heritage site, commercial areas, schools, airport and Military arears d) to obey 2014 Electricity Law especially Act 2N and Act 10 A e) notify affected residents of construction activities and schedule.	Along the transmission lines and substation	Prior to the start of the actual construction		Planning and contract department of CNHC	EA and PMU
Project approval by Government Agencies	- Coordinate with Forest Department, Myanmar Railway, Ministry of Transport and Communication, Township Administration and other relevant government agencies to obtain permission to locate tower in their properties.	Along the transmission lines	Prior to the start of the actual construction		Planning and contract department of CNHC	EA and PMU

Initiate the Environmental Management Plan	- Measures to minimize runoff of sediments, oil spills and pollution of Ayeyarwadydy River, measures to avoid Military Camps, and Private Forest plantation area, measures to avoid hazards to public health and safety and damage to properties.	Along the transmission lines and substation area	Prior to the start of the actual construction		HSE division of CNHC	EA and PMU
Impact on sensitive receptors along the alignment (airport and residential areas)	- Coordinate with airport authorities, building occupants/owners about the construction activities prior to start of works.	The towers occupied near airport and residential areas	Prior to the start of the actual construction		HSE division of CNHC	EA and PMU
Preparation of EMP Implementation	- Develop and schedule training plan for HSE/PMU/Contractor to be able to fully implement & supervise EMP, and to manage implementation of mitigation measures by contractor(s). - Create awareness plan for contractor who will implement mitigation measures.	Along the transmission lines and substation area	Prior to the start of the actual construction		HSE division of CNHC/PMU/ Contractor	EA and ECD
Community Health and Safety (Disease)	- A public health education campaign will be provided, addressing: hygiene, disease prevention (including transmission pathways and symptoms of relevant diseases) and basic health promotion. The program will be designed and implemented in consultation with district and local health authorities.	- Villages and households nearby the tower construction sites	Prior to the start of the actual construction		HSE division of CNHC/PMU/ Contractor	EA
Construction Phase						
Compliance with permits and licenses	- Contractor(s) to comply with all statutory requirements set out by GAD, MOEE, Forest Department, and other relevant agencies for use of construction equipment, and construction operations such as	For all construction sites including substation	Beginning of construction	Contractor	HSE division of CNHC/PMU/ Contractor	EA

	Township Development Committee approvals for construction vehicle use of city roads, and management of excavation and transport of soil, and from MOEE approvals for construction works near Ayeyarwadyy River pursuant to the Conservation Water Resources and Rivers Law.					
Recruitment of workers	- Use local workers as much as possible thereby reducing number of migrant workers - Create registry for construction workers including migrant workers. - Implement the ID-system at construction sites.	All construction sites including substation	Throughout the construction phase		Construction Contractor	PMU/CNHC
Soil - Potential impacts will be due to change to soil structure and soil quality as a result of excavation or compaction. - Compaction of soil during backfilling might lead to temporary effects on natural infiltration of rainwater. - Removal of vegetation and trees during construction of foundation, especially on the slopes would render soil vulnerable to erosion. - Loose soils and construction material if placed in adjoining fields will lead to damage of	- To minimize impact on vegetation and soil include means to protect excavated soil material from erosion and contamination by placing them away from streams of water along the slope or in direct line of local drainage. - Loose soil should be kept covered till the time of backfill and the excess soil should be removed after casting activities are complete. - The construction activities shall be planned in non-monsoon months which will minimize any rainwater run-off or any loss due to infiltration. - Construction materials will be stored within the footprint of the site to avoid any kind of damage or	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

existing crop and contamination of soil. - The excavated if kept uncovered and unprotected will be rendered vulnerable to loss from erosion.	contamination of soil/crop of adjoining fields. - Movement of material and manpower shall be restricted to existing roads/tracks under certain circumstances.					
Solid Waste Disposal - There is potential for spread of construction debris to areas outside that marked for construction. - The debris generated from construction activities can be carried along with small springs, rivulets and rivers flowing in proximity of the tower. - Construction debris can also contaminate wells, canals etc. in proximity of the activity. - Hazardous waste generation	- Any construction debris generated at the site will be removed from the site immediately after the completion of construction activities and the site will be leveled as original. - Workers will be strictly instructed about random disposal of any waste generated from the construction activity. - Arrangements will be made to collect and prevent littering by workers on site. - Excavated spoils shall be reused for vegetation purpose as much as possible - Reinstatement works shall be considered for borrowing pit - Designated soil disposal area shall be provided - Enough dust bins are to be located in the places where waste generated. - All waste including human waste shall be disposed of properly and environmental friendly manner at local municipal waste disposal area - Burning the solid waste shall be not being permitted. - Waste management practices should be based on the hierarchy of reduces, reuse and recycle principle	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

	- Management of general solid and liquid waste from construction will follow MONREC and City Development Committee regulations, for collection, handling, transport, recycling, and disposal of waste created from construction activities and work force. - Areas of disposal of solid and liquid waste to be determined by MONREC and Township Development Committee. - Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow MONREC and Township Development Committee regulations. - Wastes must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and sensitive receptors. - All spills must be cleaned up completely with all contaminated soil removed and handled in accordance with the requirements of MONREC and Township Development Committee.					
Aesthetics and Visual Impact - The visual impacts and change of landscape due to construction activity will	- The route is planned after a series of survey to avoid habitation and forest areas. - The clearing of trees will be kept to minimum and wherever possible,	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

be for a short period of 15-30 days. - Route of towers and transmission line are expected to cross highways/roads, and other transmission line which may lead to change of landscape resource and character due to introduction of manmade features leading to visual intrusion and loss of visual amenity. - The cumulative impact due to already existing towers can hamper the aesthetic value of the area.	trimming of trees will be adopted *vis-à-vis* felling of trees. - The lattice structure of towers provide sufficient see through effect which diminish the visual impact on the aesthetics of the area. - The area being hilly terrain with undulations restrict the view of many towers in a single view, moreover the height of tower do not appear to be significant with reference the terrain.					
Water quality - Erosion and sediment run off from construction activities that expose or move soil (including clearing of vegetation and earthworks) - Release of sediment laden effluent during construction, for example soil waste from drilling activities - Erosion and sediment released from stream bed and river bank disturbance at river course crossings	- Optimal use of water will be planned and followed at construction site. - Construction activities in proximity of water bodies will ensure prevention of runoffs. - At the river crossing the horizontal clearance (the distance between the towers) will be greater than the maximum river width at high flood levels and the vertical clearances will be according to the statutory requirements. - The rivers crossings along the route are small and will not affect any change to the span of towers. - Any groundwater encountered during excavation will be pumped out and the source will be prevented	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

	from any kind of runoff from the adjoining areas. - Clearing and earthworks will be undertaken in the dry season wherever possible to minimize erosion and subsequent release of sediment. - The period of soil exposure will be minimized by phasing clearing and construction activities and covering exposed area by sand bags or canvas sheet. Exposed areas of river banks will be covered immediately and preferably by replanted with locally native tree species like woody vegetation. - If vegetation clearing is required on river banks, vegetation will be cut near or at ground level to leave root mass in the ground. This helps to reinforce soil stability and reduce erosion. - Stockpile materials will be located at least 30 meter away from steep slopes, water courses or drainage paths - Water quality will be monitored regularly.					
Water Quality (Hazardous Materials) - Hazardous materials that may be used in the construction work: • Paints and solvents	- All fuel and hazardous material storage will be adequately bonded to prevent any spillage problem - Only minimal chemicals, hazardous substances and fuel will be stored on site works - Discharge of oil contaminated water into the environment is prohibited.	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

• Petroleum products such as oils, fuels and grease • Concrete curing and repair compounds and • Contaminated waste material. - There is potential for hazardous materials to be released to the environment, particularly during storage and handling and equipment/vehicle maintenance.						
Biodiversity (Flora and Fauna) - Loss of natural and modified habitat due to vegetation clearing	- Follow the law and rules against logging outside the approve construction areas and against wildlife hunting and poaching will be imposed on project staff, workers and all contractors and personnel engaged in or associated with the Project, with penalties levied for anyone caught carrying and using animal snares and traps, including fines and dismissal and prosecution under the Forest Law, 1992 and Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law 1994. - The CNHC shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning these restrictions as well as the punishment that can expected if any staff or workers or other person associated with the	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

	Project violate rules and regulations. - The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing; - Disturbed areas shall be rehabilitated as soon as possible following construction activities. - Contact Forest Department regarding damage to trees and vegetation along transmission line alignment - Where possible re-vegetate and landscape after construction completed. Consult ECD/ MONREC to determine the most successful restoration strategy and techniques. - Construction vehicles and machinery will be maintained in accordance with industry standard to minimize unnecessary noise generation. - Commitment will be made to raise awareness of values of natural habitat areas to construction work force and make arrangements for restriction of poaching, especially for bird. - Leaving ground vegetation and shrub within RoW unless disturbance to access. - Carrying out all vegetation clearance in consultation with Department of Forest.					

	- Disposing of chopped trees in accordance with guidance of Department of Forest. - Prohibiting forest extraction by contractor employees. - Prohibit using herbicide for clearing vegetation. - Hunting wild animals will be strictly prohibited to apply all staff. - In areas with concentrations of vulnerable bird species, the top (grounding) wire should be made more visible with plastic devices. Electrocution (mainly of large birds of prey) should be avoided through bird-friendly tower design.					
- Impacts to threatened species	- General biodiversity measures contribute to the conservation of threatened species. In addition: - If threatened flora species are identified within the Project Area (RoW), these will be specifically managed within the Biodiversity Action Plan and replanting or propagation may be appropriate. - The training and awareness program will highlight the threatened species with potential to occur in the Project Area (RoW) to further discourage hunting.	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU
- Dust emissions from exposed soils, transport of materials and increased traffic. - Dust generation from piling activities in specific river crossing sites	- Sprinkling of water on dust generating areas; - Restricting the speed limits of vehicles during movement on unpaved roads; and - Covering of vehicles carrying loose soil/construction material.	Tower sites and river crossing sites	During excavation of pile foundation		Construction Contractor	HSE Division of CNHC/PMU

	- Applying preventive maintenance system - Checking vehicle and equipment inspection daily - Stopping dust generating activities in high wind - Applying good site practice and house keeping - Turning off the engine while not in use - Optimizing construction schedule to minimize time that vehicles are in operation - Covering load-carrying platform properly when carrying earth/sand					
- Increased noise and vibration levels may disturb local residents and fauna, and can present a risk to personnel.	- All noise and vibration generating construction equipment shall be operated with appropriate sound dampening equipment. - Construction equipment and vehicles will be subjected to regular inspections to check noise emissions and noise control equipment. - Stationary noise sources will be positioned to avoid impacts to sensitive receptors. - Hearing protection will be made available for all construction personnel and required for personnel working in areas with noise above 80dB. - The contractor will maintain communication with any schools within 3 km of the Project area, and will avoid high noise activities during school hours.	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

- Community health and safety hazards	- Commit to meet Electricity Law and other Myanmar regulation requirements as well as international conventions on labour, especially on issues of child and forced labour, working conditions, collective bargaining, non-discrimination and equal opportunity, complaint and grievance mechanism as well as occupation health and safety. - No damage shall be caused to any crops unless both the landowner and the Supervisor, prior to the work commencing, agree upon the extent of the intended damage. - Provision of barricades around site where construction works are to be undertaken. - Disturbed areas must be restored to original condition after construction completed. - There shall be no littering of the ground. The Contractor shall provide suitable containers for construction debris, solid wastes and hazardous wastes. - No fires shall be allowed on site under any circumstances. - Proper fencing, protective barriers, and buffer zones should be provided around all tower construction areas. - Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all construction sites along transmission lines.	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

	- Speed limits suitable for the size and type of construction vehicles, and current traffic patterns should be developed, posted, and enforced on all roads used by construction vehicles.					
Occupational Health and Safety (Accident and Injury) - Potential for accident and injury during construction. - Accident and injury while working - Spread of transmissible diseases among workers and - Contraction of disease due to poor sanitation and environmental conditions in work and accommodation areas.	- Health Awareness Training will be mandatory for all personnel and will address both on-the-job safety and health awareness - HIV/AIDS education should be given to workers. - The Contractor shall provide (Personal Protective Equipment) to all staff and labor engaged in the works. - The Contractor will provide and maintain first-aid supplies and equipment at the Contractor's site office. At work sites where 100 persons are engaged in the works, the Contractor will at all times assign a person qualified in first-aid with access to appropriate first-aid equipment. - Clean drinking water will be provided to all camps and work areas - Use of fall protection measures - Provide portable toilets and garbage cans at work sites. Under no circumstances shall disposal of domestic sewage on grassland and surrounding premises be permitted. - First aid kits will be readily accessible by workers and first	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

	Provide portable toilets and garbage cans at work sites. Under no circumstances shall disposal of domestic sewage on grassland and surrounding premises be permitted. - First aid teams will be specifically trained and assigned in groups of two to three persons to the different sites and - Vector control of mosquitoes and other pests will be managed including by minimizing mosquito breeding habitat and providing mosquito nets and other barriers.					
Cultural Impacts - Temporary migration of workers may influence local cultural and create social tension.	- The contractor will consult with local authorities to learn of any traditional practices and rules that need to be followed and to coordinate in the enforcement of laws and regulations - A code of conduct will be established and enforced to reduce the potential for conflict between local residents and migrant workers. - Any entertainment venues or recreational facilities in the vicinity of the Project shall be operated strictly according to the local village values and traditions and - Local employment will be prioritized.	Applicable to all personnel while at worker camp and in villages	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU
Traffic and Transport - Hazards associated with the traffic movement in working areas during construction phase leading	- Avoid using community /village roads for project activities. Alternative roads should be constructed and used. All access	The construction sites near the highway road and villages network	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

to property/equipment damage and injury to workers or nearby villagers.	roads have to be fully restored after use. - Transportation schedules will be arranged to avoid peak hours of road usage. - Traffic signs will be installed for main roads throughout construction areas. - Relevant traffic regulations will be implemented throughout construction areas. - In cases where heavy loads are required to be transported, some segments of roads and bridges may be reinforced to withstand the load. - In the event that stringing conductors present a possible risk to traffic temporary barriers (such as bamboo scaffolds) will be constructed across the roads and rivers to protect the public and property.	road including substation				
Potential Hazards - Physical injury can result from workers slipping along the slopes; road accidents, accident to workers during erecting of towers and other occupational hazards. - Stringing activity around low tension/ high tension wires and other electrical units can be a potential hazard if proper planning is not followed. Workers at times are not accustomed to use of	- The staff of contractors involved in the construction activities will be trained about the mandatory precaution and safety practices prior to commencement of construction activity. - All required Personal Protection Equipment will be used by the workers at site and their use will be supervised. Safety harness will be ensured for workers while erection of tower. - Vehicle movements to follow the traffic norms and maintain a safe speed while moving through the hilly tracts.	All construction sites including substation	Throughout the construction phase		Construction Contractor	HSE Division of CNHC/PMU

Personal Protection Equipment, their attitude to avoid PPE may result in accident/hazard.	- Stringing activities near low tension wires/high tension wires and other electrical utilities will be done after proper shutdown of the line/utilities with prior information and permission. - All excavation activities will be conducted in supervision of the site contractor with prior information to the nearby inhabitants. Proper signage will be provided in places where excavated pits are close to road or hilly tracts. - The design of the towers will adhere to the Proper Standards, which will ensure sufficient safety margins to reduce the risk from wind and seismic activities. Extreme weather conditions could affect the transmission line though the very high wind speed is rare. Hence the risk of natural impacts is low.					
Operation Phase						
Biodiversity - The RoW may interrupt the continuity of forest habitat (mostly degraded deciduous forest), as vegetation heights will be limited to below 3 meter, however the maintenance of vegetation in the understorey and midstorey is likely to continue to allow arboreal species to move through the landscape.	- Within the RoW, vegetation trimming will be restricted to that required to safely operate the transmission line. - Groundcover and midstorey vegetation will be retained wherever practicable. - Vegetation management will be made to raise awareness of values of natural habitat areas to personnel work force and arrangements will be made for restriction of poaching and forest product collection.	Transmission line RoW	Throughout maintenance period	Part of operations cost	Maintenance contractor	PMU

- Disturbance and displacement of resident fauna due to noise as a result of electricity transmission and noise and light as a result of maintenance activities - During operation, mortality of avifauna (birds and bats) may occur due to collision with the transmission line and electrocution. - Avian collisions could occur in large numbers if lines are located in daily flyers, or if avifauna are travelling during low light conditions.	- Commitment will be made to raise awareness of values of natural habitat areas to personnel work force and arrangements will be made for restriction of poaching and forest product collection. - Hunting wild animal will be strictly prohibited and - Transmission line will be designed to minimize risk of electrocution, including maintain a 1.5 meter spacing between energized components and grounded hardware, or covering energized parts.					
Air Quality - The emission of ozone from transmission lines when in active corona, however ozone emitted from transmission lines not known to carry any health risk and - Air pollution due to burning of vegetation for RoW management. - Green House Gas emissions from the transmission line operation will be limited to fuel consumption in vehicle used for the maintenance activities.	- Vegetation will not be burnt for maintenance. - Mechanical method will be used to trim tall and encroaching vegetation.	Transmission line RoW	Throughout operation period	Part of operations cost	Maintenance contractor	PMU

- Noise pollution from transmission lines may disturb local residents and fauna	- Conductors designed and constructed to minimize corona effects will be chosen for transmission.	Transmission line within 1 km of natural habitat or villages.	Prior to operation	Part of operations cost	CNHC/ Contractor	PMU
Community health and safety - Community will have concerns about its safety and possibility of any accidents like electrocution, skin diseases etc. - Electrocution due to contact with high voltage electricity or items in contact with high voltage electricity (such as tools, vehicles or ladders).	- Evaluate possible risks and ensure that these are addressed and minimized. - Communicate about the technical aspects of the transmission line construction and operations, and allay fears about accidents or any other health concerns. - Use simple diagrams and pamphlets in local language for this purpose. - Train land owners about safety issues and action to be taken in case of risks. - Demonstrate that MOEE and its contractors are very concerned about health and safety of workers as well as the community. - Signs and barriers will be installed to prevent access to high voltage areas. - Grounding conducting objects will be installed near transmission lines. - Provision of safety and danger warning signs. - Conduct regular inspections of the line to help identify missing or corroded parts.	Transmission line RoW	During the Maintenance	Part of operations cost	PMU	EA
Occupational Health and Safety - Exposure to EMF at levels higher than those	- An EMF safety program will be developed prior to operation which: identifies potential levels of exposure; provides training for all workers; delineates zones	Transmission line RoW	During the Maintenance	Part of operations cost	PMU	EA

experienced by the general public. - Electrocution due to contact with high voltage electricity or items in contact with high voltage electricity (such as tools, vehicles or ladders). - Working at height on towers.	appropriate for public access and those restricted to appropriately trained workers; defines measures to limit exposure time, such as through work rotation; and provides personal monitoring equipment for workers. - Ensure compliance of safe practices and implementation of safety manual - Provide and ensure use of personal protective equipment (PPEs) like, safety goggles, gloves, safety harness, helmets, gumboots etc. - Securing the workplace, wherein all lines are shut down prior to maintenance work, use of PPE and procedures for emergencies and compensation procedures in case of accidents. - Prior training of the workers regarding health and safety procedures is essential. - Transmission lines will be deactivated and grounded prior to work on, or near, transmission lines. - Live work will only be conducted by trained workers. - Fall protection measures will be implemented including provision of appropriate fall protection equipment, training in use of equipment, training in climbing techniques, and rescue of fall-arrested workers. - - All equipment, including hoisting equipment, power tools and tool					

	bags, will be properly rated and maintained.					

