

**Appendix 2-1**

**MOM with DPTSC on Phase III**

**Minutes of Meeting**  
**on**  
**National Power Transmission Network Development Project (Phase III)**

Date: 3<sup>rd</sup> February 2020

Place: DPTSC, Nay Pyi Taw

For proceeding the essential surveys such as the route survey of transmission line and social and environmental surveys for transmission line route and substation area in the feasibility study on National Power Transmission Network Development Project Phase III ("the Project"), Department of Power Transmission and System Control ("DPTSC") of Ministry of Electricity and Energy ("MOEE") in the Republic of the Union of Myanmar and JICA Survey Team agreed the following items concerned;

**1. Scope of Work of the Project**

- Both parties agreed the scope of work of the Project as below;

(1) Transmission Line

- a) 500 kV transmission lines between Phayargyi Substation and New 500 kV Substation (Sar Ta Lin Substation): 2 circuits
- b) 230 kV transmission lines between New 500 kV Substation (Sar Ta Lin Substation) and Hlawga Substation: 4 circuits
- c) 230 kV transmission lines between New 500 kV Substation (Sar Ta Lin Substation) and East Dagon Substation: 2 circuits
- d) Reconstruction of 230 kV transmission line between Hlawga Substation and Thaketa Substation: 2 circuits\*

\*This transmission line will be included in the scope of work of the Project subject to Category B defined in the "GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS" established by JICA.

(2) Substation

- a) Construction of New 500 kV Substation (Named "Sar Ta Lin" Substation)
- b) Expansion of East Dagon Substation
- c) Upgrade all 230 kV switchgear (AIS) to GIS in Hlawga Substation
- d) Expansion of Thaketa Substation

**2. Location of New 500 kV Substation**

- JICA Survey Team proposed two locations, inside (Option-1) and outside (Option-5) of Yangon City Development Area, for construction of new 500 kV substation from the viewpoints of accessibility during construction and maintenance of the substation and further connection of transmission lines after the Project.
- After reviewing the suggestions and surveying the site by DPTSC, both parties agreed to construct new 500 kV substation in the land next to west side of Option-5

*Handwritten signatures and initials in blue ink.*

location in consideration of connection of 230 kV transmission lines. In addition, DPTSC agreed to proceed the route survey and environmental and social impact survey for substation and transmission lines.

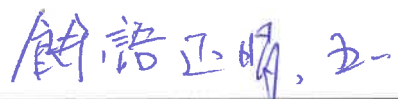
### 3. Transmission Line Route

- Both parties agreed the transmission line route of the Project as below;
  - (1) 500 kV transmission line route
    - JICA Survey Team explained there are three options for the 500 kV transmission line route in west lines and east line.
    - In the west route, the transmission line shall be passed on reserved forest and rubber plantation area. It will be difficult to secure the Right of Way (ROW) of the transmission line route. On the other hand, the east route as shown in the Attachment-1 has no potential which affect to secure the ROW from the viewpoint of compensation under the ROW.
    - Therefore, DPTSC agreed to select the east route for proceeding the environmental and social consideration survey and requested JICA Survey Team to describe about both routes in the report of the Project.
  - (2) 230 kV transmission line route
    - Both parties agreed that the 230 kV transmission line routes as shown in Attachment-1.

For  
DPTSC, MOEE

  
\_\_\_\_\_  
Aye Kyaw  
Director General

For  
JICA Survey Team

  
\_\_\_\_\_  
Masaharu YOGO  
Team Leader

END

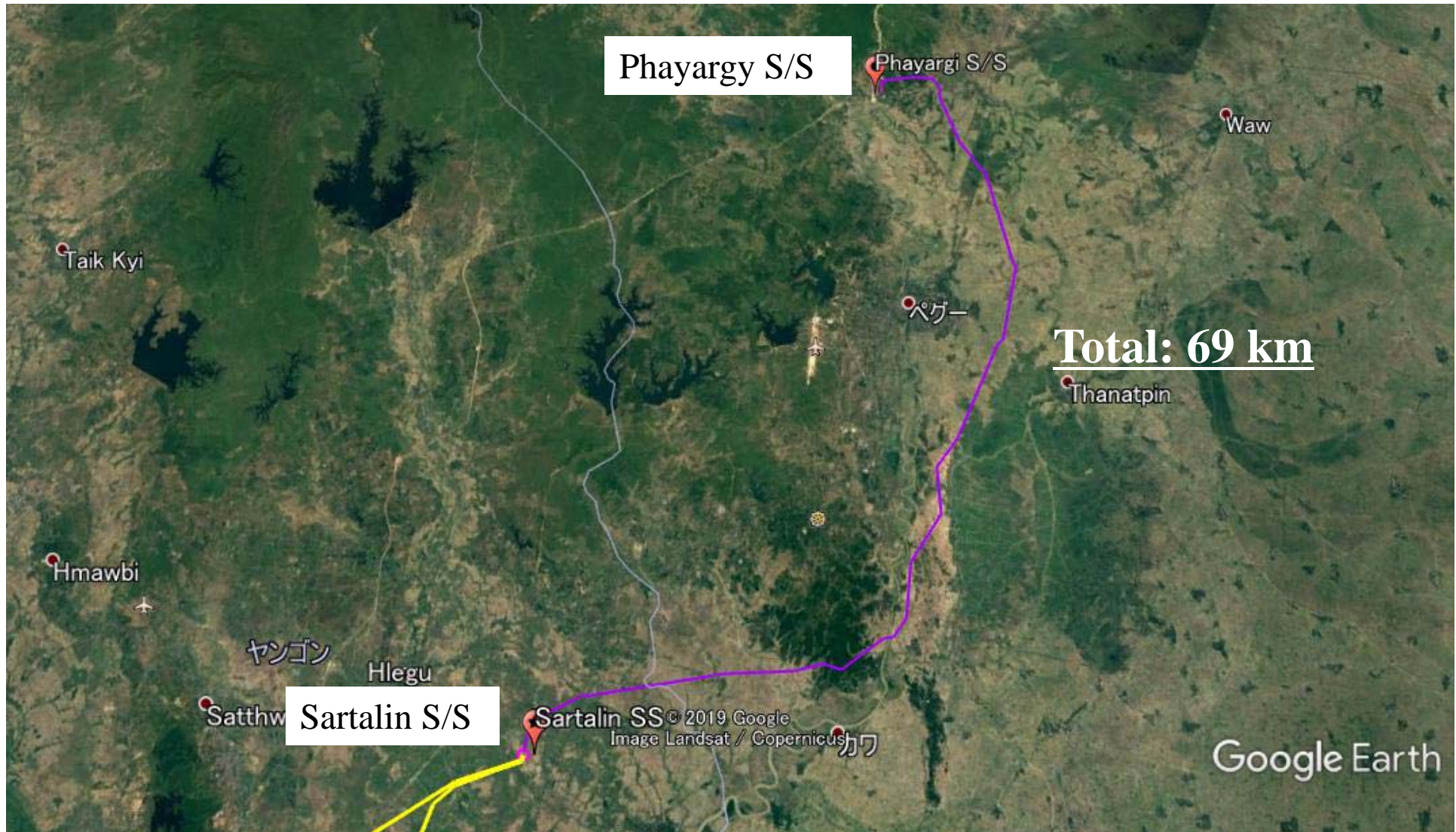


五-1

# **Proposed 500kV and 230kV T/L Routes in JICA Preparatory Survey for future T/L and S/S projects in Yangon**

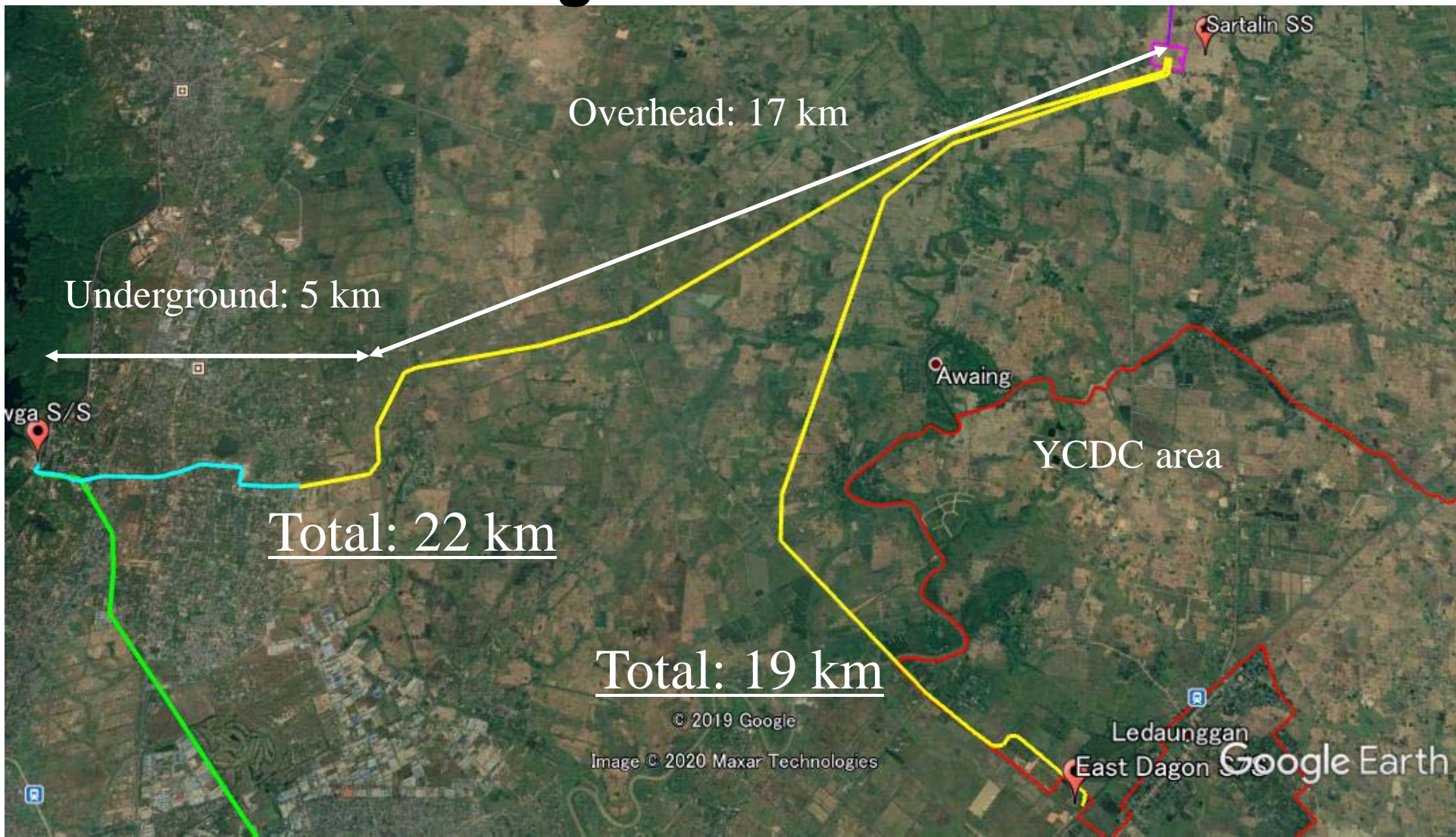


# New 500kV Route Phayargy – Sartalin





# New 230kV T/L Routes Sartalin-Hlawga and Sartalin-East Dagon



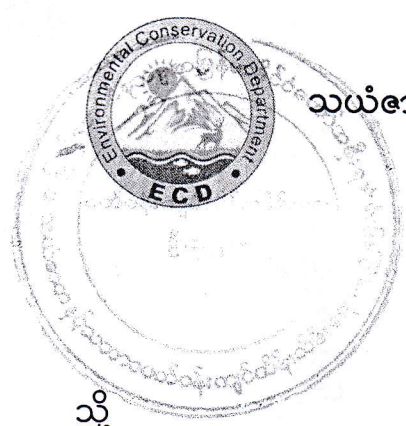


# Existing 230kV Route Hlawga–Thakheta



**Appendix 4-1-1**  
**Reply Letter from ECD**





ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ  
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန  
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန  
ညွှန်ကြားရေးမှူးချုပ်ရုံး

စာအမှတ်၊ အီးအိုင်အေ - ၂/၂ (၂၃၂/၂၀၂၀)  
ရက်စွဲ၊ ၂၀၂၀ပြည့်နှစ် ဒီဇင်ဘာလ ၂၂ ရက်

သို့

ညွှန်ကြားရေးမှူးချုပ်  
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန

အကြောင်းအရာ။ JICA ချေးငွေ Phase-3ဖြင့် ဆောင်ရွက်မည့် စီမံကိန်းများအတွက် တင်ပြ  
လာသော စီမံကိန်းအဆိုပြုလွှာနှင့်ပတ်သက်၍ သဘောထားမှတ်ချက်  
ပြန်ကြားခြင်း

- ရည်ညွှန်းချက်။
- (၁) လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေး နှင့် ကွပ်ကဲရေးဦးစီးဌာန၏ ၂.၁.၂၀၂၀  
ရက်စွဲပါ စာအမှတ်၊ ၀၁၀ /ပပစ (လုပ်ငန်း)/၂၀၂၀
  - (၂) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ ၂၉.၁.၂၀၂၀ ရက်စွဲပါ စာအမှတ်၊  
အီးအိုင်အေ-၂/၂(၂၁၅/၂၀၂၀)
  - (၃) လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၏ ၂၁.၉.၂၀၂၀  
ရက်စွဲပါ စာအမှတ်၊ ၁၃၇၂ /ပပစ (လုပ်ငန်း)/၂၀၂၀
  - (၄) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ ၄.၁၂.၂၀၂၀ ရက်စွဲပါ စာအမှတ်၊  
အီးအိုင်အေ-၂/၂(၂၉၈၀/၂၀၂၀)
  - (၅) ဤပြည်ထောင်စုဝန်ကြီးရုံး၏ ၁၅.၁၂.၂၀၂၀ ရက်စွဲပါ စာအမှတ်၊  
(သစ်တော) ၃(၂) / ၁၆ (ဃ) (၅၈၁၀/၂၀၂၀)

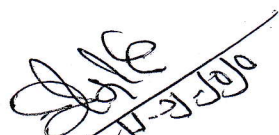
၁။ အကြောင်းအရာပါကိစ္စနှင့်စပ်လျဉ်း၍ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၊ လျှပ်စစ်ဓာတ်အား  
ပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာနမှ ရန်ကုန်တိုင်းဒေသကြီးအတွင်း လျှပ်စစ်ဓာတ်အားပိုမို  
တိုးတက်ဖြန့်ဖြူးနိုင်ရန် ဂျပန်နိုင်ငံ JICA ချေးငွေ Phase-3 ဖြင့် ဆောင်ရွက်မည့် စီမံကိန်းများ  
အတွက် စီမံကိန်းအဆိုပြုလွှာအား ရည်ညွှန်း(၁)ပါစာဖြင့် တင်ပြလာခြင်းအပေါ် ပတ်ဝန်းကျင်  
ထိန်းသိမ်းရေးဦးစီးဌာနမှ စိစစ်ပြီး စီမံကိန်းအဆိုပြုလွှာအား ပြည့်စုံစွာတင်ပြရန် ရည်ညွှန်း(၂)ပါ  
စာဖြင့် ပြန်ကြားခဲ့ရာ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာနမှ ပြန်လည်ပြင်ဆင်ပြီး  
ရည်ညွှန်း(၃)ပါစာဖြင့် ပေးပို့လာခြင်းအပေါ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ စိစစ်ဆောင်  
ရွက်ပြီး ရည်ညွှန်း(၄)ပါစာဖြင့် ပြည်ထောင်စုဝန်ကြီးရုံးသို့ တင်ပြခဲ့ရာ ခွင့်ပြုကြောင်း ရည်ညွှန်း  
(၅)ပါစာဖြင့် အကြောင်းကြားလာပါသည်။

IMP (PIP)  
Received No. \_\_\_\_\_  
Date \_\_\_\_\_



၂။ သို့ဖြစ်ပါ၍ ရန်ကုန်တိုင်းဒေသကြီးအတွင်း လျှပ်စစ်ဓာတ်အားပိုမို တိုးတက် ဖြန့်ဖြူးနိုင်ရန် ဂျပန်နိုင်ငံ JICA ချေးငွေ Phase-3ဖြင့် ဆောင်ရွက်မည့် စီမံကိန်းများနှင့်ပတ်သက်၍ အောက်ပါ အတိုင်း ဆောင်ရွက်ရန် လိုအပ်ကြောင်း သဘောထားမှတ်ချက် ပြန်ကြားအပ်ပါသည်-

- (က) လှည်းကူးတွင် ၂၅ ဟက်တာရှိသည့် ၅၀၀ကေဗွီ ဓာတ်အားခွဲရုံအသစ် တည်ဆောက်ခြင်းနှင့် ပဲခူးတိုင်း(ဘုရားကြီး)မှ လှည်းကူးသို့ ၅၀၀ကေဗွီ ၆၈.၉ ကီလိုမီတာ ဓာတ်အားလိုင်းအသစ် သွယ်တန်းခြင်း စသည့်လုပ်ငန်းအားလုံးကို ခြုံငုံသော ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာတစ်စောင် ရေးဆွဲတင်ပြရန်၊
- (ခ) ဒဂုံမြို့သစ်(အရှေ့)တွင် တည်ရှိလျက်ရှိသော ဓာတ်အားခွဲရုံအား ၂၃၀ကေဗွီ တိုးချဲ့ တည်ဆောက်ခြင်း၊ လှော်ကားတွင် တည်ရှိလျက်ရှိသော ဓာတ်အားခွဲရုံအား ၂၃၀ ကေဗွီ တိုးချဲ့တည်ဆောက်ခြင်း၊ လှည်းကူးဓာတ်အားခွဲရုံမှ ဒဂုံမြို့သစ်(အရှေ့) ဓာတ်အားခွဲရုံသို့ ၂၃၀ကေဗွီ ၁၉.၅ ကီလိုမီတာ ဓာတ်အားလိုင်းအသစ် သွယ်တန်း ခြင်း၊ လှည်းကူးဓာတ်အားခွဲရုံမှ လှော်ကားဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ ၁၇.၄ ကီလိုမီတာ Overhead ဓာတ်အားလိုင်းအသစ် သွယ်တန်းခြင်းနှင့် ၄.၆ ကီလိုမီတာ Underground ဓာတ်အားလိုင်းအသစ် သွယ်တန်းခြင်း၊ လှော်ကားဓာတ်အားခွဲရုံမှ သာကေတဓာတ်အားခွဲရုံသို့ ၂၃၀ကေဗွီ ၂၂.၃ ကီလိုမီတာ ဓာတ်အားလိုင်း အဆင့် မြှင့်တင်ခြင်း စသည့်လုပ်ငန်းများအားလုံးကို ခြုံငုံသော ကနဦးပတ်ဝန်းကျင်ဆန်း စစ်ခြင်း အစီရင်ခံစာတစ်စောင် ရေးဆွဲတင်ပြရန်၊
- (ဂ) ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ဆောင်ရွက်မည့် တတိယပုဂ္ဂိုလ် (သို့မဟုတ်) အဖွဲ့အစည်းအား ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ်(၃၂)နှင့်အညီ သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြ အတည်ပြုချက်ရယူရန်၊
- (ဃ) တတိယပုဂ္ဂိုလ် (သို့မဟုတ်) အဖွဲ့အစည်းအတွက် အတည်ပြုချက် ရရှိပြီးပါက ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအပိုဒ် (၃၄)၊(၃၅)၊(၃၆)၊ (၃၇)၊(၃၈)နှင့်အညီ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာကို သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ ပြုစုတင်ပြ အတည်ပြုချက် ရယူရန်၊

  
 ညွှန်ကြားရေးမှူးချုပ် (ကိုယ်စား)  
 (စိုးနိုင်၊ ညွှန်ကြားရေးမှူး)  
 ၅

မိတ္တူကို  
ရုံးလက်ခံ၊ မျှောစာတွဲ၊ အမှုတွဲချုပ်

The Government of The Republic of The Union of Myanmar  
Ministry of Natural Resources and Environmental Conservation  
Environmental Conservation Department  
Office of the Director-General

Letter No.- EIA -2/2 (3132/2020)

Date- 22, December 2020

To

Director-General

Department of Power Transmission and System Control

**Subject:** Issuing comments on the Project Proposal submitted for the Projects which will be implemented by JICA ODA Loan Phase 3

References:

1. Letter No.-010/ Da Pa Sa (Project)/ 2020 dated 2.1.2020 of Department of Power Transmission and System Control
  2. Letter No.-EIA – 2/2 (215/2020) dated 29.1.2020 of Environmental Conservation Department
  3. Letter No.- 1372/ Da Pa Sa (Project)/ 2020 dated 21.9.2020 of Department of Power Transmission and System Control
  4. Letter No.- EIA- 2/2 (2980/2020) dated 4.12.2020 of Environmental Conservation Department
  5. Letter No.- (Forest) 3(2)/16 (D) (5810/2020) dated 15.12.2020 of Office of Union Minister
- 
- 1) Referring to the above matter, the Environmental Conservation Department (ECD) screened the Project Proposal submitted with reference letter (1) for the JICA ODA Loan Phase-3 of National Power Transmission Network Development Projects in Yangon Region that will be implemented by the Department of Power Transmission and System Control (DPTSC) under Ministry of Electricity and Energy (MOEE), and replied with the reference letter (2) to revise the Project Proposal with the additional information. ECD screened and proceeded the revised Project Proposal submitted by DPTSC with the reference letter (3) and then submitted it to Union Minister's Office (MONREC) for approval with the reference letter (4), and Union Minister's Office issued the permission for the Project Proposal with the reference letter (5).
  - 2) Regarding the Proposed Projects to be carried out in Yangon Region with the JICA ODA Loan Phase-3, it is necessary to do the following:

- a). To submit the Initial Environmental Examination (IEE) report covering all activities, including the construction of a new 500-kV substation (25 ha) in Hlegu and the construction of a new 68.9 km of 500 kV TL from Bago Region (Hpayargyi) to Hlegu.
- b). To submit the Initial Environmental Examination (IEE) report covering all activities including - the improvement of Dagon Myothit (East) Substation (230kV) and Hlawga Substation (230kV), the construction of a new 19.5 km of 230kV TL from Hlegu Substation to Dagon Myothit (East) Substation, the construction of a new 17.4 km of 230kV Overhead TL and 4.6 km of 230 kV Underground TL from Hlegu to Hlawga, and improvement of the 22.3 km of existing overhead TL from Hlawga Substation to Thaketa Substation.
- c). To get approval for the Third Party (or) Organization from MONREC, in accordance with Article 32 of the Environmental Impact Assessment Procedures, who will conduct the Initial Environmental Examination (IEE).
- d). To submit and get the approval of IEE Reports from MONREC, in accordance with Article 34, 35, 36, 37, and 38 of EIA Procedures, after getting the approval for the Third Party (or) Organization.

Signed  
Director-General (On behalf)  
(Soe Naing/ Director)

Copy to:

Office Copy, Attachments, Case files



**Appendix 4-1-2**

**Environmental Monitoring Form**

## Environmental Monitoring Form (EMoF) during Construction

Monitoring date: \_\_\_\_\_

Implemented by: \_\_\_\_\_

### 1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Responses/Actions to Comments and Guidance from Government Authorities including MONREC-ECD*	

\*MONREC-ECD: Ministry of Natural Resource and Environment Conservation- Environment Conservation Department

### 2. Pollution Control

#### - Air Quality (Ambient Air Quality)

##### Location:

Item	Unit	Measured Value Mean)	Measured Value (Max.)	Referred Standards *	Remarks (Measurement Point, Frequency, Method, etc.)
CO <sub>2</sub>	ppm or $\mu\text{g}/\text{m}^3$			-	
PM <sub>2.5</sub>	$\mu\text{g}/\text{m}^3$ -24 hours			25	
PM <sub>10</sub>	$\mu\text{g}/\text{m}^3$ -24 hours			50	
NO <sub>2</sub>	$\mu\text{g}/\text{m}^3$ -1 hour			200	
SO <sub>2</sub>	$\mu\text{g}/\text{m}^3$ -24 hours			20	
Ozone	$\mu\text{g}/\text{m}^3$ -8 hours			100	
Wind Speed	km/h			-	
Wind Direction	Abbreviation & Degrees (°)			-	

\*There is no ambient air quality standards in Myanmar as of January 2021. The Value of “National Environmental Quality (Emission) Guidelines (2015)” are described and it’s value are came from WHO guideline value as referred international standards. If the national ambient quality standards are enacted, it is necessary to use these values.

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of water spraying, dust nets, covering construction materials and excavated earth	

#### - Water Quality (Ambient Water Quality)

##### Location:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Referred Standards *	Remarks (Measurement Point, Frequency, Method, etc.)
Temperature	°C			-	

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Referred Standards *	Remarks (Measurement Point, Frequency, Method, etc.)
pH	-			6-9	
EC	mS/cm			-	
BOD <sub>5</sub>	mg/L			30	
COD Cr	mg/L			125	
Oil and grease	mg/L			10	
Total coliform bacteria	MPN/100ml			400	
Total Nitrogen	mg/L			10	
Total phosphorus	mg/L			2	
Suspended Solids	mg/L			50	
Total Chromium	mg/L			0.5	
Cadmium	mg/L			0.1	
Arsenic	mg/L			0.1	
Zinc	mg/L			2	
Lead	mg/L			0.1	
Mercury	mg/L			0.01	
Copper	mg/L			0.5	
Iron	mg/L			3.5	
Manganese	mg/L			-	

\*There is no ambient water quality standards in Myanmar as of January 2021. The Value of “National Environmental Quality (Emission) Guidelines (2015)” are described and it’s value are came from WHO guideline value as referred international standards. pH-SS: Site Runoff and Wastewater Discharges (construction phase), Total Cr to Mn: Storm water runoff (general application), If the national water quality standards are enacted, it is necessary to use these values.

Monitoring Item	Monitoring Results during Report Period
Visual inspection and Septic tanks, temporary drainage system, bund wall or spill kit	

#### - Waste

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	

#### - Soil Contamination

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste storage conditions, fuel filling method, spill kit to consider soil contamination (photos, drawing, etc.)	

#### - Noise / Vibration

Location:

Item	Time	Unit	Measured Value (Mean)	Measured Value (Max.)	Referred Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level*	Day Time (7:00-22:00)	(LAeq, dB)			55	
	Day Time (22:00-7:00)				45	
Vibration level**	Day Time (7:00-22:00)	(L10, dB)			65	
	Day Time (22:00-7:00)				60	

\*There is no ambient noise standards in Myanmar as of January 2021. The Value of “National Environmental Quality (Emission) Guidelines (2015)” are described and it’s value are came from WHO guideline value as referred international standards. If the national noise standards are enacted, it is necessary to use these values.

\*\*There are no guideline values for vibration level in Myanmar’s NEQG, or in Southeast Asian or International organizations such as WHO and IFC. Therefore, the vibration level values are compared with the Japanese standards, Vibration Regulation Act, Japan (Law No.62, 1976, Amended 2004).

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of notice letter, work schedule and night work, inspection and maintenance of machines	

#### - Offensive Odor

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste storage conditions, odor condition around septic tank	

### 3. Natural Environment

#### - Ecosystem

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Incident and accident record, and measures as necessary	
Keeping records of replant the number of the losses of plants	

### 4. Social Environment

#### - Risks of Infectious Disease such as AIDS/HIV

Monitoring Item	Monitoring Results during Report Period
Keeping records of status of conditions of community safety and health including infectious diseases	

#### - Working conditions (including occupational safety)

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of PPE wearing, safety sign board, hazards warning post,	

tool box meeting, training, etc.	
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**5. Others**

**- Accidents**

<b>Monitoring Item</b>	<b>Monitoring Results during Report Period</b>
Keeping records of fire, and traffic accidents at the site	

## Environmental Monitoring Form (EMoF) during Operation

Monitoring date: \_\_\_\_\_

Implemented by: \_\_\_\_\_

### 1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Responses/Actions to Comments and Guidance from Government Authorities including MONREC-ECD*	

\*MONREC-ECD: Ministry of Natural Resource and Environment Conservation- Environment Conservation Department

### 2. Pollution Control

#### - Water Quality (Ambient Water Quality)

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Records of Septic tanks and drainage usage	

#### - Waste

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	

#### - Soil Contamination

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste storage conditions, oil filling method, oil pits (photos, drawing, etc.)	

#### - Noise / Vibration

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Records of inspection and maintenance of machines	

#### - Offensive Odor

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Waste storage conditions, odor condition around septic tank	

### 3. Natural Environment

#### - Ecosystem

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Incident and accident record such as bird strikes	

Monitoring Item	Monitoring Results during Report Period
Keeping records of replant the number of the losses of plants	

#### 4. Social Environment

##### - Working conditions (including occupational safety)

Monitoring Item	Monitoring Results during Report Period
Visual inspection and keeping records of Incident and accident record, Records of provided PPE wearing	

#### 5. Others

##### - Accidents

Monitoring Item	Monitoring Results during Report Period
Keeping records of fire, and traffic accidents at the site	

*End of Document*

**Appendix 4-1-3**

**Environmental Checklist**



**Environmental Checklist: 6. Power Transmission and Distribution Lines (1)**

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Project proponent submitted "Project Proposal" to the Environmental Conservation Department (ECD)/Ministry of Natural Resources and Environmental Conservation (MONREC) on Jan.2020. The draft IEE report of the Project was prepared through the JICA Feasibility study. However, the project were categorized as two IEE projects at the end of December 2020. The Project proponent will follow the official process and will get ECC (Environmental Compliance Certificate (ECC)) or an approval document for the Project before the construction start. (b) ditto (c) ditto (d) No any other approvals expect IEE/EIA approval.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) There were 5 public consultation meetings with appropriate procedures. The executive summary of the draft IEE in Myanmar language was posted on the township notice boards so that any residents or interested persons could attend. In addition, other stakeholder meetings with affected persons when the alignment of transmission lines is confirmed will be held at the project implementation stage. (b) The results including comments of the stakeholder meetings and public disclosures at the draft IEE stage was reflected to the latest draft IEE Report and will be reflected to the outline design of the project implementation stage.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The alternative plans both substation and route of transmission line including plan which the project not to be implemented, a comparison study have been conducted on the natural environment and the social environment (mainly resettlement and land acquisition), construction cost, and construction technology aspects. From the aspect of the expansion of the substation in the future, the option of construction of a new substation was selected. Also, there was no big difference in technical issues and cost between west route east route, but the west route has a large number of rubber plantations cut down on the route, and it was considered to difficult to have compensation and negotiations. Therefore, the option of east route was selected.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) Y	(a) Although it is possibility that soil runoff will occur during the construction phase, the impact is minor because most project implementation areas are far from rivers and will have appropriate mitigation measures such as the drainage system of the substation will be ensured no water ponding, overflowing and blocking.

**Environmental Checklist: 6. Power Transmission and Distribution Lines (2)**

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The project has a sufficient distance from the protected area and no direct negative impact on the protected area is to be anticipated. Even after the operation phase, the project transmission line will not be a source of air pollution or noise, so no impact is anticipated. It was confirmed the project site is not belonging to the Critical Habitat Definition, five definitions, of IFC Guidance Note 6, Biodiversity Conservation and Sustainable Management of Living Natural Resources.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N (b) N (c) N (d) Y (e) N (f) N	(a) N/A (b) N/A (c) As described above (a) and (b), the project site does not encompass a special area for the ecosystem. Therefore, significant ecological impacts are not anticipated. In addition, the transmission line will not create any large barriers to wildlife and bird movements. While the transmission line alignment does not pass through any significant wildlife habitat and it is not expected to cause any net loss of species. Even there were records of endangered species in the protected area in the township of the project. No record is observed in the Project site according to the experts and government officers hearing results in the project site. (d) During construction phase of transmission line, it is possibility that migration routes and habitat are divided by construction area temporarily. The impact is anticipated to be minor because the construction work is implemented part by part. In operation phase, impact is anticipated to be minor because the ROW will be restored and are able to be used same as before. Also, the project proponent monitor bird strikes to the transmission line and tower, and take necessary measures such as increasing visibility of transmission lines to use marker and/or bird diverter if any impacts are identified. (e) Large-scale deforestation by the project is not expected because the transmission line will pass through agricultural land. Mitigation measures such as the implementation of an environmental education programs for workers will be implemented because it is fear that illegal hunting and poaching by a construction workers during the construction phase. (f) A significant impact by the project on the natural environment is not to be anticipated. Since the transmission line of the project will be constructed along existing transmission lines, large-scale development will not be carried out.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) The project area is not included the area which has the possibility of slope failures or landslides because the transmission line is planned along the existing line and most of the project area is flat and agricultural land. (b) Slope failures or landslide caused by the project will be not expected in the project area because most of the project area is plain areas. (c) Since the project sites are development areas such as residential areas, agricultural lands, and gentle ups and downs, large-scale soil runoff is not to be anticipated. In order to prevent small soil runoff during the construction phase, recovery of vegetation and sprinkling water are expected as mitigation measures.

Environmental Checklist: 6. Power Transmission and Distribution Lines (3)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Are the compensations going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a) N (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y</p>	<p>(a) Due to the construction of the substation and the transmission lines, residents, businesses and commerce will not be physically resettled due to land acquisition. Occurrence of economic resettlement will be studied and discussed during the socio-economic survey and consultation during the implementation phase. Livelihood rehabilitation assistances are planned to minimize the negative impacts on those who will suffer economic resettlement.</p> <p>(b) Explanation on compensation and assistance is to be given to affected people prior to land acquisition. Opinions of affected people obtained in consultation meetings are to be reflected to the compensation and assistance policies.</p> <p>(c) Draft resettlement action plan is prepared. Based on the socioeconomic survey and consultation to be implemented in the implementation phase, the draft will be updated to include further precise information on compensation with full replacement costs, restoration of livelihoods and living standards.</p> <p>(d) The compensation will be paid prior to land acquisition. No physical resettlement is expected.</p> <p>(e) The compensation policies are already included in the abbreviated Resettlement Action Plan as the Entitlement Matrix. The compensation policies are to be updated based on the survey results and the consultation meetings in the implementation phase of the Project.</p> <p>(f) The resettlement action plan already proposes particular attention to vulnerable groups in the compensation policies in the abbreviated Resettlement Action Plan. The policies are to be updated based on the survey results and the consultation meetings in the implementation phase of the Project. Special attention will also be paid to vulnerable groups in the design and the implementation of the stakeholder meetings and the surveys in the implementation phase.</p> <p>(g) Agreements with the affected people is planned to be obtained prior to land acquisition, through the stakeholder meetings in the implementation phase of the Project. No physical resettlement is expected.</p> <p>(h) The organizational framework to be used is well established for land acquisition and resettlement for all public projects. The capacity and budget is secured to implement the plan.</p> <p>(i) Monitoring plan to monitor the impacts of land acquisition is included in the resettlement action plan.</p> <p>(j) The grievance redress mechanism within DPTSC and within YRG is well established for land acquisition and resettlement for all public projects.</p>

**Environmental Checklist: 6. Power Transmission and Distribution Lines (4)**

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Living and Livelihood	<p>(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered?</p> <p>(d) Are the compensations for transmission wires given in accordance with the domestic law?</p>	<p>(a) Y (b) Y (c) Y (d) Y</p>	<p>(a) During the construction of the transmission lines, temporal land lease will be necessary between the towers. The access road will require about 4m width. The access road will pass mainly on farmland. Part of the access road will cross woodland, including rubber plantation. Where the ROW crosses major road, roadside vendors may need to move out of the ROW during the construction. There is slight possibility that such vendors have difficulties in moving out of ROW (60m) and need to stop business activities. Compensation policy for the temporal income loss during the land lease is already included in the Entitlement Matrix of the abbreviated Resettlement Action Plan. The Project will positively affect in sales of local shops and vendors, etc. during the construction of towers transmission lines by workers.</p> <p>(b) All employees for the project will go through a medical examination. And, Improvement in the power distribution may create a stable and efficient electric power supply resulting in the upgrading of social infrastructures and services as well as the living condition of people.</p> <p>(c) No significant radio interference due to enough distance from objects. And, regular maintenance of transformers to avoid unnecessary noise production, and use corona rings, smooth rounded-shape high voltage electrodes, and high-quality insulation.</p> <p>(d) There is no law related to the compensations for transmission wires but the project proponent will surely follow with the domestic law.</p>
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) The impacts on the cultural heritage are negligible as the closest heritage place is approximately 5 km from the project site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Transmission line across the human settlement, open field, roads and croplands and there is no important local landscapes and viewpoints to be considered around the project area.
	(5) Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?</p>	<p>(a) N (b) Y</p>	<p>(a) No indigenous and minority people are around the Project site.</p> <p>(b) N/A</p>
	(6) Working Conditions	<p>(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?</p> <p>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?</p>	<p>(a) N (b) Y (c) Y (d) N</p>	<p>(a) The project proponent is not violating any laws and ordinances associated with the working conditions of Myanmar such as the Occupational Health and Safety Law (2019).</p> <p>(b) Tangible safety considerations such as identifying the potential exposure levels in the workplace, and providing appropriate and adequate PPE for workers are involved in the project.</p> <p>(c) Health and safety training will be taken place.</p> <p>(d) All necessary measures for security including training the workers and security guards in consideration of occupational and community safety will be taken by the project proponent.</p>

**Environmental Checklist: 6. Power Transmission and Distribution Lines (5)**

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Mitigation measures for impact by construction work (noise, vibrations, turbid water, dust, exhaust gases, and wastes) are proposed in EMP of IEE. (b) Most of the planned construction area is grassland/ farmland or ROW of the existing transmission line. Any disruption of wildlife behavior will be temporary during construction, and animals, including birds, will be able to move around or over construction sites. Also, the cutting ranges of forests will be minimized as mitigation measures. (c) Construction work of transmission line moves according to progress, the impact on the surrounding area will be local and temporary. Therefore, a serious impact on the social environment due to noise and vibration by construction work will not be expected. However, some social impacts are to be expected such as conflict with local residents due to the inflow of construction workers and sanitation problems. As mitigation measures to the problem, educational programs to workers and others are proposed as EMP.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a) The project proponent developed and will implement an appropriate monitoring program based on the EMoP specified in the IEE report. (b) The practical EMoP, monitoring plan, covers Noise and Vibration, Water quality, checking the Environmental Management Plan (EMP) implementation during construction/operation and incidence, and spills of hazardous materials will be monitored during operation which is specified in the EMoP of the IEE report. (c) The Project Implementation Unit (PIU) will be established for the Project as a responsibility section. The monitoring framework is mentioned and confirmed in the IEE report. (d) EMoP which were proposed in IEE clarify that format and frequency of reporting to MONREC-ECD as the regulatory authority and JICA.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) -	(a) N/A
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) -	(a) N/A

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.

In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

**Appendix 4-1-4**

**Initial Environmental Examination Report**

**Ministry of Electricity and Energy (MOEE)**

**The Republic of the Union of Myanmar  
National Power Transmission Network Development  
Project (Phase III)**

**INITIAL ENVIRONMENTAL EXAMINATION (IEE)  
REPORT**

**July 2020**

**Prepared by  
NIPPON KOEI CO., LTD. & MYANMAR KOEI  
INTERNATIONAL LTD.**

**For  
DEPARTMENT OF POWER TRANSMISSION AND SYSTEM  
CONTROL (DPTSC/MOEE)**

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY.....</b>	<b>1</b>
1. Background and Project Components.....	1
2. Purpose of the Project.....	2
3. Project Proponent.....	2
4. Institutional Framework.....	3
4.1 MOEE.....	3
4.2 MONREC.....	4
5. Type of Project and IEE/EIA Requirement.....	6
6. Implementing Organization for Environmental Impact Assessment.....	6
7. Project Details.....	7
7.1 Conceptual Design of 500kV Transmission Line.....	7
7.2 Conceptual Design of New Hlegu Substation.....	9
7.3 Conceptual Design of Improvement of Existing Dagon Myothit (East) Substations.....	11
7.4 Conceptual Design of Improvement of Existing Hlawga Substations.....	12
7.5 Conceptual Design of 230 kV Transmission Lines.....	14
8. Description of Surrounding Environment.....	17
9. Summary of Environmental, Social and Health Impacts and Emergency Risk Assessments...	20
9.1 Geographical Scope.....	20
9.2 Temporal Scope.....	20
9.3 Impact Assessment Methodology for IEE Study.....	20
9.4 Assessing Significance.....	21
10. Environmental management and monitoring plan.....	33
10.1 Mitigation and Consideration Measures.....	33
10.2 Environmental Monitoring Plan (EMoP).....	39
11. Public Consultation and Disclosure.....	43
11.1 Methodology for Public Consultation for IEE.....	43
11.2 Methodology for Public Disclosure for IEE.....	43
11.3 Public Consultation Meeting for the Draft IEE Report.....	44
11.4 Public Disclosure for Draft IEE Report.....	46
12. Conclusion.....	48
12.1 Key Findings.....	48
12.2 Conclusions.....	48
<b>CHAPTER 1: INTRODUCTION.....</b>	<b>1-1</b>
1.1 Project Proponent.....	1-1
1.2 Purpose of the Project.....	1-1
1.3 Type of Project and IEE/EIA Requirement.....	1-1
1.4 Implementing Organization for Environmental Impact Assessment.....	1-3
1.5 Overall Framework of Initial Environmental Examination.....	1-4
1.6 Structure of the IEE Report.....	1-5
<b>CHAPTER 2: OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK.....</b>	<b>2-1</b>



2.1	Myanmar Environmental Policy .....	2-1
2.1.1	Institutional Setting of Environmental Conservation Department .....	2-1
2.1.2	Fundamental Laws and Regulations Related to Environmental and Social Considerations .....	2-2
2.2	Quantitative Target Levels for Consideration of the Surrounding Environment .....	2-18
2.2.1	Air Quality .....	2-18
2.2.2	Water Quality .....	2-19
2.2.3	Magnetic and Electromagnetic Fields .....	2-19
2.2.4	Noise .....	2-19
2.2.5	Vibration .....	2-20
2.3	Institutional Setting of Project Proponent .....	2-20
2.4	Institutional Framework .....	2-21
2.4.1	Institutional Arrangement at Construction Stages .....	2-21
2.4.2	Institutional Arrangement at Operation Stage .....	2-22
<b>CHAPTER 3: PROJECT DESCRIPTION AND ALTERNATIVES .....</b>		<b>3-1</b>
3.1	Project Outline .....	3-1
3.1.1	Background and Project Components .....	3-1
3.1.2	Project Details .....	3-2
3.2	Design Considerations for Transmission Lines .....	3-13
3.2.1	Transmission Line Route .....	3-13
3.2.2	Number of Tower .....	3-13
3.2.3	Transmission Capacity Design .....	3-14
3.2.4	ROW of Transmission Lines .....	3-15
3.2.5	Tower Design .....	3-16
3.2.6	Underground Transmission Line Design .....	3-16
3.3	Construction Activities during Project .....	3-17
3.3.1	Construction Activities for 500 kV Substation .....	3-17
3.3.2	Construction Activities for Transmission Lines .....	3-18
3.4	Selection of Alternatives .....	3-21
3.4.1	Zero Option .....	3-21
3.4.2	Location Alternatives for Substation .....	3-21
3.4.3	Route Alternatives for 500kV Transmission Line (TL) .....	3-22
<b>CHAPTER 4: CURRENT ENVIRONMENTAL AND SOCIAL CONDITIONS .....</b>		<b>4-1</b>
4.1	Natural Environment .....	4-1
4.1.1	Meteorology .....	4-1
4.1.2	Hydrological Situations .....	4-4
4.1.3	Topography .....	4-5
4.1.4	Geological Features .....	4-6
4.1.5	Soil Erosion .....	4-8
4.1.6	Flora/Fauna and Biodiversity .....	4-8
4.1.7	Natural Hazards .....	4-31
4.2	Social Conditions .....	4-34
4.2.1	Population .....	4-34

4.2.2	Ethnicity .....	4-34
4.2.3	Religion.....	4-35
4.2.4	Land Use .....	4-36
4.2.5	Water Usage .....	4-38
4.2.6	Local Economy and Livelihood.....	4-40
4.2.7	Social Infrastructure and Service .....	4-41
4.2.8	Cultural Heritage.....	4-44
4.2.9	Landscape .....	4-46
<b>CHAPTER 5: IMPACT ASSESSMENT METHODOLOGY AND PRELIMINARY IMPACT ASSESSMENT .....</b>		<b>5-1</b>
5.1	Impact Assessment Methodology .....	5-1
5.1.1	Project Area of Influence .....	5-1
5.1.2	Scope of Assessment.....	5-3
5.1.3	Geographical Scope .....	5-4
5.1.4	Temporal Scope.....	5-4
5.1.5	Terms of Reference for Investigation of Environmental and Social Impacts .....	5-4
5.1.6	Terms of Reference for Baseline Survey .....	5-5
5.1.7	Impact Assessment Methodology for IEE Study .....	5-5
5.2	Preliminary Impact Assessment .....	5-9
<b>CHAPTER 6: FIELD SURVEY .....</b>		<b>6-1</b>
6.1	Outlines of Monitoring Plan .....	6-1
6.2	Air Quality .....	6-2
6.3	Water Quality .....	6-4
6.4	Soil Quality .....	6-7
6.5	Noise and Vibration Level .....	6-10
<b>CHAPTER 7: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS.....</b>		<b>7-16</b>
7.1	Pollution.....	7-16
7.1.1	Air Pollution.....	7-16
7.1.2	Water Pollution .....	7-18
7.1.3	Noise and Vibration.....	7-19
7.1.4	Waste.....	7-23
7.1.5	Soil Contamination .....	7-24
7.1.6	Offensive Odor.....	7-25
7.2	Natural Environment.....	7-26
7.3	Social Environment.....	7-27
7.3.1	Involuntary Resettlement and Land Acquisition.....	7-27
7.3.2	Local Economy and Livelihood.....	7-28
7.3.3	Existing Social Infrastructures and Social Services .....	7-30
7.3.4	Social Institutions.....	7-30
7.4	Health and Safety.....	7-31
7.4.1	Occupational Health and Safety.....	7-31
7.4.2	Community Health and Safety .....	7-34

7.5	Emergency Response Plan .....	7-36
7.5.1	Fire .....	7-36
7.5.2	Flood .....	7-38
7.5.3	Earthquake .....	7-40
7.6	Summary of Impact Assessment .....	7-42
<b>CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN..8-1</b>		
8.1	Outline of Environmental Management Plan.....	8-1
8.2	Mitigation and Consideration Measures .....	8-1
8.2.1	Mitigation and Consideration Measures for Construction and Closure Stage .....	8-1
8.2.2	Mitigation and Consideration Measures for Operation Stage.....	8-7
8.3	Environmental Monitoring Plan (EMoP).....	8-13
8.4	Budget for Environmental Management and Monitoring Plan.....	8-17
8.4.1	Budget Plan for the Environmental Management.....	8-17
8.4.2	Budget Plan for Environmental Monitoring .....	8-17
8.5	Grievance Resolution Process.....	8-18
8.5.1	Grievance Follow-Up.....	8-19
<b>CHAPTER 9: PUBLIC CONSULTATION AND DISCLOSURE.....9-1</b>		
9.1	Approach and Objectives.....	9-1
9.1.1	Approach of PCM and PD for IEE .....	9-1
9.1.2	Objectives of PCM and PD for IEE .....	9-1
9.2	Methodology for Public Consultation and Disclosure .....	9-1
9.2.1	Methodology for Public Consultation for IEE.....	9-1
9.2.2	Methodology for Public Disclosure for IEE .....	9-2
9.3	Public Consultation Meeting for the Draft IEE Report.....	9-3
9.3.1	Comments from Public Consultation Meeting.....	9-3
9.4	Public Disclosure for Draft IEE Report .....	9-13
9.4.1	Comments from Public Disclosure .....	9-17
9.5	Conclusion of the Comments for Draft IEE Report.....	9-21
<b>CHAPTER 10: CONCLUSIONS .....</b>		<b>10-1</b>
10.1	Key Findings.....	10-1
10.2	Conclusions.....	10-1

## **LIST OF TABLES**

Table 1 The Project Scope of the Engineering Work .....	1
Table 2 Screening for EIA/ IEE/ EMP Requirement related to the Project .....	6
Table 3 Organizations In-charge of the IEE Study.....	6
Table 4 Conceptual Design of 500 kV Transmission Lines .....	7
Table 5 Current Environmental and Social Conditions in and around the Project Area .....	17
Table 6 Magnitude Criteria for Environmental and Social Impacts.....	21
Table 7 Magnitude Criteria for OHS, CHS and Emergency Risks .....	22
Table 8 Rating for Impact Magnitude .....	22
Table 9 Rating for Impact Likelihood.....	23
Table 10 Risk Based Impact Assessment Matrix .....	23
Table 11 Significance Color Scale .....	23
Table 12 Results of Preliminary Impact Assessment .....	24
Table 13 Environmental Mitigation and Consideration Measures in the Construction/Closure Stage .....	33
Table 14 Environmental Mitigation and Consideration Measures in Operation Stage .....	38
Table 15 Environmental Monitoring Plan.....	40
Table 16 Public Consultation Meeting for the IEE .....	43
Table 17 Public Disclosure for the IEE.....	44
Table 18 Detailed Information of Public Consultation Meetings .....	44
Table 19 Disclosure Duration for PDs .....	46
Table 1.3-1 Screening for EIA/ IEE/ EMP Requirement related to the Project .....	1-1
Table 1.4-1 Organization In-charge of the IEE Study.....	1-3
Table 1.4-2 Members of the IEE Study Team.....	1-3
Table 1.5-1 Tentative Overall Schedule of Initial Environmental Examination .....	1-5
Table 2.1-1 Fundamental Laws and Regulations Related to Environmental and Social Considerations and Health in Myanmar.....	2-3
Table 2.1-2 Major International Agreements and Treaties that the Myanmar Government has Ratified Related to Environmental and Social Considerations .....	2-5
Table 2.2-1 Ambient Air Quality Standards of Myanmar (WHO AQG for Europe 1997) .....	2-18
Table 2.2-2 Effluent Water Quality for Electric Power Transmission and Distribution.....	2-19
Table 2.2-3 Exposure limits for General Public Exposure to Electric and Magnetic Fields.....	2-19
Table 2.2-4 Target Noise Level set in NEQG .....	2-20
Table 2.2-5 Target Vibration Level at Construction Phase.....	2-20
Table 3.1-1 Scope of the Engineering Work .....	3-2
Table 3.1-2 Conceptual Design of 500 kV Transmission Lines.....	3-3
Table 3.2-1 Property of Interest in Preliminary Survey and Construction Period .....	3-13
Table 3.2-2 Assumption of the Number of Towers .....	3-14
Table 3.2-3 Soil Based Temperature .....	3-14
Table 3.2-4 Specific Thermal Resistance.....	3-14
Table 3.2-5 The Minimum Height of Overhead Power Line from The Ground .....	3-15
Table 3.2-6 Minimum Distance between Power Line and Building .....	3-15
Table 3.2-7 Description of General Design Specifications of Towers .....	3-16
Table 3.2-8 Comparison table of direct burial method and management burial method .....	3-17

Table 3.4-1 Results without and with the Project (Option A and B).....	3-21
Table 3.4-2 Results between Upgrading the Existing S/S (Option A) and Construction of New S/S (Option B) .....	3-21
Table 3.4-3 Route Alternatives for 500kV TL .....	3-22
Table 4.1-1 Mean Annual Monthly Rainfall and Temperature in Yanogn City and Bago City (2009 – 2018 Average) .....	4-3
Table 4.1-2 Geological Features of the Region Located near the Project Area .....	4-7
Table 4.1-3 List of Tree Species in Bago Township.....	4-9
Table 4.1-4 List of fauna in Bago Township.....	4-11
Table 4.1-5 List of Tree Species in Thanatpin Township.....	4-11
Table 4.1-6 List of fauna species in Bago Township .....	4-12
Table 4.1-7 List of Tree Species in Thanatpin Township.....	4-13
Table 4.1-8 List of fauna species in Bago Township .....	4-13
Table 4.1-9 List of Tree Species in Hlegu Township .....	4-14
Table 4.1-10 List of fauna species in Hlegu Township .....	4-15
Table 4.1-11 List of Tree Species in Mingalardon Township .....	4-15
Table 4.1-12 List of Tree Species in Dagon Myothit (East) Township .....	4-16
Table 4.1-13 List of Tree Species in Dagon Myothit (East) Township .....	4-17
Table 4.1-14 List of Bird Species in Hlawga Wildlife Park, Yangon.....	4-18
Table 4.1-15 List of Mammal Species in Hlawga Wildlife Park, Yangon .....	4-20
Table 4.1-16 List of Reptile Species in Hlawga Wildlife Park, Yangon .....	4-20
Table 4.1-17 List of Some Flora in Hlawga Wildlife Park in Yangon .....	4-20
Table 4.1-18 Bird Species List in Moeyungyi Wildlife Sanctuary .....	4-21
Table 4.1-19 List of Endangered, Vulnerable and Nearly Threatened Bird Species in Moeyungyi Wildlife Sanctuary.....	4-26
Table 4.1-20 Land Use Condition of Intagaw Reserved Forest .....	4-28
Table 4.1-21 Hazard Cases in Yangon Region and Bago Region during 2015 to 2018.....	4-32
Table 4.2-1 Population in Project Related Townships .....	4-34
Table 4.2-2 Races in Project Related Townships .....	4-35
Table 4.2-3 Religion in Project Related Townships .....	4-36
Table 4.2-4 Land Use of Bago District of Bago Region and Northern District of Yangon Region .....	4-37
Table 4.2-5 Land Use of Eastern District of Yangon Region.....	4-37
Table 4.2-6 Source of Drinking Water in Project Related Townships.....	4-38
Table 4.2-7 Source of Drinking Water in Project Related Townships.....	4-39
Table 4.2-8 Existing Status of Local Livelihoods in Project Related Townships .....	4-40
Table 4.2-9 List of Health Facilities.....	4-42
Table 4.2-10 Government and Private Educational Buildings in Project Related Townships ...	4-42
Table 4.2-11 List of Religious Buildings in Related Townships in Project Related Townships	4-43
Table 5.1-1 Project Area of Influence .....	5-1
Table 5.1-2 Brief Description of Adverse Impacts and Approach for Evaluation .....	5-5
Table 5.1-3 Outline of Environmental Baseline Survey .....	5-5
Table 5.1-4 Magnitude Criteria for Environmental and Social Impacts .....	5-6
Table 5.1-5 Magnitude Criteria for OHS, CHS and Emergency Risks.....	5-7

Table 5.1-6 Rating for Impact Magnitude.....	5-7
Table 5.1-7 Rating for Impact Likelihood.....	5-8
Table 5.1-8 Risk Based Impact Assessment Matrix.....	5-8
Table 5.1-9 Significance Color Scale.....	5-8
Table 5.2-1 Results of Preliminary Impact Assessment.....	5-9
Table 6.1-1 Outlines of Field Survey.....	6-1
Table 6.2-1 Outlines of Air Quality Field Survey.....	6-2
Table 6.2-2 Location of Air Quality Field Survey.....	6-2
Table 6.2-3 Air Quality Survey Result (Daily Average).....	6-3
Table 6.3-1 Survey Items for Water Quality.....	6-4
Table 6.3-2 Outline of Sampling Points.....	6-5
Table 6.3-3 Sampling Time of Water Quality at WQ 1.....	6-5
Table 6.3-4 Analytic Method for Water Quality.....	6-6
Table 6.3-5 Water Quality Survey Results.....	6-6
Table 6.4-1 Survey Items for Soil Quality.....	6-7
Table 6.4-2 Location of Soil Quality Survey.....	6-8
Table 6.4-3 Sampling Date and Time of Soil at SQ 1.....	6-8
Table 6.4-4 Analytic Method for Sediment Quality.....	6-9
Table 6.4-5 Results of Soil Quality Survey at SQ.....	6-9
Table 6.5-1 Outlines of Noise and Vibration Level Survey.....	6-10
Table 6.5-2 Survey Parameters for Noise and Vibration Level.....	6-10
Table 6.5-3 Location of Noise and Vibration Survey Points.....	6-10
Table 6.5-4 Results of Noise Levels (LAeq) Monitoring at NV 1.....	6-12
Table 6.5-5 Hourly Noise Level (LAeq) Survey Results at NV-1.....	6-12
Table 6.5-6 Results of Vibration Levels (Lv10) Monitoring at NV 1.....	6-13
Table 6.5-7 Results of Hourly Vibration Levels (Lv10) Survey at NV-1.....	6-13
Table 7.1-1 General Construction Activities of Project Site.....	7-16
Table 7.1-2 Types of Machineries and their Operation Hours.....	7-20
Table 7.1-3 Relationship between rainfall intensity and audible corona noise.....	7-23
Table 7.5-1 Types And Origins of Substation Fires.....	7-38
Table 7.6-1 Summary of Impact Assessment.....	7-43
Table 8.2-1 Environmental Mitigation Measures in the Construction/Closure Stage.....	8-1
Table 8.2-2 Significance after Mitigation in the Construction/Closure Stage.....	8-6
Table 8.2-3 Environmental Mitigation Measures in Operation Stage.....	8-8
Table 8.2-4 Significance after Mitigation in Operation Stage.....	8-12
Table 8.3-1 Environmental Monitoring Plan.....	8-14
Table 8.4-1 Cost for Main Mitigation Measures.....	8-17
Table 8.4-2 Estimated Annual Costs for Monitoring in Construction/ Closing Stages and Operation Stage.....	8-18
Table 9.2-1 Summary Public Consultation Meeting for the IEE.....	9-2
Table 9.2-2 Public Disclosure for the IEE.....	9-2
Table 9.3-1 Detailed Information of Public Consultation Meetings.....	9-3
Table 9.3-2 Questions/Comments and Explanation/Response from Public Consultation Meeting.....	9-3

Table 9.4-1 Disclosure Duration for the Summary of Draft IEE Report .....	9-13
Table 9.4-2 Feedback from participants at Mingalardon PCM .....	9-17
Table 9.4-3 Feedback from Participants at Dagon Myothit (East) and Disclosure .....	9-17
Table 9.4-4 Feedback from Participants at Bago PCM and Disclosure .....	9-18
Table 9.4-5 Feedback from Participants at Hlegu PCM and Disclosure .....	9-20

## **LIST OF FIGURES**

Figure 1 Proposed Transmission Line Routes.....	3
Figure 2 Organization Structure of Ministry of Electricity and Energy (MOEE).....	4
Figure 3 Organization Structure of Department of Power Transmission and System Control (DPTSC).....	4
Figure 4 Organization Structure of MONREC .....	5
Figure 5 Organization Structure of Environmental Conservation Department (ECD) .....	5
Figure 6 Hpayargyi-Hlegu 500 kV Transmission Line Route .....	8
Figure 7 Illustrative Photo of 500 kV Transmission Line.....	9
Figure 8 Location of Proposed the New Substation, Hlegu.....	10
Figure 9 Current Photos of Dagon Myothit (East) Substation.....	11
Figure 10 Location of Existing Dagon Myothit (East) Substation.....	11
Figure 11 Location of New 230 kV Switcher at Dagon Myothit (East) Substation.....	12
Figure 12 Current Photos of Hlawga Substation.....	13
Figure 13 Location of Hlawga Substation .....	13
Figure 14 Plan View of New 230 kV GIS with Existing Layout of 230 kV Switching Equipment at Hlawga Substation.....	14
Figure 15 Locations of 230 kV Transmission Line Routes.....	16
Figure 16 Photos of Public Consultation Meetings.....	46
Figure 17 Photos of Public Disclosure.....	47
Figure 1.3-1 Proposed Project Area .....	1-2
Figure 2.1-1 Organization Structure of Ministry of Natural Resources and Environmental Conservation (MONREC).....	2-1
Figure 2.1-2 Organization Structure of Environmental Conservation Department (ECD).....	2-2
Figure 2.1-3 Myanmar IEE Procedures .....	2-8
Figure 2.3-1 Organization Structure of Ministry of Electricity and Energy (MOEE) .....	2-21
Figure 2.3-2 Organization Structure of Department of Power Transmission and System Control (DPTSC).....	2-21
Figure 2.4-1 Proposed Institutional Arrangement for Environmental Management of the Project at Construction Stages.....	2-22
Figure 2.4-2 Proposed Institutional Arrangement for Environmental Management of the Project at Operation Stage.....	2-22
Figure 3.1-1 Hpayargyi-Hlegu 500 kV Transmission Line Route .....	3-4
Figure 3.1-2 Illustrative Photo of 500 kV Transmission Line.....	3-4
Figure 3.1-3 Location of Proposed New 500 kV Substation, Hlegu.....	3-6
Figure 3.1-4 Current Photos of Dagon Myothit (East) Substation.....	3-7
Figure 3.1-5 Location of Existing Dagon Myothit (East) Substation .....	3-8
Figure 3.1-6 Location of New 230 kV Switcher at Dagon Myothit (East) Substation .....	3-9

Figure 3.1-7 Current Photos of Hlawga Substation .....	3-9
Figure 3.1-8 Location of Hlawga Substation .....	3-10
Figure 3.1-9 Plan View of New 230kV GIS with Existing Layout of 230kV Switching Equipment at Hlawga Substation.....	3-10
Figure 3.1-10 Locations of 230kV Transmission Line Routes .....	3-12
Figure 3.2-1 Right of Way (ROW) for 230 kV Transmission Lines .....	3-16
Figure 3.2-2 Schematic Diagram of Direct Burial System and Pipeline Burial System.....	3-17
Figure 3.3-1 Illustrative Photo for Construction of Transmission Line Foundation .....	3-19
Figure 3.3-2 Illustrative Photo for A Crane Carrying the Top Section of Tower for Installation...3-19	
Figure 3.3-3 Illustrative Photo for Pulling phase of a wire-stringing operation .....	3-20
Figure 3.4-1 Route Alternatives for 500 kV Transmission Line .....	3-24
Figure 4.1-1 Location of Meteorology Station in the Yangon Area.....	4-1
Figure 4.1-2 Climate Zone of Project Area.....	4-2
Figure 4.1-3 Graphs of Mean Annual Monthly Rainfall and Temperature in Yangon City and Bago City (2009-2018 Average).....	4-3
Figure 4.1-4 Hydrological Situation around the Bago and Yangon Region.....	4-5
Figure 4.1-5 Geological Map of Project Area.....	4-8
Figure 4.1-6 Photos of Some Tree Species .....	4-17
Figure 4.1-7 Bird species in Moe Yon Gyi Wildlife Sanctuary.....	4-27
Figure 4.1-8 Proposed Power Transmission Line Route in the West (Option A).....	4-29
Figure 4.1-9 Proposed Power Transmission Line Route in the East (Option B) .....	4-30
Figure 4.2-1 Location of Cultural Heritage around Project Area.....	4-46
Figure 5.1-1 Map of Project Area of Influence (PAoI) .....	5-3
Figure 6.2-1 Location of Air Quality Survey Plan at AQ 1 .....	6-2
Figure 6.2-2 Air Quality Monitoring at AQ 1 .....	6-3
Figure 6.3-1 Location of Sampling Points of Water Quality at WQ 1 .....	6-4
Figure 6.3-2 Water sampling at WQ 1 .....	6-7
Figure 6.4-1 Location of Soil Quality Survey Point at SQ 1 .....	6-8
Figure 6.4-2 Soil Quality Monitoring at SQ 1 .....	6-10
Figure 6.5-1 Location of Noise and Vibration Level Survey Points at NV 1 .....	6-11
Figure 6.5-2 Results of Noise Levels (LAeq) Survey at NV-1 .....	6-13
Figure 6.5-3 Results of Vibration Levels (Lv10) Survey at NV 1 .....	6-15
Figure 6.5-4 Noise and Vibration Level Monitoring at NV 1 .....	6-15
Figure 7.1-1 Noise Levels of Typical Construction Equipment.....	7-21
Figure 7.1-2 Main Noise from Transformer Operation.....	7-22
Figure 7.1-3 Transformer Audible Sound Levels.....	7-22
Figure 7.3-1 Livelihoods of Hlegu Township .....	7-29
Figure 7.4-1 Cases of Workplace Injuries .....	7-33
Figure 7.4-2 PPE for electrical workers.....	7-33
Figure 7.4-3 Network of Electromagnetic Field, Possibilities of Electrocutation and Dangerous Sign for Tower and Transformer.....	7-36
Figure 7.5-1 Map of Showing Flooded Area Around Bago And Ayeyarwaddy Region .....	7-39
Figure 7.5-2 Seismic Zone Map of Myanmar.....	7-41



Figure 7.5-3 Seismicity map of Bago Region (ISC earthquake catalog, 1906 – 2011) .....	7-41
Figure 7.5-4 Yearly Earthquake magnitude occurred at Bago region .....	7-42
Figure 8.5-1 Structure and Process of the Grievance Redress Mechanism .....	8-20
Figure 9.3-1 Photos of Public Consultation Meetings .....	9-13
Figure 9.4-1 Photos of Public Disclosure .....	9-17

## **LIST OF ABBREVIATIONS**

ADB	Asian Development Bank
ARAP	Abbreviated Resettlement Action Plan
B.E.H.S	Basic Education High School
B.E.M.S	Basic Education Middle School
B.E.P.S	Basic Education Primary School
BOD	Biological Oxygen Demand
CHS	Community Health and Safety
CLS	Closing Stage
COD	Chemical Oxygen Demand
CS	Construction Stage
DEPP	Department of Electric Power Planning
DHPP	Department of Hydropower Planning
DMH	Department of Meteorology and Hydrology
DPTSC	Department of Power Transmission and System Control
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department, MOECAAF
ECL	Environmental Conservation Law
ECPP	Environmental Conservation and Prevention Plan
ECRs	Environmental Conservation Rules
EHS	Environmental Health, and Safety
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EN	Endangered
EPGE	Electric Power Generation Enterprise
ESE	Electricity Supply Enterprise
FD	Forest Department
GAD	Government Administrative Department
HDPE	High Density Polyethylene
HPGE	Hydropower Generation Enterprise
ICP	Inductively Coupled Plasma
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature and Natural Resource

JICA	Japan International Cooperation Agency
MESC	Mandalay Electricity Supply Corporation
MJTD	Myanmar Japan Thilawa Development Ltd.
MKI	Myanmar Koei International
MOE	Ministry of Energy
MOECAF	Ministry of Environmental Conservation and Forestry
MOEE	Ministry of Electricity and Energy
MOEP	Ministry of Electrical Power
MONREC	Ministry of Natural Resources and Environmental Conservation
MOTC	Ministry of Transport and Communications
MPPE	Myanmar Petroleum Product Enterprise
NEQG	National Environmental Quality (Emission) Guidelines
NK	Nippon Koei International
NT	Nearly Threatened
OHS	Occupational Health and Safety
OS	Operation Stage
PAP	Project-Affected People
PCC	Public Complaints Committee
PCM	Public Consultation Meeting
PD	Public Disclosure
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
PTP	Power Transmission Project Department
REM	Resource and Environmental Myanmar
RES	Renewable Energy Sources
ROW	Right of Way
TDC	Township Development Committee
TSEZ	Thilawa Special Economic Zone
VU	Vulnerable
WHO	World Health Organization
YCDC	Yangon City Development Committee
YESC	Yangon Electricity Supply Corporation

## EXECUTIVE SUMMARY

### 1. Background and Project Components

Myanmar, since 2011, has transformed into a democratic state, adopting reform programs in political, economic, and social sectors. As the economic reform can accelerate the national reform processes, the inadequate supply of electricity in the country becomes the major issue to be addressed immediately in order to achieve quick progress in economic reform.