7.4 Environmental Monitoring

Successful implementation of Environmental Monitoring Plan depends on regular monitoring, documenting and reporting. The HSE Division of CNHC will oversee the implementation of the environmental monitoring program. The HSE Division will be responsible for the sampling of any environmental parameters that must be analyzed in a laboratory in coordination with the PMU and contractor.

After construction is completed, the potential impacts of the operation of the 230 kV transmission lines and the substations will be monitored by PMU and EA (DEPP), MOEE.

The initial monitoring program based on the impacts and mitigation measures defined in this IEE is provided in Table 7.4-1. Monitoring in the construction period can be categorized in the following:

- At Contractor level, monitoring to ensure on a day to day basis that mitigation measures are fully implemented with construction activities, and that results observed comply with the contractual obligations.
- The routine inspections to ensure that monitoring results provided by the HSE Division are corrected, to provide the necessary environmental coordination and interface with the Contractors, and to provide a comprehensive picture of the current environmental situation and efforts at site level.

7.4.1 Monitoring and Inspection

The HSE Division will employ suitably qualified inspectors, who will conduct routine inspections to evaluate compliance with commitments defined in the Construction Contractor's EMMP-CP.

Results of field observations, including documenting compliance or noncompliance, will be reported on standard forms to enable observations to be recorded in a consistent manner. The information can be entered into the database that will be used to track the status of and allow analysis of noncompliance situations.

Monitoring activities will include verification of implementation of mitigation measures defined in the EMMP, as well as water quality, air quality, noise and vibration and biological monitoring. For ambient air, noise and water quality, sampling and analysis shall be carried out relying on certified equipment and/or laboratory.

The PMU will visit and inspect each of the construction sites at the frequency defined in the monitoring plan below.

Information collected during each visit will be reported on a standard form, which provides a checklist of issues to control, depending on the degree of compliance or non-compliance observed.

7.4.2 Performance Monitoring

Performance monitoring is required to assess the overall performance of the EMP. A performance monitoring system is normally developed by the EA for the entire project. Selected indicators of major components of the environment that will be affected primarily by the construction phase are drawn from the mitigation and monitoring plans and summarized in Table 7.4-1.

7.4.3 Reporting

Regular reporting on the implementation of mitigation measures, and on monitoring activities during construction phase of the project is required. A report on environmental monitoring and implementation of EMP will be prepared semi-annually for the EA by the PMU with assistance of the HSE Division of CNHC. The report will compile monthly reports provided by the contractor and findings of the HSE's monitoring.

The reports will table all indicators measured with the monitoring plans including performance monitoring indicators (Table 7.4-1), and will include relevant environmental quality standards. A semi-annual report on the environment monitoring of the project must be prepared and submitted to the ECD by the EA.

Table 7.4-1 Performance monitoring environmental indicators

Major Environmental Component	**Key Indicator**	**Performance Objective**	**Data Source**
Pre-construction Phase			
Public Consultation and Disclosure	Affected public and stakeholders	Meetings with public stakeholders contacted during IEE and new stakeholders convened for follow-up consultation and to introduce grievance mechanism	Minutes of meeting and participants list
CEMP	Requirements of EMP (CEMP)	EMP appended to bidding documents with clear instructions to bidders for CEMP	Bidding documents
Training of PMU	Training course(s) and schedule	By end of pre-construction phase, required course(s) that will be delivered are designed and scheduled	Course(s) outline, participants, and schedule
Construction Phase			
Air Quality	PM10,CO,NO_2, SO_2	Levels never exceed pre-construction baseline levels	EMC and contractor monitoring reports
Noise	dBA	Levels never exceed pre-construction baseline levels	EMC and contractor monitoring reports
Water quality of Ayeyarwady River	TSS, DO, BOD, oil and grease	Levels never exceed pre-construction baseline levels	EMC and contractor monitoring reports
Soil and wastewater management	Solid and liquid waste	Rigorous program of procedures and rules to collect and store all waste from construction sites practiced.	Contractor and EMC monitoring reports
Hazardous materials and waste	Oil, gasoline, grease	Rigorous program of procedures to manage and store all waste from construction camps and sites practiced.	Contractor and EMC monitoring reports
Public and worker safety	Frequency of injuries	Adherence to occupational health and safety regulations (IFC EHS Guideline)	Contractor reports
Traffic	Frequency of disruptions and blocked roadways	Disruptions, stoppages, or detours are managed to absolute minimum.	Public input, contractor reports, EMC reports
Operation Phase of Transmission Lines and Substations			
Worker and Public Safety	Frequency of accidents and spills	No increase in pre - construction frequency	EA
Electromagnetic field	EMF	EMF levels are below ICNIRP and NEQEG exposure limits:	EMF meter readings

Table 7.4-2 Environmental Monitoring Program

Environmental Aspect/Area to be concerned	Mitigation measures	Monitoring method	Monitoring frequency	Institutional Responsibility		Location
				Implementing Unit	Monitoring Unit	
Construction Phase						
Capacity of personnel	Provision of training and education	Review, training, register to verify mandatory training has been attended.	Monthly	Mitigation measures implemented by Contractor	HSE Division	Human Resources Office
Air Quality	Daily monitoring of dust levels	Visual assessment of dust level and implementation of further dust suppression	Daily	Mitigation measures implemented by Contractor	HSE Division	All cleared/exposed work areas.
Air Quality	Dust suppression, including restricting vehicle movement to designated access routes; covering all loads; watering exposed surfaces during windy conditions; vehicle speed limits; cleaning of vehicles;	Visual verification that mitigation measures are implemented.	Weekly	Contractor	HSE Division	All cleared/exposed work areas.
Air Quality	Vehicles switched off when stopped. PPE for emission protection provided to all workers working in activities generating emissions.	Verification of sample of vehicles and work areas.	Weekly	Contractor	HSE Division	Throughout construction areas
Air quality and Noise and Vibration	Regular maintenance of vehicles and equipment	Review of vehicle and equipment log books to verify maintenance	Quarterly	Contractor	HSE Division	Throughout construction areas
Noise and vibration	High noise activities carried out between 6am and 7pm, and not during schools days.	Verify monthly based on daily reports.	Monthly	Contractor	HSE Division	Throughout construction areas
Water Quality	- Undertake clearing and earthworks in dry season.	- Verification of construction schedule.	Monthly	Contractor	HSE Division	Water quality monitoring locations (to be

	- Minimize period of soil exposure. - Stockpile management measures, including stabilization, drainage, righting and sediment traps. - Water quality monitoring	- Verification of construction schedule. - Visual verification of stockpile - stabilization, distance from watercourses and drainage paths and installation of sediment traps. Measurement of parameters are same as baseline data collection				defined before construction phase)
Water Quality	Appropriate location of stockpile materials.	Visual verification.	Weekly	Contractor	HSE Division	All construction area
Terrestrial Biodiversity	- Vegetation clearing areas clearly marked. - Microhabitat features relocated. - Weed and pest management measures.	- Visual verification of demarcation of clearing areas, and restriction of clearing to within defined area. - Visual verification of relocation of microhabitat features, and implementation of weed and pest management measures.	Weekly	Contractor	HSE Division	All construction area
Terrestrial Biodiversity	Delivery of training and awareness.	Discussion with sample of personnel to determine level of understanding of biodiversity values and management measures.	Monthly	Contractor	HSE Division	All construction area
Economy and Livelihoods	Employment of local people.	Verification of the number of local people employed, and identification of additional local employment opportunities.	Quarterly	Contractor	HSE Division	NA
Community Health and Safety (Disease)	- Delivery of public health campaign. - Provision of mosquito nets, latrines and malaria treatment programs.	Review of implementation of public health program	Monthly	HSE Division	PMU	Villages
Occupational Health and Safety (Accident and Injury)	A Health and Safety program will be developed and implemented which includes an initial safety induction for all employees, on-going safety	Verify implementation of Health and Safety program.	Monthly	HSE Division	PMU	All construction area

	awareness and an incident reporting system.					
Occupational Health and Safety (Accident and Injury)	First aid kits will be readily accessible by workers and trained first aid teams will be assigned to work sites.	Visual verification of availability of first aid kits.	Monthly	HSE Division	PMU	All construction area
Occupational Health and safety (Disease)	Clean drinking water will be provided.	Monitor drinking water quality.	Monthly	HSE Division	PMU	Worker Camps
Occupational Health and safety (Disease)	Education and awareness programs will be provided addressing disease prevention and treatment.	Verification of delivery of education and awareness program.	Monthly	HSE Division	PMU	Worker Camps
Culture and Customs	Code of conduct will be established and enforced to reduce the potential for conflict between local residents and migrant workers.	Supervisors to monitor employee behavior throughout construction period.	Ongoing	Contractor	HSE Division	All construction area
Traffic and access	Abide by traffic rules; appropriate road barriers applied to separate public traffic from construction areas.	Visual verification of driver behavior and road safety devices.	Monthly	Contractor	HSE Division	All construction area
Operation Phase						
Biodiversity	Re-vegetation after completion of construction using locally native species.	Visual verification of tower sites following construction.	Once, or weekly Until achieved, at each tower site following construction.	DPTSC	PMU/EA	Tower sites
Biodiversity	- Vegetation trimming will be restricted to that required to safely operate the transmission line. - Use of herbicides minimized. - Speed limits of 40 km/hr enforced.	Verify that mechanical and manual methods of vegetation management are being utilized where practicable, and that vegetation trimming is minimized.	At each vegetation management event.	DPTSC	PMU/EA	RoW

Community Health and Safety	Management of vegetation to limit fire risk.	Visual verification that: - Vegetation is not encroaching - RoW and does not exceed 4.5 m - height; - Fuel breaks are maintained; - Vegetative debris is disposed of in a location/manner that does not increase fire risk.	Quarterly	DPTSC	PMU/EA	RoW
Community Health and Safety	- Signs and barriers will be installed to prevent access to high voltage areas. - Grounding conducting objects will be installed near transmission lines.	Visual verification of installation of signs and barriers, and grounding conducting objects.	Quarterly	DPTSC	PMU/EA	RoW

Table 7.4-3 Performance Indicator Environmental Monitoring Program

Environmental Indicators	**Location**	**Method of Monitoring**	**Monitoring frequency**	**Institutional Responsibility**		Cost (USD)
				Implementing Unit	**Monitoring Unit**	
Public consultation meeting	Waingmaw, Myitkyina, Mogaung, Mohnyin and Indaw Township	Presentation, Minutes of meeting, and participants list	One time	HSE Division	PMU	1,000.00
Air Quality (PM10, CO, NO_2, SO_2)	1. Waingmaw Substation, 2. Primary school compound, Sanka village 3. Primary school compound, Mayan village 4. Monastry compound, Mawlu village	Using field and analytical methods approved by MONREC	24 hours continuous monitoring (Biannually)	HSE Division	PMU	3,500.00
Noise Level (dBA)	1. Waingmaw Substation, 2. Primary school compound, Sanka village 3. Primary school compound, Mayan village	Using field and analytical methods approved by MONREC	24 hours continuous monitoring (Biannually)	HSE Division	PMU	1,600.00

	4. Monastry compound, Mawlu village					
Water quality: DO, BOD, TSS, oil/grease	1. Ayeyarwady River crossing point	Using field and analytical methods approved by MONREC	Annual	HSE Division	PMU	600.00
Construction sites: solid waste mgt, sanitation, health and safety, public complaints, incidence of worker or public accidents, EMP measures	All construction sites	Visual observation, regular reporting bycontractors/PIU, interviews	Monthly by HSE division and Bi-annual by PMU	HSE Division	PMU	300.00
Operation						
Incidence of worker or public accidents and injuries, or spills of hazardous materials	Transmission Line Route	Visual observation, regular reporting by PIU, interviews	Monthly	PMU	EA	Part of O & M cost
EMF levels	Sites where sensitive receptors are located within 5m from the alignment	Measurement of EMF levels	Monthly	PMU	EA	Part of O & M cost

7.4 Estimated cost for Environmental Monitoring

Implementation of environmental controls during construction is the responsibility of the construction contractor. The EMP costs are primarily for environmental monitoring because the costs for implementing impact mitigation measures are included with the construction costs in contractor bid documents. The environmental costs in Table 7.4-1 are for field sampling and laboratory analyses which include professional per diems of technicians.

Table 7.4-1 Estimated costs for Environmental Monitoring Plan of EMP

Project Phase	**Monitoring Item**	**Estimated Cost (USD)**	**Source of Fund**
Construction Phase	Training of PMU/EA/HSE on environment safeguards	**1,500.00**	CNHC
	Air quality (4 locations)	**3,500.00**	CNHC
	Noise level (4 locations)	**1,600.00**	CNHC
	Water quality (1 location)	**600.00**	CNHC
	Public consultation (Prior to construction work)	**6,000.00**	CNHC
	EMF meter (1 unit)	**1,000.00**	CNHC
Operation phase	EMF and safety clearance monitoring	No marginal cost	PMU/EA
Total cost		**13,200.00**	

6 Conclusion and Recommendation

The Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project construction is necessary to enable connection of northern Myanmar power grid to main grid via 230kV line, mitigate the power shortage in Myanmar, drive the local economic development, increase the people's living standards and meet the requirements of power distribution from Chipwi Nge Hydropower Station.

The extended Waingmaw substation, the new 132 kV line and 230kV line passes through Kachin State and Sagaing Region in Myanmar.

This IEE report identified risks to the environment and local communities, including impacts to biodiversity, water quality, traffic and community health and safety. Management actions outlined in this document will be refined and developed further into the appropriate Environmental Management Plan documentation that will be implemented to avoid and minimize the identified impacts.

The evaluation of the present power transmission project indicates that potential environmental impacts are restricted to the construction phase of the new 230 kV and 132 kV transmission lines and substation. The common construction-related disturbances such as elevated dust and noise levels, traffic disruptions, solid and liquid construction waste, soil erosion and sedimentation of the river and streams, and public and worker safety can be managed effectively with standard construction practices.

The proposed transmission line and substation project has been categorized as a Category B project (as per the IFC criteria: Category B - Applies to projects with potential limited adverse social or environmental impacts that are few in number, generally site- specific, largely reversible and readily addressed through mitigation measures;) due to the following reasons:

- The transmission line project is a linear project that runs for about 240km requiring land as “right of way” of about 25m either side of the center of the proposed transmission line;
- The Project during operation phase will have low potential of pollution;
- The Project will have some adverse social and environmental impacts; however, they are few in number, restricted to the corridors of right of way;
- Impacts caused during construction phase are mostly reversible except that of revenue and forest lands that are taken as right of way for the transmission line.

Recommendations

The total number of residential and farmland houses to be affected which located in the convenient transportation area and near river area shall be identified before construction phase to determine requirements of house owner for relocation.

Follow-up public consultation meeting shall be carried out organized by MOEE/DPTSC and project developer (CNHC) before commencement of construction of transmission lines to present the detailed line route, potential impacts and losses and proposed mitigation measures and management plan.

If there are changes to the project locations and scope which would significantly affect the outcome of the project, the updated IEE and EMP will be prepared again to check whether additional mitigation plans and corrective action plans are necessary to meet the final detailed designs of the 230 kV and 132 kV lines. During the implementation of the project, semi-annual

environmental monitoring reports will be submitted by MOEE to ECD to validate implementation of the measures outlined in the EMP.