The Yangon area, which is Myanmar's largest power demand area, has a shortage of power grid and unstable power supplies. It has already been estimated that the transmit power has exceeded the transmission capacity limit in some transmission sections, and aging transmission and substation equipment is at a high risk of failure. In order to improve this situation, JICA has been gradually supporting the development of the 500kV backbone transmission system in the “National Power Transmission Network Development Project”. Stabilization of the power supply through the improvement of the backbone systems in Yangon, where power demand is expected to increase, is essential for the economic development of Myanmar, even after the installation of backbone transmission lines via these projects.

National Power Transmission Network Development Project had started since (2015) in Myanmar and took place in Mandalay Region, Bago Region, and Yangon Region. The phase-I of the Project took place in Mandalay Region, and it includes the construction of two new substations: Meiktila Substation and Taungoo Substation. Phase II took place in Bago and Yangon Regions, and it includes the construction of two new substations: Hpayargyi Substation and Hlaingtharya Substation and installation of the new 500kV transmission line between those two substations. In phase III, one new Substation will be constructed in Dagon Myothit (East) Township of Yangon Area, and new 500kV transmission lines will be installed from Hpayargyi Substation to a new Substation in Hlegu Township.

Moreover, two 230kV transmission lines will be installed from the new Substation to the existing Dagon Myothit (East) substation and Hlawga substation, respectively. This IEE report is for Phase III (hereinafter the Project).

The implementation organization for the Project is the Department of Power Transmission and System Control (DPTSC), Ministry of Electricity and Energy (MOEE) and which will manage project implementation, operation, and maintenance of the transmission lines and substations. Department of Electric Power Planning (DEPP) under MOEE will take a leading role in the project investigation and appraisal of the feasibility of the Project, formulating The Master Plan, coordinating the respective expansion plans for power generation, transmission and distribution in Myanmar, planning for bilateral cooperation with International Organizations, etc. The scope of engineering works is summarized in the following Table 1 and followed by the following explanations.

**Table 1 The Project Scope of the Engineering Work**

Facility	Type	Name	Scale/Size	Region
Substation	New Substation	Hlegu	25-32 ha	Yangon
	Expansion/ improvement of existing Substation	Dagon Myothit (East)	Existing land	Yangon
		Hlawga	Existing land	Yangon

Facility	Type	Name	Scale/Size	Region
Transmission Line	New/Overhead 500kV	From Hpayargyi to Hlegu (by construction new overhead transmission line)	About 68.9 km	Bago- Yangon
	New/Overhead 230kV	From Hlegu to Dagon Myothit (East) (by construction new overhead transmission line)	About 19.5 km	Yangon
	New/Overhead/ Underground 230kV	From Hlegu to Hlawga 1. by construction new overhead transmission line 2. by construction new underground transmission line	About 17.4 km (overhead)  About 4.6 km (underground)	Yangon
	Upgrading /Overhead 230kV	From Hlawga to Thaketa (by improving the existing Right of Way/Overhead)	About 22.3 km	Yangon

Source: IEE Study Team

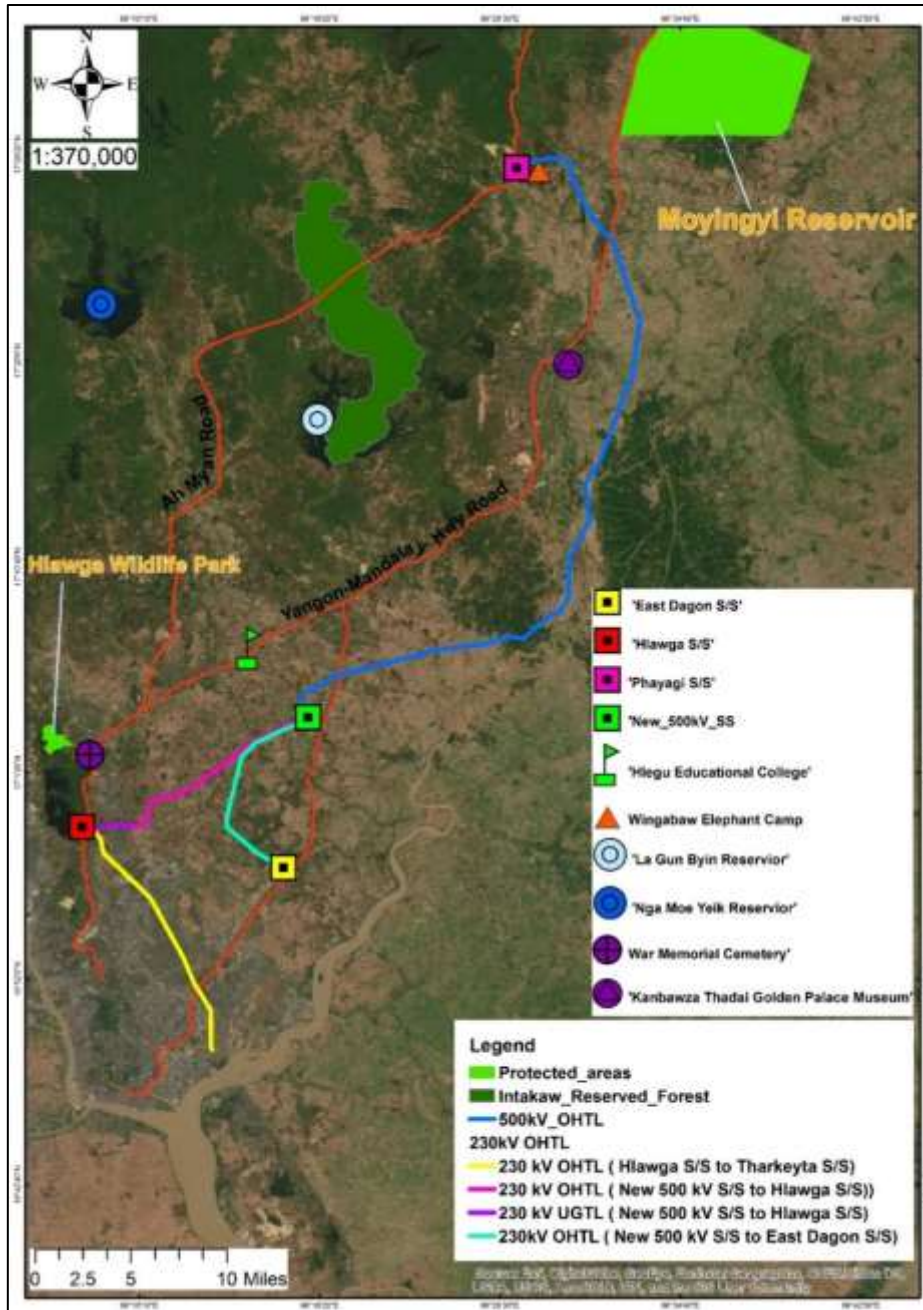
The construction sites for expansion/ improvement of existing substations will be Hpayargyi Substation (500kV / 230kV), Dagon Myothit (East) Substation (500kV / 230kV), and Hlawga Substation (230kV / 33kV / 11kV). The areas of transmission line construction are from a Hpayargyi substation in the Bago Region to the new Hlegu Substation in the Yangon Region, from the new Hlegu Substation to Dagon Myothit (East) Substation and Hlawga Substation, and from Hlawga Substation to Thaketa Substation in Yangon City (See Figure 1).

## 2. Purpose of the Project

The purpose of the Project is to support the power supply capacity of the Yangon area by installing and strengthening backbone transmission lines and substation facilities and then thereby contributing to the economic development of Myanmar and the improvement of people's lives.

## 3. Project Proponent

- 1) Project Name: National Power Transmission Network Development Project (Phase III)
- 2) Proponent Name: Department of Power Transmission and System Control (DPTSC), Ministry of Electricity and Energy (MOEE)
- 3) Address: Building No. (27), Nay Pyi Taw, The Republic of the Union of Myanmar



Source: IEE Study Team

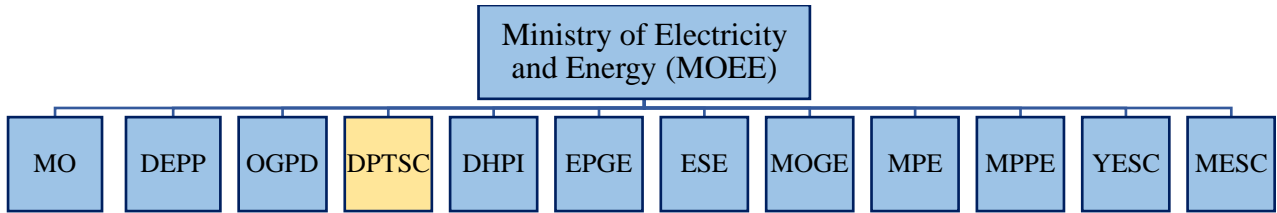
Figure 1 Proposed Transmission Line Routes

## 4. Institutional Framework

### 4.1 MOEE

The Project proponent for National Power Transmission Network Development (Phase-III) is DPTSC under MOEE, which is mainly responsible for planning and implementation of the power transmission network and power system projects. DPTSC has five main departments which are administration department, finance department, material planning department, power transmission projects department, and power system department. Among those departments, the power transmission projects department is mainly responsible for environmental and social considerations during the pre-construction and

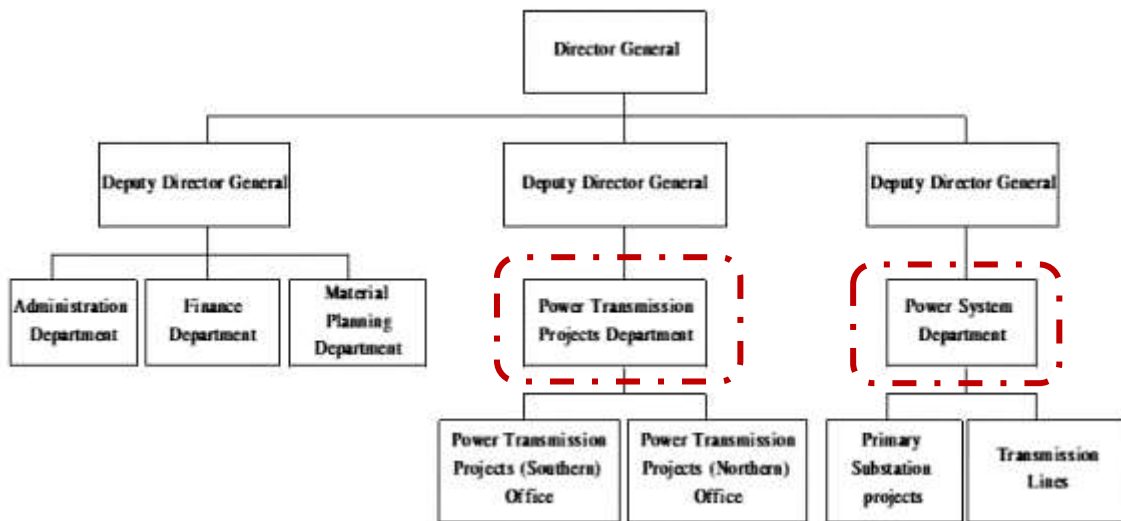
construction stages while the power system department will be responsible for all the substantive works at the Project site during the operation stages. The organization structure of MOEE and DPTSC are shown in Figure 2 and Figure 3, respectively.



- MO = Ministry Office
- DEPP = Department of Electric Power and Planning
- OGPD = Oil and Gas Planning Department
- DPTSC = Department of Power Transmission and System Control
- DHPI = Department of Hydropower Implementation
- EPGE = Electric Power Generation Enterprise
- ESE = Electric Supply Enterprise
- MOGE = Myanmar Oil and Gas Enterprise
- MPE = Myanmar Petrochemical Enterprise
- MPPE = Myanmar Petroleum Product Enterprise
- YESC = Yangon Electricity Supply Corporation
- MESC = Mandalay Electricity Supply Corporation

Source: MOEE

**Figure 2 Organization Structure of Ministry of Electricity and Energy (MOEE)**



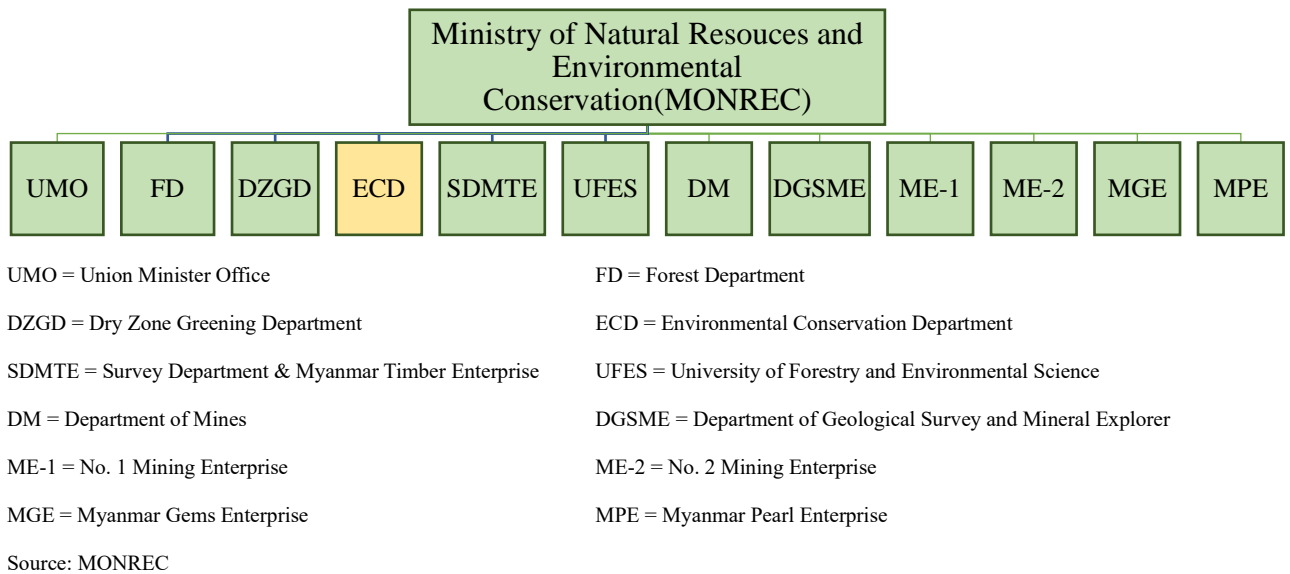
Source: MOEE

**Figure 3 Organization Structure of Department of Power Transmission and System Control (DPTSC)**

## 4.2 MONREC

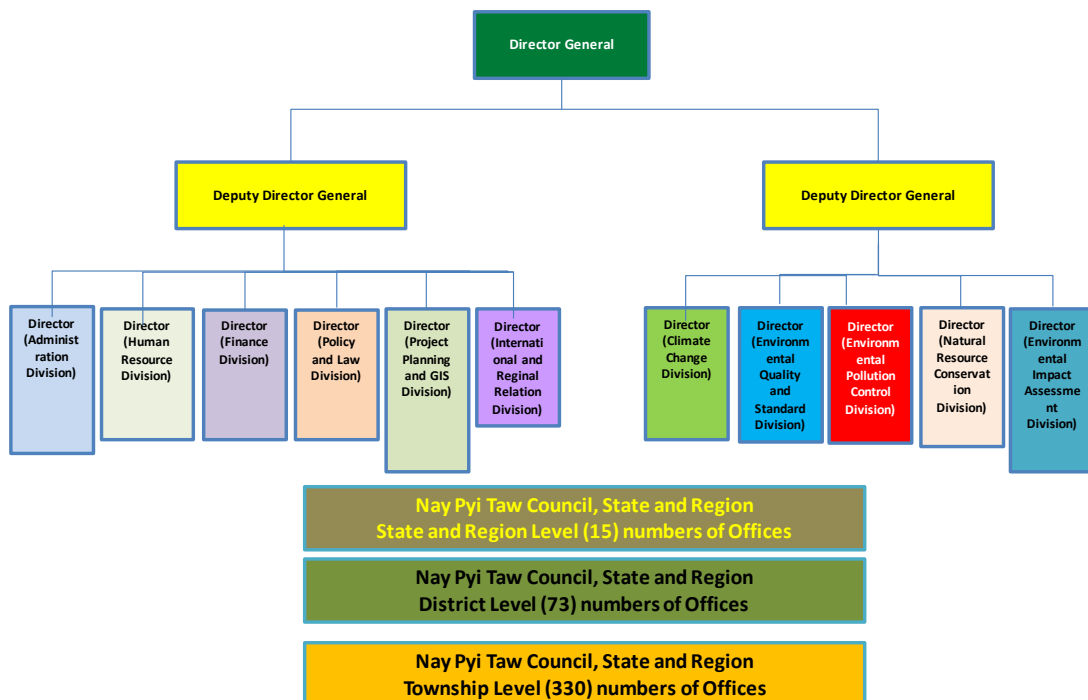
Myanmar has 24 ministries under the Office of the President as of Feb 2020. The leading ministry in-charge of environmental and social considerations is the Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation (MONREC), which was reorganized with the former Ministry of Environmental Conservation and Forestry (MOECAF) and Ministry of Mines in April 2016. The MONREC is acting as the main ministry for the preparation of environmental-related laws/rules/procedures/policies/guidance, the management of environmental issues, and the development of environmentally friendly businesses and sustainable projects in

Myanmar. The organization structure of MONREC is described in the following Figure 4.



**Figure 4 Organization Structure of MONREC**

In the MONREC, Environmental Conservation Department (ECD) has 11 (eleven) Divisions and State & Regional Offices as shown in Figure 5. Among the Divisions, the EIA Division is in charge of EIA issues, i.e., Screening, reviewing, and evaluation of the EIA, IEE or EMP as well as issuing an Environmental Compliance Certificate (ECC) as evidence of environmental approval. In addition, if the Project proponent is one of Line Ministries of Central Government such as MOEE, Central Office of ECD, Nay Pyi Taw is responsible for EIA issues and if the proponent is located in a regional area, a regional office of ECD is responsible for the EIA issues.



Source: ECD, MONREC

**Figure 5 Organization Structure of Environmental Conservation Department (ECD)**



## 5. Type of Project and IEE/EIA Requirement

- 1) Type of Project: Energy Sector Development especially
- 2) Type of Economic Activities: Electrical Power Transmission Line  $\geq 230$ kV  
High Voltage (230kV and 500kV) Transformer Substations
- 3) Main Infrastructure & Utilities: The scope of the engineering work includes analysis of facilities, new construction of Substation (about 25-32 ha), expansion/improvement of existing Substation, new 500kV overhead transmission line, new 230kV overhead transmission line, and new 230kV underground transmission line.
- 4) EIA/ IEE/ EMP Requirement: To be continued

In accordance with Appendix-1: Project Categorization for Assessment Purposes, of EIA Procedures stipulated in December 2015, as prepared by the MONREC (former MOECAP), the Project is under the categorization of Table 2.

**Table 2 Screening for EIA/ IEE/ EMP Requirement related to the Project**

No.	Type of Investment Projects	Size of Project which requires IEE	Size of Project which requires EIA	Note
ENERGY SECTOR DEVELOPMENT				
27	Electrical Power Transmission Lines $\geq 230$ kV	All sizes	All activities where the Ministry requires that the Project shall undergo EIA	-
28	High Voltage (230 kV and 500 kV) Transformer Substations	$\geq 4$ ha	All activities where the Ministry requires that the Project shall undergo EIA	The size of the Project is less than 32 ha, including Staff dormitories.

Source: IEE Study Team

## 6. Implementing Organization for Environmental Impact Assessment

The organizations in charge of the implementation of the Initial Environmental Examination (IEE) Study and detail information of the IEE study team are presented in Table 3.

**Table 3 Organizations In-charge of the IEE Study**

Nippon Koei Co., Ltd	No. 0012 dated 05 July 2017	Yangon Office: Grand Pho Sein Condo, No. 36A, 1st Floor, Pho Sein Road, Tamwe Township. Yangon	Ph: +95 (1) 563281 Fax: +95 (1) 8500107 Email: nipponkoeiygn@myanmar-koei.com	Overall management of IEE Study
Myanmar Koei International Ltd. (MKI)	No. 0024 dated 05 July 2017	Grand Pho Sein Condo, No. 36A, 1st Floor, Pho Sein Road, Tamwe Township. Yangon	Tel/Fax: +95-1-548814 E-mail: info@myanmar-koei.com	Implementation technical aspect of ESIA Study

Resource and Environment Myanmar Ltd. (REM)	No. 0002	B-702, Delta Plaza, Shwegondaing Road, Bahan Township, Yangon.	Ph: +95 9 73013448 Fax: +95 1 552901 Email: service@enviromyanmar.net	Social Survey
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Source: IEE Study Team

The preparation of the IEE study follows the detail process of IEE report described in the Instruction.

## 7. Project Details

### 7.1 Conceptual Design of 500kV Transmission Line

At present, the loads of some 230kV transmission lines in Yangon exceed their power transmission capacities. In the future, the loads of the 230kV transmission lines from the north to Hlawga and Thakheta will significantly exceed their transmission capacities. This situation needs to be urgently improved because 230kV is not enough for stable power transmission of its load. The installation of a new 500kV transmission line from Hpayargyi to Hlegu will be carried out as an effective measure for the improvement of the overloading in the 230kV system.

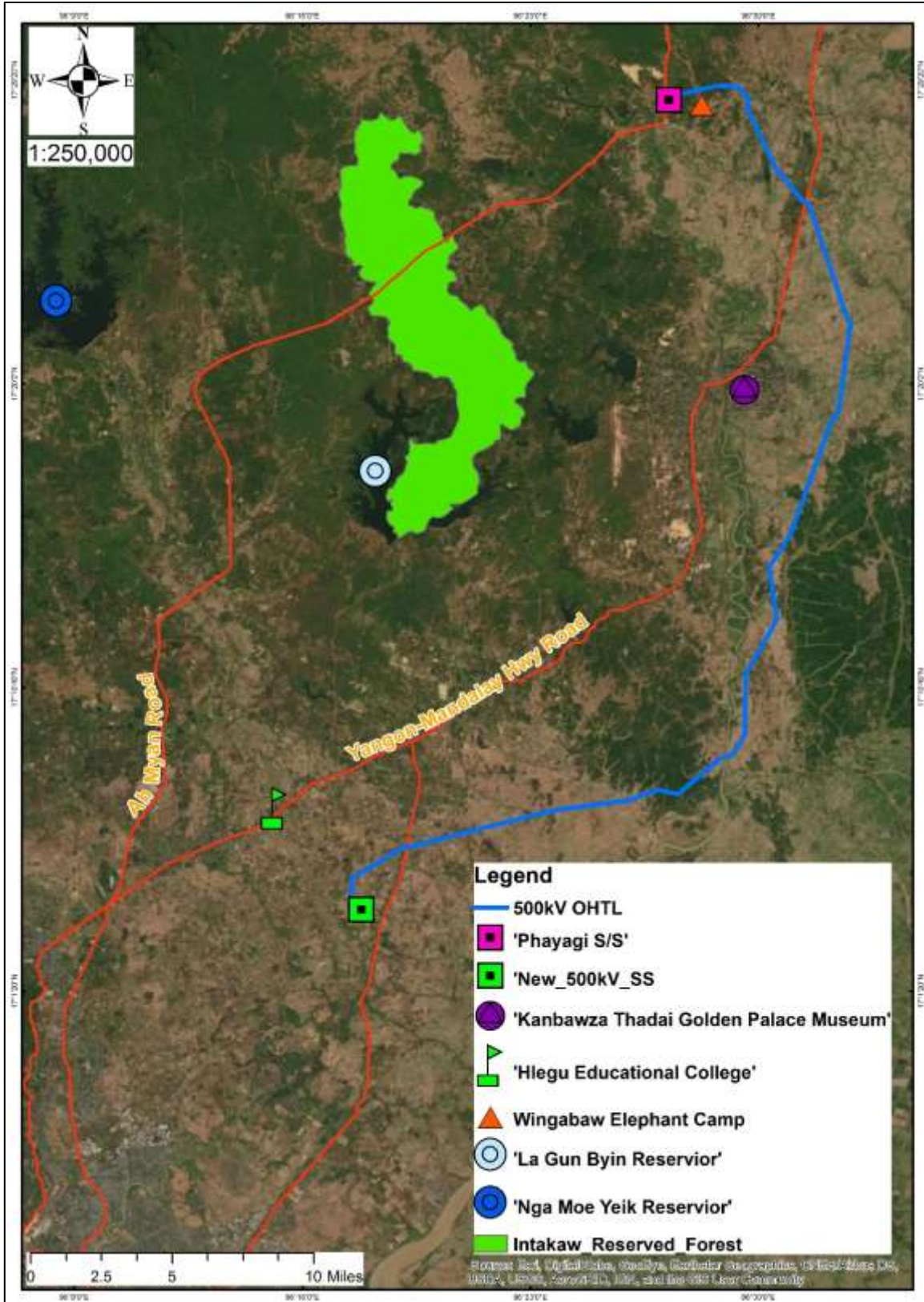
This 500kV transmission line alignment will originate from Hpayargyi Substation, which is located in Bago Region and terminate in a new Hlegu Substation located in Yangon Area. The total length is expected to be about 68.9 km and the line will compose between 140 to 150 towers with the average area span length of 450 meters. The detailed design of 500kV transmission lines is described in Table 4.

**Table 4 Conceptual Design of 500 kV Transmission Lines**

Line Design Features	500kV Transmission Line between Hpayargyi – Hlegu
Line Length	68.9 km (42.81 miles)
Type	Galvanized steel towers with concrete foundations
Number of Towers	About 140 - 150
Average Span Between Towers	About 450 meters (0.27 miles)
Tower Height	65 meters to 110 meters (average 70 meters)
Tower Land Area	Investigating
Right of Way (ROW)	60 meters (30 meters either side of line)

Source: IEE Study Team

Figure 6 shows Hpayargyi-Hlegu 500kV transmission line route and Figure 7 shows illustrative photo of 500 kV transmission line.



Source: IEE Study Team

**Figure 6 Hpayargyi-Hlegu 500 kV Transmission Line Route**



Source: IEE Study Team

**Figure 7 Illustrative Photo of 500 kV Transmission Line**

The total number of 140 to 150 towers will be used in this Project with different types and sizes of towers based on the topographic conditions. The line will cross the Bago Township, Thanatpin Township and Kawa Township in Bago Region and Hlegu Township in Yangon Region.

The transmission line will cross Yangon-Mandalay Highway near the Bago city from west to east and will cross No. 2 Main Road near new the Hlegu substation from east to west. The Wingabaw Elephant Camp is also located approximately 1.5 km from the origin of the transmission line in Hpayargyi Segment. The majority of transmission line alignment pass plantation area, degraded forest land mixed with undergrowth, rivers, and creeks, and active agriculture lands within three townships.

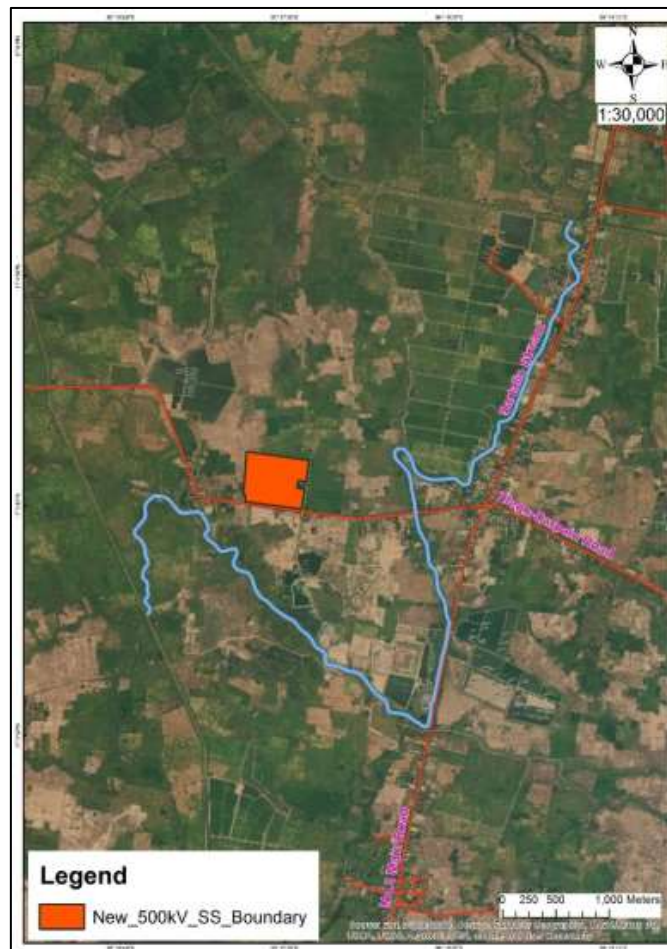
## **7.2 Conceptual Design of New Hlegu Substation**

As the 500kV transmission line will be constructed from Hpayargyi Substation, the 500kV substation facilities are required to be installed. Although these facilities can be installed in the existing Dagon Myothit (East) substation area, there is not enough space for future expansion. Therefore, new substation location is considered and selected near the existing Dagon Myothit (East) substation. The new Hlegu substation will be constructed for installation of 500kV facilities and 500kV transmission lines will be connected from Hpayargyi Substation to Hlegu Substation instead of existing Dagon Myothit (East) Substation. The main equipment to be installed at the new 500 kV substation in this Project are as follows.

- 500kV switchgear (H-GIS)
  - 6 bays for power lines
  - 3 bays for transformer
  - Spare 1 bay
- 500/230/33kV transformer 2 units (single-phase transformer x 7 units (including spare))
- Complete 230kV switchgear (AIS)
  - 8 bays for transmission lines (including spares)
  - 3 bays for transformer
- Control and protection device
  - Transmission line protection device 1 set
  - Transformer protection device 1 set

- Busbar protection device 1 set
- SCADA 1 set
- On-site power supply
  - AC panel 1 set
  - DC panel 1 set
  - DC battery charger 1 set
  - Battery 1 set
  - Emergency power generation equipment 1 set
- Communication system 1 set

The New Hlegu 500kV Substation will be located in the area of the Sar Ta Lin Village in the Hlegu Township. The site is bounded by farmland in all four cardinal directions. The residential areas are found in the east, south and south-west of the site. The nearest access road is the Hlegu-Dar Pein Road, located beside the Project site in the south. It is connected to the No.2 Main Road in the east of the Project site. A small creek is located in the east of the Project site and later it discharges into the Pazundaung creek and the final discharge point is the Yangon River. The Substation will occupy approximately 25 - 32 ha. Figure 8 shows the location of proposed new Substation.



Source: IEE Study Team

**Figure 8 Location of Proposed the NewSubstation, Hlegu**



### 7.3 Conceptual Design of Improvement of Existing Dagon Myothit (East) Substations

The Dagon Myothit (East) Substation is located at 16 ° 57: 02N and 96 ° 16: 43E. It is located in the Dagon Myothit (East) Township, Yangon Region. The surrounding area is using for farming, fishery and other development activities. Currently, the Dagon Myothit (East) Substation consists of the following equipment and it was put into operation in 2016.

- 230kV gas-insulated switchgear (Hyundai)
- 230/66/11kV main transformer (Hyundai) x 2
- 66kV gas-insulated switchgear (Hyundai)
- 11kV switchgear
- On-site power supply

Figure 9 shows the current photos of Dagon Myothit (East) substation.



Source: IEE Study Team

**Figure 9 Current Photos of Dagon Myothit (East) Substation**

The location of the existing Dagon Myothit (East) Substation is described in Figure 10.



Source: IEE Study Team

**Figure 10 Location of Existing Dagon Myothit (East) Substation**

In this Project, the existing 230kV GIS bay will be expanded and the protection and control equipment will be expanded to connect two 230kV transmission lines, one for the new 500kV Substation. The Project requires additional GIS for two feeders. The main facilities to be installed in the existing Dagon Myothit (East) substation in this Project are as follows:

- Complete 230 kV switchgear (GIS)
  - 2 bays for power lines
- Control and protection device
  - 230kV transmission line protection device 2 panel
  - SCADA (expansion) 1 set

As shown in Figure 11, there is an empty space of about 30 m on the east side of the existing 230kV GIS. Currently, there is no plan to use this site, and it is large enough to add two feeders for this Project.



Source: IEE Study Team

**Figure 11 Location of New 230 kV Switcher at Dagon Myothit (East) Substation**

#### **7.4 Conceptual Design of Improvement of Existing Hlawga Substations**

The Hlawga Substation is located at 16 ° 58: 54N and 96 ° 7: 35E. It is located in the Mingaladon Township, Yangon Region. The area is surrounded by national parks and military land, and it is necessary to keep the existing premises for expansion and reinforcement under this Project. Currently, the Hlawga Substation consists of the following equipment, which has been operating for nearly 60 years since its operation in 1960. The photo of existing Substation is described in Figure 12.



Source: IEE Study Team

**Figure 12 Current Photos of Hlawga Substation**

The existing facilities are as follow:

- 230kV air-insulated switchgear
- 230/66/11kV main transformer
- 230/33/11kV main transformer x 3
- 66kV switchgear
- 33kV switchgear
- 11kV switchgear
- On-site power supply

Figure 13 shows the current location of Hlawga substation.

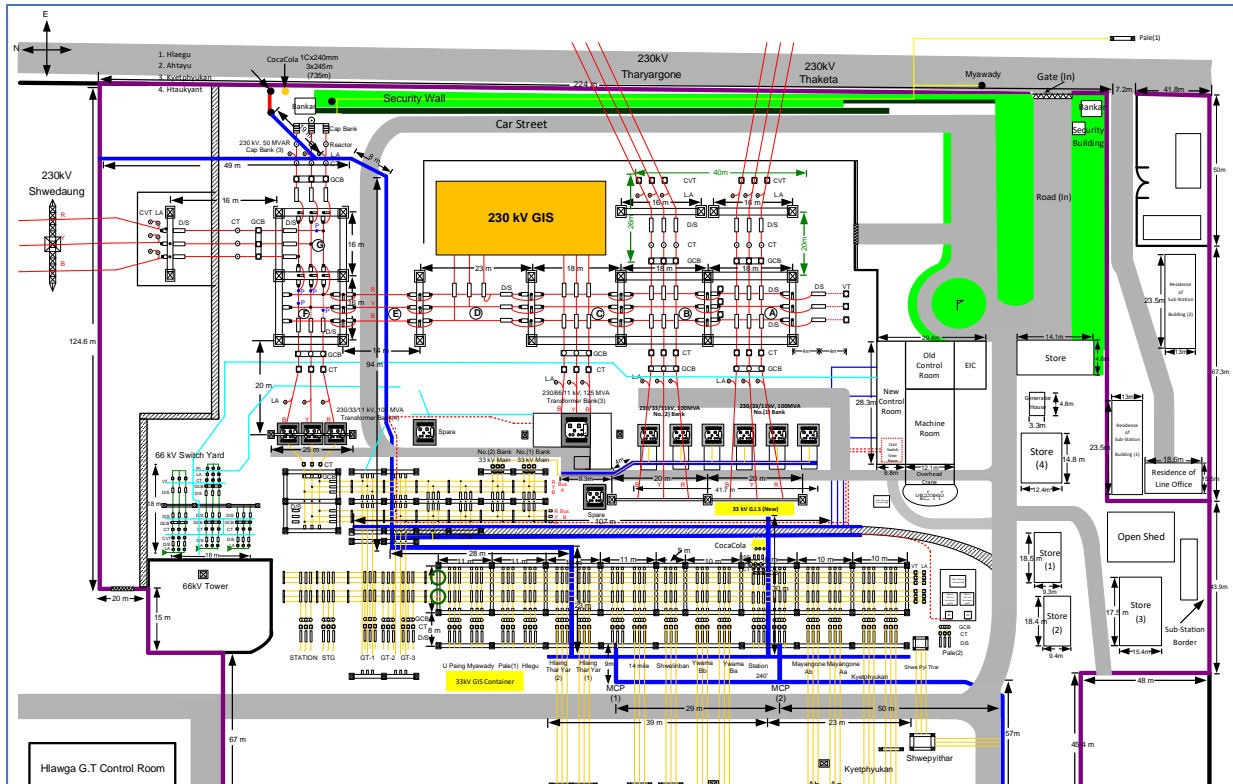


Source: IEE Study Team

**Figure 13 Location of Hlawga Substation**

The Hlawga Substation has plans to increase the number of 230kV facilities. The plan view of the installation of a new 230kV facility area in the existing layout is shown in Figure 14.





Source: DPTSC

**Figure 14 Plan View of New 230 kV GIS with Existing Layout of 230 kV Switching Equipment at Hlawga Substation**

The main equipment Yard to be installed at the Hlawga substation in this Project are as follows.

- Complete 230kV switchgear (GIS)
  - 3 bays for power transmission lines (including spares)
  - 2 bays for bus connection
- Control and protection device
  - Transmission line protection device 2 panel
  - Busbar protection device 1 set
  - SCADA (expansion) 1 set

### 7.5 Conceptual Design of 230 kV Transmission Lines

In National Power Transmission Network Development Project Phase III, total three new 230kV transmission lines will be constructed as follow:

- 1) 230kV transmission line from new Hlegu substation to existing Dagon Myothit (East) substation,
- 2) 230kV transmission line from new Hlegu substation to existing Hlawga substation, and
- 3) 230kV transmission line from Hlawga substation to existing Thaketa substation.

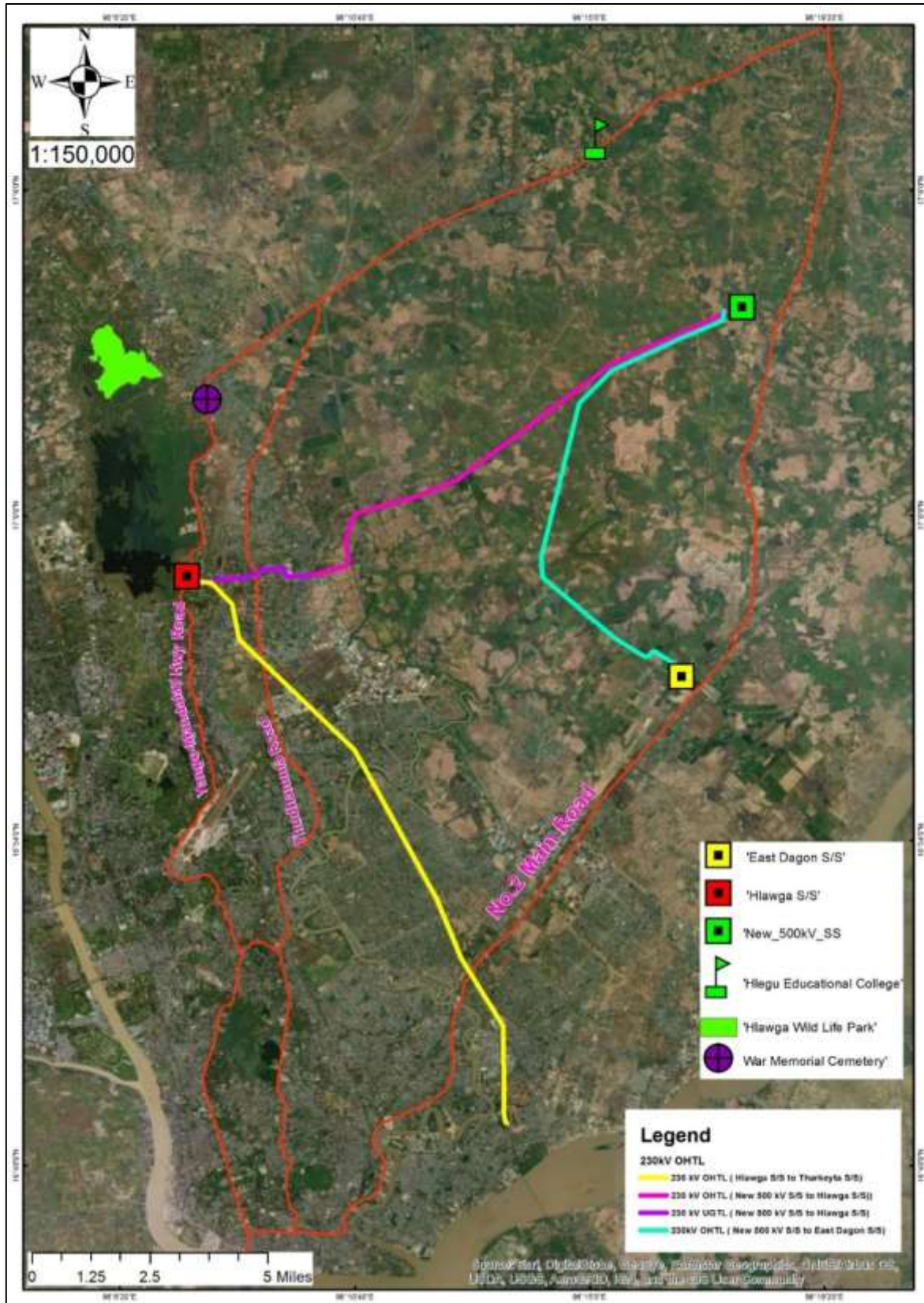
The first transmission line alignment, from Hlegu to Dagon Myothit (East), will length about 19.5 km and which will cross through Hlegu Township and Dagon Myothit (South) Township. The line is overhead transmission line, and the majority of the line will pass through the agricultural land, rivers

and creeks, and rural roads. Some residential areas and commercial fish farming areas are also found near the transmission line alignment.

The expected length of second transmission line alignment, from Hlegu to Hlawga, is about 22 km and which will cross through Hlegu Township and Mingalardon Township. The route includes an underground line of approximately 5 km in the residential area of Mingalardon Township, considering the possibility of issues concerning environmental and social considerations such as a residential area with a road width of about 4.5 m and crossing of Yangon Mandalay Highway (about 16 m wide).

The total length of the existing overhead transmission lines from the Hlawga (230kV) substation to Thaketa (230kV) substation is about 22.3 km. This transmission line will be improved/ upgraded by using the existing one-line transmission line route.

The locations of 230kV transmission line routes are described in Figure 15. The transmission line highlighted by pink and violet colors is the Hlegu-Hlawga 230kV line, where pink color means overhead transmission line and violet color means an underground transmission line. The turquoise color transmission line is Hlegu-Dagon Myothit (East) 230kV line, and the yellow one is the Hlawga-Thaketa 230kV line.



Source: IEE Study Team

Figure 15 Locations of 230 kV Transmission Line Routes

## 8. Description of Surrounding Environment

The current environmental and social conditions in and around the Project area are shown in Table 5. The results of air quality, water quality, soil quality, and noise and vibration are conducted from the field survey during the IEE study of the National Power Transmission Network Development Project. Other information was collected through a literature survey and/or reconnaissance survey in Table 5.

**Table 5 Current Environmental and Social Conditions in and around the Project Area**

Item	Description
Natural Environment	
Meteorology/ Temperature and Rainfall	Upper east of Yangon region and lower east of Bago region has three- seasons, s. Summer season starts is from March till to May, the rainy season starting is from June till to October, and winter starts is from November till to February. According to the records of by Kaba aye Meteorological station, the highest temperatures occurring in Yangon and Bago are 30.7 and 30.9 in April, and the lowest temperatures is 24.9 and 24.4, respectively. Except in January, the monthly temperatures in both cities are above 25.0 °C. The southwest monsoon wind is the main source of rain, and the Yangon and Bago area receives rain during the period from May to October. The average annual amount of rainfall is 241 mm and 278 mm in Yangon and Bago cities. Rainfall sharply decreases from November and continues at nearly 10 mm from December to February.
Hydrological Situations	Main river around the project area is the Bago River, which the source of which is source near Thikkyi in Bago Yoma, and it runs from Phayagyi substation and Hlegu substation. The total length of the river is about 260 km (162 miles) long, and it flows into the Yangon River. Pazundaung Creek (upstream as Ngamoeyeik creek) can be found around the project area, and it also flows into the Yangon River. There are also have two main reservoirs, called Ngamoeyeik and Lagunbyin reservoir, around the project area.
Topography	This Project will pass through eight cities, and they are: East Dagon, Hlegu, Mingaladon, Bago, North Okkalapa, North Dagon, South Dagon, and Thaketa, etc. A flat, lowland, and clay type soil can be found in East Dagon and it this is located about 9m above sea level. North-West and North area of Hlegu Tsp are the edge of Pegu Range end, with which have a flat plain situated at the bottom of mountain ranges. A flat plane plain descends from north to south and, situated about 45.5 m above the sea level. Except for the Ngweyar mountain and Hlawga Lake, which are located in the western region of the township, the rest of the Mingalardon Tsp are plains. Bago township is the drainage area of Pegu Range and the western part of the township is a highland area. The reserved forests with merchantable trees are located in the northern part of the township. The township is 21 miles from east to west and 43 miles from north to south by area, and about 30 m above sea level. North Okkalapa and North Dagon has a plain land mass topography. Therkata Township is located on the peninsula and it has a flat plain topography. Silty soil can be found in this township. The A landmass of plain and clay soil can be found in Dagon Myothit (south).
Geographical Features	Myanmar Central Belt (MCB) exists between the Indo-Burman Ranges and Shan Plateau. Bago Yoma Range is sitting in the northwest (NW) of the Project area. This area is in a north-South trending sedimentary deposited of Minbu Basin and Pegu Yoma Sittaung Basin. All of the mineral deposits in the Minbu basin are 23.7 Million Years Ago to Present day. This is related with to the Sagaing Fault and also have has Unconformity, Folds and Faults in Myanmar Central

Item	Description
	Belt. The most of the deposits are Sedimentary Rock in Myanmar Central Belt, which are mostly formed by Irrawaddy Formation and Recent Alluvial deposits.
Soil Erosion	In the Project area, the different varieties of the soil deposited are from Central Basin of Minbu Basin (Pegu Group) and Pegu-Yoma Sittaung Basin. The rocks mainly found in Pegu group are located in the north and northwest from the center of the project area. The project area is covered mainly with gravel, sand, silt and clay, of which grained size and several colors are in several kind, and it also has forest soil. Mostly in this area, soil erosion will occur due to the corrosion of wind and storm water runoff.
Flora, Fauna, and Biodiversity	Flora and Fauna lists for Bago, Hlegu, Mingaladon and East Dagon are collected as the secondary data of GAD department. The protected areas of Hlawga Wildlife Park (It was created to protect evergreen, mixed deciduous and swamp forest and for environmental education), Moeyungyi Wetland Sanctuary (It was established in 1988 and gained the status of an Important Bird Area i) and Intagaw Reserved Forest (It is just for reserved forest) are located around the project site.
Emergency Risks	Floods, cyclones, and earthquakes are identified as notable natural hazards around the project area.
Social Conditions	
Population	According to the October 2018 Township General Administration Office, Dagon Myothit (East, South and North) District Data, there are about 157,785 people in Dagon Myothit (East), 155,611 people in Dagon Myothit (South) and, 92,774 people in Dagon Myothit (North), 234,229 people in Hlegu, 257,250 people in Mingalardon, 436,022 people in Bago, 135913 people in North Okkalapa, 114,202 people in Thaketa, 217,604 people in Kawa and 165,378 people in Thanatpin Township.
Ethnicity	In 2018, most of the people who live in Dagon Myothit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myothit (North), Dagon Myothit (South), Thaketa, Kawa, Thanatpin townships are Bamar, followed by Kayin, Mon and Rakhine.
Religion	More than 90% of the people living in Dagon Myothit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myothit (North), Dagon Myothit (South), and Thaketa, Kawa, Thanatpin townships are Buddhists.
Local Economy and Livelihood	The main sources of livelihood in the townships are trading, factories and official employment in the government.
Access Road	Around the project area, the related main roads are Yangon-Mandalay expressway, Yangon-Mandalay highway, No. 2 main road, No. 3 main road and No. 7 road. The two main roads that connect from Phayagyi Substation to Yangon City are Yangon-Mandalay expressway in the west and Yangon-Mandalay highway in the east. The proposed new Hlegu substation can be reached from Yangon City by using No. 2 main road. The 230 kV transmission line that, which is the a combination of overhead and underground lines and which connects between Hlawga Substation and the proposed new Hlegu substation, will pass across the No. 7 road, No. 3 main road and Yangon-Mandalay expressway.
Water Source/ Usage	The majority of sources of drinking water and non-drinking water are different for each township. However, generally, the drinking water sources are tube well/ borehole and tap water/ piped and non-drinking water source is improved water sources respectively.

Item	Description
School	There are a number of schools, including basic education primary schools (B.E.P.S.), basic education middle schools (B.E.M.S), basic education high schools (B.E.H.S) and universities, in that these eight cities.
Cultural Heritage/ Assets	Two cultural heritage sites designed designated by the Myanmar Government, namely Kanbawzathadi Palace and Htaunt Kyant War Memorial Cemetery, are located near the project area.
Landscape	Most of the area along the 500 kV OH line and, 230 kV lines are covered with green spaces, such as Intagaw Forest, cultivated lands and other forests near river and creek banks, and residential areas in the outskirts area of Yangon.
<b>Environmental Baseline Situation</b>	
Air Quality	<p>The monitoring survey of for SO<sub>2</sub>, NO<sub>2</sub>, Ozone, PM<sub>2.5</sub> and PM<sub>10</sub> for the ambient air quality was conducted in the Project site for a continuous 24 hours during the dry season.</p> <p>Comparing with the NEQG Guideline, the concentration of NO<sub>2</sub> results was lower than the NEQG guideline (results: 70.11µg/m<sup>3</sup>/h, NEQG: 200µg/m<sup>3</sup>/h), while the value of SO<sub>2</sub> (results: 200µg/m<sup>3</sup>/24h, NEQG: 20µg/m<sup>3</sup>/24h), PM<sub>2.5</sub> (results: 55.14µg/m<sup>3</sup>/24h, NEQG: 25µg/m<sup>3</sup>/24h), PM<sub>10</sub> (results: 75.67µg/m<sup>3</sup>/24h, NEQG: 50µg/m<sup>3</sup>/24h) and ozone (results: 109µg/m<sup>3</sup>/8h, NEQG: 100µg/m<sup>3</sup>/8h) at the monitoring point is were higher than the NEQG value.</p> <p>Possible emission sources are affected from transportation on Hlegu- Dar Pein road and natural origins such as dust from unpaved vacant areas and the brick manufacturing process.</p>
Water Quality	<p>The field survey of the water quality was conducted from Sar Ta Lin Creek. The water quality results were compared with the guideline values for of the effluents in for the Electric Power Transmission and Distribution sector in the NEQG Guidelines in Myanmar. The results of for total coliform (results: 92,000 MPN/100mL, NEQG: 400MPN/100mL) and iron (results: 13.21 mg/L, NEQG: 3.5mg/L) exceeded the NEQG values.</p> <p>Two expected reasons for the exceeding exceedance of coliform in water would be existing natural bacteria and delivering from upstream areas. The A possible reasons for exceeding iron may be due to the influence of natural origins (iron can reach out from soil by due to run-off). In Yangon, soil is naturally rich in iron.</p>
Soil Quality	The results of soil quality analysis showed significantly lower levels than the examined standards examined in Vietnam and Thailand. Therefore, the soil quality of in Project the area surrounding the project area are is good condition.
Noise and Vibration Level	<p>Noise and vibration measurements were carried out for one location on a 24-hour basis. Comparing with the guideline value of for noise level prescribed in the NEQG Guidelines, the day time results was were under the guideline values and the night time results was were slightly higher than the guideline value.</p> <p>The value of vibration level is value was compared with the target value of for Thilawa Special Economic Zone B, which is set based on the Japanese standard. By comparing with the target vibration level in for the operation stage in the EIA report for Thilawa Special Economic Zone development project Zone B, all of the results were under the target values.</p>

Source: IEE Study Team

## **9. Summary of Environmental, Social and Health Impacts and Emergency Risk Assessments**

### **9.1 Geographical Scope**

According to Article 25 of EIA Procedure Notification No.616/2015, the following conservation areas are categorized as sensitive environmental and conservation areas required for special consideration to conserving the areas.

- 1) Forest conservation area (including biodiversity reserved area)
- 2) Public forest
- 3) Park (including marine parks)
- 4) Mangrove swamp
- 5) Any other sensitive coastal area
- 6) Wildlife sanctuary
- 7) Scientific reserve
- 8) Nature reserve
- 9) Geophysical significant reserve
- 10) Protected cultural heritage area
- 11) Protected archeological area or area of historical significance

Since the proposed Project is to construct and facilitate the transmission lines and substations, the study area is located along the transmission route and surrounding areas of substations, and these areas are positioned within the Bago and Yangon Regions. The area where the impacts will be assessed is set within the 200 m on both sides of transmission routes and within 300 m from the boundaries of substations area. The above stated conservation areas are NOT expected to exist in the area of the Project.

### **9.2 Temporal Scope**

The temporal scope of the IEE study with regard to the construction phase will be the whole period of construction stage. For the operational phase, the temporal scope relates to beyond the starting of power line operation.

### **9.3 Impact Assessment Methodology for IEE Study**

The assessment of the environmental and social impacts, OHS, CHS and emergency risks will be based on the following:

- Proposed design and facilities of the Project,
- Construction method,
- Construction materials,
- General Environmental, Health and Safety (EHS) Guidelines and EHS Guidelines for Electric Power Transmission and Distribution,
- Other related IEE/ EIA reports,
- Comments from public, stakeholders and Public Consultation Meetings (PCMs), and
- Data collected during the field survey, predictions on and assessment of environmental and social impacts.



## 9.4 Assessing Significance

Impacts are described in terms of ‘*significance*’. *Significance* is a function of the *magnitude* of the impact and the *likelihood* of the impact occurring. Impact magnitude (sometimes termed severity) is a function of indicators such as the extent, duration and intensity of the impact. The criteria used to determine magnitude for environmental and social impacts are described in Table 6.

**Table 6 Magnitude Criteria for Environmental and Social Impacts**

Impact Magnitude		Score
Extent	<b>On-site</b> – impacts that are limited to the boundaries of the development site.	1
	<b>Local</b> – impacts that affect an area in a radius of 20km around the development site.	2
	<b>Regional</b> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ ecosystem.	3
	<b>National</b> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.	4
Duration	<b>Temporary</b> – impacts are predicted to affect resource/ receptor in intermittent (< 1 month)	1
	<b>Short-term</b> – impacts are predicted to affect resource/ receptor in short duration ( $\leq 2$ yr), period of impact occurrence is less than the Project period.	2
	<b>Long-term</b> – impacts are predicted to affect resource/ receptor in long term duration (> 5 yr or < 10 yr), period of impact occurrence is same as the Project period.	3
	<b>Permanent</b> – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	4
Intensity	<b>BIOPHYSICAL ENVIRONMENT:</b> <i>Intensity can be considered in terms of the sensitivity of the biodiversity receptor (i.e. habitats, species or communities).</i> Negligible – the impact on the environment is not detectable.	1
	<b>Low</b> – the impact affects the environment in such a way that natural functions and processes are not affected.	2
	<b>Medium</b> – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.	3
	<b>High</b> – where natural functions or processes are altered to the extent that they will temporarily or permanently cease. <i>Where appropriate, national and/or international standards are to be used as a measure of the impact.</i>	4
	<b>SOCIO-ECONOMIC ENVIRONMENT:</b> <i>Intensity can be considered in terms of the ability of people/communities affected by the Project to adapt to changes brought about by the Project.</i> Negligible – there is no perceptible change to people’s livelihood.	1
	<b>Low</b> - people/communities are able to adapt with relative ease and maintain pre-impact livelihoods. (or) Few people/communities get benefits from infrastructure development and employment in the facilities.	2



Impact Magnitude		Score
	<b>Medium</b> – people/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. (or) A large number of people/communities get benefits from infrastructure development and employment in the facilities.	3
	<b>High</b> - affected people/communities will not be able to adapt to changes or continue to maintain pre-impact livelihoods.	4

Source: IEE Study Team

For OHS, CHS and emergency risks, the **Magnitude** of the impact occurring were assessed and evaluated via three (3) factors – intensity, duration and legal requirement as described in Table 7.

**Table 7 Magnitude Criteria for OHS, CHS and Emergency Risks**

Impact Magnitude		Score
<b>Intensity</b>	<b>Negligible</b> – Minor injury requiring first aid treatment	1
	<b>Low</b> – Non-permanent injury requiring single occurrence of medical treatment	2
	<b>Medium</b> – Serious or permanent injury requiring multiple medical treatments or hospitalization	3
	<b>High</b> – Injury/illness resulting in immediate loss of life	4
<b>Duration</b>	<b>Temporary</b> – Immediately reversible (eg.1 day)	1
	<b>Short-term</b> – Short term (eg.1 week)	2
	<b>Long-term</b> – Long term (e.g. more than 1 month)	3
	<b>Permanent</b> – impacts that cause a permanent change in the wellbeing of the affected person	4
<b>Legal Requirement</b>	<b>Negligible</b> – Standard values & regulations not required	1
	<b>Low</b> – Standard values & regulations requires mitigation measures to be in place	2
	<b>Medium</b> – Non-compliance with standard values & regulations in some sectors but most are compliant	3
	<b>High</b> – Non-compliance & exceeding standard values & regulation	4

Source: IEE Study Team

The level of magnitude is determined based on the total score interval which is obtained by summing of the score of each component as shown below in Table 8.

**Table 8 Rating for Impact Magnitude**

Total Score Interval	Magnitude
1 – 3	Negligible
4 - 6	Low
7 - 9	Medium
10 - 12	High

Source: IEE Study Team

Likelihood of an impact is qualified through a statement on the degree of occurrence. The prediction

for degree of occurrence is a function of uncertainties, for example, where information is insufficient to assess the impact. The Likelihood of an impact is categorized as below in Table 9.

**Table 9 Rating for Impact Likelihood**

<i>Likelihood - the likelihood that an impact will occur</i>	
Unlikely	The impact is unlikely to occur.
Occasional	The impact is likely to occur sometimes.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

Source: IEE Study Team

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance.

**Table 10 Risk Based Impact Assessment Matrix**

<b>LIKELIHOOD</b>  <b>MAGNITUDE</b>	<b>Unlikely</b>	<b>Occasional</b>	<b>Likely</b>	<b>Definite</b>
<b>Negligible</b>	Negligible	Negligible	Minor	Minor
<b>Low</b>	Negligible	Minor	Moderate	Moderate
<b>Medium</b>	Minor	Moderate	Moderate	Major
<b>High</b>	Moderate	Moderate	Major	Major

Source: IEE Study Team

**Table 11 Significance Color Scale**

<b>Negative ratings</b>		<b>Positive ratings</b>	
Negligible	D	Negligible	D
Minor	C-	Minor	C+
Moderate	B-	Moderate	B+
Major	A-	Major	A+

Source: IEE Study Team

The impacts of pollution, natural environment and social environment will be evaluated based on the above risk-based impact assessment methodology. The methodology provides two (2) metrics: likelihood and magnitude. Each impact is assessed by ratings with increasing or decreasing likelihood and magnitude.

The risk level is indicated by a color code, with green denoting negligible and red denoting major/very significant impact. The moderate/significant impact is identified by a yellow zone and minor/insignificant impact is identified by a gold zone.

**Table 12 Results of Preliminary Impact Assessment**

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Air Pollution	Exhaust gas emissions		C-		OS: The main source of air pollution will be the exhaust gas emission from vehicle movements. Therefore, the significance of impact can be assessed as minor.
		PM, Dust and exhaust gas emissions	B-		B-	CS/CLS: The principal source of potential air pollutant will be dust from construction/ demolition works. The exhaust gases (SO <sub>2</sub> , NO <sub>2</sub> & PM <sub>10</sub> ) will be emitted from the construction vehicles, generators and machinery. Therefore, the significance of impact can be assessed as moderate.
	Water Pollution	Domestic wastewater & storm water		B-		OS: Wastewater may be generated from the staff housing, toilets, canteen etc. Therefore, the significance of impact can be assessed as moderate.
			C-		C-	CS/CLS: Wastewater may be generated from the site cleaning activities, temporary toilets, etc. Stormwater runoff passed through the construction sites may contain muddy water, suspended sediments and construction materials. Therefore, the significance of impact can be assessed as minor.
	Noise and Vibration	Noise level		B-		OS: Noise from the operation of transformers will be in the form of buzzing and humming which will be felt only up to 15 to 50 m from the substation area. Noise from overhead transmission lines will be from corona phenomenon which is the ionization of the air around the conductors as cracking or hissing noise. Therefore, the significance of impact can be assessed as moderate.
		Noise level	B-		B-	CS/CLS: During Construction and Closing Stage, the major sources of noise and vibration will be construction equipment and vehicle movement. Therefore, the significance of impact can be assessed as moderate.
	Solid Waste	Managements of waste disposal		B-		OS: If there have replacement in existing old equipment and devices and others, such as transformers, it would generate the used coolant oil, oil contaminated metal scraps, rag and soil, and expired standby batteries. Non-hazardous solid wastes such as paper, food waste, plastic bags, drink cans, etc. may be generated from staff housing. Therefore, the significance of impact can be assessed as moderate.
			C-		C-	CS/CLS: Less amount of hazardous wastes (such as used car batteries, broken glass, broken light fixtures, engine oil, etc.) and non-hazardous wastes (such as debris, concrete, metal, timber, etc. and pieces of iron, electric wire, empty package of material, etc.) may be generated from construction/

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						demolishing activities. Therefore, the significance of impact can be assessed as minor.
	Soil Contamination	Spill/ leakage of hazardous materials/waste and fuel		B-		OS: In operation stage, soil contamination in and around the Project area may probably occur due to the direct discharging of wastewater (domestic) onto the soil, spillage/leakage of oil and fuel from on-site storage. Therefore, the significance of impact can be assessed as moderate.
			B-		B-	CS/CLS: Oil spillage may arise from transferring oil to the machine, equipment or vehicle or from equipment, machinery and vehicle during maintenance works. Therefore, the significance of impact can be assessed as moderate.
	Offensive Odor	Odor emission		C-		OS: Offensive odor may be generated due to the improper management of sewage and domestic waste from staff housing etc. Therefore, the significance of impact can be assessed as minor.
			D		D	CS/CLS: There is no use of materials and facility which cause offensive odors. Therefore, the significance of impact can be assessed as negligible.
	Ground Subsidence	Withdraw of groundwater/ use of heavy machines	D	D	D	CS/OS/CLS: In substation area, much amount of groundwater will not be withdrawn during construction and operation stage. Moreover, heavy machines will not be used for long time. Therefore, the significance of impact can be assessed as negligible.
	Sediment	Wastewater discharge	D	D	D	CS/OS/CLS: Wastewater drainage including heavy metals or high -level organic substances will not be discharged into the water body. Therefore, the significance of impact can be assessed as negligible.
Natural Environment	Protected area Flora and Fauna, Ecosystem Topography and Geography	Site cleaning and other construction activities	C-	C-	C-	CS/CLS /OS: There will be no forest and wildlife park passed through by the transmission line. There will be only vegetation clearing along the ROW. There will be no impact on topography & geography. There are nine flyways that migratory birds take around the world, and Myanmar has two of them. They are the Central Asian Flyway, and the East Asian Australasian Flyway. These two paths include the Mottama gulf, Indawgyi Lake, Moe Yoon Gyi Wetland, Inle Lake, and Mein Mahla Kyun. However, detailed flyways haven't found yet. Therefore, the significance of impact can be assessed as minor.
	Hydrological conditions		D	D	D	CS/OS/CLS: The proposed Project will not include the activities that may cause hydrological conditions changes.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						Therefore, the significance of impact can be assessed as negligible.
Social Environment	Involuntary Resettlement and Land Acquisition	Land acquisition and resettlement	B-	B-	B-	CS/OS/CLS: Permanent land of approximately 32.37ha (80 acre) has to be acquired for construction of Substation. The total area of tower bases along the transmission line has to be acquired for installation of transmission lines to following the appropriate rule. Therefore, the significance of impact can be assessed as moderate.
				A+		OS: The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City. Therefore, the significance of impact can be assessed as major.
	Local Economy and Livelihood	Local Economy	C-		C-	CS/CLS: The Project will temporarily in sales of local shops and vendors, etc. during the construction of towers transmission lines. Therefore, the significance of impact can be assessed as minor.
				B-		OS: The alternation in livelihoods will occur for the PAPs which lands are permanently acquired. Therefore, the significance of impact can be assessed as moderate.
					CS/CLS: During the construction phase, a lot of job opportunities will be created as most of general construction labor work force will derived from the local population. Therefore, the significance of impact can be assessed as moderate.	
		B+		B+		
	Existing social infrastructures and services	Accessibility		D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as negligible.
			B-		B-	CS/CLS: The Project will not relocate houses based on the current plan. Accessibility of social infrastructure/services will be affected due to the increase of construction vehicles. Therefore, the significance of impact can be assessed as moderate.
	Social Institutions	Traffic congestion		D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as minor.
			B-		B-	CS/CLS/OS: Due to the traffic congestion impact on social infrastructure and services, the community near the Project area will be affected. Therefore, the significance of impact can be assessed as moderate.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Landscape and Greening	Effects on landscape and greening	D	D	D	CS/CLS/OS: The transmission line will mostly cross the agriculture land and rural road in rural area and go along the road in the urban area. Therefore, the significance of impact can be assessed as minor.
	Indigenous and Ethnic People	Effects on indigenous and ethnic people	D	D	D	CS/CLS/OS: No indigenous and minority people are around the Project site. Therefore, the significance of impact can be assessed as minor.
	Land use and local resources	Effects on land use and local resources	D	D	D	CS/CLS /OS: There will not have impacts on land use & local resources. Therefore, the significance of impact can be assessed as minor.
	Conflict of interests within the region	Causes of conflict of interests	D	D	D	CS/CLS /OS: There may not have conflict of interests within the region. Therefore, the significance of impact can be assessed as minor.
	Cultural Heritage	Effects on cultural heritage	D	D	D	CS/CLS/OS: The impacts on the cultural heritage such as Taukkyan war ceremony and Kanbawzathadi palace are negligible as this place are approximately 6km and 5km from the Project site. Therefore, the significance of impact can be assessed as minor.
	Gender Discrimination	Effects on gender	D	D	D	CS/CLS/OS: The Project will not make any impact of gender discrimination. Therefore, the significance of impact can be assessed as minor.
	Children's Right	Effects on children's right	D	D	D	CS/CLS/OS: The Project will not induce any impact of children's right. Therefore, the significance of impact can be assessed as minor.
Social Environment	Involuntary Resettlement and Land Acquisition	Land acquisition and resettlement	B-	B-	B-	CS/OS/CLS: Permanent land of approximately 32.37ha (80 acre) has to be acquired for construction of Substation. The total area of tower bases along the transmission line has to be acquired for installation of transmission lines to following the appropriate rule. Therefore, the significance of impact can be assessed as moderate.
	Local Economy and Livelihood	Local Economy		A+		OS: The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City. Therefore, the significance of impact can be assessed as major.
			C-		C-	CS/CLS: The Project will temporarily in sales of local shops and vendors, etc. during the construction of towers transmission lines. Therefore, the significance of impact can be assessed as minor.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
		Livelihood		B-		OS: The alternation in livelihoods will occur for the PAPs which lands are permanently acquired. Therefore, the significance of impact can be assessed as moderate.
			B+		B+	CS/CLS: During the construction phase, a lot of job opportunities will be created as most of general construction labor work force will derived from the local population. Therefore, the significance of impact can be assessed as moderate.
Existing social infrastructures and services	Accessibility			D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as negligible.
		B-		B-	CS/CLS: The Project will not relocate houses based on the current plan. Accessibility of social infrastructure/services will be affected due to the increase of construction vehicles. Therefore, the significance of impact can be assessed as moderate.	
Social Institutions	Traffic congestion			D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as minor.
		B-		B-	CS/CLS/OS: Due to the traffic congestion impact on social infrastructure and services, the community near the Project area will be affected. Therefore, the significance of impact can be assessed as moderate.	
Landscape and Greening	Effects on landscape and greening	D	D	D	CS/CLS/OS: The transmission line will mostly cross the agriculture land and rural road in rural area and go along the road in the urban area. Therefore, the significance of impact can be assessed as minor.	
Indigenous and Ethnic People	Effects on indigenous and ethnic people	D	D	D	CS/CLS/OS: No indigenous and minority people are around the Project site. Therefore, the significance of impact can be assessed as minor.	
Land use and local resources	Effects on land use and local resources	D	D	D	CS/CLS /OS: There will not have impacts on land use & local resources. Therefore, the significance of impact can be assessed as minor.	
Conflict of interests within the region	Causes of conflict of interests	D	D	D	CS/CLS /OS: There may not have conflict of interests within the region. Therefore, the significance of impact can be assessed as minor.	
Cultural Heritage	Effects on cultural heritage	D	D	D	CS/CLS/OS: The impacts on the cultural heritage such as Taukkyan war ceremony and Kanbawzathadi palace are negligible as this place are approximately 6km and 5km from the Project site. Therefore, the significance of impact can be assessed as minor.	



Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Gender Discrimination	Effects on gender	D	D	D	CS/CLS/OS: The Project will not make any impact of gender discrimination. Therefore, the significance of impact can be assessed as minor.
	Children's Right	Effects on children's right	D	D	D	CS/CLS/OS: The Project will not induce any impact of children's right. Therefore, the significance of impact can be assessed as minor.
Occupational Health and Safety (OHS)	Air Pollution, Noise exposure, Heat exposure, Work Place Injuries, Exposure to Hazardous materials, Others	Managements of OHS		B-		<p>OS:</p> <p>Workplace injuries</p> <p>Workplace injuries are far too common on the job, and the majority of such random events can happen to anyone and at any time. Not only is it the employer's responsibility to ensure a safe work environment, but each employee also has a responsibility to themselves to exercise caution when on the job.</p> <p>Exposure to radiation</p> <p>Engineers, electricians and overhead line workers are most exposed to electrical hazards. Electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines, such as through electrical installation and repairs, testing of fixtures and equipment and inspection and maintenance activities.</p> <p>Other Accidents</p> <p>Unforeseen accidents such as road and traffic accidents, emergencies such as fires, explosions, heavy rain and flooding, earthquakes with loss of human life and damage to structures and facilities could have a high impact on the safety and health of the employees.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
			B-		B-	<p>CS/CLS: There is a possibility of air pollution, noise pollution, heat exposures, exposure to hazardous materials, etc. during the construction and closure stages. Moreover, the possibility of accidents and incidents is expected to occur more or less.</p> <p>In order to prevent the occurrence of accidents and incidents, working conditions during the construction and closing stages shall be managed by the Contractor based on OHS training stipulated in international guidelines, such as EHS Guidelines by the IFC.</p> <p>The Contractor shall prepare and implement appropriate mitigation measures under the respective impact assessment. Especially during the hot season, countermeasures for intense heat should be well prepared and announcements must be made for the prevention of heat stroke. In addition, accommodation for workers must be arranged to provide safe resting places for them.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
Community Health and Safety	Impact on Public Health and Community, Electrocutation, electromagnetic field, Public Safety, Public Security and Others	Managements of CHS		B-		<p>OS: Public Health and Community</p> <p>Improvement in the power distribution may create a stable and efficient electric power supply resulting in an upgrading of social infrastructures and services as well as the living condition of people. Electromagnetic fields from operation and overhead high voltage AC transmission lines can lead to incidences of health effects, including child leukemia, miscarriages, nausea, depression, loss of libido, and infertility.</p> <p>Public Safety</p> <p>Impacts on public safety consist of traffic accidents and incidents due to vehicle movement (supply of machines, raw materials, ferry services, etc.). In the operation phase, transmission lines present a risk of electrocution due to direct contact with high-voltage equipment and lines and also induced voltages, especially in the case of tools, vehicles and farm machinery that transit beneath transmission lines. Humans and farm animals can also risk electrocution or nuisance shock when inadequate grounding at substations energizes metal objects, such as stock tanks, outside substation grounds. The collapse of transmission towers during storms is also included in electrocution causes.</p> <p>Public security and others</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>The effects of power-line frequency electromagnetic fields (EMF) in humans are relatively high-level EMFs from overhead high-voltage AC transmission lines, and equipment too can lead to an increased incidence of adverse health effects including childhood leukemia and miscarriages. Moreover, Corona and induced electromagnetic fields from the operation of high voltage transmission lines can also produce electromagnetic interference or electrical noise on the community, which affects the functioning of electronic and telecommunications equipment. “Jitter” in television screens and computer monitors can result from electromagnetic interference.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
		Managements of CHS	C-		C-	<p>CS/CLS: There is a possibility of air pollutant emissions, including dust due to the operation of construction machines and vehicles, as well as construction work, which might cause some adverse effects on respiratory organs. Impacts on public health and communities, the dusty conditions of the construction site, exhaust gases from the machinery &amp; vehicles, the discharge of site-generated waste water, the generation of construction waste, demolition debris, domestic wastes, hazardous wastes, and the noise generated by construction machinery may affect the surrounding community.</p> <p>These impacts shall be managed by the construction contractor through provision of safety education and training for workers based on the OHS training stipulated in the international guidelines such as EHS Guidelines by IFC.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
Emergency Risks	Fire	Managements of Fire Prevention		B-		<p>CS/OS/CLS:</p> <p>In the operation stage, there will be a risk of potential fire accidents from the substation and transmission lines. At the substation, transformer explosions and fires can result from a breakdown of insulation due to over-current, over-voltage or short circuit. Degradation of insulation, like decay of transformer oil due to moisture or aging or decomposition, is another cause of fire in substations. Once the insulation drops below a threshold value an electric arc is generated. The temperature of the oil increases and oil decomposes, leading to</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>generation of ignitable gases and pressurization of the oil tank, which may lead to explosion of transformer.</p> <p>The most common causes of fire in transmission lines are weather-related events such as thunderstorms and strong winds etc. that cause damage to lines and equipment attached to them. Once the equipment is damaged or downed, wires may contact trees and other combustible materials resulting in sparks, smoke and fires. In other cases, animal or human contact, equipment failures and conductor slaps can also create fire hazards in transmission lines.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
		Managements of Fire Prevention	C-		C-	<p>CS/OS/CLS: In the construction and closing stages, although the construction and closure works for the proposed project will contain large-scale work using fire-arms and explosives, the risk of fire accidents could be considered low. However, the risks are inevitable because some activities taken by the workers, such as smoking and cooking, could lead to fire accidents in the proposed project. To eliminate the risks of fire accidents, the behavior of the workers shall be managed by the construction contractor through provision of safety education and training for workers based on the OHS training stipulated in international guidelines such as the EHS Guidelines by IFC.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
	Flood	Managements of Flood Prevention	C-	C-	C-	<p>CS/OS/CLS: Heavy rains, overflowing of canals, flooding, etc. during heavy storms, cyclones, rainfall, unexpected weather conditions, etc. may cause flooding in and around the project sites. In the construction, operation and closing stages, the risk of flood occurrence is considered very low because the project area is located in a low flood zone and will be constructed to satisfy the level requirements for flood prevention.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
	Earthquake	Managements of Earthquake Prevention	B-	B-	B-	<p>CS/OS/CLS: Foundations of equipment, depending on their depths and dimensions, can collapse due to overturning moments because the depth and foundation weight of these foundations are insufficient for resistant moments.</p> <p>Bolts for connecting steel structures to foundations may not have enough shear strength to transfer loads to foundations and break after seismic loads.</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>Parts which connect electrical parts to structural supports can be insufficient and become damaged due to earthquake loads.</p> <p>Insulator and electrical parts made of porcelain may break after earthquake loads and due to internal materials, casing thickness and joint connection systems with other parts.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>

Source- IEE Study Team

## 10. Environmental management and monitoring plan

- 1) Environmental mitigation and consideration measures which shall be taken in the course of the Project implementation in operation and closure stages. The measures were examined based on the Project description and assessment results of environmental impacts, social impacts, health and safety impacts, and emergency risks.
- 2) Environmental monitoring plan to supervise/examine the implementation of proposed environmental mitigation and consideration measures and to measure the quality of surrounding environments under the influence of the Project activities during operation and closure stages.

### 10.1 Mitigation and Consideration Measures

#### 10.1.1 Mitigation and Consideration Measures for Construction and Closure Stage

Environmental mitigation and consideration measures in construction/closure stages for different aspects including pollution, natural environment, social environment, health and safety, and emergency risk are summarized in the following Table 13. Most of the environmental mitigations and consideration measures will be implemented by the contractor of construction/demolishing work under the management of the Project proponent.

**Table 13 Environmental Mitigation and Consideration Measures in the Construction/Closure Stage**

Category	Impact Item	Mitigation Measures	Implementer
Pollution	Air pollution	<ul style="list-style-type: none"> <li>▪ Water spraying of the entire construction site will be carried out during the demolition activities to suppress and control dust emissions.</li> <li>▪ Dust nets of adequate height shall be erected around the entire construction site perimeter.</li> <li>▪ The excavated earth material should be kept at the designated place and should be covered to prevent wind erosion.</li> <li>▪ In higher wind forces, construction work relating to dust generation will not be allowed.</li> <li>▪ Netting will be attached along fences to minimize the spread of dust to neighboring areas.</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Construction materials that emit dust will be covered.</li> </ul>	
	Water pollution	<ul style="list-style-type: none"> <li>▪ Cover piles of building materials like cement, sand, and other powders, regularly inspect for spillages and locate them where they will not be washed into waterways or drainage areas.</li> <li>▪ Generators are sited on concrete foundations and with a bund wall to prevent any spillage or leakage.</li> <li>▪ Sewage from septic tanks will be disposed of via request to Township Development Committee.</li> <li>▪ Site drainage system (temporary open soil gutter) will be in effect to prevent water ponding, overflowing and blocking.</li> </ul>	Contractor
	Noise and vibration	<ul style="list-style-type: none"> <li>▪ Prior notification to the local community on the schedule of construction activities.</li> <li>▪ Restriction of operation hours for heavy construction machines (such as excavators fitted with construction/demolition/breaking equipment) and avoid idling.</li> <li>▪ Pay attention when dropping materials from a height.</li> <li>▪ Construction work will not be conducted at night.</li> <li>▪ Regular inspection, maintenance and servicing of machines and equipment will be conducted.</li> </ul>	Contractor
	Solid Waste	<ul style="list-style-type: none"> <li>▪ Prepare a plan which includes the control of receipt, storage and final disposal of such substances.</li> <li>▪ Waste should be collected daily.</li> <li>▪ Non-hazardous waste should not be mixed with any category of hazardous waste at any time.</li> </ul>	Contractor
	Soil contamination	<ul style="list-style-type: none"> <li>▪ Construction materials of hazardous or non-hazardous type are stored in adequate places to avoid contamination during occurrences of rain or floods.</li> <li>▪ Maintenance of heavy equipment, machinery and vehicles will be conducted by authorized and experienced personnel.</li> <li>▪ Fuel filling of certain machinery, equipment and vehicles will be carried out by an authorized vendor to prevent spill-over and leakage from fuel transfer and on-site storage.</li> <li>▪ In any cases of occurrence, the contaminated soil will be collected, placed in appropriate containers and disposed through TDC.</li> </ul>	Contractor
Natural Environment	Flora, Fauna, Ecosystem	<ul style="list-style-type: none"> <li>▪ Identify and prepare the lists of trees to be cut down</li> <li>▪ Cooperate with relevant Government authorities (FD, TDC, etc.) for replantation</li> </ul>	Project Proponent/ Contractor
Social	Involuntary Resettlement	<u>Substation Land Acquisition</u>	Project Proponent

Category	Impact Item	Mitigation Measures	Implementer
	and Land Acquisition	<ul style="list-style-type: none"> <li>▪ The land required for the substation area will be purchased in the help of YRG from the landowner. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul> <p><u>Transmission Line Land Acquisition</u></p> <ul style="list-style-type: none"> <li>▪ An appropriate amount of compensation will be provided in accordance with The Farmland Law and Rules (2012), and Land and Crop Compensation Regulations by MOEE. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul>	
	Local Economy	<ul style="list-style-type: none"> <li>▪ For persons affected by acquired agricultural land, the proper amount of compensation should be provided to not only the landowner but also the laborers working in those areas.</li> <li>▪ Moreover, temporary crop compensation in accordance with The Farmland Law and Rules (2012), and Land and Crop Compensation Regulations by MOEE should be provided to the affected business owner during the construction phase.</li> <li>▪ Mobilization and construction work for the project should be carried out carefully so that standing crops are not damaged unnecessarily.</li> <li>▪ The project work may be delayed allowing the farmers to harvest their crops.</li> <li>▪ Work should not be continued through ripened crop fields.</li> </ul>	Contractor
	Livelihood	<ul style="list-style-type: none"> <li>▪ Investigating the possible procurement needs of the Project that can be sourced locally.</li> <li>▪ Identifying the range of skill required for the labor force and conduct a gap analysis against skills availability.</li> <li>▪ Providing information to local people of job openings through local advertising, information center, project notice boards.</li> <li>▪ Developing and implementing a local employment policy for the people of affected communities.</li> <li>▪ Practicing careful management about the expectation of local people in regard to the employment to avoid any disputes.</li> </ul>	
	Existing Social Infrastructures and Social Services	<ul style="list-style-type: none"> <li>▪ Arrange careful logistics management with an understanding of the bearing capacity of roads and bridges to be utilized.</li> <li>▪ Dispatch road maintenance crews to areas where access roads are damaged by construction activities, in consultation with relevant authorities.</li> <li>▪ Deliver prior notification to local authority and public for temporary road closures.</li> </ul>	Contractor



Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Provide road signs and safety barriers.</li> <li>▪ Avoid the rush hours when higher traffic volumes are expected, such as school start and end times, for transportation of construction materials and heavy machinery.</li> </ul>	
	Social Institutions	<ul style="list-style-type: none"> <li>▪ Arrange careful logistics management with an understanding of the bearing capacity of roads and bridges to be utilized</li> <li>▪ Dispatch road maintenance crew to areas where access roads are damaged by construction activities in consultation with relevant authorities.</li> <li>▪ Deliver prior notification to local authorities and public for temporary road closures.</li> <li>▪ Avoid the rush hours when higher traffic volume is expected, such as school start and end times, for transportation of construction materials and heavy machinery.</li> </ul>	Contractor
Health and Safety	Occupational Health and Safety	<ul style="list-style-type: none"> <li>▪ Visitors to the site are provided with PPE and escorted around the construction site.</li> <li>▪ PPE requirement signboards.</li> <li>▪ Nettings, and toe boards are provided at scaffolding workplaces to prevent falling material hazards.</li> <li>▪ Warning signages for various hazards are visibly posted to warn workers of at the workplace.</li> </ul>	Contractor
	Community Health and Safety	<ul style="list-style-type: none"> <li>▪ Implement regular water spraying on dust -emitting materials/surfaces.</li> <li>▪ Vehicles, machines and equipment must be routinely inspected, maintained and serviced to prevent exhaust emissions.</li> <li>▪ Ensure discharges of waste water from the project site do not affect/disturb the local community.</li> <li>▪ Ensure waste/rubbish disposal is conducted properly and regularly.</li> <li>▪ Avoid dangerous routes and consider rush-hour, school hours to reduce the risk of traffic accidents.</li> <li>▪ Understanding of traffic rules and regulations.</li> <li>▪ Educate employees on correct ways to integrate into the community and understanding local culture and traditions.</li> <li>▪ Restrict access to the site.</li> <li>▪ Establish site safety and security plan.</li> </ul>	Contractor
Emergency Risk	Flood	<ul style="list-style-type: none"> <li>▪ Proper communication systems such as alarm bells, visual alarms, etc. to provide emergency warning to workers and community.</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Collection of updated emergency flood information related to project area through any media.</li> <li>▪ Preparation of flood response plan, including preparation for pumping out water in case of flooding, etc.</li> <li>▪ Arrangement of training by identifying roles and responsibilities, capabilities and requirements of personnel in an emergency and other training related to evacuation program in case of emergency.</li> </ul>	
	Fire	<ul style="list-style-type: none"> <li>▪ Behavior of workers (smoking, cooking near flammable sources, etc.)</li> <li>▪ Storage of fuel (e.g. diesel and petrol for generators, heavy machinery equipment such as excavators)</li> <li>▪ Electrical fires (e.g. usage of faulty equipment, un-safe electrical connections, broken electrical cords, etc.)</li> <li>▪ Welding (from the welding of structures during construction)</li> <li>▪ Cutting (sparks from the cutting of steel items by for example acetylene torches during demolition)</li> <li>▪ Some of the mitigation measures for prevention of fire during construction and closing are as follows:                             <ul style="list-style-type: none"> <li>▪ Prohibit smoking and cooking especially near flammable sources such as near fuel storage areas, waste rubbish areas, etc., provide a designated smoking</li> <li>▪ Proper storage of fuel (e.g. designate storage and warn with danger signs, etc.)</li> <li>▪ Inspect electrical equipment for faults, broken cords/wires, etc. and provide safe electrical equipment (usage of industrial approved sockets and wiring, etc.)</li> <li>▪ Implement safe welding plan (check for un-safe condition, incompatible work nearby e.g. painting works, etc., provide cover around welding area to prevent sparks igniting other nearby items, check gas canisters and connections, provide portable fire extinguisher at every welding work place, etc.)</li> <li>▪ Check gas cylinders, valves and connections for usage of acetylene torches, incompatible work nearby, provide portable fire extinguisher, etc.</li> </ul> </li> </ul>	Contractor
	Earthquake	<ul style="list-style-type: none"> <li>▪ Prevention of transmission lines passing paths experiencing land sliding, turnovers, cuttings, and liquefaction hazard areas.</li> <li>▪ Prevention of transmission line and substation constructions where ground properties will resonate earthquake forces, such as high grounds with special geotechnical conditions.</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Perform thoroughgoing Soil test considering proper development length and good connections to equipment for insulators during construction time regarding seismic conditions.</li> <li>▪ Prepare proper bedding for substation equipment and transmission line foundations from compacted soil.</li> <li>▪ Prepare a suitable design for equipment column foundations and control the settlement items.</li> <li>▪ Prepare a proper design for electrical power and control cabinet seating.</li> <li>▪ Construct a proper barrier around the substations.</li> <li>▪ Implement a proper connection for equipment on structures and foundations using bolts.</li> <li>▪ Avoid the construction of elevated water tanks near buildings and equipment.</li> </ul>	

Source: IEE Study Team

### 10.1.2 Mitigation and Consideration Measures for Operation Stage

Environmental mitigation and consideration measures in the operation stage for different aspects including pollution, natural environment, social environment, health and safety, and emergency risk are summarized in the following Table 14. Most of the environmental mitigations and consideration measures will be implemented by the Project proponent.

**Table 14 Environmental Mitigation and Consideration Measures in Operation Stage**

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
Pollution	Air Pollution	<ul style="list-style-type: none"> <li>• Transportation vehicles, tools and machinery will be controlled, inspected and maintained regularly.</li> <li>• Avoiding idling vehicles; all the drivers must avoid unnecessary warm up of engines or use of vehicle.</li> <li>• Use low Sulphur diesel oil in all vehicle and equipment engines</li> </ul>	Project Proponent
	Water Pollution	<ul style="list-style-type: none"> <li>• Sewage generated from staff housings will be disposed by requesting Township Development Committee.</li> <li>• Ensure no leakage from oil pit to drain line.</li> <li>• Drainage system of substation will be ensured no water ponding, overflowing and blocking.</li> </ul>	Project Proponent
	Noise and vibration	<ul style="list-style-type: none"> <li>• Regular maintenance of transformer to avoid unnecessary noise production.</li> </ul>	Project Proponent
	Solid Waste	<ul style="list-style-type: none"> <li>• Proper storage and disposal of the chemical and hazardous wastes.</li> <li>• Regular and proper cleaning of storage area at the time of contamination or leakage</li> <li>• Keep dustbins for wastes which may be damaged electrical equipment or used by surrounding people.</li> </ul>	Project Proponent

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
	Soil contamination	<ul style="list-style-type: none"> <li>Fuel filling of some machineries, equipment and vehicles will be carried out properly to avoid any oil leakage</li> <li>Proper plan of control measures in case of any oil leakage</li> </ul>	Project Proponent
Health and Safety	Occupational Health and Safety	<p><b>Workplace injuries</b></p> <ul style="list-style-type: none"> <li>Certified and competent electrical workers should conduct all electrical works, checking and usage of safe and approved electrical equipment should be implemented, avoid usage of un-safe and faulty electrical devices.</li> <li>Provision of first aid kits</li> <li>A worker safety plan will be implemented to reduce risks that include testing of structural integrity prior to proceeding with the work and the use of fall protection measures.</li> </ul> <p><b>Exposure to Radiation</b></p> <ul style="list-style-type: none"> <li>To develop an EMF safety program prior to operation.</li> <li>To make sure that transmission lines are deactivated and grounded prior to work on</li> </ul> <p><b>Other accidents</b></p> <ul style="list-style-type: none"> <li>Training for OHS such as safety induction, safety orientation, toolbox meetings, safety committee meetings, visitor orientation, proper management, as well as implementing adequate plans for emergencies such as training, drills, response will be the main control for the accidents and emergencies.</li> </ul>	Project Proponent
	Community health and safety	<p><b>Public Health and Community</b></p> <ul style="list-style-type: none"> <li>Initiate education for employees and area residents on the risk, prevention and available treatment of diseases</li> <li>Implement regular water spraying on dust emitting materials/surfaces in the project site</li> </ul> <p><b>Public security and others</b></p> <ul style="list-style-type: none"> <li>Restrict access to the site</li> </ul>	Project Proponent
Emergency Risk	Fire	<ul style="list-style-type: none"> <li>Arrangement of training by identifying roles and responsibilities, capabilities and requirements of personnel in an emergency and other training related to evacuation program in case of emergency.</li> </ul>	Project Proponent

Source: IEE Study Team

## 10.2 Environmental Monitoring Plan (EMoP)

Environmental monitoring plan including monitoring items, location, frequency and responsible organization in construction/closure stages and operation stage are shown in the Table 15. Monitoring for construction/closing stage will be implemented by the contractors and monitoring for operation stage will be implemented by DPTSC.

**Table 15 Environmental Monitoring Plan**

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
<b>Construction/ Closure Stage</b>							
Air Quality	One point at the new 500 kV substation	CO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , SO <sub>2</sub> , Ozone, Wind Speed, Wind Direction	On-site measurement	Annually	Annually	MOEE/ DPTSC	Contractor
	In and around of substation area and along all transmission lines	water spraying, dust nets, covering materials and excavated earth	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor
Water Quality	One point near new 500kV substation	Temperature, pH, Electrical Conductivity,	On-site measurement	Once in dry season and once in rainy season	Annually	MOEE/ DPTSC	Contractor
		BOD, COD, Oil and grease, Total coliform bacteria, Total Nitrogen, Total phosphorus, Suspended Solids, Chromium, Cadmium, Arsenic, Zinc, Lead, Mercury, Copper, Iron, Manganese	Laboratory analysis				
	In and around of all substation and along all transmission lines	Septic tanks, temporary drainage system, bund wall or spill kit	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor
Noise and Vibration	One point at the new 500kV substation	Noise Level L <sub>Aeq</sub> (dB) Vibration Level L <sub>v10</sub> (dB)	On-site measurement	Annually	Annually	MOEE/ DPTSC	Contractor
	In and around of all substation and along all transmission lines	Records of notice letter, work schedule and night work, inspection and maintenance of machines	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Solid Waste	All construction sites	Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Soil Contamination	All construction sites	Waste storage conditions, fuel filling method, spill kit (photos, drawing, etc.)	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Occupational Health and Safety	All construction sites	Records of PPE wearing, safety sign board, hazards warning post, tool box meeting, training, etc.	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Community Health and Safety	All construction sites	Water spraying near residential area, wastewater discharge point, traffic control, training to drivers, restrict sign at the boundary of site	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Emergency Responses (Flood, Earthquake)	All construction sites	Records of drills for fire, flood and earthquake	Keeping records	quarterly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPTSC	MOEE/ DPTSC	Contractors
<b>Operation Stage</b>							
Water Quality	In and around of all substation	Septic tanks and drainage system	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC
Noise	In side substation	Records of inspection and maintenance of machines	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC
Solid Waste	In and around of all substation	Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC
Soil Contamination	In and around of all substation	Waste storage conditions, oil filling method, oil pits (photos, drawing, etc.)	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC
Offensive Odor	Staff housings	Waste storage conditions, odor condition around septic tank	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Occupational Health and Safety	In and around of all substation	Incident and accident record, Records of provided PPE wearing,	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC
Community Health and Safety	In and around of all substation	Incident and accident record	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	DPTSC



Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Emergency Repairs	In and around of all substation	Records of drills for fire, flood and earthquake	Keeping records	quarterly	Bi-annually	MOEE	DPTSC

Source: IEE Study Team

## 11. Public Consultation and Disclosure

### 11.1 Methodology for Public Consultation for IEE

The methodology of the PCM is presented in the following Table 16.

**Table 16 Public Consultation Meeting for the IEE**

Stage	Methodology and Special Considerations
Draft IEE stage: planned in March 2020	<p><b>【Method and the No. of the Meetings】</b> District level stakeholder meeting: 1 meeting is planned for one day for Bago district and East Yangon district and Township level stakeholder meeting: 1 meeting is planned for one day for Hlegu, Mingaladon and Dagon Myo Thit (East)each township. The meetings will be organized in order to ensure the participation of the stakeholders in the public sector as well as the local residents.</p> <p><b>【Venue】</b> Related District or Township General Administration Department. (Mingalardon, Hlegu, Dagon Myothit (East) and Bago, North Okkala, South Dagon, North Dagon, Thaketa).</p> <p><b>【Agenda】</b> Draft IEE on the Department of Power Transmission and System Control (DPTSC). Baseline survey result and impact assessment results Proposed environmental mitigation measures and environmental monitoring plan IEE study schedule</p> <p><b>【Expected Participants &amp; Invitation Method】</b> Local government body in and around the related townships. Local residents in project area. Project Proponent and related government organizations Any interested individuals and parties The invitation/notice on the meeting will be posted in each village 1 week in advance.</p> <p><b>【Language Used】</b> The presentation and handout will be in the Myanmar Language. The explanation will also be provided in the Myanmar Language.</p> <p><b>【Special Considerations to Socially Vulnerable Groups】</b> Feedback forms will be provided to the participants so that the people who hesitate to speak out in public can share their views and comments in written form Assistants will be available to fill out the form in case the participant requires assistance in writing/reading. Female assistants will be available for the female participants who need any assistance.</p>

Source: IEE Study Team

### 11.2 Methodology for Public Disclosure for IEE

The Executive Summary in Myanmar language of the draft IEE report will be disclosed for review and comments as shown in the following Table 17. The final IEE will be available for public viewing at the

web-site of MOEE.

**Table 17 Public Disclosure for the IEE**

Stage	Methodology and Special Considerations
Draft IEE stage: planned in March 9-16 2020	<p><b>【Announcement Method】</b> Public disclosure will be announced 10 days before the public consultation meeting and 10 days after the public consultation meeting. (Totally 20 days). Disclosure period, comment submission method will be described in the disclosure places. The draft IEE report will be available on the official website.</p> <p><b>【Disclosure Place】</b> Related Township General Administration Department (Mingalardon, Hlegu, Dagon Myothit (East) and Bago, North Okkala, South Dagon, North Dagon, Thaketa). Village Tract Offices/Ward Offices in the Project area.</p> <p><b>【Disclosure Period】</b> 20 working days (to exclude National Holidays, Saturdays and Sundays)</p> <p><b>【Comment Submission Method】</b> Comments can be submitted with the comment form provided at the disclosure places or by e-mail either in Myanmar Language or English language.</p>

Source: IEE Study Team

### 11.3 Public Consultation Meeting for the Draft IEE Report

The public consultation meeting is held for five sessions to cover all of the project area of influence.

**Table 18 Detailed Information of Public Consultation Meetings**

Time and Date	1 <sup>st</sup> session: Friday, 13 March 2020, 10:00 am to 12:00 pm 2 <sup>nd</sup> session: Monday, 16 March 2020, 10:00 am to 12:00 pm 3 <sup>rd</sup> session: Wednesday, 18 March 2020, 10:00 am to 12:00 pm 4 <sup>th</sup> session: Thursday, 19 March 2020, 4:00 pm to 5:00 pm 5 <sup>th</sup> session : Friday, 20 March 2020, 10:00 am to 12:00 pm
Venue	1 <sup>st</sup> session: Administration Office, Thingangyungyi Village, Mingalardon Township, Yangon 2 <sup>nd</sup> session: General Administration Department, Dagon Myothit (East) Township, Yangon 3 <sup>rd</sup> session: General Administration Department, Bago District, Bago 4 <sup>th</sup> session: General Administration Department, Eastern Yangon District, Yangon 5 <sup>th</sup> session : General Administration Department, Hlegu Township, Yangon
Attendees	1 <sup>st</sup> session: 33 peoples 2 <sup>nd</sup> session: 29 peoples 3 <sup>rd</sup> session: 54 peoples 4 <sup>th</sup> session: 17 peoples 5 <sup>th</sup> session : 34 peoples Total: 167 peoples
Agenda	Explanation on the Project Description Explanation on JICA's Policy Explanation on Result of IEE Study Question and Answer
Language used	In local language, Myanmar language
Feedback Sheet	In total 38 comments during five PCM sessions and disclosure were submitted.

Source: IEE Study Team



Mingalardon Township



Mingalardon Township



Dagon Myo Thit (East)



Dagon Myo Thit (East)



Bago District



Bago District



Source: IEE Study Team

**Figure 16 Photos of Public Consultation Meetings**

**11.4 Public Disclosure for Draft IEE Report**

Executive Summary of IEE report translated by Myanmar language, is prepared and disclosed together with feedback form to each invitee during PCM. The disclosure duration was 7 weekdays starting from the date of holding PCM. The notice of disclosure duration and handout which describe project description briefly, were also posted on the notice board of the government offices for public access as shown in the following table.

**Table 19 Disclosure Duration for PDs**

Public Consultation Meeting	Disclosure Duration
1 <sup>st</sup> Session	13-23 March 2020
2 <sup>nd</sup> Session	16-24 March 2020
3 <sup>rd</sup> Session	18-26 March 2020
4 <sup>th</sup> Session	19-30 March 2020
5 <sup>th</sup> Session	20-31 March 2020

Source: IEE Study Team





Source: IEE Study Team

**Figure 17 Photos of Public Disclosure**

## **12. Conclusion**

### **12.1 Key Findings**

The proposed project is the power sector improvement project within the Yangon Region. It aims for stabilization of the power supply through improvement of the backbone systems in Yangon, where power demand is expected to increase.

The Project consists of three components in total and they are 1) Installation of New 500 kV Transmission Lines, 2) Construction of New 500 kV Substation in Hlegu, 3) Installation of Facilities to existing 230kV Substations and Two 230 kV Transmission Lines. Therefore, preparation of the IEE is conducted for three (3) components altogether taking into consideration that similar negative impacts are anticipated for these three components, although extent of the impact is somewhat different.

According to preliminary environmental impact assessment described in Chapter 5, key environmental impacts are air pollution, water pollution, waste pollution, hazardous material, pollution, noise and vibration pollution, soil contamination, offensive odor, occupational health and safety, community health and safety and emergency hazards and risks. These environmental impacts to the sensitive receptors are assessed in detail in the draft IEE stage.

Regarding lifecycle of target substations and transmission lines, it is unlikely that facilities are closed and operation is stopped in the immediate future, although rehabilitation and/or renewal will be done as necessary. In addition, anticipated activities and negative impacts during Closing Stage are mostly same as those of Construction Stage. Therefore, results of identification and evaluation during Closing Stage is basically excluded.

The transmission lines and its connecting substations will be located in Bago and Yangon region. The Project sites are not located in ecologically sensitive areas. Moreover, the Project sites will be located far from the buildings and structures mentioned in Yangon City Heritage List.

In the construction stage, most of the impacts are temporary and site-specific and is considered insignificant as the Contractor entrusted by the Project Proponent carried out the necessary mitigation measures.

No significant negative impact is anticipated for procurement of goods such as utility vehicles and pole erection machine.

In the operation phase, most of the impacts are controlled and limited within the Project site.

Based on the results of identification and evaluation, examination of mitigation measures for pollution, natural environment and social, safety and health environment, an adequate Environmental Management Plan (EMP) and relating Environmental Monitoring Plan (EMoP) was established. In addition, an Emergency Risk Management Plan (ERMP) was examined.