Appendix 1

Approval Letter of Project Proposal

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပြည်ထောင်စုဝန်ကြီးရုံး

စာအမှတ် (သစ်တော) ၃(၂)/၁၆(ဃ)(ပုဇွန္ဒ /၂၀၁၉)
ရက်စွဲ ၂၀၁၉ ခုနှစ် ၊ ဇူလိုင်လ ၈ ရက်

သို့

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန

အကြောင်းအရာ။ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံမှ ဝိုင်းမော်-နဘားသို့ ၂၃၀ ကေဗွီ ဓာတ်အားလိုင်း တည်ဆောက်နိုင်ရန်အတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (Initial Environmental Examination – IEE) ဆောင်ရွက်ခွင့်ပြုပါရန် တင်ပြခြင်းကိစ္စ

ရည်ညွှန်းချက် ။ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၏ ၉-၅-၂၀၁၉ ရက်စွဲပါစာအမှတ်၊ MOEE-၂/ (၁၀)/ (က)/ (ချီဖွေငယ်)/ (၇၁၅၃)/၂၀၁၉

၁။ ချီဖွယ်ငယ်ရေးအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံမှ ၂၃၀ ကေဗွီ (ဝိုင်းမော်-နဘား) ဓာတ်အားလိုင်း ၂၄၀ ကီလိုမီတာနှင့် ၁၃၂ ကေဗွီ (ချီဖွေငယ်-ဝိုင်းမော်) ဓာတ်အားလိုင်း ၁၆.၇ ကီလိုမီတာတည်ဆောက်ခြင်းလုပ်ငန်းများကို ဆောင်ရွက်နိုင်ရန်အတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (Initial Environmental Examination-IEE) လုပ်ငန်းအား Resources & Environmental Myanmar Co., Ltd ဖြင့် ဆောင်ရွက်ခွင့်ပြုပါရန် ရည်ညွှန်းစာဖြင့် ညှိနှိုင်းထားရှိပါသည်။

၂။ အဆိုပါကိစ္စနှင့်ပတ်သက်၍ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနမှ စိစစ်ရာ ပေးပို့လာသော အဆိုပြုစီမံကိန်းတွင် ၁၃၂ ကေဗွီ ဝိုင်းမော်ဓာတ်အားခွဲရုံအား ၂၃၀ ကေဗွီ ဓာတ်အားခွဲရုံသို့ အဆင့်မြှင့်တင်ခြင်း၊ ၁၂၅ ကေဗွီအေ ထရန်စဖော်မာ (၂) လုံးအား တိုးချဲ့တပ်ဆင်ခြင်း၊ ၂၄၀ ကီလိုမီတာ ရှည်လျားသော ၂၃၀ ကေဗွီ (ဝိုင်းမော်-နဘား) ဓာတ်အားလိုင်းသွယ်တန်းခြင်းနှင့် ၁၆.၇ ကီလိုမီတာ ရှည်လျားသော ၁၃၂ ကေဗွီ (ချီဖွေငယ်-ဝိုင်းမော်) ဓာတ်အားလိုင်းသွယ်တန်းခြင်း စသည့် လုပ်ငန်းများ ပါဝင်မည်ဖြစ်ကြောင်း တွေ့ရှိရပါသည်။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း နောက်ဆက်တွဲ (က) ဆန်းစစ်ခြင်းဆောင်ရွက်ရန် လိုအပ်သည့် စီမံကိန်းလုပ်ငန်းအမျိုးအစားများ သတ်မှတ်ချက် ဇယားအမှတ်စဉ် (၂၆) အရ ၁၃၅ ကေဗွီနှင့်အထက်၊ ၂၃၀ ကေဗွီအောက် လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်းအတွက် ၅၀ ကီလိုမီတာနှင့်အထက်ကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ပြုလုပ်ရမည်ဟုလည်းကောင်း၊ အမှတ်စဉ် (၂၇) အရ ၂၃၀ ကေဗွီနှင့်အထက် လျှပ်စစ်ဓာတ်အားလိုင်း (မဟာဓာတ်အားလိုင်း) သွယ်တန်းခြင်းလုပ်ငန်းအတွက် အရွယ်အစားအားလုံးကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ပြုလုပ်ရမည်ဟုလည်းကောင်း၊ အမှတ် (၂၈) တွင် ဗို့အားမြင့် ၂၃၀

ကေဗွီနှင့် ၅၀၀ ကေဗွီဓာတ်အားခွဲရုံ တည်ဆောက်ခြင်းလုပ်ငန်းအတွက် ၄ ဟတ်တာနှင့်အထက် ကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ပြုလုပ်ရမည်ဟုလည်းကောင်း ဖော်ပြပါရှိပါသည်။

၄။ သို့ဖြစ်ပါ၍ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံမှ ထွက်ရှိလာသော ဓာတ်အား များကို မဟာဓာတ်အားလိုင်းသို့ ပို့ဆောင်သွယ်တန်းနိုင်ရန် ၂၄၀ ကီလိုမီတာ ရှည်လျားသော ၂၃၀ ကေဗွီ (ဝိုင်းမော်-နဘား) ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်း၊ ၁၆.၇ ကီလိုမီတာရှည်လျားသော ၁၃၂ ကေဗွီ (ချီဖွေငယ်-ဝိုင်းမော်) ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်း ၁၃၂ ကေဗွီ ဝိုင်းမော် ဓာတ်အားခွဲရုံအား ၂၃၀ ကေဗွီဓာတ်အားခွဲရုံသို့ အဆင့်မြှင့်တင်ခြင်းနှင့် ၁၂၅ ကေဗွီ အေထရန် စဖော်မာ(၂)လုံးအားတိုးချဲ့တပ်ဆင်ခြင်းလုပ်ငန်းများအတွက် အောက်ဖော်ပြပါအတိုင်း ဆောင်ရွက် ရန်လိုအပ်ကြောင်း ပြန်ကြားအပ်ပါသည်-

(က) ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနောက်ဆက်တွဲ(က) ၊ အမှတ်စဉ် (၂၇) အရ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (Initial Environmental Examination-IEE)ကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ် ၃၅၊ ၃၆ နှင့်အညီ ရေးဆွဲပြုစု၍ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြအတည်ပြုချက်ရယူရန်၊

(ခ) ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာ ရေးသားပြုစုမည့် Resources & Environmental Myanmar Co., Ltd သည် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ်ရရှိထားပြီးဖြစ်ပါ၍ ကန့်ကွက်ရန်မရှိ ပါကြောင်းနှင့် အဆိုပါကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ဆောင်ရွက်မည့်တတိယ အဖွဲ့အစည်းတွင် Air Pollution Control ၊ Noise and Vibration နှင့် Land Use ဆိုင်ရာ ကျွမ်းကျင်ပညာရှင်များကို ထပ်မံဖြည့်ဆည်းဆောင်ရွက်ရန်၊

(ဂ) ပြဋ္ဌာန်းထားသည့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ လုပ်ထုံး လုပ်နည်းညွှန်ကြားချက်များနှင့်အညီ လိုက်နာဆောင်ရွက်ရန်၊

(ဃ) သက်ဆိုင်ရာတိုင်းဒေသကြီး/ပြည်နယ်အစိုးရအဖွဲ့နှင့် ဒေသခံပြည်သူတို့၏ ဆန္ဒနှင့် သဘောထားရယူဆောင်ရွက်ရန်။

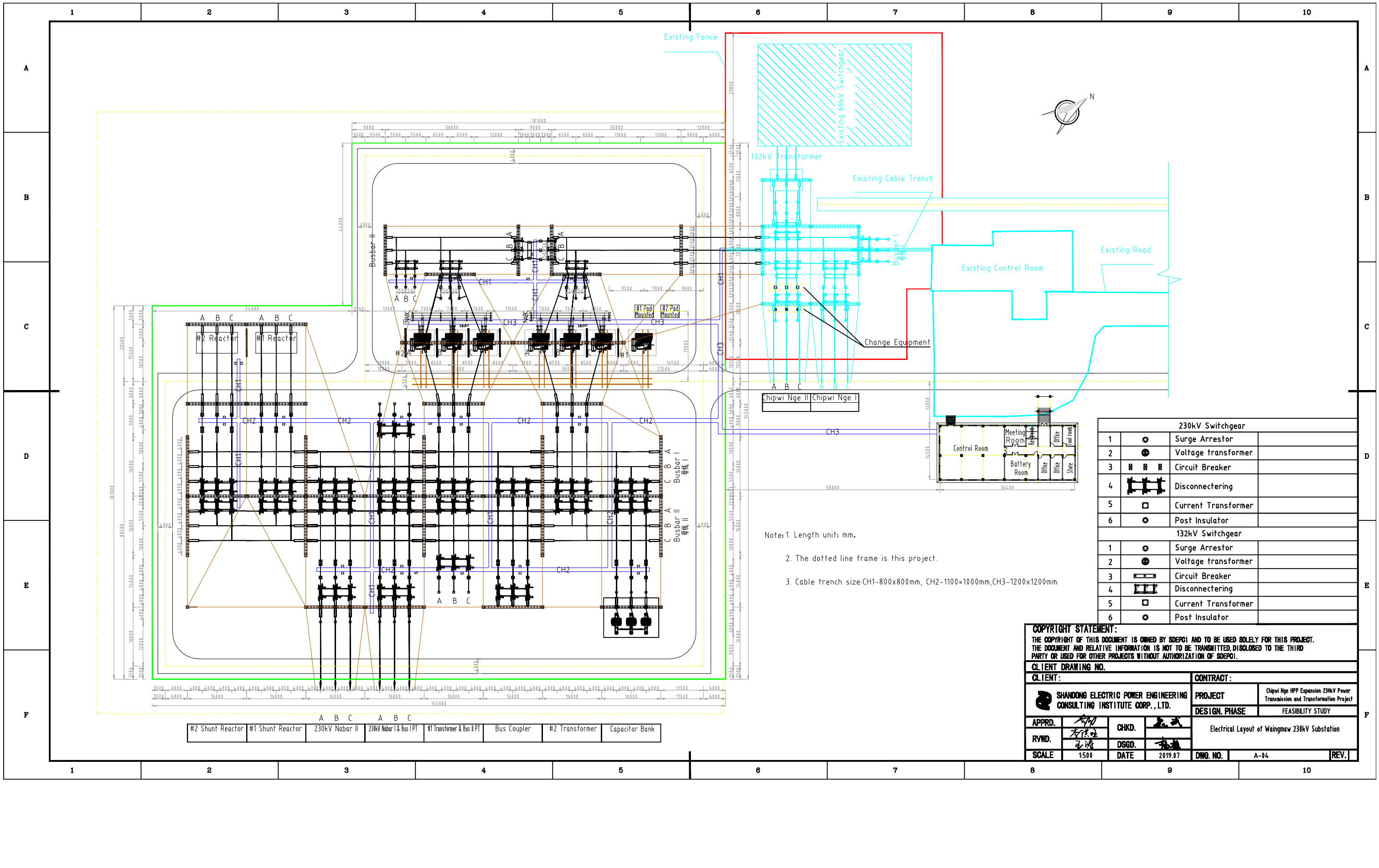
ပြည်ထောင်စုဝန်ကြီး(ကိုယ်စား)
(ကျော်ဇော၊ ဒုတိယအမြဲတမ်းအတွင်းဝန်)

မိတ္တူကို

ညွှန်ကြားရေးမှူးချုပ်
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

Appendix 2

Layout Plan of the Waingmaw Substation



Note: 1. Length unit: mm.

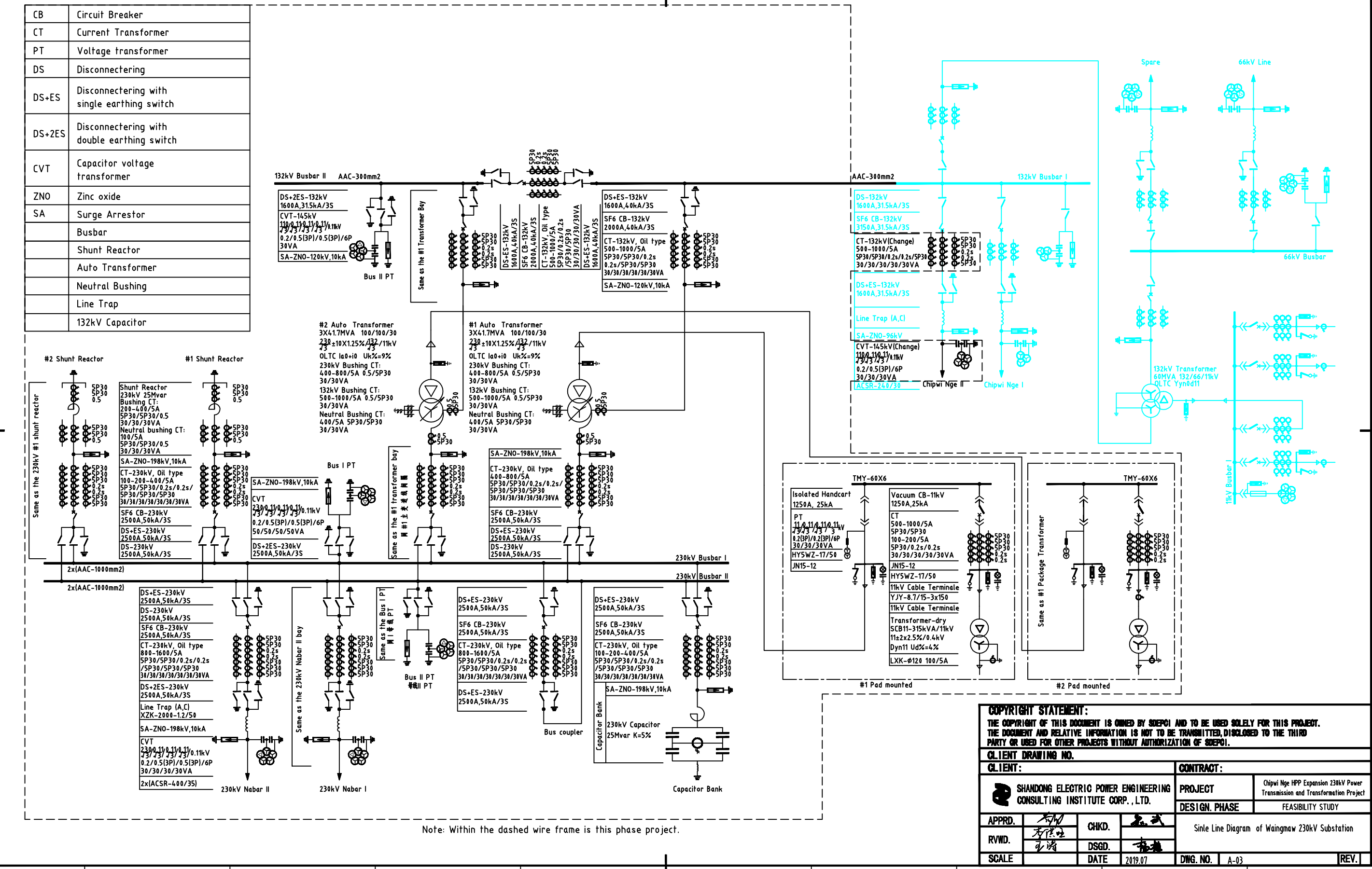
2. The dotted line frame is this project.

3. Cable trench size:CH1-800x800mm, CH2-1100×1000mm,CH3-1200x1200mm

230kV Switchgear			
1		Surge Arrestor	
2		Voltage transformer	
3		Circuit Breaker	
4		Disconnectering	
5		Current Transformer	
6		Post Insulator	
132kV Switchgear			
1		Surge Arrestor	
2		Voltage transformer	
3		Circuit Breaker	
4		Disconnectering	
5		Current Transformer	
6		Post Insulator	

CLIENT DRAWING NO.			
CLIENT:		CONTRACT:	
SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP., LTD.		PROJECT	Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project
		DESIGN. PHASE	FEASIBILITY STUDY
APPRD.		CHKD.	Electrical Layout of Waingmaw 230kV Substation
RVWD.		DSGD.	
SCALE	1:500	DATE	2019.07
		DWG. NO.	A-04
		REV.	

CB	Circuit Breaker
CT	Current Transformer
PT	Voltage transformer
DS	Disconnectering
DS+ES	Disconnectering with single earthing switch
DS+2ES	Disconnectering with double earthing switch
CVT	Capacitor voltage transformer
ZNO	Zinc oxide
SA	Surge Arrestor
	Busbar
	Shunt Reactor
	Auto Transformer
	Neutral Bushing
	Line Trap
	132kV Capacitor



Note: Within the dashed wire frame is this phase project.

CLIENT DRAWING NO.

CLIENT:

CONTRACT:

SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP., LTD.

PROJECT: Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project

DESIGN. PHASE: FEASIBILITY STUDY

APPRD.		CHKD.		Sinle Line Diagram of Waingmaw 230kV Substation
RVWD.		DSGD.		
SCALE		DATE	2019.07	DWG. NO. A-03 REV.

Appendix 3

Line Route

132kV WaShawng"T-point"-WaingMaw Line Route Map

Waing Maw 230kV Substaion

N

MaingNa

NaungTaLaw

Waingmaw

ThaGaYa

Lwe

MaDaing

WuYang

WaShawng

WaShawng"T-point"

As Built 132kV Line

132kV WaShawng"T-point"-WaingMaw Line

230kV Waingmaw-Nabar Line

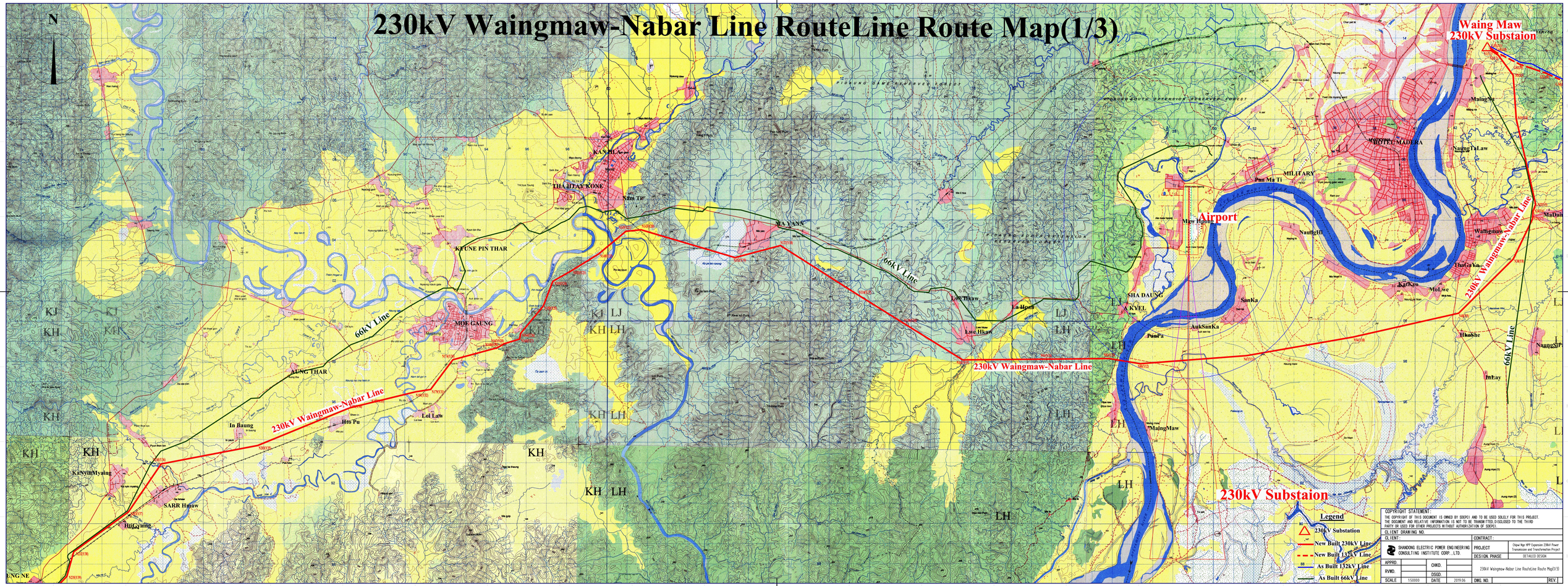
G45(J11) G44(J10) N1(Y1) N2(Y2) G41(J9) N3(Y3) G37(J8) G34(J7) G26(J6) N11(Y4) G22(J5) N23(Y5) N24(Y6) N25(Y7) N30(Y8) G9(J4) G4(J3) G2(J2) G1(J1)