### **12.2 Conclusions**

The proposed transmission line routes and location of the new substation are not included in the environmental priority area as it does not exist in the conservation areas designated by Myanmar Government. The area has been in common with paddy fields, commercial plantations, secondary forests, scrub land and human habitation areas. For the safe side, Flora and Fauna secondary baseline data collection was conducted through the IEE study.

Moreover, the Project Proponent is promoting the use of high technology machine and equipment and raw materials. The key environmental impacts such as air pollution, water pollution, solid waste, noise

pollution, hazardous materials, occupational health and safety, community health and safety and emergency risks were assessed in detail. IEE Report was prepared and the Project Proponent (DPTSC) will submit draft IEE Report to ECD for obtaining Environmental Compliance Certificate (ECC) as an evidence of environmental approval by Myanmar Government (MONREC). After issuance of ECC basically 30 working days after submission and at the implementation of the Project such as construction and operation, DPTSC will conduct environmental monitoring based on condition under the ECC and EMP/EMoP specified in the IEE Report and report to ECD every 6 months during the construction stage in general according to the EIA Procedure, 2015.

Consequently, it was concluded that the Project (new/expanded substation and 230kV/500kV transmission line) does not cause serious adverse impacts in operation stage and the majority of negative impacts are temporary and site-specific due to construction activities during the construction phase and the expected impacts could be avoided or minimized by implementing the mitigation measures.



## CHAPTER 1: INTRODUCTION

### 1.1 Project Proponent

- 1) Project Name: National Power Transmission Network Development Project (Phase III)
- 2) Proponent Name: Department of Power Transmission and System Control (DPTSC), Ministry of Electricity and Energy (MOEE)
- 3) Address: Building No. (27), Nay Pyi Taw, The Republic of the Union of Myanmar
- 4) Project Location: Area from Hpayargyi substation in Bago Region to the new Hlegu Substation, from the new Hlegu Substation to Dagon Myothit (East) Substation and Hlawga Substation, and from Hlawga Substation to Thaketa Substation in Yangon City (See Figure 1.3-1).

### 1.2 Purpose of the Project

The purpose of the Project is to support the power supply capacity of the Yangon area by installing and strengthening backbone transmission lines and substation facilities and then thereby contributing to the economic development of Myanmar and the improvement of people's lives.

### 1.3 Type of Project and IEE/EIA Requirement

- 1) Type of Project: Energy Sector Development especially
- 2) Type of Economic Activities: Electrical Power Transmission Line  $\geq 230\text{kV}$  High Voltage (230kV and 500kV) Transformer Substations
- 3) Main Infrastructure & Utilities: The scope of the engineering work includes analysis of facilities, new construction of Substation (about 25-32 ha), expansion/improvement of existing Substation, new 500kV overhead transmission line, new 230kV overhead transmission line, and new 230kV underground transmission line.
- 4) EIA/ IEE/ EMP Requirement: IEE is required (See below)

In accordance with Appendix-1: Project Categorization for Assessment Purposes, of EIA Procedures stipulated in December 2015 which is prepared by MONREC (former MOECAAF), the Project can be categorized as “IEE required project” as shown in Table 1.3-1.

**Table 1.3-1 Screening for EIA/ IEE/ EMP Requirement related to the Project**

No.	Type of Investment Projects	Size of Project which requires IEE	Size of Project which requires EIA	Note
ENERGY SECTOR DEVELOPMENT				
27	Electrical Power Transmission Lines $\geq 230$ kV	All sizes	All activities where the Ministry requires that the Project shall undergo EIA	-

28	High Voltage (230 kV and 500 kV) Transformer Substations	≥ 4 ha	All activities where the Ministry requires that the Project shall undergo EIA	The size of the Project is less than 32 ha, including Staff dormitories.
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Source: IEE Study Team

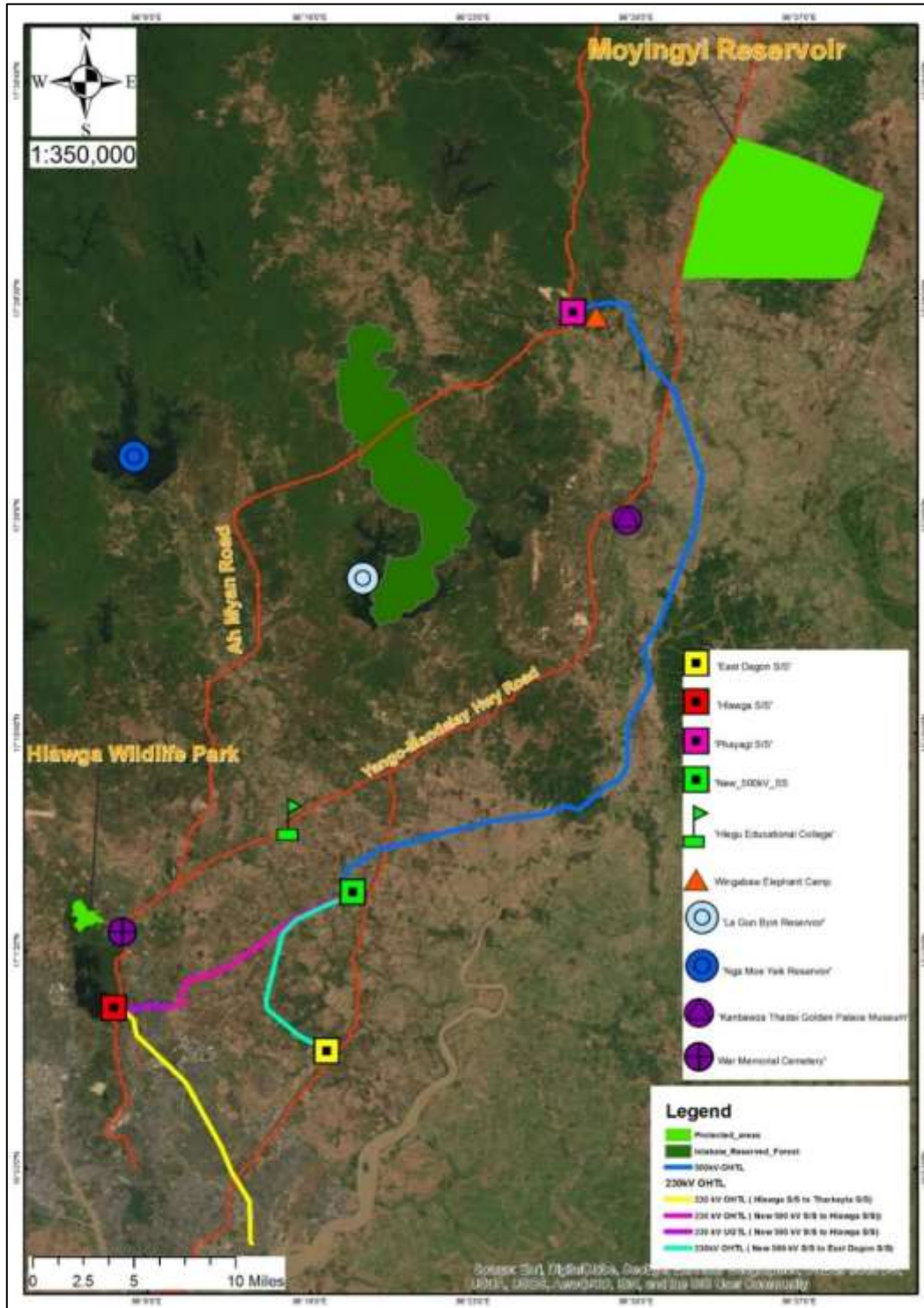


Figure 1.3-1 Proposed Project Area

## 1.4 Implementing Organization for Environmental Impact Assessment

The organizations in charge of the implementation of the Initial Environmental Examination (IEE) Study and detail information of the study team are presented in Table 1.4-1 and Table 1.4-2.

**Table 1.4-1 Organization In-charge of the IEE Study**

Nippon Koei Co., Ltd	No. 0012 dated 05 July 2017	Yangon Office: Grand Pho Sein Condo, No. 36A, 1st Floor, Pho Sein Road, Tamwe Township. Yangon	Ph: +95 (1) 563281 Fax: +95 (1) 8500107 Email: nipponkoeiygn@myanmar-koei.com	Overall management of IEE Study
Myanmar Koei International Ltd. (MKI)	No. 0024 dated 05 July 2017	Grand Pho Sein Condo, No. 36A, 1st Floor, Pho Sein Road, Tamwe Township. Yangon	Tel/Fax: +95-1-548814 E-mail: info@myanmar-koei.com	Implementation technical aspect of ESIA Study
Resource and Environment Myanmar Ltd. (REM)	No. 0002	B-702, Delta Plaza, Shwegondaing Road, Bahan Township, Yangon.	Ph: +95 9 73013448 Fax: +95 1 552901 Email: service@enviromyanmar.net	Social Survey

Source: IEE Study Team

**Table 1.4-2 Members of the IEE Study Team**

No.	Name	Position	Academic Background	Area of Expertise
1	Mr. Hiroshi Nakano	Team Leader	M.Sc. (Life and Bioresource Sciences) B.Sc. (Life and Bioresource Sciences)	Overall Management of IEE Study
2	Ms. Yamin Thant	Environmental Expert (Ecology & biodiversity, legal)	Ph.D. (Agricultural Science) M.Sc. (Agricultural Science) B.Sc. (Forestry)	1. Ecology & biodiversity 2. Land use 3. Legal analysis 4. Socio-economy
3	Ms. Aye Aye Aung	Environmental Expert (Air & water pollution control, noise & vibration)	M.E. (Chemical Engineering) B.E. (Chemical Engineering)	1. Ground water & hydrology 2. Air pollution control 3. Noise & vibration 4. Water pollution control
4	Mr. Phyo Thu Aung	Environmental Expert (Air Quality, risk and hazard management)	Ph.D. (Chemical Engineering) M.E. (Chemical Engineering) B.E. (Chemical Engineering)	1. Meteorology, Modelling for air quality 2. Risk assessment & hazard management 3. Waste management 4. Water pollution control
5	Ms. Tin Mar Lwin	Environmental Expert (Land use & stakeholder engagement)	Ph.D. (Water Resources Engineering) M.E. (Civil) B.E. (Civil)	1. Ground water & hydrology 2. Land use 3. Socio-economy 4. Others (PCM & stakeholder engagement)
6	Ms. Zun Pwint Phyu	Junior Environmental and Social Expert	B.E (Mechatronic Engineering)	1. Waste management 2. Facilitation of meeting

No.	Name	Position	Academic Background	Area of Expertise
		(Facilitation of meeting, legal)		
7	Mr. Naing Htet Aung	Junior Environmental Expert (Ecology & biodiversity)	B.Sc. (Forestry)	1. Ecology & biodiversity 2. Geology & soil
8	Ms. Shwe Yee Mon Mon	Junior Environmental and Social Expert (Geology & soil)	M.E. (Water Resource Engineering) B.E. (Civil Engineering)	1. Ground water & hydrology 2. Geology & soil 3. Modeling for water quality
9	Ms. Ei Mon Cho	Junior Environmental Expert (Air & water pollution control)	M.E. (Harbor, Coastal and Offshore Engineering) B.E. (Port & Harbour Engineering)	1. Air pollution control 2. Water pollution control
10	Mr. Lwin Ko	Junior Environmental and Social Expert (Noise & vibration, facilitation of meeting)	B.E. (Naval Architecture)	1. Noise & vibration 2. Facilitation of meeting 3. Others (GIS)
11	Ms. Wint Theingi Maw	Junior Environmental Expert (Air & water pollution control, noise & vibration)	B.Sc. (Industrial Chemistry)	1. Ground water & hydrology 2. Air pollution control 3. Noise & vibration 4. Water pollution control
12	Ms. Phoo Pwint Pwint Thu	Junior Environmental Expert (Legal & public health)	B.V.Sc. (Veterinary science)	1. Legal analysis 2. Others (Public Health)
13	Ms. Myint Myat Win Min	Junior Environmental Expert (Structure)	B.E. (Port & Harbour Engineering)	1. Ground water & hydrology 2. Others (Structure)
14	Ms. Khin Ohnmar Htwe	Social Expert	M.A. (Geography)	1. Socio-Economy
15	Mr. Kyaw Zin Win	Junior Environmental Expert (Ecology & biodiversity)	M. Sc. (Geographic Information Science & System)	1. GIS & RS
16	Ms. Phyo Thaw Thaw Htun	Social Expert	Master of Public Administration	1. Socio-Economy 2. Facilitation of Meeting
17	Mr. Aung Thu Phyoo	Junior Social Expert	B.Sc. (Physics)	1. Socio-Economy

Source: IEE Study Team

## 1.5 Overall Framework of Initial Environmental Examination

The MONREC issued the Environmental Impact Assessment Procedure on 29 December 2015, which defines a detailed legal process regarding EIA/IEE procedures, including preparation of an EIA/IEE report, Environmental Management Plan (EMP), public involvement, approval of EIA/IEE report by the MONREC, and monitoring process after approval of EIA/IEE report. Also, the MONREC is preparing the draft administrative instruction of environmental impact assessment procedure, hereafter called as the Instruction, which addresses how IEE/EIA reports and/or the other relevant documents to be submitted should be structured, what the documents should encompass, how data and information should be presented and the level of detail and comprehensiveness required or recommended in those

documents. The Instruction covers all process defined by the IEE/EIA procedures such as Project Proposal, Terms of Reference (TOR) for IEE/EIA, Initial Environmental Examination (IEE) Report, and Environmental Management Plan (EMP). The expected key milestone of the Project as of July 2020 is shown below.

- 1) Application to Project Proposal February 2020
- 2) IEE report preparation Aug 2019 - Feb 2020
- 3) Public Consultation Meeting March 2020
- 5) Draft Final IEE Report April 2020
- 6) MONREC make comments/approve IEE Report
- 7) Receive of Environmental Compliance Certificate

The preparation of the IEE study follows the detailed process of the IEE report described in the Instruction. The tentative overall schedule of Initial Environmental Examination is shown in Table 1.5-1.

**Table 1.5-1 Tentative Overall Schedule of Initial Environmental Examination**

Schedule	Item	Schedule (Year/ Month/ Week)																														
		2019												2020						2020												
		Aug			Sep					Oct				Nov				Dec				Jan		Feb.				Mar.				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Carrying out the IEE/EIA and preparing a draft IEE/EIA Report including ARAP preparation																																
<b>(1) Reviewing Existing Documents</b>																																
i)	Reviewing Existing Project Documents such as Project specification, survey reports																															
ii)	Confirmation on Latest Legal Documents																															
<b>(2) Scoping of Initial Environmental Examination Report including Resettlement Action Plan</b>																																
i)	Site Visit																															
ii)	Identify items of environmental consideration																															
iii)	Preparing baseline survey plan & location																															
iv)	Preparing Detail Measure Survey Plan (DMS Plan)																															
v)	Preparing the Plan to develop ARAP (Abridged Resettlement Action Plan)																															
<b>(3) Preparing Initial Environmental Examination Report</b>																																
i)	Preparing report based on latest documents and reports																															
ii)	Review relevant law and regulation																															
iii)	Implementation of environmental baseline survey (transmission lines & substations)																															
iv)	Implementation of DMS (PAH, socio-economic, land, crops, price, compensation, etc.)																															
v)	Preparing environmental and social data (secondary & baseline data)																															
vi)	Preparing environmental management plan and monitoring plan (EMP & EMoP)																															
vii)	Finalizing RAP																															
viii)	Preparation of IEE draft report																															
ix)	Public Disclosure of updated IEE report																															
x)	Public Consulting Meeting (PCM) of Updated IEE report (4 locations (Townships) x 1 round)																															
xi)	Modification of Final IEE report according to Comments from the Client (MDEE)																															
xii)	Preparation of Final IEE report																															

Source: IEE Study Team

## 1.6 Structure of the IEE Report

This IEE report presents the results from the assessment of the environmental, social, health, and safety and emergency that may arise during the construction, operation, and closing stages of the Project. Following impact prediction, the requirement for environmental mitigation measures is presented. This report also describes the Environmental Monitoring Plan that is considered to be necessary during respective stages. The content of the report except the Executive Summary is as follows:

EXECUTIVE SUMMARY

CHAPTER 1: INTRODUCTION

CHAPTER 2: OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

- CHAPTER 3: PROJECT DESCRIPTION AND ALTERNATIVES
- CHAPTER 4: CURRENT ENVIRONMENTAL AND SOCIAL CONDITIONS
- CHAPTER 5: IMPACT IDENTIFICATION AND ASSESSMENT METHODOLOGY
- CHAPTER 6: FIELD SURVEY
- CHAPTER 7: IMPACT ASSESSMENT AND MITIGATION MEASURES
- CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN
- CHAPTER 9: PUBLIC CONSULTATION AND DISCLOSURE
- CHAPTER 10: KEY FINDINGS AND CONCLUSIONS

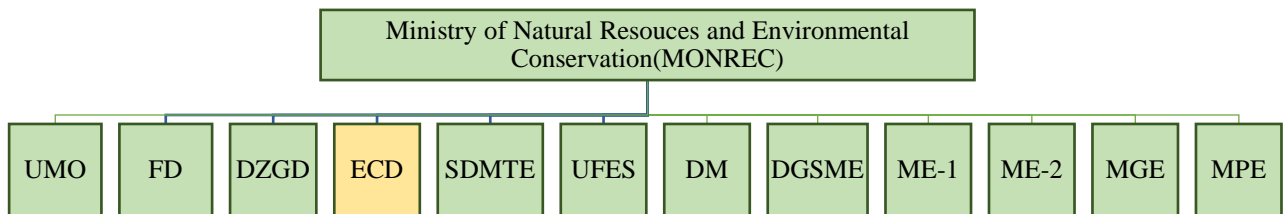
## CHAPTER 2: OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

### 2.1 Myanmar Environmental Policy

The national environmental policy in short is sustainable development. As the country is still a developing country infrastructure and services development, have to be accelerated while the environment should be conserved as far as possible. In his policy speech on the environment delivered in March 2011 President U Thein Sein has stressed the conservation of forests and wildlife, the reduction of air, water and land pollution and the controlled dumping of industrial waste. He had also emphasized the need for economic development in harmony with environmental conservation.

#### 2.1.1 Institutional Setting of Environmental Conservation Department

Myanmar has 24 ministries under the Office of the President as of Feb 2020. The lead ministry in-charge of environmental and social considerations is the Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation (MONREC), which was reorganized with the former Ministry of Environmental Conservation and Forestry (MOECAF) and Ministry of Mines in April 2016.



UMO = Union Minister Office

FD = Forest Department

DZGD = Dry Zone Greening Department

ECD = Environmental Conservation Department

SDMTE = Survey Department & Myanmar Timber Enterprise

UFES = University of Forestry and Environmental Science

DM = Department of Mines

DGSME = Department of Geological Survey and Mineral Explorer

ME-1 = No. 1 Mining Enterprise

ME-2 = No. 2 Mining Enterprise

MGE = Myanmar Gems Enterprise

MPE = Myanmar Pearl Enterprise

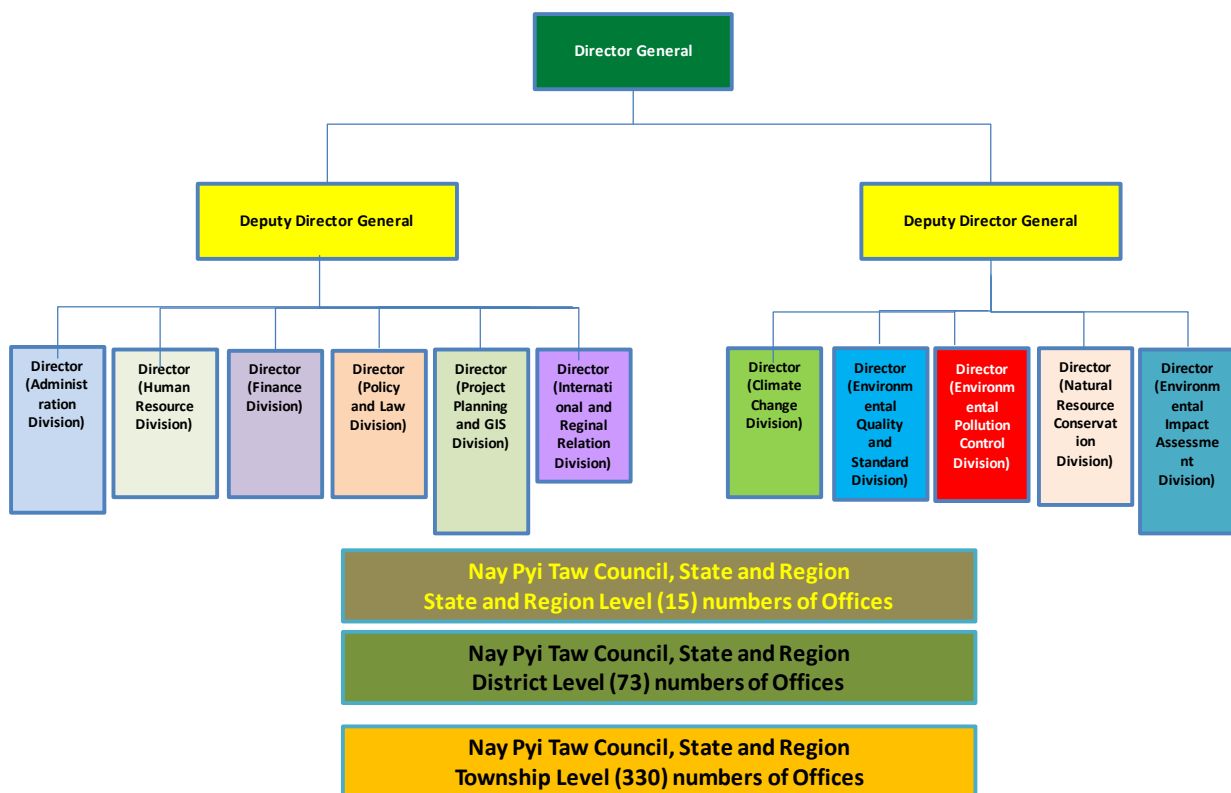
Source: MONREC

**Figure 2.1-1 Organization Structure of Ministry of Natural Resources and Environmental Conservation (MONREC)**



The MONREC acts as the main ministry for the preparation of environment- related laws/rules/ procedures/policies/guidance, the management of environmental issues, and the development of environmentally-friendly businesses and sustainable projects in Myanmar. The organization structure of MONREC is described in Figure 2.1-1.

In the MONREC, Environmental Conservation Department (ECD) has 11(eleven) Divisions and State & Regional Offices, as shown in Figure 2.1-2. Among these Divisions, the EIA Division is in charge of EIA issues, i.e., Screening, reviewing and evaluation of the EIA, IEE or EMP as well as issuing Environmental Compliance Certificate (ECC) as an evidence of environmental approval. If the Project proponent is one of Line Ministries of Central Government such as MOEE, Central Office of ECD, Nay Pyi Taw is responsible for EIA issues and if the proponent is located in a regional area, the regional office of ECD is responsible for the EIA issues.



Source: ECD, MONREC

**Figure 2.1-2 Organization Structure of Environmental Conservation Department (ECD)**

### 2.1.2 Fundamental Laws and Regulations Related to Environmental and Social Considerations

The fundamental laws and regulations related to the environmental and social considerations and health in Myanmar are shown in Table 2.1-1 . In addition, major international agreements and treaties that the Myanmar government has ratified related to the environmental and social considerations are shown in Table 2.1-2 .

**Table 2.1-1 Fundamental Laws and Regulations Related to Environmental and Social Considerations and Health in Myanmar**

No.	Laws and Regulations as of October 2019
<i>Environmental Framework</i>	
1	<i>The National Environmental Policy (2019)</i>
2	<i>The Climate Change Policy (2019)</i>
3	<i>Myanmar Agenda 21 (1997)</i>
4	<i>National Sustainable Development Strategy (2009)</i>
5	<i>The Environmental Conservation Law (2012)</i>
6	<i>The Environmental Conservation Rule (2014)</i>
7	<i>EIA Procedures (December 2015)</i>
8	<i>National Environmental Quality (Emission) Guidelines (December 2015)</i>
9	<i>Draft Guideline on Public Participation in Myanmar's EIA Processes (2017)</i>
<i>Water Environment</i>	
10	<i>The Underground Water Act (1930)</i>
11	<i>The Territorial Sea and Maritime Zone Law (2017)</i>
12	<i>The Law on Aquaculture (1989)</i>
13	<i>The Conservation of Water Resources and Rivers Law (2006)</i>
14	<i>The Conservation of Water Resources and Improvement of River Systems Rules (2013)</i>
<i>Forestry/Biodiversity/Agriculture</i>	
15	<i>The Pesticide Law (1990, Amendment in 2016)</i>
16	<i>The Forest Law (2018)</i>
17	<i>The Forest Rules (1995)</i>
18	<i>The Plant Pest Quarantine Law (1993)</i>
19	<i>The Protection of Biodiversity and Protected Areas Law (2018)</i>
20	<i>The Animal Health and Development Law (1994, Amendment in 2010)</i>
21	<i>The Fertilizer Law (2002)</i>
<i>Land Use</i>	
22	<i>The Land Acquisition, Resettlement and Rehabilitation Act (2019)</i>
23	<i>The Farmland Law (2012)</i>
24	<i>The Farmland Rules (2012)</i>
25	<i>The Vacant, Fallow and Virgin Lands Management Law (2012)</i>
26	<i>The Vacant, Fallow and Virgin Lands Management Rules (2012)</i>
27	<i>Land and Crop Compensation</i>
<i>Heritage</i>	
28	<i>The Protection of Preservation of Cultural Heritage Region Law (1998, Amendment in 2009)</i>
29	<i>The Heritage Goods Protection Law (or) The Protection and Preservation of Ancient Monuments Law (2015)</i>
<i>Public Health and Safety</i>	
30	<i>The Penal Code of Offences Affecting the Public Health, Safety Convenience, Decency and Morals (1961)</i>
31	<i>The Public Health Law (1972)</i>
32	<i>The National Drug Law (1992)</i>
33	<i>The Narcotic Drugs and Psychotropic Substances Law (1993)</i>
34	<i>The Prevention and Control of Communicable Diseases Law (1995, Amendment in 2011)</i>
35	<i>The Traditional Drug Law (1996)</i>
36	<i>The National Food Law (1997)</i>

No.	Laws and Regulations as of October 2019
37	<i>The Control of Smoking and Consumption of Tobacco Product Law (2006)</i>
38	<i>The Law related to Private Health Care Services (2007, Amendment in 2013)</i>
39	<i>The Automobile Law (2015)</i>
<i>Electricity Law</i>	
40	<i>Electricity Law (2014)</i>
41	<i>Electricity Rules (2015)</i>
42	<i>National Energy Policy (2014)</i>
<i>Industrial Law</i>	
43	<i>The Occupational Explosive Materials Act (2018)</i>
44	<i>The Explosive Substances Act (1908/Amendment in 2001)</i>
45	<i>The Law relating to the Fishing Rights of Foreign Fishing Vessels (1989, Amendment in 1993)</i>
46	<i>The Private Industrial Enterprise Law (1990)</i>
47	<i>The Marine Fisheries Law (1990/Amendment in 1993)</i>
48	<i>The Freshwater Fisheries Law (1991)</i>
49	<i>The Salt Enterprise Law (1992)</i>
50	<i>The Science and Technology Development Law (1994)</i>
51	<i>The Myanmar Mines Law (1994)</i>
52	<i>The Myanmar Pearl Law (1995, Amendment in 2014)</i>
53	<i>The Myanmar Gemstone Law (1996)</i>
54	<i>The Prevention of Hazard from Chemicals and Related Substances Law (2013)</i>
55	<i>The Business for Ozone Depleting Substances: Notification No.37/2014</i>
56	<i>The Prevention of Hazard from Chemicals and Related Substances Rules (2016)</i>
57	<i>The Petroleum and Petroleum Product Law (2017)</i>
<i>Working Environment</i>	
58	<i>The Worker's Compensation Act (1923)</i>
59	<i>The Payment of Wages Act (2016)</i>
60	<i>The Factory Act (1951/Amendment in 2016)</i>
61	<i>The Shops and Establishment Act (1951)</i>
62	<i>The Leave and Holiday Act (1951, partially Amendment in 2014)</i>
63	<i>The Labor Organization Law (2011)</i>
64	<i>The Social Security Law (2012)</i>
65	<i>The Labor Organization Rule (2012)</i>
66	<i>The labor Dispute Settlement Law (2012/Amendment in 2016)</i>
67	<i>The Employment and Skill Development Law (2013)</i>
68	<i>The Minimum Wage Law/Rules (2013)</i>
69	<i>The Social Security Rules (2014)</i>
70	<i>The Occupational Health and Safety Law (2019)</i>
71	<i>The Payment of Wages Law (2016)</i>
<i>Infrastructure/Economic Development/ Administration</i>	
72	<i>The Town Act (1907)</i>
73	<i>The Village Act (1907)</i>
74	<i>The Ports Act (1908)</i>
75	<i>The Myanmar Insurance Law (1993)</i>
76	<i>The Myanmar Hotel and Tourism Law (1993)</i>
77	<i>The Constitution of the Union of Myanmar (2008)</i>

No.	Laws and Regulations as of October 2019
78	<i>The Ward or Village Tracts Administration Law (2012/ Amendment in 2012/2016)</i>
79	<i>The Export and Import Law (2012)</i>
80	<i>The Myanmar Investment Law (2016)</i>
81	<i>The Myanmar Investment Rules (2017)</i>
82	<i>The Boiler Law (2015)</i>
83	<i>The Foreign Investment Law (2012/Amendment in 2015))</i>
84	<i>The Foreign Investment Rules (2013)</i>
85	<i>The Myanmar Citizen Investment Law (2013/ Amendment in 2012/ 2016)</i>
<i>Emergency</i>	
86	<i>The Natural Disaster Management Law (2013)</i>
87	<i>The Myanmar Fire-brigade Law (2015)</i>

Source: IEE Study Team

**Table 2.1-2 Major International Agreements and Treaties that the Myanmar Government has Ratified Related to Environmental and Social Considerations**

No.	International Agreements and Treaties	Date Ratified
1	Ramsar Convention (Convention on Wetlands of International Importance Especially as Waterfowl Habitat), 1971	2005
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, D.C., 1973; and this convention as amended in Bonn, Germany, 1979	1997
3	Vienna Convention for the Protection of the Ozone Layer, 1985	1993
4	Basel Convention, 1989	2015
5	Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	1993
6	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990	1993
7	United Nations Framework Convention on Climate Change (UNFCCC), New York, 1992	1994
8	Convention on Biological Diversity, Rio de Janeiro, 1992	1994
9	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)

Source: The Republic of the Union of Myanmar, National Biodiversity Strategy and Action Plan (2011), Website of the Basel Convention (<http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx>) (As of May 2016)

The following are summaries of the key laws related to the natural and social environment in Myanmar that will likely be relevant to the Project.

### (1) Environmental Framework

#### The Rio Declaration

Agenda 21 – a program of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992. Principle No. 10 of the declaration underscores that environmental issues are best handled with participation of all concerned citizens at all the relevant levels. At the national level, each individual shall have appropriate access to information that is concerning the environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings,

including redress and remedy shall be provided. The foregoing discussion is relevant to the proposed development because EMCA demands that the public must be involved before any development project that is likely to have adverse impacts to the environment is initiated by a proponent. The Act has further established Public Complaints Committee (PCC) where the issues raised by the public in regard to any proposed development can be addressed.

### **The Environmental Conservation Law (ECL) (2012) and Environmental Conservation Rules (ECRs) (2014)**

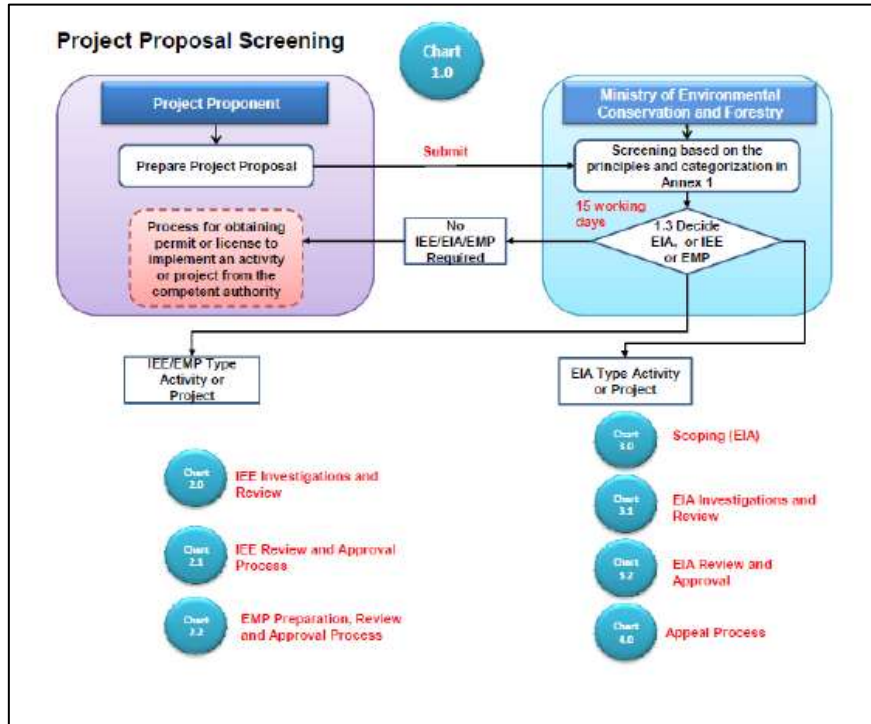
The Environmental Conservation Law (ECL) was enacted in March 2012. This law is the fundamental law of environmental management and environmental conservation in Myanmar prepared by MOECAF. Subsequently, the Environmental Conservation Rules (ECRs) were enacted in June 2014 as the detailed enforcement regulations for ECL. ECL stipulates MOECAF's responsibility for environmental policy and administration, formulation of environmental management plan, implementation of environmental monitoring, setting of environmental standards, management of hazardous waste, and formulation and implementation of EIA, among others.

Moreover, ECRs stipulate the basic policy and concept of EIA application for the development of projects (Article 55).

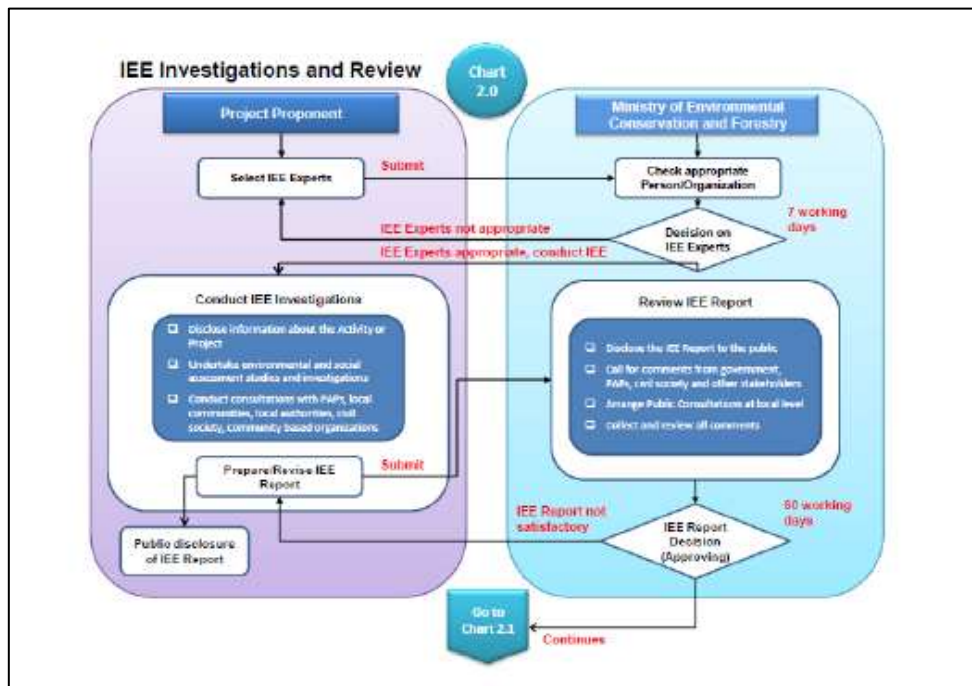
- To prepare the environment impact assessment system and submit to the Ministry (Article 55 (a) in ECRs); and
- To implement and carry out environmental management plan within the time stipulated by the Ministry and submit the performance situation to the Ministry (Article 55 (b) in ECRs).

### **Myanmar EIA Procedures**

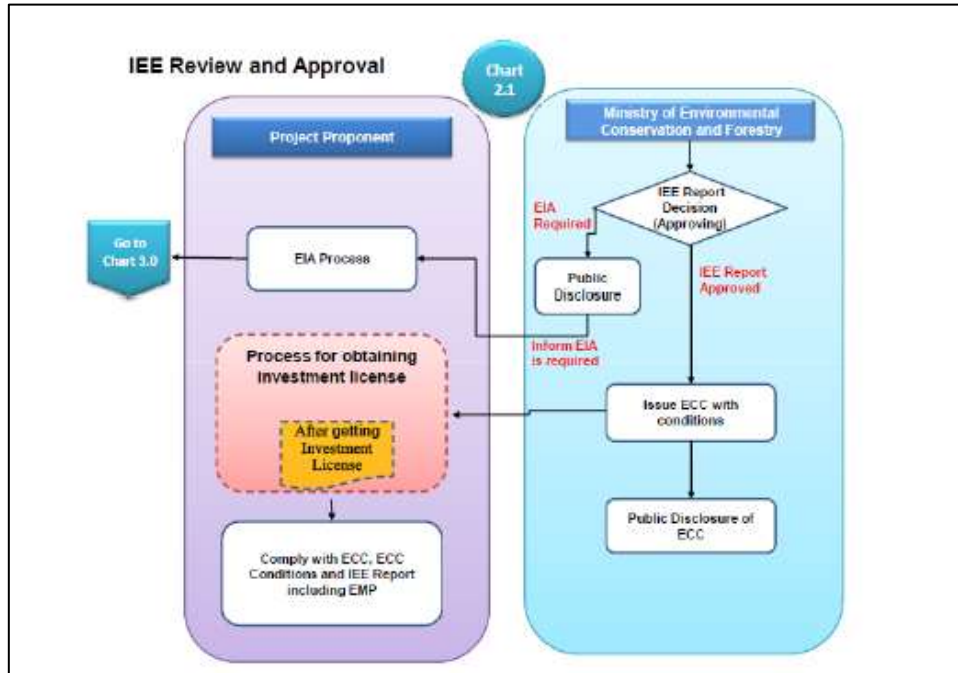
The first full-scale legal framework for EIA was established by "Environmental Assessment Procedure, Notification No. 616/2015", which came into force on 29 December 2015, by MONREC. The first step in the EIA procedure is to submit a project proposal to the Environmental Conservation Department (ECD) of MONREC. Then, ECD will decide on an EIA, IEE or EMP according to the project description. After the decision by ECD, the project proponent must propose expert lists (3rd party consultants) for ECD approval. After the approval, the experts/consultants can start to conduct the EIA/IEE/EMP investigation and submit the report to ECD for approval. A detailed description of EIA/IEE procedures, which the Project is expected to require, is given in the following charts step by step as shown in Figure 2.1-3.



(a) Screening of Project Proposal



(b) IEE Investigation and Review



(c) IEE Investigation and Review

Source: ECD, MONREC

Figure 2.1-3 Myanmar IEE Procedures

(2) Water Environment

**The Conservation of Water Resources and Rivers Law (2006)**

The aims of this law are as follows: (a) to conserve and protect the water resources and river system for the beneficial utilization of the public; (b) to enable smooth and safe waterways navigation along rivers and creeks; (c) to contribute to the development of the state economy through improving water resources and river system; and (d) to protect environmental impact.

However, this law is under the jurisdiction of the Ministry of Transport, not MOECAF. This law focuses on transportation safety and its development. However, it lacks actual numerical criteria for the natural environment.

(3) Forestry/Biodiversity/Agriculture

**The Pesticide Law (1990, Amendment in 2016)**

The State Law and Order Restoration Council enacted “The Pesticide Law” in January 2016 to protect the environment and community. This law stipulates that the Registration Board with suitable nationals formed by the Government may in order to prevent hazard, issue from time to time directives based on International recommendations, in the preparation and production of pesticide, in the handling and use, in the transportation, in the storage, and in the sale of pesticide.

According to the section (13) of the Pesticide Law, a person desirous of engaging in enterprise for



production and sale in the country of pesticide mixture compounded from toxic substance imported from abroad shall apply to the Registration Board in the prescribed form.

According to the section (17) of the Pesticide Law, a person desirous of engaging in enterprise for production and sale in the country of pesticide mixture compounded from toxic substance imported from abroad shall, for the purpose of obtaining a license, apply to Department of Agriculture under Ministry of Agriculture Livestock and Irrigation (MOALI).

According to the section (23) of the Pesticide Law, the person permitted registration to import from abroad, to export abroad from the country prepared mixture of pesticide or toxic substance

- has rights to work for the term of registration contained in the registration;
- shall pay the registration fees, analytical fees payable;
- shall comply with the conditions described in the registration certificate;
- shall comply with regulations and directives prescribed by the Registration Board from time to time;

According to the section (24) of the Pesticide Law, the person obtaining a license for compounding and selling of pesticide:

- has rights to work for the term of period contained in the license;
- shall pay the license fees, analytical fees payable;
- shall compound in conformity with formulation containing the percentage of toxic substances at the time the license is applied for;
- shall comply with conditions described in the license;

### **The Protection of Biodiversity and Protected Areas Law (2018)**

The objectives of this law are to implement the Government policy for the protection of biodiversity and protected areas, to carry out in accordance with the relevant International Conventions, to protect endangered species of wildlife and their natural habitats, to control illegal trading of wildlife and species including their parts, products and secondary products made from their parts, to contribute for the development of research on natural science, and to protect wildlife by the establishment of zoological/botanical gardens. It prescribes the formation of the committee for the protection of biodiversity and protected areas with its function and duties and the determination of natural areas and endangered species of a wild animal which are to be protected.

### **Myanmar Protected Areas**

The first legal instrument related to protected areas, which designated a wildlife sanctuary in the environs of the Royal Mandalay City, was promulgated in 1859. The first piece of wildlife legislation to be enacted was the Wild Elephant Protection Act of 1879. The Forest Act of 1902 gave responsibility

for wildlife management to the Forest Department. Legislation specific to wild animals followed in 1927, and broader legislation followed nine years later with the Wildlife Protection Act of 1936. This provided for designation of wildlife sanctuaries with species-specific conservation objectives. Legislation was revised in 1994 with issue of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law. The 1994 Law, which was issued by the State Law and Order Restoration Council, provides for:

- A Committee for the Protection of Wildlife and Wild Plants and Conservation of Natural Areas, which is to serve as an advisory body to the Minister of Forestry; supervise implementation of the Law; give guidance in matters of research, conserving species in danger of extinction and international cooperation.
- Categories of ‘natural areas’ and zoological and botanical gardens, their declaration and uses.
- Categories of protected wild animals (almost the same as provided for under earlier law): completely protected, normally protected and seasonally protected.
- Hunting licenses
- Establishment of zoological and botanical gardens.
- Registration of ownership of completely protected animals or trophies thereof.
- Administrative actions
- Appeals
- Offences and penalties.

The categories of so-called ‘natural areas’ are defined in the Law described above as:

- Scientific Nature Reserve
- National Park
- Marine National Park
- Nature Reserve
- Wildlife Sanctuary
- Geo-Physically Significant Reserve
- Other Nature Reserve Determined by the Minister.

#### **(4) EIA/Environmental Standards**

##### **National Environmental Quality (Emission) Guidelines (2015)**

MOECAAF 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, and odors, and those for sector-specific emissions such as emissions from forestry, agribusiness/food production, chemicals, oil and gas, infrastructure, general manufacturing, mining, and power.

## **(5) Land Use**

### **The Land Acquisition, Resettlement and Rehabilitation Act (2019)**

The Land Acquisition Act (2019) serves as the fundamental law for land acquisition in Myanmar that sets out the procedure of land acquisition and compensation. The act further outlines relevant procedures, including notice periods, procedures for objections to acquisition (Article 17 and 18), method of valuation of land, process for taking possession of land (Article 18,22 and 42), court processes and appeals (Article 18 and 24), and procedures for the temporary occupation of land (Article 54). The act describes the procedures required for compensation payment, resettlement and rehabilitation to whom the land is acquired (Article 39 and 46).

### **The Farmland Law and Rules (2012)**

The law determines the land use rights of farmland and the granting of land use rights to eligible farmers. It allows the right to sell, mortgage, lease, exchange, and give either whole or part of the right to use the farmland. The law determines the formation as well as the roles/responsibilities of farmland administrative bodies at various levels. The Farmland Law and Rules determine procedures such as the application for farmland registration and obtaining land use certificates, application of transfer of farmlands for other purposes, and indemnities and compensation.

### **Land and Crop Compensation for Construction of Power Transmission Lines and Sub-stations**

1. To establish the township land and management committee contacting the township supervisor to estimate the land/crop damage due to the construction of power transmission line in the locations that the power line cross.
2. To confirm the amount of damage by the committee which have to make field inspection.
3. To get the approval of the amount of damage by meeting the people who loss with the members of the township land management committee to compensate for the amount of damage.
4. To rate the amount of damage by contacting the local authorities through the Project manager and to notify about the formation of the township land management committee.
5. To form the township land management committee.
6. To negotiate with the responsibilities people from relevant project manager office and local people who suffered losses after confirming the amount of damage and value by field inspection.
7. To obtain step-by-step approval from the Township land Management Committee to the District and State / Region Governments for the confirmed amount to be compensated.
8. To submit the list of confirmed prices by State/ Region Governments to the Ministry of Electricity and Energy.
9. To instruct the Department of Power Transmission and System Control for the payment of compensation from Ministry Office.
10. To allow the Ministry Management Committee by getting the step-by-step approval for giving the compensation.
11. To allow the Executive Committee of Ministry for giving the compensation for the amount of

damage and value that had been sent.

12. To yield the compensation from Department to project manager.
13. To inform the local people who suffered loss by the Project manager to local authorities for giving the compensation.
14. To record the contract which include payment and receipt has been done by holding the compensation ceremony as the department has damages.

## **(6) Heritage**

### **The Protection of Preservation of Cultural Heritage Region Law (1994)**

This law prescribes the determination of cultural heritage regions for protection and preservation so as not to deteriorate due to natural disaster or man-made destruction.

## **(7) Public Health**

### **The 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.

### **The Prevention and Control of Communicable Diseases Law (1995, revised in 2011)**

This law 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.

## **(8) Public Safety**

### **The Automobile Law (2015)**

Pyidaungsu Hluttaw enacted "The Automobile Law" in September 2015 to protect the environment and community. The main objective of this law are as follows:

- (a) For the safe driving of motor vehicles in public areas through registration according to official rules and regulations.
- (b) For the easy flow of road users and for the protection against road risks and vehicle perils.
- (c) To reduce environmental pollution caused by motor vehicles.

According to the section (49) of Automobile Law, no one is allowed to do the following in public places:

- (a) Driving above the speed limit or below the minimum speed.
- (b) Driving a motor vehicle which endangers others.
- (c) Driving a motor vehicle after the consumption of narcotic drugs or alcohol.

According to the section (54) of Automobile Law, no one is allowed to do the following:

- (a) Working as a motor vehicle assistant without assistant permit.
- (b) Driving a motor vehicle while in an inappropriate mental or physical state.
- (c) Driving a motor vehicle loaded above the loading capacity.

## **(9) Electricity Law**

### **Electricity Law (2014)**

In 2014, the Electricity Law of 1984 was replaced by the new Electricity Law, a comprehensive piece of legislation covering licensing, a new regulatory commission, standards, inspection, tariff, and restrictions. The Electricity law, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. The Electricity law, 2014, also established the Ministry of Electricity and Energy (MOEE) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the Electricity Supply Enterprise (ESE) under Ministry of Electricity & Energy has distributed to other State and Regions except Yangon & Mandalay Regions Totally (2.32) millions among (7.972) million households are electrified at present and the rest is (5.652) millions.

The Electricity Law divides projects into “small” (up to 10 MW), “medium” (between 10 MW to 30 MW) and large (upwards of 30 MW); the states and regions can issue permits for small and medium power plants. In case these plants are not connected to the national grid, the Union Government Ministry is not the primary authority involved. The authorities have a legal right to use land for the purpose of power plants under the Electricity Law and have the right to expand and maintain their facilities. The law also provides that the authorities can build transmission lines in accordance with existing laws.

### **Electricity Rules (2015)**

The Electricity rules were enacted according to the authority of sub article A of article (72) in Electricity law in 2015. The electricity rules cover the following ten chapters; name and definition, duties and responsibilities of the Ministry of Electricity and Energy, type of issuable orders, canonizing the sanctions, charges of electricity, other disciplinary duties, setting of quality and standards, inspection for electrical works and materials, disciplines, penalties and actions, and general.

MOEE has been planning to supply electricity for un-electrified places which arrive Power System and un-electrified places carrying out to get electricity by regional program is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 2 of the Electricity Rules, 2015.

The Project proponent will consider for mitigation of the environmental issues due to the Project following some related articles described in the electricity rule (2015) as below;

Article 16: The Ministry may refuse to issue a Permit under following circumstances.

- b) When the Commission concludes that the site, technology, design, fuel type and other relevant matters are not environmentally suitable

Article 18: Generation Permits shall include conditions requiring permitted persons issued generation permits to comply with the followings;

- b) To comply with all environmental requirements

Article 24: The National Transmission Permit shall include conditions requiring the Permitted Person issued such permit to comply with the following:

- a) To operate, maintain and expand the National Grid in accordance with all applicable Law and regulatory requirements
- b) To comply with all grid code and applicable performance standards approved and issued by the Ministry and all environmental requirements; and
- c) To enable that the National Grid and the generation facilities and distribution networks to which it is connected are safe, secure and operate reliably and economically.

Article 41: Distribution Permits shall include conditions to require that subject Permitted Persons to comply with the following:

- a) the operation, maintenance and expansion of distribution systems in accordance with all applicable law and regulatory requirements,
- b) compliance with all applicable distribution codes and performance standards approved and issued by the Ministry and all environmental requirements,
- c) the distribution systems are safe, secure and operate reliably and economically.

Article 49: Wholesale Power Supply Permits shall include conditions to require the activities of the subject Permitted Person satisfy all applicable law and regulatory requirements, all applicable industry codes and performance standards approved and issued by the Ministry and all environmental requirements.

Article 53: Retail Power Supply Permits shall define the following Service Obligations of Permitted Persons to whom issued.

Retail Power Supply Permits shall include conditions to require that Permitted persons issued Retail Power Supply Permits to satisfy all applicable laws and regulatory requirements and Consumers Service Manual issued by the Permitted Person.

### **Ministry of Energy: Notification No. 100/2013**

Ministry of Energy issued this notification to carry out petroleum product importing, storing, transporting, distributing systematically in accord with the section 4 of important goods and services law.

### **National Energy Policy (2014)**

The main objective of the Myanmar Energy Sector Policy is to ensure energy security for the sustainable economic development in the country; and to provide affordable and reliable energy supply to all categories of consumers, especially to those living in the remote areas that are currently without electricity. The policy aims to achieve the Government's overarching objective of poverty reduction and improvement in the quality of life of its people. The policy also aims to increase foreign exchange earnings through energy exports after meeting the national demand. The Energy Sector Policy also aims to integrate the social and environmental considerations in national energy planning and in the complete cycle of energy development.

- (1) To minimize environmental impact and social impact in the energy implementation projects.
- (2) To promote extended utilization of new energy resources and renewable energy resources.
- (3) To operate such energy production facility based on crops, plants and animal waste with minimum impact of environment.
- (4) Power systems based on renewable energy sources (RES) such as solar, wind, hydro, biomass, geothermal etc., and improvements in the energy efficiency and conservation programs in the existing facilities are considered promising solutions for alleviating some of the power shortages in the country and also in reducing GHG emissions.

## **(10) Working Environment**

### **The Worker's Compensation Act (1923)**

It stipulates that employer is required to make payments to employees who become injured or who die in any accidents arising during and in consequence of their employment. Such compensation also must be made for diseases which arise as a direct consequence of employment, such as carpal tunnel syndrome.

### **The Payment of Wages Act (2016)**

The Payment of Wages Law (2016) replaces the Payment of Wage Act (1937). It defines the payment obligation to the workers employed in the factories or railway administration. It stipulates the method of payment stating that the payment should be made in cash on a regular payday and allows legal action against delayed payment or un-agreeable deduction.

### **The Leave and Holidays Act (1951, partially revised in 2014)**

This act has been used as the basic framework for leaves and holidays for workers with minor amendment in 2006 and 2014. This defines the public holidays that every employee shall be granted with full payment. It also defines the rules of leaves for workers including medical leave, earned leave and maternity leave.

### **The Labour Organization Law (2011)**

The Labour Organization Law replaced the Trade Union Act enacted in 1927 for protecting the rights of the workers, having good relations among the workers or between the employer and the worker, and for forming and carrying out the labour organizations systematically and independently. Under the law, the



labour organization has the right to carry out freely in drawing up their constitution and rules. It has the right to negotiate and settle with the employer if the workers are unable to obtain the right of the workers contained in the labor laws. On the other hand, the employer shall recognize the labour organizations and assist as much as possible if the labour organizations request for help for the interest of his workers.

### **The Social Security Law (2012)**

The Social Security Law, enacted in 2012, was amended the Social Security Act in 1954. It stipulates the formation and implementation of social security systems.

Kinds of social security funds are:

- a) Health and social care fund
- b) Family assistance fund
- c) Injury fund
- d) Invalidity benefit, superannuation benefit and survivors' benefit fund
- e) Unemployment benefit fund
- f) Other social security fund (e.g. housing plan)

### **The Labor Dispute Settlement Law (2012)**

This law was enacted for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly. It stipulates that employer in which more than 30 workers are employed shall form the workplace coordinating committee consisting of the representatives of workers and the representatives of employer.

### **The Minimum Wage Law (2013)**

The minimum wage law, passed in March 2013, was replaced the 1949 Minimum Wage Act. The law provides a framework for minimum wage determination: the presidential office establishing a tripartite minimum wage committee shall decide minimum wage with industrial variation based on a survey on living costs of workers possibly every two years. This also stipulates equal payment.

### **Employment and Skill Development Law (2013)**

#### Signing Employment Agreement (Section 5a & e)

- If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment.
- The employment agreement made under sub-section (a) shall be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization.

#### Compensation to the Employee for Termination of Employment (Section 5, d)

- According to the employment agreement, the Ministry shall issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected

condition or the work has to be terminated due to various conditions.

### **The Payment of Wages Law (2016)**

The Payment of Wage Law defines the payment obligation to the workers employed in the factories or railway administration. It stipulates the method of payment stating that the payment should be made in cash on a regular payday and allows legal action against delayed payment or un-agreeable deduction.

### **The Occupational Health and Safety Law (2019)**

The Occupational Health and Safety Law which was developed by the Ministry of Labor, Immigration and Population with the participation of representatives of the various regulatory agencies pertaining to Occupational Health and Safety as well as the participation of the private sector was signed into law in March 2019. Under new and comprehensive OHS Law, a Central Body would be formed to co-ordinate various activities of the present regulating agencies charged with the administration of various aspects of OHS. Supporting the Law would be the Rules and Regulations pertaining to safety which will update existing provision of the Law and Rules covering the entire field of OHS.

The objectives of this Law are as follow:

- a. to effectively implement the measures related to safety and health at every industry
- b. to lay down the duties and responsibilities of those who are responsible under this Law including the workers and the employers so as to reduce the workplace accidents and occupational diseases
- c. to make preventions, by the employers, workers and those who are responsible under this Law, on the workplace accidents and occupational diseases
- d. to ensure the occupational safety and health of workers and to boost the productivity by preventing the workplace accidents and occupational diseases
- e. to set occupational safety and health standards which reflect the context of Myanmar while being in conformity with the regional and internal ones so as to create safe and healthy workplaces
- f. to assist the research on the improvement of the occupational safety and health matters

## **(11) Emergency**

### **The Natural Disaster Management Law (2013)**

The Natural Disaster Management Law was enacted to implement natural disaster management programmes systematically and expeditiously in order to reduce disaster risks; to form the National Committee and Local Bodies in order to implement natural disaster management programmes systematically and expeditiously; to coordinate with national and international government departments and organizations, social organizations, other non-government organizations or international organizations and regional organizations in carrying out natural disaster management activities; to conserve and restore the environment affected by natural disasters; to provide health, education, social

and livelihood programmes in order to bring about better living conditions for victims.

### **The Myanmar Fire-brigade Law (2015)**

The Myanmar Fire-brigade Law was purposed to take precautionary and preventive measures against destruction and loss of State-owned property, private property, cultural heritage and the lives and property of the public; to organize systematically and to train the fire brigades, auxiliary fire brigades and reserve fire brigades; to enable cooperation among the fire brigades, auxiliary fire brigades and reserve fire brigades for prevention, fire extinguishing and relief work when fire disaster, natural disaster, epidemic disease or any kind of sudden danger occurs; to educate, organize and incite extensively so as to achieve public cooperation when any catastrophe occurs.

## **2.2 Quantitative Target Levels for Consideration of the Surrounding Environment**

According to Article 10 of the Environmental Conservation Law, MONREC shall set the following environmental quality standards, with the approval of the Union Government and the Committee:

- a) Suitable surface water quality standards for the public usage of rivers, streams, canals, springs, marshes, swamps, lakes, reservoirs, and other inland water sources of the public;
- b) Water quality standards for coastal and estuarine areas;
- c) Underground water quality standards;
- d) Atmospheric quality standards;
- e) Noise and vibration standards;
- f) Emissions standards;
- g) Effluent standards;
- h) Solid waste standards; and
- i) Other environmental quality standards stipulated by the Union Government.

As of December 2016, emission guideline and target values of ambient air quality, air emission, wastewater, and noise levels were set in NEQG, while other standards have not been set yet by MONREC. In the Project, the Project Proponent will have to apply the target values set in NEQG. Each quantitative target value to be applied is described below.

### **2.2.1 Air Quality**

NEQG has set World Health Organization (WHO) Air Quality Guidelines (AQG) for Europe 1997 as the ambient air quality in Myanmar as shown in Table 2.2-1.

**Table 2.2-1 Ambient Air Quality Standards of Myanmar (WHO AQG for Europe 1997)**

<b>Item</b>	<b>Average Period</b>	<b>Myanmar (NEQG)</b>
SO <sub>2</sub>	10 mins	0.5 mg/m <sup>3</sup>
	24 hours	0.02 mg/m <sup>3</sup>
NO <sub>2</sub>	1 hour	0.2 mg/m <sup>3</sup>
	1 year	0.04 mg/m <sup>3</sup>
PM <sub>10a</sub>	24 hours	0.05 mg/m <sup>3</sup>

Item	Average Period	Myanmar (NEQG)
	1 year	0.02 mg/m <sup>3</sup>
PM2.5 <sup>b</sup>	24 hours	0.025 mg/m <sup>3</sup>
	1 year	0.01 mg/m <sup>3</sup>
Ozone	8 hours daily maximum	0.1 mg/m <sup>3</sup>

<sup>a</sup> Particulate matter 10 micrometers of less in diameter

<sup>b</sup> Particulate matter 2.5 micrometers of less in diameter

Source: NEQG

### 2.2.2 Water Quality

NEQG has set the effluent water quality for “Electric Power Transmission and Distribution,” as shown in Table 2.2-2.

**Table 2.2-2 Effluent Water Quality for Electric Power Transmission and Distribution**

Parameter	Unit	Maximum Concentration
Biological oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	S.U. <sup>a</sup>	6-9
Total coliform bacteria	100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

<sup>a</sup> Standard unit

Source: NEQG (December 2015)

### 2.2.3 Magnetic and Electromagnetic Fields

Additionally, exposure limits for general public exposure to electric and magnetic fields should comply with 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) as shown in Table 2.2-3.

**Table 2.2-3 Exposure limits for General Public Exposure to Electric and Magnetic Fields**

Frequency	Electric Field (V/ma)	Magnetic Field (μTb)
50 Hz <sup>c</sup>	5000	100
60 Hz	4150	83

<sup>a</sup> Volts per meter; <sup>b</sup> Micro tesla; <sup>c</sup> SI unit of frequency

Source: NEQG (December 2015)

### 2.2.4 Noise

In NEQG, the noise level is set as shown in and noise impact should not exceed the levels shown below or result in a maximum increase in background levels of three decibels at the nearest offsite receptor location. Noise prevention and mitigation measures will be taken by Project Proponent where the

predicted or measured noise impacts from a project facility or operation exceed the applicable noise level guideline at the most sensitive point of reception.

**Table 2.2-4 Target Noise Level set in NEQG**

Receptor	One Hour LAeq (dBA)	
	Daytime (7:00-22:00) (10:00-22:00 for public holidays)	Nighttime (22:00-7:00) (22:00-10:00 for public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: NEQG (December 2015)

### 2.2.5 Vibration

There is no vibration standard of construction activity to receptors issued by government sector in Myanmar as well as south-east Asia and International Organizations such as WHO and IFC. Thus, the target vibration level at construction phase shall be set based on the standards described in internal regulations of Thilawa Special Economic Zone, Myanmar. The TSEZ's target vibration level is shown in Table 2.2-5.

**Table 2.2-5 Target Vibration Level at Construction Phase**

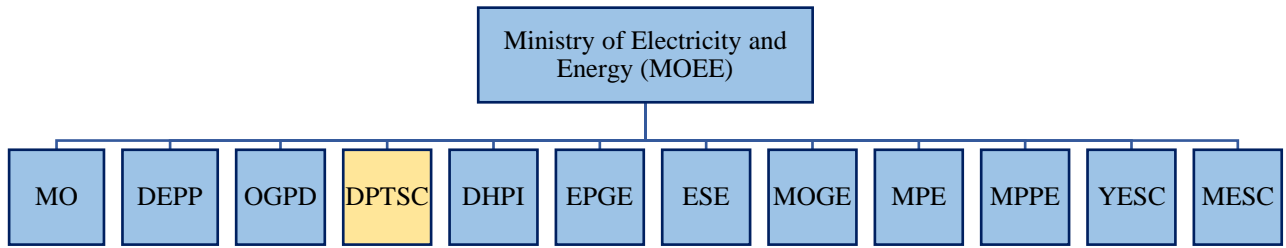
Category	Day time (La) (7am-7pm)	Evening Time (La) (7pm-10pm)	Night-time (La) (10pm-7am)
Residential houses and monastery	65 dB	65 dB	60 dB
Office, commercial facilities, and factories	70 dB	70 dB	65 dB

Note: Evaluation point is at boundary of buildings

Source: MJTD Internal Regulations

## 2.3 Institutional Setting of Project Proponent

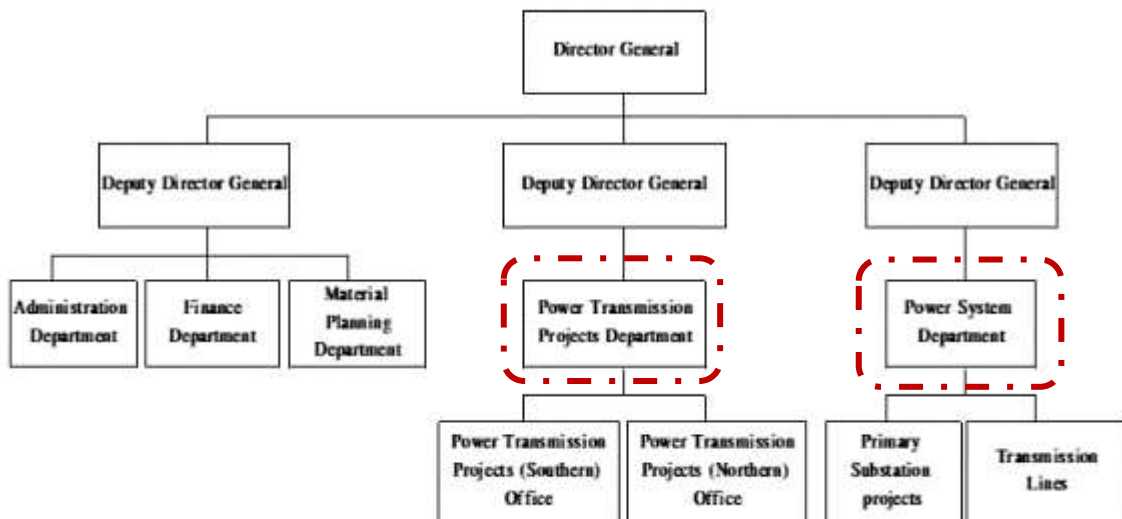
The Project proponent for National Power Transmission Network Development (Phase-III) is DPTSC under MOEE which is mainly responsible for planning and implementation of the power transmission network and power system projects. DPTSC has five main departments which are administration department, finance department, material planning department, power transmission projects department and power system department. Among those departments, power transmission projects department is mainly responsible for environmental and social considerations during the pre-construction and construction stages while the power system department will be responsible for all the substantive works at the Project site during the operation stages. The organization structure of MOEE and DPTSC are shown in Figure 2.3-1 and Figure 2.3-2, respectively.



MO = Ministry Office	ESE = Electric Supply Enterprise
DEPP = Department of Electric Power and Planning	MOGE = Myanmar Oil and Gas Enterprise
OGPD = Oil and Gas Planning Department	MPE = Myanmar Petrochemical Enterprise
DPTSC = Department of Power Transmission and System Control	MPPE = Myanmar Petroleum Product Enterprise
DHPI = Department of Hydropower Implementation	YESC = Yangon Electricity Supply Corporation
EPGE = Electric Power Generation Enterprise	MESC = Mandalay Electricity Supply Corporation

Source: MOEE

**Figure 2.3-1 Organization Structure of Ministry of Electricity and Energy (MOEE)**



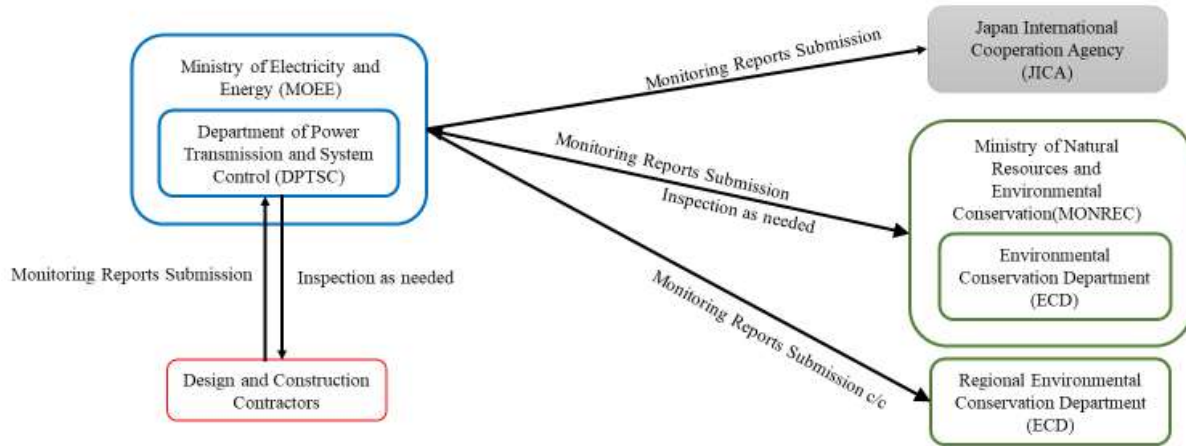
Source: MOEE

**Figure 2.3-2 Organization Structure of Department of Power Transmission and System Control (DPTSC)**

## 2.4 Institutional Framework

### 2.4.1 Institutional Arrangement at Construction Stages

The key parties who are responsible for the implementation of Environment Management Plan (EMP) at construction stages is proposed as shown in Figure 2.4-1. DPTSC as a project proponent is wholly responsible for the implementation and supervision of the Project including the environmental aspect. The Project proponent will implement the environmental monitoring and submit the monitoring report to MONREC.