Legend

- 230kV Substation
- New Built 230kV Line
- New Built 132kV Line
- As Built 132kV Line
- As Built 66kV Line

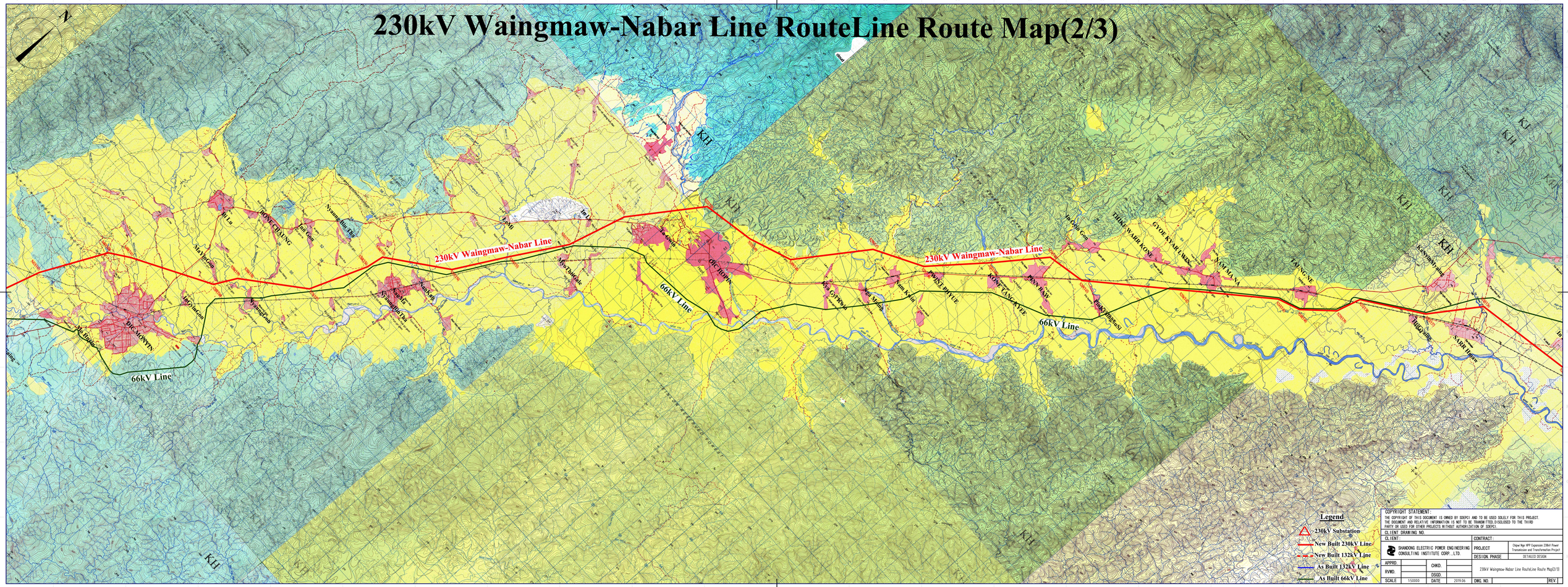
CLIENT DRAWING NO.					
CLIENT:				CONTRACT:	
SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP., LTD.				PROJECT	Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project
				DESIGN. PHASE	DETAILED DESIGN
APPRD.		CHKD.		132kV WaShawng"T-point"-WaingMaw Line Route Map	
RVWD.		DSGD.			
SCALE	1:50000	DATE	2019.06	DWG. NO.	REV.

230kV Waingmaw-Nabar Line RouteLine Route Map(1/3)



CLIENT DRAWING NO.		CONTRACT :	
CLIENT		PROJECT	Chipwi Myo HPP Expansion 230kV Power Transmission and Transformation Project
SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP. LTD.		DESIGN PHASE	DETAILED DESIGN
APPRD.		CHKD.	230kV Waingmaw-Nabar Line RouteLine Route Map(1/3)
RVWD.		DSGD.	
SCALE	150000	DATE	2019/06
		DWG. NO.	REV.

230kV Waingmaw-Nabar Line RouteLine Route Map(2/3)



Legend

- △ 230kV Substation
- 🟥 New Built 230kV Line
- - - New Built 132kV Line
- 🟦 As Built 132kV Line
- 🟩 As Built 66kV Line

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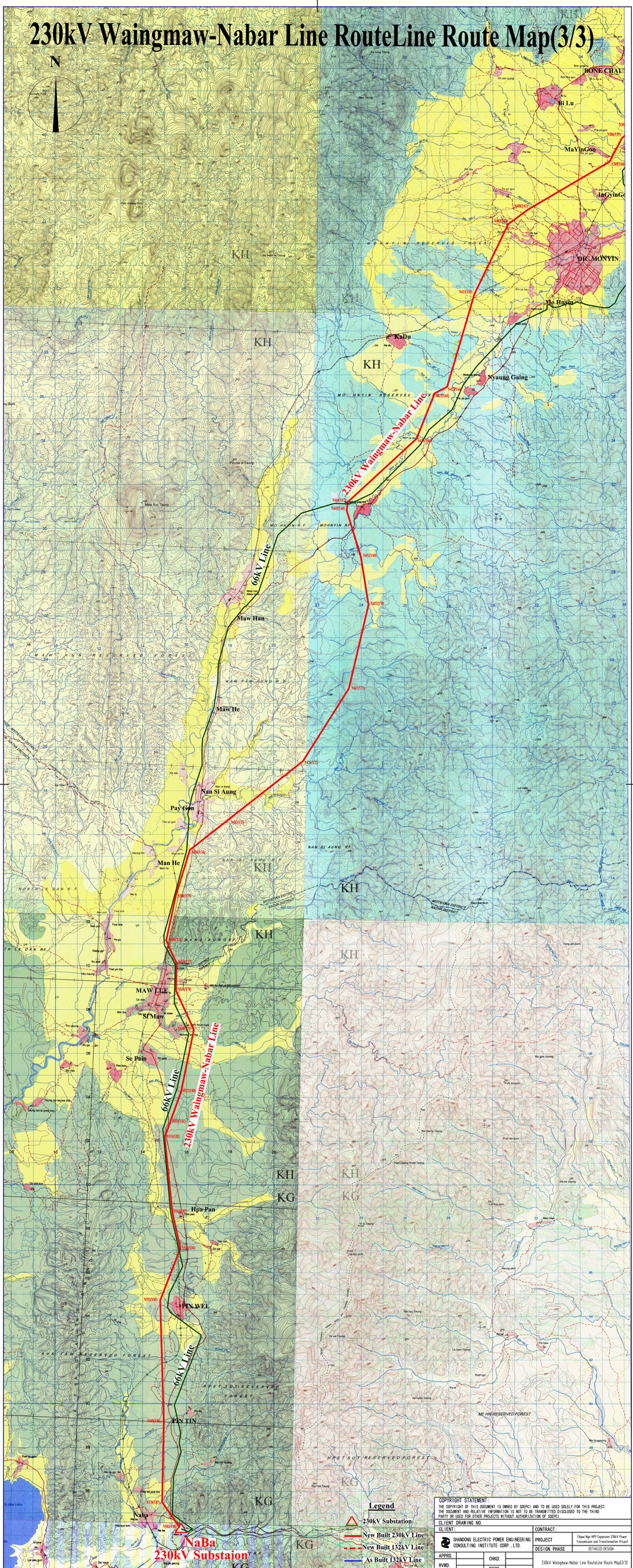
CLIENT DRAWING NO.					
CLIENT:				CONTRACT:	
SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP., LTD.				PROJECT	Chipwi Nge HPP Expansion 230kV Power Transmission and Transformation Project
				DESIGN. PHASE	DETAILED DESIGN
APPRD.		CHKD.		230kV Waingmaw-Nabar Line RouteLine Route Map(2/3)	
RVWD.					
		DSGD.			
SCALE	1:50000	DATE	2019.06	DWG. NO.	REV.

230kV Waingmaw-Nabar Line RouteLine Route Map(3/3)



Legend

- 230kV Substation
- New Built 230kV Line
- New Built 132kV Line
- As Built 132kV Line
- As Built 66kV Line

CLIENT DRAWING NO.	
CLIENT:	CONTRACT:
SHANDONG ELECTRIC POWER ENGINEERING CONSULTING INSTITUTE CORP., LTD.	PROJECT: Ongyi Nge HPP Expansion 230kV Power Transmission and Transformation Project
	DESIGN. PHASE: DETAILED DESIGN
APPRD. / CHKD. / RVWD. / DSGD.	230kV Waingmaw-Nabar Line RouteLine Route Map(3/3)
SCALE 150000 / DATE 2019.06	DWG. NO. / REV.

Appendix 4

Laboratory Results

REM-UAE LABORATORY AND CONSULTANT COMPANY LIMITED

REM-UAE Laboratory and Consultant Co., Ltd.
B702 Delta Plaza, Shwegondaing Road, Bahan, Yangon, 11201, Myanmar.
Tel. 959 7301 3448, 959 5144005, 959 5376382
www.rem-uaeconsultant.com E-mail: contact@rem-uaeconsultant.com

ANALYSIS REPORT

PROJECT : IEE FOR 230 AND 132 KV TRANSMISSION LINE PROJECT FROM WAINGMAW TO NABAR
CUSTOMER NAME : RESUORCE AND ENVIRONMENT MYANMAR CO.,LTD
ADDRESS : B-702, DELTA PLAZA, SHWEGONDAING ROAD, BAHAN TOWNSHIP, YANGON, MYANMAR
SAMPLING SOURCE : SW-1
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : JUNE 1, 2019
SAMPLING TIME : 13:50 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : RU
SUBMITTAL/ RECEIPT NO. : 3/6/2019
RECEIVED DATE : JUNE 6, 2019
ANALYSIS DATE : JUNE 6-26, 2019
ANALYSIS NO. : LAA201/2019
REPORT NO. : L00201/2019

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT SW-1 LAA201/2019	DETECTION LIMIT
BIOCHEMICAL OXYGEN DEMAND	mg/L	MEMBRANE ELECTRODE METHOD (SM : 5210 B AND 4500-O G)	ND	1.0
CHEMICAL OXYGEN DEMAND	mg/L	CLOSED REFLUX, TITRIMETRIC METHOD (SM : 5220 C)	28	25
TOTAL SUSPENDED SOLIDS	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105°C (SM : 2540 D)	51.4	5.0
TOTAL COLIFORM BACTERIA	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM : 9221 B)	13,000	18
OIL AND GREASE	mg/L	PARTITION-GRAVIMETRIC METHOD (SM : 5520 B)	ND	3
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			BROWN / TURBID	
SEDIMENT			BROWN	

SM : APHA/AWWA/WEF STANDARD METHOD FOR THE EXAMINATION OF WATER AND WASTEWATER, 23rd EDITION, 2017

ND : NON-DETECTABLE.

Toe Toe Hlaing

(MS TOE TOE HLAING)
LABORATORY HEAD
DATE JULY 10,2019

- **DO NOT COPY PARTIAL OF THIS ANALYSIS REPORT WITHOUT OFFICIAL APPROVAL.**
- **REPORTED ANALYSIS REFERS TO SUBMITTED SAMPLE ONLY.**

REM-UAE
LABORATORY AND CONSULTANT COMPANY LIMITED

REM-UAE Laboratory and Consultant Co., Ltd.
B702 Delta Plaza, Shwegondaing Road, Bahan, Yangon, 11201, Myanmar.
Tel. 959 7301 3448, 959 5144005, 959 5376382
www.rem-uaeconsultant.com E-mail: contact@rem-uaeconsultant.com

ANALYSIS REPORT

PROJECT : IEE FOR 230 AND 132 KV TRANSMISSION LINE PROJECT FROM WAINGMAW TO NABAR
CUSTOMER NAME : RESUORCE AND ENVIRONMENT MYANMAR CO.,LTD
ADDRESS : B-702, DELTA PLAZA, SHWEGONDAING ROAD, BAHAN TOWNSHIP, YANGON, MYANMAR
SAMPLING SOURCE : SW-2
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : JUNE 3, 2019
SAMPLING TIME : 10:05 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : RU
SUBMITTAL/ RECEIPT NO. : 3/6/2019
RECEIVED DATE : JUNE 6, 2019
ANALYSIS DATE : JUNE 6-26, 2019
ANALYSIS NO. : LAA202/2019
REPORT NO. : L00202/2019

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			SW-2	
			LAA202/2019	
BIOCHEMICAL OXYGEN DEMAND	mg/L	MEMBRANE ELECTRODE METHOD (SM : 5210 B AND 4500-O G)	ND	1.0
CHEMICAL OXYGEN DEMAND	mg/L	CLOSED REFLUX, TITRIMETRIC METHOD (SM : 5220 C)	ND	25
TOTAL SUSPENDED SOLIDS	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105°C (SM : 2540 D)	ND	5.0
TOTAL COLIFORM BACTERIA	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM : 9221 B)	14,000	18
OIL AND GREASE	mg/L	PARTITION-GRAVIMETRIC METHOD (SM : 5520 B)	ND	3
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			COLORLESS / CLEAR	
SEDIMENT			-	

SM : APHA/AWWA/WEF STANDARD METHOD FOR THE EXAMINATION OF WATER AND WASTEWATER, 23rd EDITION, 2017

ND : NON-DETECTABLE.

Toe Toe Hlaing

(MS TOE TOE HLAING)
LABORATORY HEAD
DATE JULY 10,2019

- **DO NOT COPY PARTIAL OF THIS ANALYSIS REPORT WITHOUT OFFICIAL APPROVAL.**
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Tel. 959 7301 3448, 959 5144005, 959 5376382
www.rem-uaeconsultant.com E-mail: contact@rem-uaeconsultant.com

ANALYSIS REPORT

PROJECT : 230KV TRANSMISSION LINE PROJECT (WAIINGMAW-NABAR SUBSTATION)

CUSTOMER NAME : RESOURCE AND ENVIRONMENT MYANMAR COMPANY

ADDRESS : (702), BUILDING (B), DELTA PLAZA, SHWEGONDAING ROAD, BAHAN TOWNSHIP, YANGON, MYANMAR.

SAMPLING SOURCE : SW-3

SAMPLE TYPE : SURFACE WATER

SAMPLING DATE : AUGUST 29, 2019

SAMPLING TIME : 10:15 HOUR

SAMPLING METHOD : GRAB

SAMPLING BY : RU

SUBMITTAL/ RECEIPT NO. : 2/9/2019

RECEIVED DATE : SEPTEMBER 2, 2019

ANALYSIS DATE : SEPTEMBER 2- 22, 2019

ANALYSIS NO. : LAA256/2019

REPORT NO. : L00261/2019

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT
			SW-3
			LAA256/2019
BIOCHEMICAL OXYGEN DEMAND	mg/L	MEMBRANE ELECTRODE METHOD (SM : 5210 B AND 4500-O G)	2.5
CHEMICAL OXYGEN DEMAND	mg/L	CLOSED REFLUX, TITRIMETRIC METHOD (SM : 5220 C)	31
TOTAL SUSPENDED SOLIDS	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105°C (SM : 2540 D)	41.4
TOTAL COLIFORM BACTERIA	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM 2012:9221 B)	14,000
OIL AND GREASE	mg/L	PARTITION-GRAVIMETRIC METHOD (SM : 5520 B)	ND (<3)
SAMPLE CONDITION			
WATER'S COLOUR/TURBID			LIGHT GREY / LITTLE TURBID
SEDIMENT			GREY

SM : APHA/AWWA/WEF STANDARD METHOD FOR THE EXAMINATION OF WATER AND WASTEWATER, 23rd EDITION, 2017

ND : NON-DETECTABLE.

Toe Toe Hlaing

(MS TOE TOE HLAING)

GENERAL MANAGER

DATE OCTOBER 4, 2019

- **DO NOT COPY PARTIAL OF THIS ANALYSIS REPORT WITHOUT OFFICIAL APPROVAL.**
- **REPORTED ANALYSIS REFERS TO SUBMITTED SAMPLE ONLY.**

United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

PROJECT NAME : IEE FOR 230 AND 132 KV TRANSMISSION LINE PROJECT FORM WAINGMAW TO NABAR
CUSTOMER NAME : RESOURCE AND ENVIRONMENT MYANMAR CO., LTD.
ADDRESS : B702 DELTA PLAZA, SHWEGONDAING ROAD, BAHAN, YANGON MYANMAR
CONTACT INFORMATION : TEL : +959 7301 3448 e-mail : thandartun@enviromyanmar.net
SAMPLING SOURCE : NANTSANKYIN STREAM
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : JUNE 1, 2019
SAMPLING TIME : -
SAMPLING METHOD : -
SAMPLING BY : CUSTOMER
ANALYZED BY : MR KARNPHONG BOONPUANG

RECEIVED DATE : JUNE 10, 2019
ANALYTICAL DATE : JUNE 10-17, 2019
REPORT NO. : 2019-U32091
WORK NO. : 2019-004206
ANALYSIS NO. : T19AH394-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			SW-1 T19AH394-0001	
TOTAL NITROGEN	mg/L N	PERSULPHATE METHOD (SM: 4500-N C)	1.35	0.1
TOTAL PHOSPHORUS	mg/L P	PERSULPHATE DIGESTION AND ASCORBIC ACID METHOD (SM: 4500-P B AND 4500-P E)	0.03	0.01
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23 rd EDITION, 2017.

Piyapat S.
.....
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

JULY 19, 2019

United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

PROJECT NAME : IEE FOR 230 AND 132 KV TRANSMISSION LINE PROJECT FORM WAINGMAW TO NABAR
CUSTOMER NAME : RESOURCE AND ENVIRONMENT MYANMAR CO., LTD.
ADDRESS : B702 DELTA PLAZA, SHWEGONDAING ROAD, BAHAN, YANGON MYANMAR
CONTACT INFORMATION : TEL : +959 7301 3448 e-mail : thandartun@enviromyanmar.net
SAMPLING SOURCE : NABAR STRHEAM
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : JUNE 3, 2019
SAMPLING TIME : -
SAMPLING METHOD : -
SAMPLING BY : CUSTOMER
ANALYZED BY : MR KARNPHONG BOONPUANG

RECEIVED DATE : JUNE 10, 2019
ANALYTICAL DATE : JUNE 10-17, 2019
REPORT NO. : 2019-U32092
WORK NO. : 2019-004206
ANALYSIS NO. : T19AH394-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT SW-2 T19AH394-0002	DETECTION LIMIT
TOTAL NITROGEN	mg/L N	PERSULPHATE METHOD (SM: 4500-N C)	1.44	0.1
TOTAL PHOSPHORUS	mg/L P	PERSULPHATE DIGESTION AND ASCORBIC ACID METHOD (SM: 4500-P B AND 4500-P E)	ND	0.01
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			COLOURLESS/CLEAR	
SEDIMENT			BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23 rd EDITION, 2017.
ND : NON-DETECTABLE.

Piyapat S.
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

JULY 19, 2019

United Analyst and Engineering Consultant Co., Ltd.
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Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

PROJECT NAME	: IEE FOR 230 AND 132 KV TRANSMISSION LINE PROJECT FROM WAINGMAW TO NABAR		
CUSTOMER NAME	: RESOURCE AND ENVIRONMENT MYANMAR CO., LTD.		
ADDRESS	: B702 DELTA PLAZA, SHWEGONDAING ROAD, BAHAN, YANGON MYANMAR		
CONTACT INFORMATION	: TEL : +959 7301 3448 e-mail : thandartun@enviromyanmar.net		
SAMPLING SOURCE	: MYITKYINA, AYEYARWADY RIVER		
SAMPLE TYPE	: SURFACE WATER	**RECEIVED DATE**	: SEPTEMBER 11, 2019
SAMPLING DATE	: AUGUST 29, 2019	**ANALYTICAL DATE**	: SEPTEMBER 11-16, 2019
SAMPLING TIME	: -	**REPORT NO.**	: 2019-U54811
SAMPLING METHOD	: -	**WORK NO.**	: 2019-006454
SAMPLING BY	: CUSTOMER	**ANALYSIS NO.**	: T19AM757-0001
ANALYZED BY	: MISS KALLAYA SOMPHONG		

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT SW-3 T19AM757-0001	DETECTION LIMIT
TOTAL NITROGEN	mg/L N	PERSULPHATE METHOD (SM: 4500-N C)	1.28	0.1
TOTAL PHOSPHORUS	mg/L P	PERSULPHATE DIGESTION AND ASCORBIC ACID METHOD (SM: 4500-P B AND 4500-P E)	0.01	0.01
SAMPLE CONDITION				
WATER'S COLOUR/TURBID			COLOURLESS/CLEAR	
SEDIMENT			YELLOW	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23 rd EDITION, 2017.

*United Analyst Engineering Consultant Co., Ltd is Sub-contractor of REM-UAE Laboratory and Consultant Co., Ltd

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

SEPTEMBER 17, 2019

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL INTERPREATATION OF RESULTS

Division –

Township – မြစ်ကြီးနား

Resource and Environment Myanmar

Sheet No. 1

Sr No. S 1–3 / 18–19

Sr No.	Sample	Depth in Centimeter	pH Soil:Water 1:2.5	Organic Carbon	Total N	Water Soluble $SO_4^=$ meq/100gm	Exchangeable Cations meq/100gm				Available Nutrients	
							Ca^{++}	Mg^{++}	K^+	Na^+	P	K_2O
1	S – 1 30.5.2019	30–50	Strongly acid	Very low	Low	Low	Very low	Very low	Low	Low	Low	Low
2	S – 2 1.6.2019	30–50	Moderately acid	Very low	Very low	Low	Low	Not detected	Low	Low	Low	Low
3	S – 3 3.6.2019	30–50	Strongly acid	Very low	Low	Low	Very low	Very low	Low	Low	Medium	Low

(ဒေါက်တာသန္တာညီ)

လက်ထောက်ညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Division –

Township – မြစ်ကြီးနား

Resource and Environment Myanmar

Sheet No. 1

Sr No. S 1-3 / 18-19

Sr No.	Sample		Depth in Centimeter	Moisture %	pH Soil:Water 1:2.5	Organic Carbon %	Humus %	Total N %	Water Soluble $SO_4^{=}$ meq/100gm	Exchangeable Cations meq/100gm				Available Nutrients		Nitrate Nitrogen NO_3-N
										Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P ppm (Bray)	K_2O mg/100gm	
1	S – 1	30.5.2019	30–50	8.26	4.74	0.67	1.15	0.17	0.44	2.91	0.73	0.21	0.31	3.27	9.81	0.07
2	S – 2	1.6.2019	30–50	2.55	5.54	0.43	0.73	0.09	0.08	4.79	Not detected	0.08	0.27	1.54	3.70	0.03
3	S – 3	3.6.2019	30–50	4.48	4.60	0.58	1.00	0.15	0.12	2.79	0.70	0.17	0.23	22.51	8.17	0.03

(ဒေါက်တာသန်းညီ)

လက်ထောက်ညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

Appendix 5

Summary of Issues Raised During Public Consultations

Appendix 5

Summary of Issues Raised During Public Consultations

1. Summarized results of PCM at Myitkyina

Date/Place of Meeting	Stakeholder	Comment	Response by DPTSC and Project
August 22,2019 (Thursday) Meeting Hall, Township GAD Office, Myitkyina	Lwel Khaw Village	Total of 4 or 5 farmers were not included in data collection stage during previous transmission line project. So, they did not get the compensation. However, I will find in your presentation you will meet with farmers. It is good. I suggested that you should consult with the affected farmers and make negotiation as transparently.	**DPTSC** - The space will take 150 feet around for tower construction. It is just for construction phase. Therefore, 2.5 square feet for four legs of towers will be left after construction. After the construction period, reinstate back to original land and replantation with the seasonal crops under the line and tower but cannot grow the perennial trees. For the crops that have been destroyed during construction will be compensated. In other way, crop damage caused by carrying raw material for construction will be compensated according to crop price defined by regional government. Crop compensation will be paid for every time when crop damage occurs. For perennial trees, compensation will also be paid one time depend on size and age of plant. Already collected the affected farmers by tower but not for access road and ROW of power line. Ah Kyel village and Lwel Khaw village will be affected by the construction activities of the project. In our survey form, the affected owner name, Father's name, NRC number, land plot number, type and size of crops loss. **REM** Yes, we will summit the summary of IEE report.
	U Than Win, Township Administrator	We will organize the crop compensation committee, and in this group have Farm Land Management Statistics Department, Agriculture Department, and Forest Department and so on. Farm Land Management and Statistics Department will check the farmland has already received form 7. Did you collected the affected list? I gave you advice that do not cut the big tree for the environment. In Myitkyina township which villages will be affected? Should be detail survey for damage list. I would like to request to REM, please submit the summary of IEE report after your survey. We want to get the survey form of damage list. Mainly, we will consult and negotiated with affected farmers for crop compensation.	

Public consultation photo - Myitkyina Township

Photos of Township Meeting		
		
		
		
		

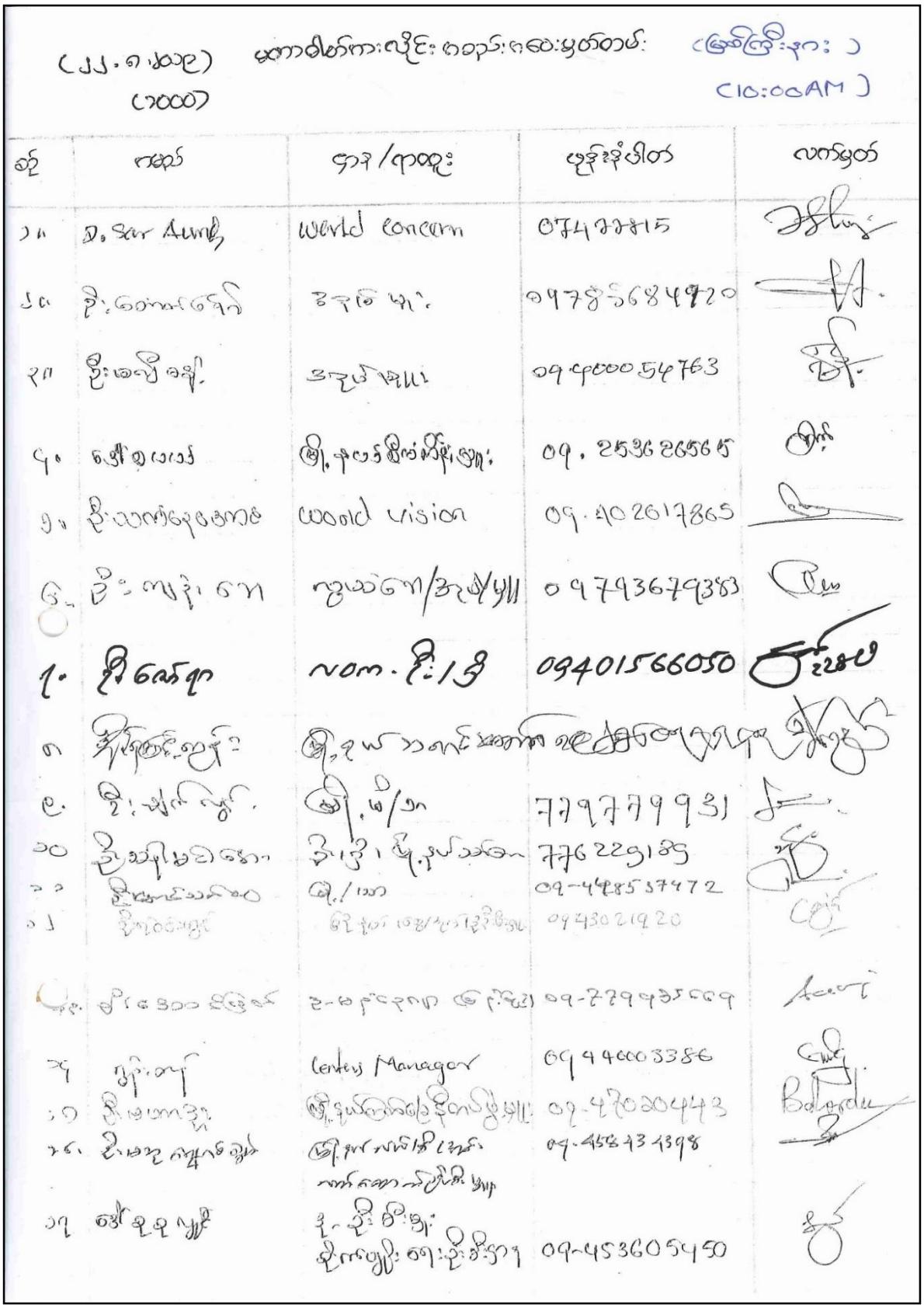
Photos of village meeting		
		
		
		
		
		

Participant List in Myitkyina Township

Organization	Name/Title		Total
Township General Administrative Department	U Than Win,Township Administrator U Ye Win Htut, Deputy Staff Officer		2
Farm Land Management & Statistics Department	U Ma Bu Gyaung Khun, Assistant Township Officer		1
Electric Power Enterprises	U Aung Myat, Deputy Manager		1
Immigration and National Registration Department	U Zaw Yar, Staff Officer		1
Planning Department	Daw Sapal, Township Officer		1
Forest Department	U Than Min Aye, Staff Officer		1
Agriculture Department	Daw Su Su Hlaing, Deputy Staff Officer		1
NGO/ INGO	Dr. Sar Aung ((World Concern) U Thet Nay Aung (World Vision)	U Ron Tan (Center Manager) U Bahar Du (Red Cross)	4
Media	U Myint Tun (Reporter)		1
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	U Nay Myo Tun Translator, SPI	3
Ah Kyel Village	U Bauk Naw, Village Tract Leader		1
Sha Daung Village	U Ma Gyi Mant, Village Tract Leader		1
Lwel Khaw Village	U Kyan Khaw, Village Tract Leader		1
Interested Person	U Chat Lwin, Town's Elder Person		1
Total			**28**

Meeting Tittle : Public Consultations
Meeting Place : Myitkyina Township GAD Office
Date : 22-8-2019 (Thursday)
Time : 10:00am- 11:30 am



2. Summarized results of PCM in Waingmaw Township

Date/Place of Meeting	Stakeholder	Comment	Response
August 22,2019 (Thursday) Meeting Hall, Township GAD Office, Waingmaw	**Township Administrator**	This project is national level project and power distribution from Kachin State to Central Myanmar connect with national grid.	
	Mai Nar Village	I understand that land acquisition for the project shall make agreement with local people before commencement of any project. This project will start on September 2019 and finish in December 2020. So you need to consult and negotiate with affected farmers before commencement of the project. Who will pay compensation for damage of crop? You need to disclose the project information as soon as possible.	**DEPP** Yes, we understand your comments. We Will consider your suggestions. **REM** Our consultant team will collect the data and held public consultation in the villages before commencement of the project. The representative from Ministry of Electricity and Energy will also make consultation meetings with local affected persons separately before commencement of the project.
	Forest Department	Which standard do you follow for the sampling of air quality? Is it enough? How to avoid the collisions of avifauna if line is located in their daily flying way? I would like to suggest that in your village survey please ask and discuss villagers for the avifauna flying way. Should be update the forest law in the presentation, I worry about for misunderstanding during in your survey.	**REM** We will follow the National Environmental Quality (Emission) Guidelines for air quality. Our Ecology team studied and collected the flora and fauna data in last June. They also interviewed with local people and recorded their suggestions. Thanks for your suggestion and will update the law.
	Wu Yan Village	Towers were built in the center of the road in previous transmission line project. So, construction contractor need to discuss with the local people for construction of towers.	**REM** We will advise to the authority to negotiate with land owner and collect their feedback. **REM** MOEE will negotiate with forest department. **DPTSC** REM will submit the IEE report to Environmental Conservation Department (ECD) and ECD will review their IEE report and will give approval letter.
	Forest Department	Shall consider the compensation for community forest where	**REM** MOEE will negotiate with forest department.

		the transmission line pass through? **(Farm Land Management & Statistics Department)** Will give the land compensation? How to compensate the crops compensation, after project or before project? How many times? **(Township Development Committee)** In previous project construction activities will be done in farmland, and they did not remove the construction wastes such as concrete, sand, stones and did not make land reinstatement. If the Project start after harvesting the paddy, it will not make so many damage on the crops.	**DPTSC** Project has 3 working process: such as foundation stage, tower building stage and installing the electric line. We will not compensate for land, but only for crop according to the price defined by land management Committee. The crops that have been destroyed during construction will be compensated after the project. Crop compensation will be paid for every time when destruction occurs. The space will take 150 feet around for tower construction. It is just for construction stage and therefore 2.5 square feet of four legs of towers will be left after construction. After the construction, can be planted the seasonal crops under the line and tower but cannot planted the perennial trees. The crops that have been destroyed during construction will be compensated. In other way, destruction caused by carrying raw material for construction will be compensated according to crop price defined by regional government. Crop compensation will be paid for every time when destruction occurs. For perennial trees we size and age compensation will be one time depend on size and age of plant.

Public consultation photo - Waingmaw Township

Photos of Township Meeting	 	 

		
		
		
Photos of Township Meeting		
		

Photos of village meeting		
		
		
		
		

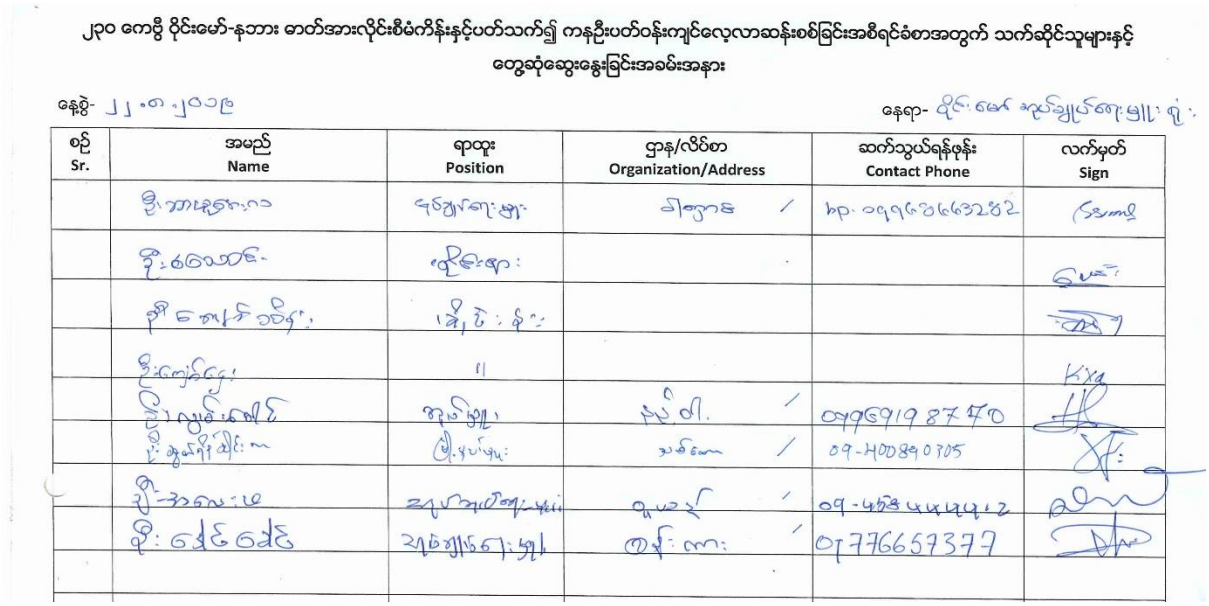



Participant List in Waingmaw Township

Organization	Name/Title		Total
Township General Administrative Department	U Tun Tun,Township Administrator		1
Farm Land Management & Statistics Department	U Myo Min Naing, Township Officer		1
Electric Power Enterprises	U Aung Naing Oo, Deputy Manager		1
Township Police Force	U Thein Kyaw, Township Commander		1
Forest Department	U Hsut Rain Hsai La, Township Officer		1
Agriculture Department	U Soe Naing Win, Staff Officer		1
Township Development Committee	U Kyaw Nyein U Nan War Htin Aung, Deputy Staff Officer		2
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	U Nay Myo Tun Translator, SPIC	3
War Shaung Village	U Sar Mu Aye La Village Tract Leader		1
Nant War Village	U Za Tan Lwan Khaung, Village Tract Leader		1

Wu Yan Village	U Alay Pha, Village Tract Leader		1
San Kar Village	U Daung Khaung, Village Tract Leader		1
Madain Village	U Tain Khaw Village Tract Leader		1
Mai Nar Village	U Jan Phaung Dai Daung Village Tract Leader		1
No(1) Ward	U Aung Soe Thant Village Tract Leader		1
Mont Lwel Village	U Aung Soe Village Tract Leader		1
Mai Nar Village, Land Owner	U San Thaung U Kyaw Thein U Kyaw Htay U Maung Aike	U Myint Maung U Phon Naing U Khaung Zaung U Thaung	8
Total			**35**

Meeting Tittle : Public Consultations
Meeting Place : Waingmaw Township GAD Office
Date : 22-8-2019 (Thursday)
Time : 02:00pm – 03:30 pm



၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign

၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့ရွှဲ-

နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
	ဦးဘန်းမင်းခိုင်	ဒိုင်ဒိုးကာကွက်	MOEE (ဝန်ထမ်း)	09456354114	
	ဦးသူဇော်ဝင်း	"	MOEE (ဒီဇာဘန်ဒေသ)		
	ဦးထွန်းဝေဒိတာ	နု-ဦးစီးမှူး	"	09	
	Guan Weihua	၁-ကြီး	SPIC		
	Hongjie Li	၂-ကြီး	SPIC		
	နေမျိုးထွန်း	၃-ကြီး	SPIC		
	ဒေါ်ဖြူဖြူမြတ်နိုး	Consultant	R.E.M. Company	09-777006384	

စဉ်	အမည်	ရာထူး/အဆင့်	ဌာန၊ နေရပ်လိပ်စာ	ဆက်သွယ်ရန်
	ဦးကျော်ကျော်ဝင်း		စည်ပင်သာယာရေးမှူး	
	ဦးနုအောင်ကိုမြတ်ဖြိုး	၃-ဦးစီးမှူး	သတင်းစာ	
	ဦးမောင်အိုကာ		မိုင်းကား	
	ဦးဇွန်းမောင်	"		
	ဦးထွန်းဦးမြင့်	"		
	ဦးစိုးမောင်ကြီး	"		
	ဦးမောဘဝင်း	"		
	ဦးကျော်ကြီး	"		
	ဦးမောကြေးကြီး	"		

ရက်စွဲ ၊ ၂၂ - ၀၄ - ၂၀၂၃

စဉ်	အမည်	ရာထူး/တာဝန်	ဌာန/ကုမ္ပဏီ/အသင်းအဖွဲ့	လက်မှတ်
၁။	ဒေါက်တာမြင့်မြင့်ဝင်း	ဆရာဝန်ကြီး	ဆေးရုံကြီးတာဝန်ခံ	
၂။	ဦးဝေဆာင်နိုင်ဦး	ဦးစီးဌာနမှူး	ဆေးရုံကြီးအုပ်ချုပ်ရေး	
၃။	ဦးဆွေးမြင့်ထိုက်ဝေယံ	ဦးစီးဌာနမှူး	ဆေးရုံကြီးသားရေးတော်	
၄။	ဦးကျော်ဇေယျာဦး	ဦးစီးဌာနမှူး	ဆေးရုံကြီးဓာတုဗေဒဌာန	
၅။	ဦးနိုင်နိုင်ဝင်း	ဦးစီးဌာနမှူး	ဆေးရုံကြီးဆိုင်ကယ်ပျံဌာန	
၆။			ဆေးရုံကြီးသူဌေးမယ်ကြီးကြောင်းဌာန	
၇။	ဦးအိုးဇော်	ကျေးရွာခရီးဆောင်	မဒေါင်ကျေးရွာ	
၈။	ဦးစောလောင်း	"	ဝါးသာကျေးရွာ	
၉။	ဦးစောကျော်ကျော်ထွန်း	"	နှင်းဝါကျေးရွာနှင့်	
၁၀။	ဦးကျော်ဇေယျာဆိုင်ဒေါင်း	"	ဖျံခြင်းကျေးရွာ	
၁၁။	ဦးဝေဆာင်ဆွဲအော်	"	ခရမ်းချဉ်သီး(၁၁)	
၁၂။			ခရမ်းချဉ်သီး(၉)	
၁၃။			ခရမ်းချဉ်သီး(၇)	
၁၄။			ခရမ်းချဉ်သီး(၅)	
၁၅။	ဦးဝေဆာင်ဆွဲ	"	ခရမ်းချဉ်သီး(၃)	
၁၆။	ဦးဆောင်းဆောင်းလေး	"	ခရမ်းချဉ်သီး(၁)	

၂။ ဆေးရုံကြီးတာဝန်ခံ - ဒေါက်တာမြင့်မြင့်ဝင်း ၊ ၀၉၂၁၀၄၂၃၄ ဖြစ်ပေါ်ပါက အကူအညီတောင်းခံနိုင်ပါသည်။

3. Summarized results of PCM in Mogaung Township

Date/Place of Meeting	Stakeholder	Comment	Response
August 26,2019 (Monday) Meeting Hall, Township GAD Office,	**Htone Yay Pauk Village Administrator**	The present transmission line is higher voltage than the previous transmission line. So, we worry about the cable slack and I would like to suggest that make sure the tension of cable.	**DPTSC** The proposed transmission line is started from Waingmaw to Myitkyina – Mogaung – Mohnyin- Nabar. The distance between each towers is 1200 ft. to 1500 ft. and there are 4 strings in the left and right side. The lowest cable line is 50ft. above the ground.
	Kone Tan Gyi Village	How much do you compensate for crops? We lost the land permanently. How many year will you compensate for?	**DPTSC** The crops that have been destroyed during construction will be compensated. Besides, damage caused by carrying raw material for construction will be compensated according to crop price defined by Regional Government. Crop compensation will be paid for every time when damage occurs. For perennial trees we measure size and defined age and compensation will be paid one time depend on size and age of plant.
	Ma Yan Village	Will you change the location of tower if land owner is not agree? If tower is located in the land that owned by land owner who own many acres, it is no problem. But the land owner who own a little acres it is a problem. Will you compensate per yield? How will you consider the loss of land for land owner? What is the area occupied by tower? 40 square feet is nearly half of the acres. The transmission line will pass through the Danyin field in my village. Will you compensate those with market price?	**DPTSC** We cannot able to move the tower location. The space will take about 150 feet around for tower construction area and the area for four legs of tower is about 40 square feet. It is just for construction phase and about 2.5 square feet of four legs of towers will be left after construction period. After construction period, the seasonal crops, orange and tea leaf etc. can be planted under the line and tower. Yes, we compensated according to market price defined by Regional Government.
	Myo Hla	We planted the perennial for long term plan. How to do this? Can reduce electricity charges by the project? Other telecom company has compensated the land for tower. How about this project?	**DPTSC** Compensation for perennial trees, the compensation will be one time depend on the type, size, age and yield of plant. We will negotiate with forest department for some kind of plantation (eg. Teak). Private company can pay the land compensation because they have many income. We will only pay for crops

			compensation and land compensation will not be paid. **REM** I would like to explain a little, this project type is not same with other project. This is the country electricity development project. So, private company project is their own business and they have benefit so, they can pay land compensation. Government will pay the compensation from the tax which is from public.
	The Unity Party	How to benefit for our township?	**Township Administrator** Compensation will be defined and present by village management committee to township committee and township to district management committee step by step. After getting the agreement of regional government, the compensation will be paid three time of market price according to 2012 farm land law. For this project the electricity is come from Chipwi Nge Hydropower project and connect with National Grid. So, it can reduce the electricity cutoff and improve electricity network.
	Township Police Force commander **Township Administrator**	This is high voltage line so, you have to make awareness for public and notice the electricity hazards. What is the safe distance from tower? Please make sure cross over the place of Mogaung creek because of bank collapse.	**DPTSC** We will make notice board in every towers. People can touch the tower but they cannot climb on the tower. There is about 25 feet above the ground from lower line is safe for electromagnetic wave. Yes, thanks for your suggestion. We will aware of this.
	Farm Land Management & Statistics Department	Need to corporate with us for data collection of crop compensation. Want to get affected land owner list and inform to us when the project will start, we will give one of our staff for your survey. We will record type of crops, yield and market price. Should be considering how to do for vacant land.	**DPTSC** Yes, we will give the line map and MOEE negotiate with the forest department for reserve forest. Thanks for your suggestion. Now, we have affected land owner list for tower and I will share. The project will be start probably on September, 2019.
	Forest Department **Township Administrator**	Should be classified the kinds of plant, if transmission line pass through the reserve forest area. Want to get the line map. Township Land management committee cannot calculate for the some kind of restrict plant (eg. Teak). Teak is the own by government.	**DPTSC** In Mogaung township, The transmission line route in Mogaung Township will not pass any forest area and the line route will traverse farm land and orchard land.

	Parliament Member	I would like to request for village leader and land owner side please corporate with survey team and record you're lost before the start of project for any unexpected problem may not occur. For Teak plant, your plant is already register to forest department or not? How to compensate for no register plant. Please make sure the record.	
	Ma Yan Village Leader	The tower is located in the cultivated in vacant land, in this case, the land area is narrow and tower occupied about 40square feet so, they cannot give permission to occupy, how to do it.	**Township Administrator, Farm Land Management & Statistics Department** Have the mandate of vacant land? If they have ownership, we will consider for compensation by law. This is government project and if they haven't mandate do the project with negotiation.

Public consultation photo - Mogaung Township

Photos of Township Meeting




Photos of Township Meeting











		
		
Photos of village		
		
		

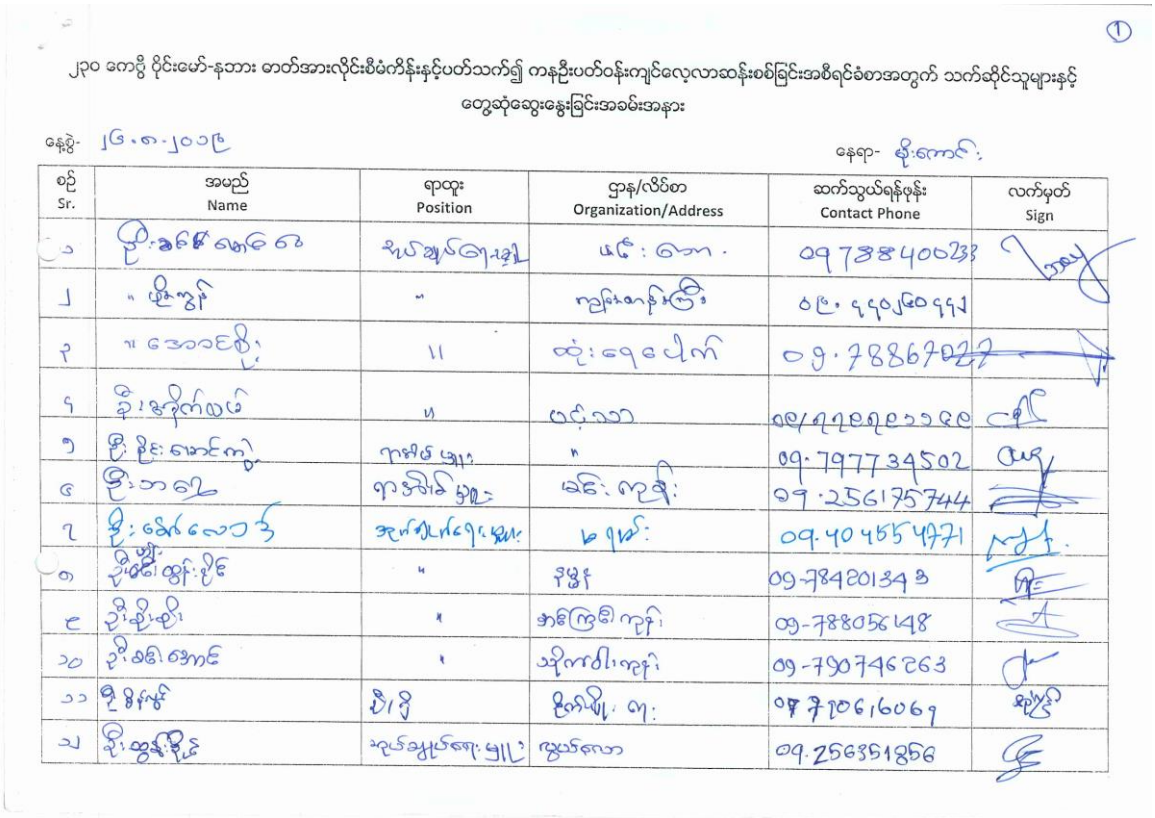
Participant list in Mogaung

Organization	Name/Title	Total
Township General Administrative Department	U Yan Naing Tun, Township Administrator	1
Farm Land Management & Statistics Department	U Hla Myint, Staff Officer	1

Parliament Member	Daw Mya Thwe San Representative of Kachin State Parliament		1
Township Police Force	U Win Myint Aung, Township Commander		1
Forest Department	U Myo Tun, Township Officer		1
Agriculture Department	U Sein Lwin, Staff Officer		1
Immigration Department	U Hla Nyein, Assistant Township Officer		1
Planning Department	Daw Tin Tin San, Staff Officer		1
National Unity Party	U Nyi Lay		1
Media	U San Win EPN	U Win Naing Myanma Ahlinn	2
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	Daw Lin Lin Lwin Translator, ACHC Office	3
Pin Baw Village	U Khin Maung Wai Village Tract Leader		1
Kone Tan Gyi Village	U Phoe Kon, Village Tract Leader		1
Htone Yay PaukVillage	U Aung Soe, Village Tract Leader		1
Pint Thar Village	U Aik Lan, Village Tract Leader	U Sai Maung Kwet Hundred Household Leader	2
Min Kone Village	U Ba Shwe Hundred Household Leader		1
Mayan Village	U Naw Lawt Village Tract Leader		1
Nanmana Village	U Hein Tun Naing Village Tract Leader		1
InnGyin Kone Village	U Soe Soe Village Tract Leader		1
Theik War Kone Village	U Sinn Aung Village Tract Leader		1
Lwe Law Village	U Tun Naing Village Tract Leader		1
Myo Thar Yar Village	U Khin Maung Aye Village Tract Leader		1
Myo Ma Ward	U Khin Maung Latt Ward Leader		1
Myo Oo Ward	U Hla Aung Village Tract Leader		1
Kyar Inn Village	U Yann Naw Village Tract Leader		1

Ohn Baung Village	U Thein Win Aung Village Tract Leader		1
Shwe Inn Village	U Chit Nyo Village Tract Leader		1
Inn Baung Village	U Kyaw Moe Tun Junior Clerk		1
Pin Khar Village	U La Sai Village Tract Leader		1
Nan Khwin Village	U Sai Nay Min Tun Village Tract Leader		1
Pwint Phyu Village	U Maung Hla Village In Charge		1
Myo Hla Village	U Myint Lwin Village Tract Leader		1
Yay Twin Kone Village	U San Yin Village In Charge		1
Taung Ni Village	U Kyaw Kyaw Oo Village Tract Leader	U Nyunt Wai Hundred Household Leader	2
Total			46

Meeting Tittle : Public Consultations
Meeting Place : Mogaung Township GAD Office
Date : 26-8-2019 (Monday)
Time : 10:30pm – 12:00 pm



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၂၃၀ ကေဖို ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၂၆-၈-၂၀၁၉ နေရာ- မိုးကောင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဦးခင်မောင်ဝေ	ရပ်အုပ်ချုပ်ရေးမှူး	ပန်း၊ ဘော	09738400233	
၂	" မိုးကွန်	"	ကျင်းခေါင်းကြီး	၀၉-၄၄၅၂၆၀၄၄	
၃	" အောင်စိုး	"	ထဲ့းရေငါးကျ	၀၉-788670227	
၄	ဦး အိုက်လယ်	"	ပလုံသာ	၀၉/ရ၇၉ရ၉၁၄၉	
၅	ဦး နိုင်းဆောင်ကျဲ	ကုမ္ပဏီ ပြန်း	"	09-797734502	
၆	ဦး ဘဝေ	ရာအိုးခံ ပြန်း	ခင်း၊ ကူမှိ	09-256175744	
၇	ဦး အောင်လောဘ	အကောင်းဆုံးရပ်ရွာ ပြန်း	ဗဟန်း	09.404554771	
၈	ဦးဝင်းထွန်းမိုင်	"	ဒီမွန်	09-784201343	
၉	ဦးဆိုးဆိုး	"	အင်ကြင်းကုန်း	09-788056148	
၁၀	ဦးဝင်းအောင်	"	သိုက်ဝါးကုန်း	09-790746263	
၁၁	ဒေါ်နုနုမွန်	ဒေါ်နု	ဦးကိုမို၊ ဂျ	09 7706,6069	
၁၂	ဦး ထွန်းမိုင်	ရပ်အုပ်ချုပ်ရေးမှူး	ကွယ်လာ	09.256351856	

၂၃၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၂၆.၈.၂၀၁၉ နေရာ- မိုင်းကောင်

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ခိုင်းဒင်ဝေးဝင်းစော	ဥပဒေချုပ်ရေးမှူး	ဖြို့ပသာယာ	09400050402	
၂	ခိုင်းဒင်ဝေးလတ်	〃 〃	မြို့ပ	09421671009	
၃	ခွန်းမှတ်ဆင်	ဌာနဆိုင်ရာအရာရှိ	ရေနွေးပေါက်ကွဲ	09 420704249	
၄	ခွန်းလာမြိုင်	〃 〃	ကာဆတ်	09250885749	
၅	ခိုင်းသိန်းဝင်းဒေါက်	အငြိမ်ချုပ်ငြိမ်းရေးမှူး	ဒဂုံမြို့သစ်	09-42566411820	
၆	ခိုင်းချစ်ဇူဝိ	အုပ်ချုပ်ရေးမှူး	ရွှေဆာဝီး	09-450520620	
၇	ခိုင်းကျော်ဝိုက်ဆွန်း	နောက်ခံသတင်းအချက်အလက်ကောက်ယူရေးအရာရှိ	ကစဉ်-ဆင်းကောင်းကြီးဌာန	09250680549	
၈	ခိုင်းလဲဆိုင်ဒူး	ပိုးတွယ်ကင်းရှင်းရေးမှူး	ပန်းပေါင်ကျေးရွာ	09250664790496	
၉	ခိုင်းဇိုးဆေဝေးဟွန်း	〃	ဒုံးဖွင် 〃	09785518227	
၁၀	ခိုင်းတောင်ဒျ	ကျေးရွာတာဝန်ခံ	ခွင်းလျှော	09250165094744	
၁၁	ခိုင်းမြင့်လွင်	အုပ်ချုပ်ရေးမှူး	ဖြို့ပ	7922348440	
၁၂	ခိုင်းစံလွန်	ကျေးရွာတာဝန်ခံ	ဆက္ကရီကုန်း	09250165094744	

၂၃၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၂၆.၈.၂၀၁၉ နေရာ- မိုင်းကောင်

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဒေါ်ဖြဴဖြဴသွေး	MPS.	ယွမ်တော်.(၂)မဂ္ဂဇင်း	09.961999669.	
၂	ဂါမဏိ ဝင်းမြင့်ကောင်	ဖြို့နယ်ဂုဏ်ထူးဆောင်အရာရှိ	ဖြို့နယ်ဂုဏ်ထူးဆောင်အဖွဲ့ချုပ်	09 444274374	

၂၃၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

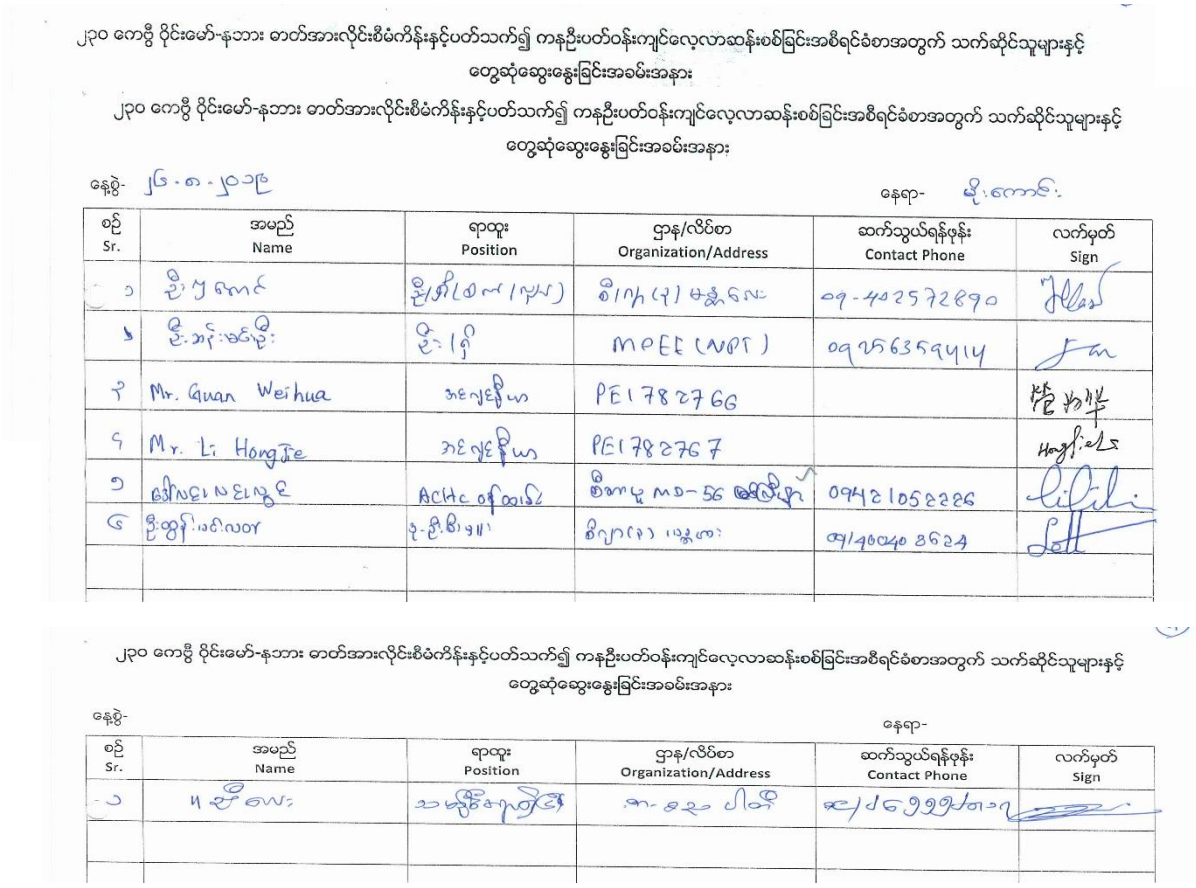
နေ့စွဲ- ၂၆.၈.၂၀၁၉ နေရာ- မိုင်းကောင်

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ခိုင်းဆန်းဝင်	EPN.	မိုင်းယန်	09.44000145041.	
၂	ခိုင်းဂင်းမိုင်	ဖြန်ဖြာစောင့်ရှောက်ရေးမှူး	မိုင်းယန်	09.444000202444	

၂၃၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- 26.8.2019 နေရာ- မိုင်းကောင်းမြို့

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ခိုင်းကျော်ကျော်ဦး	အုပ်ချုပ်ရေးမှူး	ကောင်းမြို့	09-780138667	
၂	ခိုင်းညွှန့်စဝ	ရဟန်းခံမှုပ်	〃	09-774492165	



၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

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နေ့စွဲ- ၂၆-၈-၂၀၁၉ နေရာ- မို့ကောင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဦးမှတ်ဆောင်	ဦးစီးအရာရှိ(ပြော်ရေး)	စီပက(၃)မန်နေဂျာ	၀၅-၄၀၂၅၇၂၈၅၀	
၂	ဦးအောင်မင်းမြို့	ဦးစီးရုံး	MOEE (NPT)	၀၅၇၅၆၃၅၄၄၁၄	
၃	Mr. Guan Weihua	အင်ဂျင်နီယာ	PE1782766		
၄	Mr. Li Hongjie	အင်ဂျင်နီယာ	PE1782767		
၅	ဒေါ်လဲဒေါင်ဇွေ	ACHC ဝန်ထမ်း	စီဆာမူ MD-56	၀၉၄၂၁၀၅၉၂၂၆	
၆	ဦးထွန်းဝင်းလွင်	ဒု-ဦးစီးမှူး	စီဘုရား ယန္တရား	၀၅/၄၀၀၄၀ ၃၆၂၄	

၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဦးစိုးလေး	သမ္မတရာဇာ	အ-၀၃၀ ပါတီ	၀၉၇၇၃၃၅၀၁၇	

4. Summarized results of PCM in Indaw

Date/Place of Meeting	Stakeholder	Comment	Response
August 27,2019 (Tuesday) Meeting Hall, Township GAD Office,	**Township Administrator**	Na Bar Substation is the network of electricity supply and it has high voltage input and output. This area is center of Myitkyina, Shwebo and Kathar. In future, the city will develop. I would like to know the electricity hazards caused by Natural disasters.	**DPTSC** Electricity hazards may not occur even electricity user will increase. We already checked the strength of tower in China, the resistance of tower is up to 80 to 90 mile per hour of wind speed.
	Township Police force	This area is brown area so do you take the security for tower? In my township, we will have 95 of police staffs and cannot give the full security. Should be take special security. Do you have plan to fence the tower area? If you make notice sign at tower, the police case may reduce.	**DPTSC** Security is arranged by national grid office. For the long and, the transmission security for line, tower, linemen in charge post will assign from the local people. We do not fence the tower and no electrical danger because the lower line is 50 feet from ground level. Every tower have notice sign and lighting conductor. Can touch the tower but cannot climb.
	Township Administrator	How to manage the land that own by department? Have the CSR program? Need to clear the construction	**DPTSC** Will be compensated by departmental land according to procedure. Sure residual

		materials such as stone, sand and concrete etc.	construction materials will be remove and recondition.
	Ywar Thit Kone Village	Will you give the crops compensation only?	**DPTSC** Yes, we will only pay for crops not pay compensation for land.
	Staff Officer of GAD	In your presentation, the transmission line pass through the residential area but in village huts under the transmission line were removed. Why?	**DPTSC** Yes, remove the huts in previous 66kV line. For this line not need to remove and we will use high technology. We sampling the air quality at points of sub-station. This project is transmission line project so, very least impact and emission rather than other projects.
	Township Police force	Any foreigner in construction period? How to do the security for them?	**DPTSC** 100 of foreigner will work in project sites. For the moment we do not know the number of foreigner in Inndaw site. We will inform to immigration department.
	Township development committee	How far the safe distance from line? Which place of high way road passing the transmission line and how to do this.	**DPTSC** 24 feet away from the line is safe. Transmission line will pass the high way road near Mawlu town and we will construct the scaffolding.

Public consultation photo - Indaw Township

Photos of Township Meeting		
		
		

		
		
Photos of Township Meeting		
		
Photos of village meeting		
		

Participant List in Indaw Township

Organization	Name/Title		Total
Township General Administrative Department	U Thein Tan,Township Administrator		1
Farm Land Management & Statistics Department	U Tun Lwin Oo, Assistant Township Officer		1
Electric Power Enterprises	U Tin Tun Naing		1
Township Police Force	U Khin Maung Thin, Township Commander		1
Forest Department	U Than Sein		1
Agriculture Department	U Thar San, Deputy Staff Officer		1
Township Development Committee	U Aye Min Tun, Officer		1
Law Office	U San Oo, Senior Clerk		1
Audit Department	U Kyi Thar Phyo, Auditor		1
Information Department	U Kyaw Thiha, Staff officer Daw Myint Myint Naing		2
Co-operative Department	Daw Tin Ohn		1
Agricultural Bank	U Kyaw Lwin Win, Manager		1
Livestock Breeding and Veterinary Department	Daw Zar Chi Oo, Deputy Staff Officer		1
Rural Development Department	U Aung Myo Htet, Senior Clerk		1
Immigration Department	U Kyaw Nyunt Thein		1
Sport Department	Daw Myint Myint San, Trainer		1
Health Department	Dr. Aung Myo Naing, Assistant Surgeon		1
Department of Revenue	U Hlaing Min Kyaw, Senior Clerk		1
Planning Department	Daw Lwin Lwin Nu, Assistant Director		1
Road Management Department	Daw Aye Aye Tun, Staff Officer(Civil)		1
Inland Freight Handling	U Tun Tun Win		1
Railway Department	Daw Hay Mar Soe		1
Fire Extinguish Department	U Hla Myo Lwin		1
Township Commission	U Ohn Myint		1
Rural Road Department	Daw Myat Su Kyi		1
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	Daw Lin Lin Lwin Translator, SPIC	3
Aung Mingalar Ward	U Zaw Win Naing, Ward Leader		1
Aung Chan Thar Ward	U Naing Tun Win, Ward Leader		1
Nant Khin Village	U Myo Aung Village tract leader		1
Nar Ma Kyaing Village	U Phoe Pwe, Ten Household Leader U Maung Ngwe Village In-charge	U Win Tun Hundred Household Leader	3
Pint Tin Village	U Win Tun		1

	Hundred Household Leader		
Ywar Thit Kone Village	U Sinn Aung Hundred Household Leader	U Saw Win Village In Charge	2
Total			**44**

Participant List in Mawlu

Organization	Name/Title		Total
Electric Power Generation Enterprise	U Maung Maung Nyein		1
Maw Lu High School	Daw Ni Ni Khaing, High School Head		1
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	Daw Lin Lin Lwin Translator, SPIC	3
Hpar PanVillage	U Maung Paw Village incharge		1
Min Zay Yar Ward	U Moe Swe Oo Ward Leader	U Zaw Naing Oo Hundred Household Leader	2
Min Yar Zar Ward	U Maung Kyu Ward Leader U Win Naing Hundred Household leader	U Aye Ngwe Elder person	3
Min Chan Thar Village	U Mya Thein Ten Household Leader	U Than Naing Hundred Household leader	2
Man He Village	U Win Kyaing Village leader	U Ngwe Tun, Elder Person	2
Myay Palin Village	U Gan Sai, Village Incharge		1
Kayin Ywar	U Han Thein Village Incharge		1
Min Chan Thar Ward	U Than Naing Hundred Household Leader	U Ba Pyu, Elder person U Thet Lwin, Elder Person U Kyin Shwe, Elder Person	4
Nyaung Pin Thar Village	U Ye Shwe, Village In charge		1
Maw Lu Town	U Tin Shwe Elder Person	U U Mya Than, Elder Person	2
Si Maw Village	U Tun Wai Village In Charge		1
Total			**33**

Meeting Tittle : Public Consultations
Meeting Place : Indaw Township GAD Office
Date : 27-8-2019 (Tuesday)
Time : 10:00am – 11:30 p

၂၀၁၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- 27.8.2019 နေရာ- အင်းတော်ကြီ.

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
	ဦးထိုက်မြင့်	အသိုက်အဝန်းကိုယ်စား	နားမကျိုင်း	09-258071714	
	ဦးမောင်ကြွေ	တာဝန်ခံ	〃	09-452083225	
	ဦးမိုးချို	ဥက္ကဋ္ဌ	ပင်တင်	09-768525110	
	ဦးထားထွန်း	ဥက္ကဋ္ဌ	နားမကျိုင်း	09-422879506	
	ဦးစော်ဝ	ဥက္ကဋ္ဌ	ဆွာသော်ကျေး	09258630	
	ဦးဆောင်း	တာဝန်ခံ	ရွာသစ်ကြီး	09,256165443	

၂၀၁၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၂၇ ၈ ၂၀၁၉ နေရာ- အင်းတော်

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
	ဦးကျော်မောင်	ဦးစီးဌာနမှူး (စီမံရေး/လျှပ်)	မိုင်းကုန်းမြို့နယ်လေး	09-411257272890	
	Mr. Li Hongjie		PEIHONG		
	ဒေါ်လင်းလင်းကြည်		စီတာမူ၊ ဖြန့်ချိရေးနာ	09-420105626	
	ဦးထွန်းမင်းမောင်	ဒနဂင် (စီမံရေးဝန	မိုးယာန်းမြို့လေး	09/400408624	
	ဦးစောကြိုးဝင်းဦး	ဦးပိုင်	ကဝင်း (ယခုကို)	09456354914	

၂၀၁၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- 27.8.2019 နေရာ- အင်းတော်ကြီ.

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁၃	မိုးဘိုကြီး	ရပ်မိရပ်ဖ	မြေးသျှမ်းသာရပ်ကွက်		
၁၄	ဦးသောင်ကွင်	〃	〃		
၁၅	ဦးကျင်ဇွဲ		မြင်းခြံသင်္ဘော		
၁၆	ဦးမောင်ဝေငြိမ်	ကျေးရွာအုပ်ချုပ်	မောလမြိ	400462199	
၁၇	ဦးဂိုဝင်္ဂ	ကျေးရွာကဝန်ခံ	ဆောင်မင်းသာ		
၁၈	ဦးတင်ထွန်း	ဂျပ်မိရပ်ရာ	ဝမ်းမြေ	09.777965432	
၁၉	ဦးဖြေသန်း	ရပ်မိရပ်ဖ	ဝေလင်း	09254019616	
၂၀	ဇော်နိုင်ဦး	ထက်အုပ်	ဘ.ဝမ်းမြေ	09.403737805	
၂၁	ဦးတင်ဝေ	တာဝန်ခံ	မြို့ဝေမော်	09.892584960	

အင်းတော်မြို့နယ်၊ ဌာနဆိုင်ရာများ၏ အပတ်စဉ်လုပ်ငန်းညှိနှိုင်းအစည်းအဝေး

တက်ရောက်မှုမှတ်တမ်း

စဉ်	အမည်	ဌာန	တာဝန်	၂၇/၈/၂၀၁၉
၂၇		မီးရထား		
၂၈	ဒေါ်စောစောဆန်း	သံလမ်း	ဂျာသာ	
၂၉	မြို့အုပ်ချုပ်ရေးမှူး	စည်ပင်	အတွဲဆောင်ဟန်ဆောင်	
၃၀	ဦးကျော်ကျော်	မီးသတ်		
၃၁		ဆက်သွယ်ရေး		
၃၂	ဦးဇော်ဝေဒိ	ကော်မရှင်	ဦးခေါင်းဖျားကို	
၃၃	ဆရာမကြည်ကြည်သာ	ကျေးလက်လမ်း	B C.	
၃၄		ခရိုင်ငါးလုပ်ငန်း		
၃၅		ဆည်/မြောင်း		
၃၆		ရေအရင်းအမြစ်		
၃၇		ဥက္ကဋ္ဌ စည်ပင်		
၃၈	ဦးဇော်ဝင်းမြင့်	အောင်မင်္ဂလာ	အုပ်ချုပ်ရေးမှူး	
၃၉		အောင်မေတ္တာ		
၄၀		အောင်ဓေယျ		
၄၁	ဦးစိုင်းကျော်ထိုက်	အောင်ချမ်းသာ	အုပ်ချုပ်ရေးမှူး	
၄၂	ဒေါ်မိုးမိုးဝေဟန်	နန်းခင်	နည်းပြဆရာမကြီး	
၄၃		လယ်ပြင်		

အင်းတော်မြို့နယ်၊ ဌာနဆိုင်ရာများ၏ အပတ်စဉ်လုပ်ငန်းညှိနှိုင်းအစည်းအဝေး
တက်ရောက်မှုမှတ်တမ်း

စဉ်	အမည်	ဌာန	တာဝန်	၂၇/၈/၂၀၁၉
၁		မြို့နယ်ရဲတပ်ဖွဲ့		
၂		ဥပဒေရုံး		
၃		မြို့နယ်တရားရုံး		
၄		စာရင်းစစ်ရုံး		
၅		ပြန်/ဆက်		
၆		ရုပ်/သံ		
၇		သမ		
၈		စိုက်ပျိုးရေး		
၉		လယ်စိ/အင်း		
၁၀		စိုက်ဘဏ်		
၁၁		မွေး/ကု		
၁၂		ကျေး/ဖွံ့		
၁၃		စာတိုက်		
၁၄		သစ်တော		
၁၅		သစ်ထုတ်ရေး		
၁၆		လျှပ်စစ်		
၁၇		လ.ဝ.က		
၁၈		စားသုံးသူရေးရာ		
၁၉		အား/ကာ		
၂၀		ပညာရေး		
၂၁		ကျန်းမာရေး		
၂၂		အခွန်		
၂၃		စီးပွားဘဏ်		
၂၄		စီမံကိန်း		
၂၅		လမ်းဦးစီး		
၂၆		ကုန်တင်/ချ		

၂၃၀ ကေဒို ဝိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့်
တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ-

နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁					
၂					

5. Summarized results of PCM in Mawlu Township

Date/Place of Meeting	Stakeholder	Comment	Response
August 27,2019 (Tuesday) Meeting Hall, Township GAD Office,	**Nant Si Aung Village**	How many area of land will use for tower construction? Is it only for the crops compensation? How many times?	**DPTSC** The space will take 150 feet around for tower construction. The crops that have been destroyed during construction will be compensated. Crop compensation will be paid for every time when destruction occurs. We will not pay compensation for land area.
	Min Chan Thar Ward	Is can cause electrical danger because of high voltage.	**DPTSC** Under the tower, it can be cultivated the seasonal crops and orange, banana and tea leaf but cannot plant the perennial trees. Don't be worry about for electrical danger and thunder because every tower have lighting conductor. Can be touch the tower but cannot climb.
	Myay Palin	Worry about for electric shock and thunder in raining season. Shall you disclose the project information to the local farmer before the commencement of the project?	**DPTSC** Under the tower, it can be cultivated the seasonal crops and orange, banana and tea leaf but cannot plant the perennial trees. Don't be worry about for electrical danger and thunder because every tower have lighting conductor. Can be touch the tower but cannot climb.
	Pay Kone Village Administrator	In previous telecom tower construction project, they do not remove the construction residual materials so farm lands are damage and land owner have lost.	We will use the example of previous experience and negotiate the local farmers**.** We will remove and recondition the land after the construction.

Public consultation photo - Mawlu Township

Photos of Township Meeting

		
		
		
		
Photos of village meeting		
		

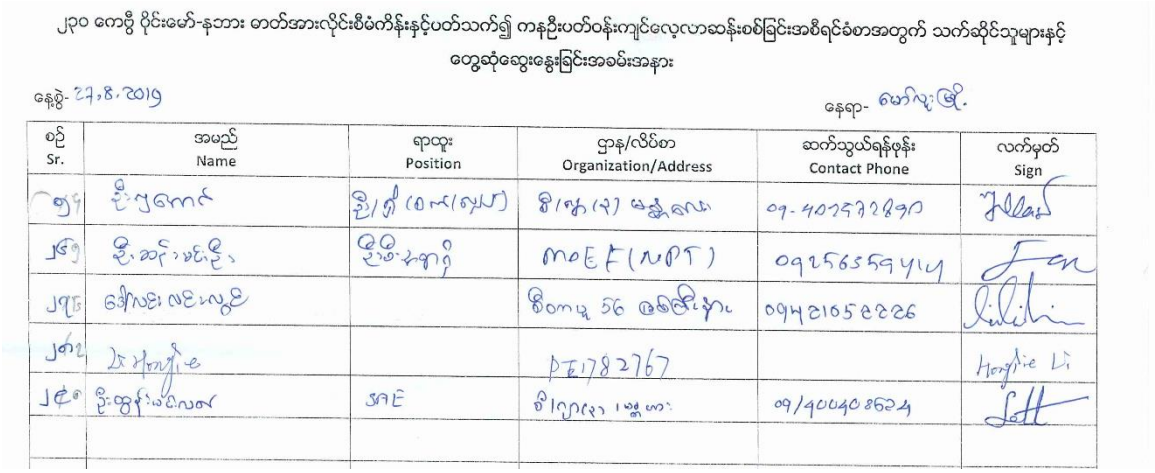
				
				

Meeting Tittle : Public Consultations
Meeting Place : Mawlu Township GAD Office
Date : 27-8-2019 (Tuesday)
Time : 02:00pm – 03:30 pm

၂၃၀ ကေဗွီ ပိုင်းမော်-နားဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၂၇.၈.၂၀၁၉ နေရာ- မော်လမြိုင်

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဒေါ်ခင်ငယ်	အကူအညီ	အားလုံး	၀၉.၇၆၇၁၀၄၇၈၃	
၂	မြိုးမိုးဆွေ	ဥပဒေရေးရာ	မြင်ကွေးမြို့နယ်ရုံးကြီး	၀၉.၂၅၆၀၄၈၅၆၆	
၃	မြိုးမောက်ကြယ်	-	မြင်းကုန်းရပ်ကွက်	၀၉.၄၅၆၅၆၆၀၃၃	
၄	မိုးထက်ဝင်း	-	ပဲတော်ကျေးရွာဆုတ်ခွဲ	၀၉.၇၇၁၆၄၇၆၇၅	
၅	မို့-ရေမြို့ဦး	တာဝန်ခံ	ဖြေပုလွန်	၀၉.၇၆၃၅၁၆၁	
၆	ကြူးဟန်-သိမ့်	"	ကမ္ဘာငြိမ်း	၀၉.၂၅၇၆၆၈၅၅၇၊	
၇	ခွန်းဖြဘီဆုံး	ဆေးသိပ္ပံမှူး	မင်းဘူးနာရေး	၀၉၄၅၆၂၆၀၇၃၇	
၈	မိုးစောဆိုင်ဦး	ရာဒေသမှူး	မင်းရေယာဂုပ်ကွက်	၀၉-၇၅၁၀၆၇၆၆	
၉	မိုးသက်ဇုန်း	ကုမ္ပဏီမှူး	ပဒေသရာဇာတ	၀၉၂၆၀၆၀၆၆	
၁၀	ဝင်းနိုင်	ကုမ္ပဏီမှူး	မင်းကာတာ	၀၉.၇၆၄၃၀၇၆၀၊	
၁၁	စော:ဇွေ	ကပ်ရုံ/က.	"	၀၉.၂၈၇၆၁၆၀၁၀	
၁၂	ဇွေဇွေ		မဟာ	၀၉ ၇၆၀၅၅၇၆၄၅	



၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား တတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့်
တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့ရွှေ- ၂၇,၈,၂၀၁၉ နေရာ- မောလျှင်မြို့

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	မြင့်ကောင်	ဦးစီး(စက်လယ်)	ဓါတ်(၃) မန္တလေး	၀၇-၄၀၇၄၇၃၈၅၁	
၂	မြ.ဆင်းမင်းမြ	ဦးဖြစ်အရာရှိ	MOEF(NPT)	၀၉၂၅၆၅၄၄၄၂၄	
၃	ခေါ်လေးလင်းလွင်		ဖိတ်ကူ 56 ဖောင်းနှာ	၀၉၄၂၁၀၅၉၃၃၆	
၄	Dr Myint Lwin		PE1782767		Myint Lwin
၅	မြင့်ထွန်းမင်းလတ်	အင်ဂျင်	ဓါတ်ကျော်၊ ၁၀၀ ကား	၀၉/၄၀၆၄၀၃၆၀၄	

6. Summarized results of PCM in Mohnyin Township

Date/Place of Meeting	Stakeholder	Comment	Response
August 30,2019 (Friday) Meeting Hall, Township GAD Office,	**Farm Land Management & Statistics Department**	When will you start the project? Start after harvesting of paddy? Will compensate just only for 40 sq. ft. of tower, how about the destruction caused by carrying raw material for construction.	**DPTSC** May be affected about 3 time - during foundation, construct the tower and stringing period. **Township Administrator** MOEE will pay the crops compensation from government budget according to 2012 farm land law. The crops that have been destroyed during construction will be compensated. Compensation price will be defined by farm land management committee, and approve the regional government.
	Myo Thit Kalay Village	Do not want to loss for the farmers who grow the crops after monsoon paddy. When construct the tower, you should negotiate with the local farmers	**Township Administrator** Farmer can grow seasonal crops normally. If the crops that have been destroyed during construction MOEE will be compensated.
	Myo Ma Ward	Do you compensate for land?	**DPTSC** We will not compensate for land, but will compensate only for crops.
	Pin Lon Village	I would like to know will you pay compensation either for crop where tower will be constructed or for land (2.5 feet around) occupied by the tower. Although it is 2.5 feet around land area, farmers have other grievances such as inconveniences when they plough the land.	**DPTSC** We are going to do survey the village and meet the land owner before the project.

		Should you discuss with the local farmer before the project.	

Public consultation photo - Mohnyin Township

Photos of Township Meeting		
		
		
		
		

Photos of village meeting

















Participant List in Mohnyin Township

Organization	Name/Title		Total
Township General Administrative Department	U Ye Aung, Township Administrator U San Shwe Myint, Town Administrator, Indaw Gyi Town		2
Farm Land Management & Statistics Department	U Zin Min Htut, Staff Officer		1
DPTSC, Project Manager Office 3 (northern), MOEE	U Hla Aung, Staff Officer	U Tun Min Latt, Deputy Staff Officer	2
DEPP, MOEE	U San Min Oo, Staff Officer		1
Resource and Environment Myanmar Co., Ltd Environmental Consultant	Daw Phyu Phyu Shein, Senior Consultant	Daw Nan Thazin Oo Consultant	5
	U Aung Thu Phyo Consultant	U Min Min Naing Consultant	
	Daw Chu Cherry Lwin Consultant		
Project Developer	Mr.Guan Weihua Engineer, SPIC Mr.Li Houg Jie Engineer, SPIC	Daw Lin Lin Lwin Translator, SPIC	3
Nar Khar	U Win Aung Nyunt	Junior Clerk	1
Pinn He	Daw Thein Thein Nu	Junior Clerk	1
Myoma	U Zaw Aye Min	Junior Clerk	

Maw Han Village	U Sai Thurain Tun	Junior Clerk	
Nant Poon	U Tun Tun Oo	Administrator	
Sa Nwin Kone	U Sein Min	Administrator	
Lal Hmee	U Nyunt Shwe	Administrator	
Shwe Pyi Thar	U Myo Kyaw	Administrator	
Shwe Inn Thar	U Aye Myint	Administrator	
Shwe Chaung Thar	U Ba Yan Shaung	Administrator	
Ma Mhon Kai	U Soe Myint	Administrator	
Nant Yinn Village	U Zaw Naing	Administrator	
Lwe Mon	U Thaung Sein	Administrator	
Nyaung Kine	Daw May Kyi	Junior Clerk	
Aung Thapyay	Daw Ja Nan	Junior Clerk	
Lone San	U Zaw Lay	Junior Clerk	
He Lone	Daw Ohnmar Soe	Clerk	
Nyaung Pin	Daw Khin Htay Maw	Clerk	
A Shae Su	U Win Naing	Administrator	
Tauk Kone	U Phyo Zayar Tun	Clerk	
Tar Duu	U Phoe Yone	Administrator	
Ywar Thit Kone	U Kyaw Su	Administrator	
Myoma Ward	U Win Naing Soe	Administrator	
Mya Thidar Ward	U Soe Min Tun	Administrator	
Maw Han	U Aung San Win	Administrator	
Myo Thit Kalay	U Linn Zaw	Administrator	
Nant Moon (1)	U Win Htain	Administrator	1
Nant Moon(3)	U Kyaw Min Aung	Administrator	1
Kone Mana	U Aung San Oo	Administrator	1
Nyaung Pin	U Thet Tun	Administrator	1
Pin Lon	U Thar Soe	Administrator	1
Ywar Thit Kyi	U Maung Tun	Administrator	1
Nant Moon(2)	U Than Ngwe	Administrator	
Sal Mai	U Tun Wai	Administrator	
Sal Mai	U Hla Thein	Clerk	
Kyar Kyi Kwin	U Soe Nyain Kyaw	Administrator	
Inndaw Kyi	U San Shwe Myint	Administrator	
Myo Ma(South)	U Kyaw Thu Ya	Administrator	
Myo Ma (North)	U Win Oo	Administrator	
Mya Zayar	U Myo Aung	Administrator	
Nant Saw Law	U Htay Win	Administrator	
(7) Mai	U Aung win	Administrator	
He Phu	U Tin San Win	Administrator	
Zawti Kone	U Maung Ko	Administrator	
Myo Ma (North)	U Maung Maung Lwin	Clerk	
Myo Ma (South)	U Kyaw Moe Tun	Clerk	
Ma Pyin	U Kyaw Thein	Administrator	
Sal Mai	U Tun Wai	Administrator	
Ta Kwin	U Sai Law Man	Administrator	
Lone San	U Kyaw Naing	Administrator	
Innlay	U Thein Oo	Administrator	
Chaung Wa	U Kyaw Htay	Administrator	
Oakkyin	U Saw Maung	Administrator	
Pann Lar	Daw Myo Ma Ma Moe	Clerk	
Pann Lar	U Aung Linn	Administrator	
Mai Poat	U Myint Oo		
Total			**66**

Meeting Tittle : Public Consultations
Meeting Place : Mohnyin Township GAD Office
Date : 30-8-2019 (Friday)
Time : 10:00am – 11:00 am

၂၃၀ ကေဗွီ ဝိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၄၃	မြို့ကောင်စီ	အုပ်ချုပ်ရေးမှူး	ဝေဂျာဝိ:ဝ	၀၄၄၇၄၅၅၀၂၂	
၄၃	ဦးစောဖေဝင်	″	အုပ်ချုပ်ရေး	၀၅.7841490937	
၄၄	စိုးမြဲမေမြို့	ဝန်ထမ်း	ပန်းလာ	၀၅-4547880926	
၄၅	ဦးဇော်ဝင်းထိုက်	ဌာနမှူးရာထူး	ပန်းလာ	၀၅.4555863209	
၄၆	ဦးဇွန်ဦး	အယ်ဂျင်ငေးပုဂ္ဂိုလ်	ပျဉ်းပုစု	၀၅.2537249814	

၂၃၀ ကေဗွီ ဝိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- နေရာ- မိုးညှင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၁	ဦးမောင်မြို့	ဌာနမှူးရာထူး	ရေအရင်းမြစ်	၀၅၄၀၀၀၂၇၃၆၅	
၂	ဒေါက်တာမြင့်မြင့်	အရာရှိ	ကျေးရွာ	၀၉.၇၀၀၀၅၅၈၀	
၃	ဦးစောမိုးဇွန်	စာရေး	မြို့မဟော်	၀၉ ၄၀၀၀၃၂၀၁၅	
၄	ဦးကျော်ဝင်းဒင်	အုပ်ချုပ်ရေးမှူး	ဒေသ	၀၅-4533637	
၅	ဦးထွန်းဝေ	ဒုတိယဌာနမှူး	ဆေးခန်း	၀၅-4000397440	
၆	ဦးခိုင်းဆောဝေ	လယ်သမား	တောင်ဒေ	၀၅၀၀၀၅၀၆၄၄	
၇	ဦးမျိုးမင်း	〃	လုံးခေါင်	၀၅.2574953424	
၀	ဦးဘဝိန်းဦး	〃	ဘဝိန်းလေး		

၂၃၀ ကေဗွီ ဝိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၈.၁၀.၂၀၁၉ နေရာ- မိုးညှင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
၄၀	မြို့ကောင်စီ	ဌာနမှူးရာထူး	မြေဆေးကျွန်	၀၅.256076688	
၄၁	ဦးဝေဖြဲဝင်း	အရာရှိ	ကျေးရွာ	၀၅.7800928185	
၄၂	ဦးဇောဝင်းဒင်	အုပ်ချုပ်ရေးမှူး	ဝေဂျာမြို့	၀၅.4000047898	
၄၃	ဦးထွန်းဆက်ဝေး	ဆေးစုဆောင်း	ဟမ္ဘ	၀၉.၅၉၁၃၀၄၁၂	

၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ-

နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
37				09-428119530	
38				09-444011749	
39				09-450040256	

၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား တတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၃၀.၈.၂၀၁၉

နေရာ- မိုးညှင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
25				09-784749450	
26				09-400004418	
27				09/	
28				09-42400000550	
29				09-401349796	
30				09459126578	
31				09-778043614	
32				09777344891	
33					
34				094000597420	
35					

၂၃၀ ကေဗွီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ-

နေရာ-

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
13				09-455464477	
14				0954000299229	
15				09-4000299291	
16				09-799787697	
17				095119549546	
18				09-500911166	
19				09-444368411	
20				09-951436473	
21				095599992221	
22				09-261725648	
23				09-400020771	
24				09-400004800	

၂၀၁၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၁၀.၆.၂၀၁၅ နေရာ- မိုးညှင်းမြို့

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
1				09 25723456988	
2				09	
3				09-4900035134	
4				09-420007235419	
5				09-421149316	
6				09-4993102247	
7				09 7879239	
8		"		09-7239	
9		"		09	
10		"		09	
11		"		09-25516791	
12		"		09-254554456	

၂၀၁၀ ကေဒီ ပိုင်းမော်-နဘား ဓာတ်အားလိုင်းစီမံကိန်းနှင့်ပတ်သက်၍ ကနဦးပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းအစီရင်ခံစာအတွက် သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်းအခမ်းအနား

နေ့စွဲ- ၃၀.၈.၂၀၁၅ နေရာ- မိုးညှင်း

စဉ် Sr.	အမည် Name	ရာထူး Position	ဌာန/လိပ်စာ Organization/Address	ဆက်သွယ်ရန်ဖုန်း Contact Phone	လက်မှတ် Sign
47				09-402572849	
48			MD-56	09-42105	
49					
50			MOEE (MPT)	09	
51				09	

Appendix – 6

PUBLIC GRIEVANCE SAMPLE FORM

Appendix – 6

PUBLIC GRIEVANCE SAMPLE FORM

Reference No:	
Full Name	
Contact Information **Please mark how you wish to be contacted (mail, telephone, e-mail).**	☐ **By Post: Please provide mailing address:** _____ _____ _____ ☐ **By Telephone:** _____ ☐ **By E-mail** _____
Preferred Language for communication	☐ **Burmese** ☐ **English** ☐ **Other**

Description of Incident or Grievance:	What happened? Where did it happen? To whom did it happen? What is the result of the problem?

Date of Incident/Grievance	
	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**

What would you like to see happen to resolve the problem?

Signature: _____
Date: _____

Please return this form to:

Name of Contact Person, Position and Title:_____
Address:_____
Tel.:_____
E-mail: _____