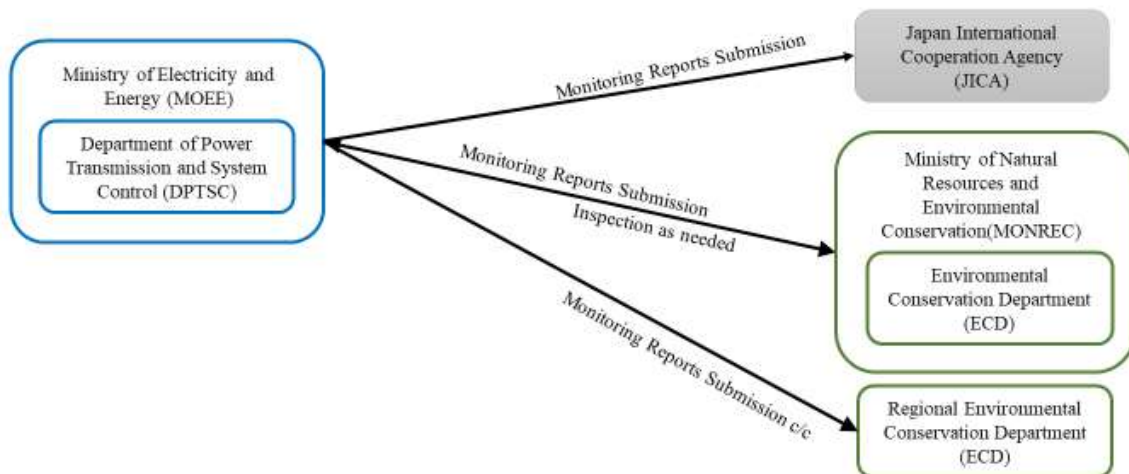
Source: IEE Study Team

**Figure 2.4-1 Proposed Institutional Arrangement for Environmental Management of the Project at Construction Stages**

The Environmental, Social and Health management will be the responsibility of HSE team of Design and Construction Contractors during construction stages. The team shall include one OHSE officer and one OHSE supervisor for monitoring the environmental, social and health issues during the construction stages. They will report the issues to the Project manager of the construction sites.

**2.4.2 Institutional Arrangement at Operation Stage**

Institutional arrangement at the operation stage is shown in Figure 2.4-2. As for the operation stage, DPTSC will takes care of all the substantive work at the site.



Source: IEE Study Team

**Figure 2.4-2 Proposed Institutional Arrangement for Environmental Management of the Project at Operation Stage**



## **CHAPTER 3: PROJECT DESCRIPTION AND ALTERNATIVES**

### **3.1 Project Outline**

#### **3.1.1 Background and Project Components**

Myanmar, since 2011, has transformed into a democratic state, adopting reform programs in political, economic, and social sectors. As the economic reform can accelerate the national reform processes, the inadequate supply of electricity in the country becomes the major issue to be addressed immediately in order to achieve quick progress in economic reform.

The Yangon area, which is Myanmar's largest power demand area, has a shortage of power grid and unstable power supplies. It has already been estimated that the transmit power has exceeded the transmission capacity limit in some transmission sections, and aging transmission and substation equipment is at a high risk of failure. In order to improve this situation, JICA has been gradually supporting the development of the 500kV backbone transmission system in the “National Power Transmission Network Development Project”. Stabilization of the power supply through the improvement of the backbone systems in Yangon, where power demand is expected to increase, is essential for the economic development of Myanmar, even after the installation of backbone transmission lines via these projects.

National Power Transmission Network Development Project had started since (2015) in Myanmar and took place in Mandalay Region, Bago Region, and Yangon Region. The phase-I of the Project took place in Mandalay Region, and it includes the construction of two new substations: Meiktila Substation and Taungoo Substation. Phase II took place in Bago and Yangon Regions, and it includes the construction of two new substations: Hpayargyi Substation and Hlaingtharya Substation and installation of the new 500kV transmission line between those two substations. In phase III, one new substation will be constructed in Dagon Myothit (East) Township of Yangon Area, and new 500kV transmission lines will be installed from Hpayargyi Substation to a new Substation in Hlegu Township.

Moreover, two 230kV transmission lines will be installed from the new substation to the existing Dagon Myothit (East) substation and Hlawga substation, respectively. This IEE report is for Phase III (hereinafter the Project).

The implementation organization for the Project is the Department of Power Transmission and System Control (DPTSC), Ministry of Electricity and Energy (MOEE) and which will manage project implementation, operation and maintenance of the transmission lines and substations. Department of

Electric Power Planning (DEPP) under MOEE will take a leading role in the project investigation and appraisal of the feasibility of the Project, formulating The Master Plan, coordinating the respective expansion plans for power generation, transmission and distribution in Myanmar, planning for bilateral cooperation with International Organizations, etc. The scope of engineering works is summarized in Table 3.1-1 and followed by the following explanations.

**Table 3.1-1 Scope of the Engineering Work**

Facility	Type	Name	Scale/Size	Region
Substation	New substation	Hlegu	32 ha	Yangon
	Expansion/ improvement of the existing substation	Dagon Myothit (East)	Existing land	Yangon
		Hlawga	Existing land	Yangon
Transmission Line	New/Overhead 500kV	From Hpayargyi to Hlegu (by construction new overhead transmission line)	About 68.9 km	Bago- Yangon
	New/Overhead 230kV	From Hlegu to Dagon Myothit (East) (by construction new overhead transmission line)	About 19.5 km	Yangon
	New/Overhead/ Underground 230kV	From Hlegu to Hlawga 1. by construction new overhead transmission line 2. by construction new underground transmission line	About 17.4 km (overhead)	Yangon
			About 4.6 km (underground)	
Upgrading/Overhead 230kV	From Hlawga to Thaketa (by improving the existing Right of Way/Overhead)	About 22.3 km	Yangon	

Source: IEE Study Team

The construction sites for expansion/ improvement of existing substations will be Hpayargyi Substation (500kV / 230kV), Dagon Myothit (East) Substation (500kV / 230kV), and Hlawga Substation (230kV / 33kV / 11kV). The areas of transmission line construction are from a Hpayargyi substation in the Bago Region to Hlegu Substation in the Yangon Region, from Hlegu Substation (500kV) to Dagon Myothit (East) Substation (230kV) and Hlawga Substation (230kV), and from Hlawga Substation (230kV) to Thaketa Substation (230kV) in Yangon City.

### 3.1.2 Project Details

#### (1) Conceptual Design of 500 kV Transmission Lines

At present, the loads of some 230kV transmission lines in Yangon exceed their power transmission capacities. In the future, the loads of the 230kV transmission lines from the north to Hlawga and Thaketa will significantly exceed their transmission capacities. This situation needs to be urgently

improved because 230kV is not enough for stable power transmission of its load. The installation of a new 500kV transmission line from Hpayargyi to Hlegu will be carried out as an effective measure for the improvement of the overloading in the 230kV system.

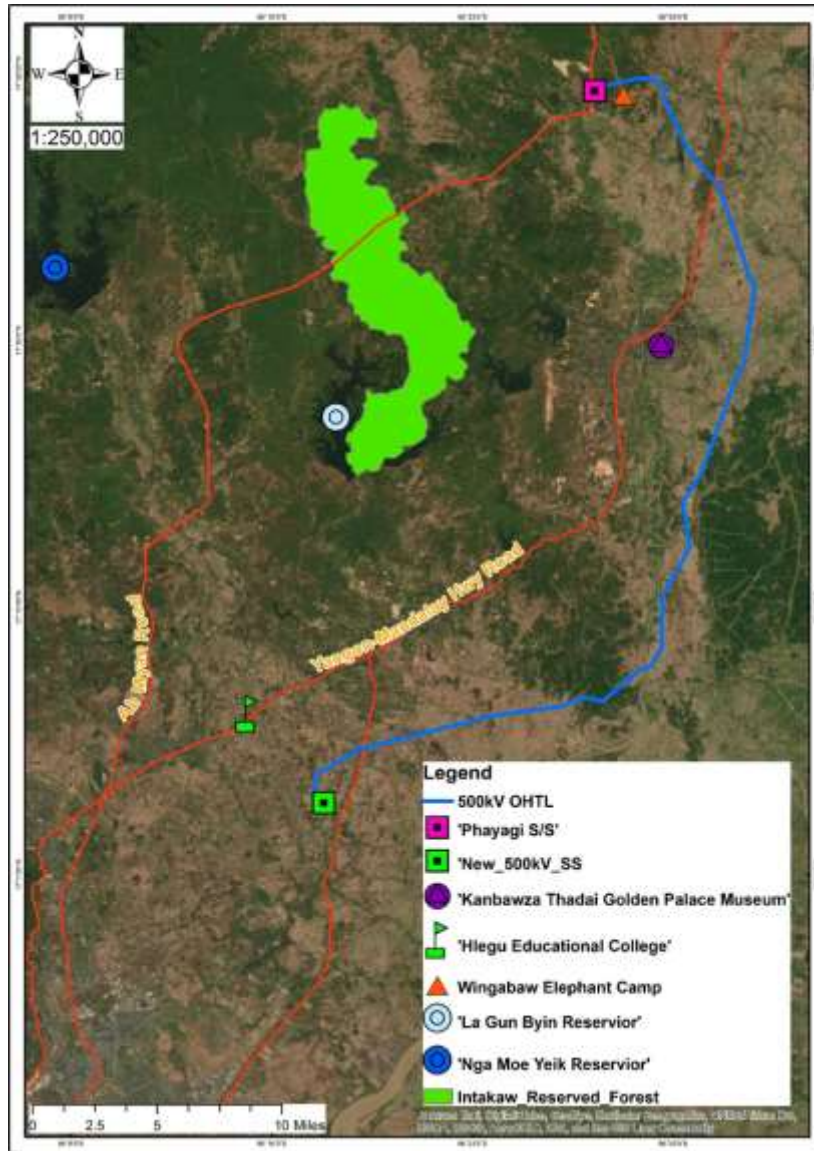
This 500kV transmission line alignment will originate from Hpayargyi Substation, which is located in Bago Region and terminate in a new Hlegu Substation located in Yangon Area. The total length is expected to be about 68.9 km and the line will compose between 140 to 150 towers with the average area span length of 450 meters. The detailed design of 500kV transmission lines is described in Table 3.1-2.

**Table 3.1-2 Conceptual Design of 500 kV Transmission Lines**

<b>Line Design Features</b>	500kV Transmission Line between Hpayargyi – Hlegu
<b>Line Length</b>	68.9 km (42.81 miles)
<b>Type</b>	Galvanized steel towers with concrete foundations
<b>Number of Towers</b>	About 140 - 150
<b>Average Span Between Towers</b>	About 450 meters (0.27 miles)
<b>Tower Height</b>	65 meters to 110 meters (average 70 meters)
<b>Tower Land Area</b>	Investigating
<b>Right of Way (ROW)</b>	60 meters (30 meters either side of line)

Source: IEE Study Team

Figure 3.1-1 shows Hpayargyi-Hlegu 500kV transmission line route and Figure 3.1-2 shows illustrative photo of 500kV transmission line.



Source: IEE Study Team

**Figure 3.1-1 Hpayargyi-Hlegu 500 kV Transmission Line Route**



Source: IEE Study Team

**Figure 3.1-2 Illustrative Photo of 500 kV Transmission Line**

The total number of 140 to 150 towers will be used in this project with different types and sizes of towers based on the topographic conditions. The line will cross the Bago Township, Thanatpin Township and Kawa Township in Bago Region and Hlegu Township in Yangon Region.

The transmission line will cross Yangon-Mandalay Highway near the Bago city from west to east and will cross No. 2 Main Road near new the Hlegu substation from east to west. The Wingabaw Elephant Camp is also located approximately 1.5 km from the origin of the transmission line in Hpayargyi Segment. The majority of transmission line alignment pass plantation area, degraded forest land mixed with undergrowth, rivers and creeks, and active agriculture lands within three townships.

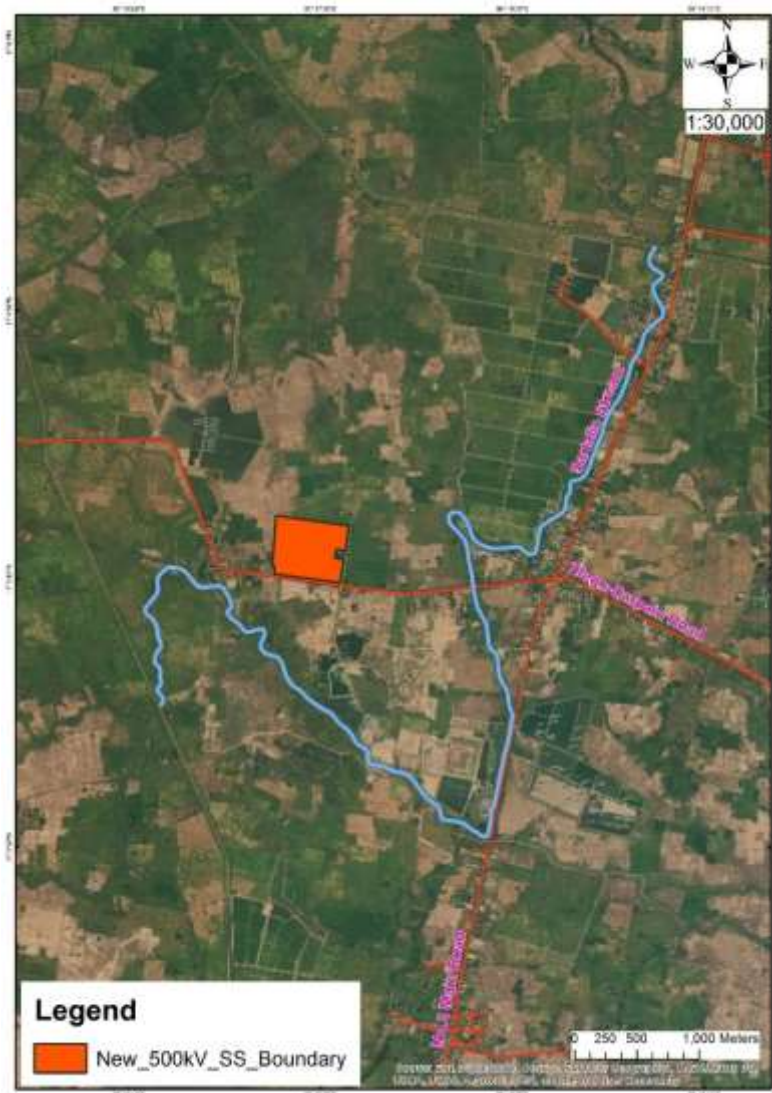
## **(2) Conceptual Design of New Hlegu Substation**

As the 500kV transmission line will be constructed from Hpayargyi Substation, the 500kV substation facilities are required to be installed. Although these facilities can be installed in the existing Dagon Myothit (East) substation area, there is not enough space for future expansion. Therefore, new substation location is considered and selected near the existing Dagon Myothit (East) substation. The new Hlegu substation will be constructed for installation of 500kV facilities and 500kV transmission lines will be connected from Hpayargyi Substation to Hlegu Substation instead of existing Dagon Myothit (East) Substation. The main equipment to be installed at the new 500 kV substation in this project as follows.

- 500kV switchgear (H-GIS)
  - 6 bays for power lines
  - 3 bays for transformer
  - Spare 1 bay
- 500/230/33kV transformer 2 units (single-phase transformer x 7 units (including spare))
- Complete 230kV switchgear (AIS)
  - 8 bays for transmission lines (including spares)
  - 3 bays for transformer
- Control and protection device
  - Transmission line protection device 1 set
  - Transformer protection device 1 set
  - Busbar protection device 1 set
  - SCADA 1 set
- On-site power supply
  - AC panel 1 set
  - DC panel 1 set

- DC battery charger 1 set
- Battery 1 set
- Emergency power generation equipment 1 set
- Communication system 1 set

The New Hlegu 500kV Substation will be located in the area of the Sar Ta Lin Village in the Hlegu Township. The site is bounded by farmland in all four cardinal directions. The residential areas are found in the east, south and south-west of the site. The nearest access road is the Hlegu-Dar Pein Road, located beside the Project site in the south. It is connected to the No.2 Main Road in the east of the Project site. A small creek is located in the east of the Project site and later it discharges into the Pazundaung creek and the final discharge point is the Yangon River. The substation will occupy approximately 25 - 32 ha. Figure 3.1-3 shows the location of proposed new substation.



Source: IEE Study Team

**Figure 3.1-3 Location of Proposed New 500 kV Substation, Hlegu**

### (3) Conceptual Design of Improvement of Existing Dagon Myothit (East) Substations

The Dagon Myothit (East) Substation is located at 16 ° 57: 02N and 96 ° 16: 43E. It is located in the Dagon Myothit (East) Township, Yangon Region. The surrounding area is using for farming, fishery and other development activities. Currently, the Dagon Myothit (East) Substation consists of the following equipment and it was put into operation in 2016.

- 230kV gas insulated switchgear (Hyundai)
- 230/66/11kV main transformer (Hyundai) x 2
- 66kV gas insulated switchgear (Hyundai)
- 11kV switchgear
- On-site power supply

Figure 3.1-4 shows the current photos of Dagon Myothit (East) substation.



Source: IEE Study Team

**Figure 3.1-4 Current Photos of Dagon Myothit (East) Substation**

The location of existing Dagon Myothit (East) Substation is described in Figure 3.1-5.





Source: IEE Study Team

**Figure 3.1-5 Location of Existing Dagon Myothit (East) Substation**

In this Project, the existing 230kV GIS bay will be expanded and the protection and control equipment will be expanded to connect two 230kV transmission lines, one for the new 500kV substation. The Project requires additional GIS for two feeders. The main facilities to be installed in the existing Dagon Myothit (East) substation in this Project are as follows:

- Complete 230kV switchgear (GIS)
  - 2 bays for power lines
- Control and protection device
  - 230kV transmission line protection device 2 panel
  - SCADA (expansion) 1 set

As shown in Figure 3.1-6, there is an empty space of about 30 m on the east side of the existing 230kV GIS. Currently, there is no plan to use this site, and it is large enough to add two feeders for this project.





Source: IEE Study Team

**Figure 3.1-6 Location of New 230 kV Switcher at Dagon Myothit (East) Substation**

**(4) Conceptual Design of Improvement of Existing Hlawga Substations**

The Hlawga Substation is located at 16 ° 58: 54N and 96 ° 7: 35E. It is located in the Mingaladon Township, Yangon Region. The area is surrounded by national parks and military land, and it is necessary to keep the existing premises for expansion and reinforcement under this Project. Currently, the Hlawga Substation consists of the following equipment, which has been operating for nearly 60 years since its operation in 1960. The photo of existing substation is described in Figure 3.1-7.



Source: IEE Study Team

**Figure 3.1-7 Current Photos of Hlawga Substation**

The existing facilities are as follow:

- 230kV air-insulated switchgear
- 230/66/11kV main transformer
- 230/33/11kV main transformer x 3
- 66kV switchgear

- 33kV switchgear
- 11kV switchgear
- On-site power supply

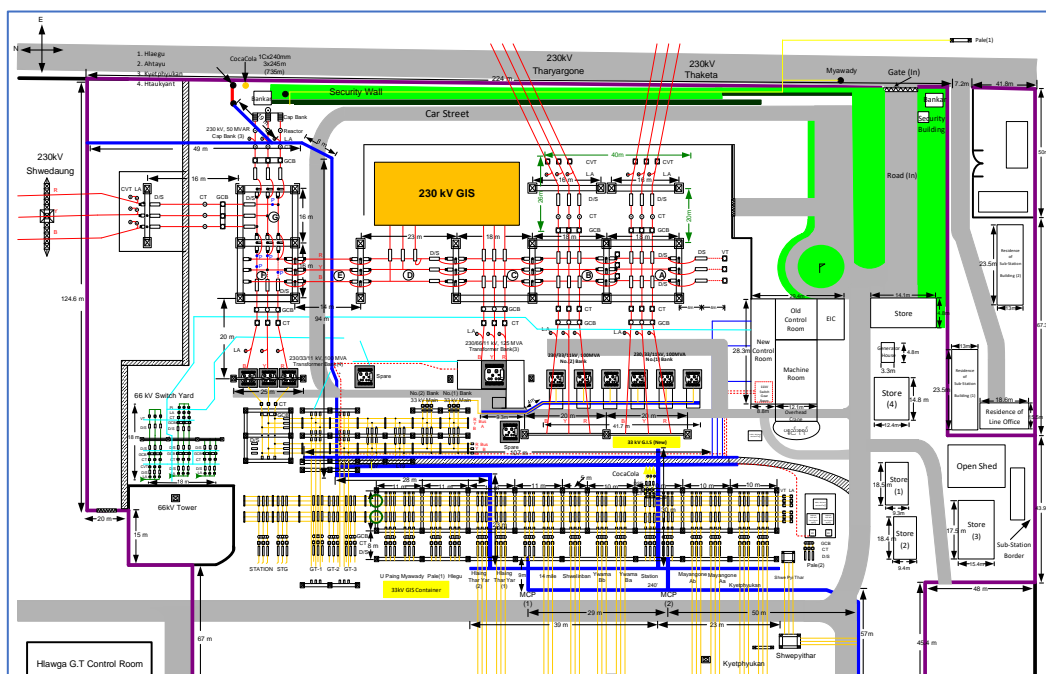
Figure 3.1-8 shows the current location of Hlawga substation.



Source: IEE Study Team

**Figure 3.1-8 Location of Hlawga Substation**

The Hlawga Substation has plans to increase the number of 230 kV facilities. The plan view of installation of new 230kV facility area in existing layout is shown in Figure 3.1-9.



Source: DPTSC

**Figure 3.1-9 Plan View of New 230kV GIS with Existing Layout of 230kV Switching Equipment at Hlawga Substation**

The main equipment to be installed at the Hlawga substation in this project are as follows.

- Complete 230kV switchgear (GIS)
  - 3 bays for power transmission lines (including spares)
  - 2 bays for bus connection
- Control and protection device
  - Transmission line protection device 2 panel
  - Busbar protection device 1 set
  - SCADA (expansion) 1 set

### **(5) Conceptual Design of 230 kV Transmission Lines**

In National Power Transmission Network Development Project Phase III, total three new 230kV transmission lines will be constructed as follow:

- 1) 230kV transmission line from new Hlegu substation to existing Dagon Myothit (East) substation
- 2) 230kV transmission line from new Hlegu substation to existing Hlawga substation and
- 3) 230kV transmission line from Hlawga substation to existing Thaketa substation.

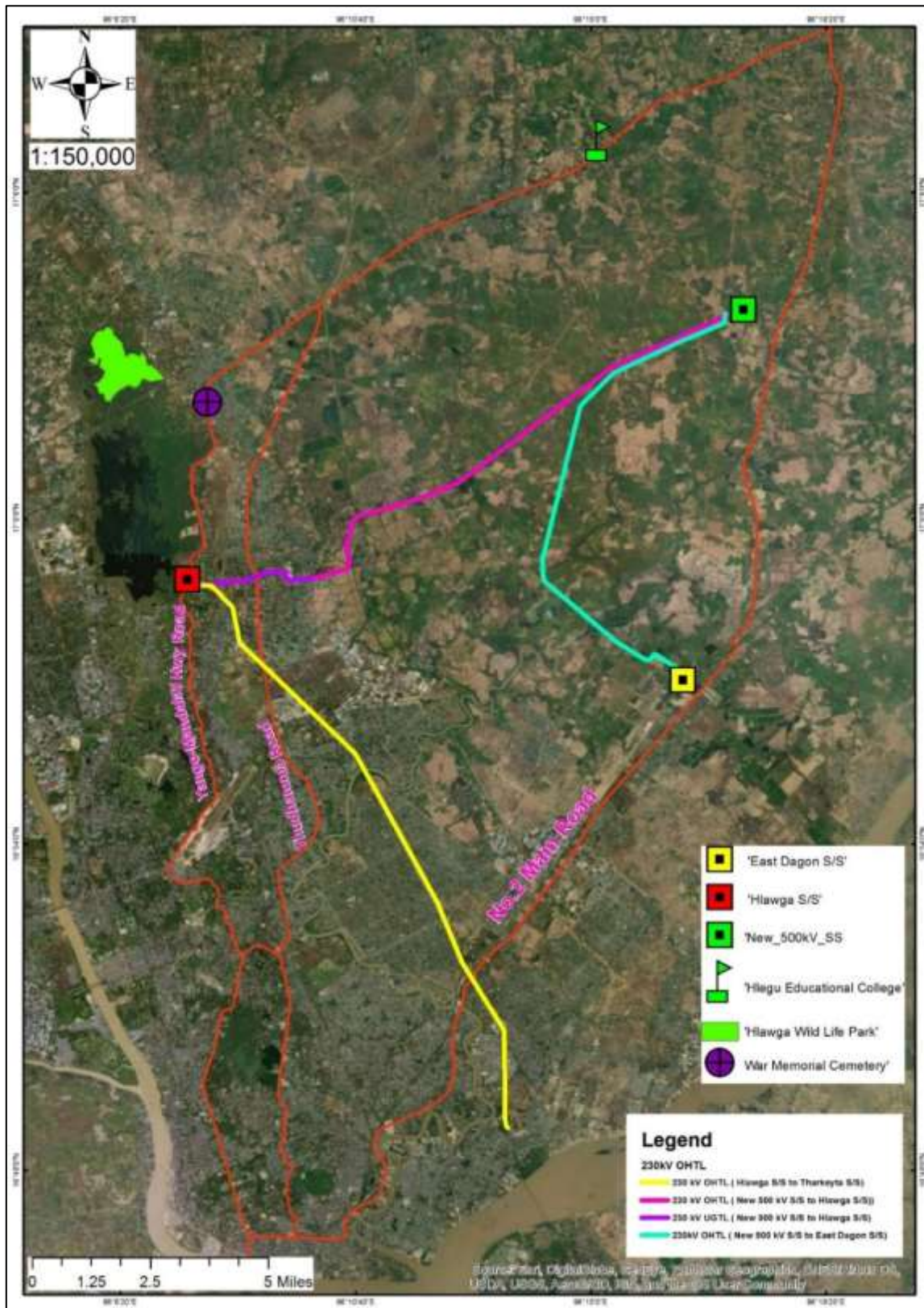
The first transmission line alignment, from Hlegu to Dagon Myothit (East), will length about 19.5 km and which will cross through Hlegu Township and Dagon Myothit (South) Township. The line is overhead transmission line and the majority of the line will pass through the agricultural land, rivers and creeks, and rural roads. Some residential area and commercial fish farming area are also found near the transmission line alignment.

The expected length of second transmission line alignment, from Hlegu to Hlawga, is about 22 km and which will cross through Hlegu Township and Mingalardon Township. The route includes an underground line of approximately 5 km in the residential area of Mingalardon Township considering the possibility of issues concerning environmental and social considerations such as a residential area with a road width of about 4.5 m and crossing of Yangon Mandalay Highway (about 16 m wide).

The total length of the existing overhead transmission lines from Hlawga (230kV) substation to Thaketa (230kV) substation is about 22.3 km. This transmission line will be improved/upgraded by using the existing one-line transmission line route.

The locations of 230kV transmission line routes are described in Figure 3.1-10. The transmission line highlighted by pink and violet colors is Hlegu-Hlawga 230kV line where pink color means overhead transmission line and violet color means underground transmission line. The turquoise color transmission line is Hlegu-Dagon Myothit (East) 230kV line and the yellow one is Hlawga-Thaketa 230kV line.





Source: IEE Study Team

**Figure 3.1-10 Locations of 230kV Transmission Line Routes**

## 3.2 Design Considerations for Transmission Lines

### 3.2.1 Transmission Line Route

For the consideration of the transmission line route, the following points of focus described in Table 3.2-1 are needed to consider in Myanmar.

**Table 3.2-1 Property of Interest in Preliminary Survey and Construction Period**

<b>Properties that generally hinder</b>	<p><b>National parks, etc.:</b> Avoidance due to environmental and social considerations</p> <p><b>Airport:</b> Yangon International Airport and military facilities airports are nearby, so restrictions on air route construction are taken into consideration</p> <p><b>Micro communication route:</b> Consider the height and direction of communication route</p> <p><b>Large rivers:</b> grasp large rivers that can belong spans, and consider clearances that take into account the navigating vessels, etc.</p> <p><b>Special high-voltage transmission lines:</b> Consideration for clearance between wires</p> <p><b>Expressways and major roads:</b> Consideration of road width, ancillary road facilities, road clearance, traffic volume, etc.</p> <p><b>Railway:</b> Consideration for track width, track auxiliary equipment (communication line, etc.), track height above the track, and measures to prevent electric wire falling</p> <p><b>Housing:</b> Avoid crossings to reduce the number of housing moves</p> <p><b>Schools:</b> Avoidance due to environmental and social considerations</p> <p><b>Religious facilities and cemeteries:</b> Avoidance due to environmental and social considerations</p> <p><b>Local community facilities:</b> Avoidance due to environmental and social considerations</p> <p><b>Chimney:</b> Avoiding the chimney of a brick sintering kettle to prevent electrical accidents and corrosion of electric wires</p>
<b>Myanmar-specific obstacles</b>	<p><b>Military facilities/ sites:</b> Avoiding the passage of military facilities with large sites scattered throughout Myanmar</p> <p><b>Rubber forest:</b> High asset value, need to avoid reducing RoW compensation fee</p> <p><b>Mango garden:</b> High asset value, need to avoid reducing RoW compensation fee</p> <p><b>Teak forests:</b> Mainly in forest management, need to avoid reducing RoW compensation fee</p>
<b>Properties that require confirmation for transmission line construction</b>	<p><b>Soft ground area:</b> Confirmation of foundation support layer of soft ground area in river basin by visual inspection and geological survey</p> <p><b>Flood area:</b> Confirmation of water level at the time of flood (for examination of basic shape)</p> <p><b>Roads:</b> Consider access during construction, necessity of temporary roads, maintenance after construction</p>
<b>Underground transmission line obstruction</b>	<p><b>Underground buried:</b> Water pipes, gas pipes, other infrastructure for power lines</p> <p><b>Crossing:</b> Points on river crossings, railways, etc.</p>

Source: IEE Study Team

### 3.2.2 Number of Tower

The Project plans to develop a 230kV transmission line for about 64 km (22 km for Hlegu-Hlawga, 19.5 km for Hlegu-Dagon Myothit (East), and 22.3 km for Hlawga-Thaketa) and a 500kV transmission line for about 68.9 km. However, for the assumption of tower number, the distances for the underground transmission line and Hlawga-Thaketa transmission line shall be excluded.

**Table 3.2-2 Assumption of the Number of Towers**

kV	Route extension (m)	Distance between towers (m)	Assumed number of towers
	a	b	c = a/b
500kV	approximately 68.9 km	450m*	150→155
230kV	approximately 41.6 km	150m	240→250

Source: IEE Study Team

### 3.2.3 Transmission Capacity Design

The design is always based on IEC60287. Confirmation at the time of failure is based on IEC60949. The main conditions required for the design are as follows.

- 1) Number of lines
- 2) Transmission capacity at all times (MVA / line)
- 3) Soil base temperature
- 4) Soil specific thermal resistance
- 5) Current at the time of accident (kA, sec)

Soil specific thermal resistance and soil base temperature are selected from IEC60287-3-1. The climate in Myanmar is almost subtropical, and the maximum soil base temperature is selected as 30 ° C. The collected soil base temperature values are shown in Table 3.2-3.

Regarding soil specific thermal resistance, the country has a rainy season and a dry season, and 0.7 is selected when considering only the rainy season. However, there is also a dry season during the year, and 1.0 K.m / W can be selected considering safety. The collected soil specific thermal resistance values are shown in Table 3.2-4.

**Table 3.2-3 Soil Based Temperature**

Climate	Soil base temperature (depth 1m) unit: ° c (centigrade)
	Minimum value
Thermal zone	25
Subtropical	15
Warm zone	10

Source: IEE Study Team

**Table 3.2-4 Specific Thermal Resistance**

Soil specific thermal resistance (K.m/W)	Soil Conditions	Weather Condition
0.7	Very Moist	Continuously moist
1.0	Moist	Regular rainfall
2.0	Dry	Seldom rain
3.0	Very Dry	Little or no rain

Source: IEE Study Team

### 3.2.4 ROW of Transmission Lines

The following table shows the minimum distance of the transmission line from the ground. The case of 500kV is not described in the source, so it will be clarified by hearing from DPTSC in the future.

**Table 3.2-5 The Minimum Height of Overhead Power Line from The Ground**

No	Content	Volt (KV)	
		230	500
1	The height of overhead power line where vehicles cannot go through.	6.7 m 22ft	investigating
2	The height of overhead cable line in parallel with any road, passage and village streets.	7.32 m 24 ft	investigating
3	The height of overhead cable line passing over any road, passage and village streets.	7.01 m 23 ft	investigating
4	Passing over the railway track.	7.62 m 25 ft	investigating
a) The maximum distance must be (36.58 m) to pass over railway track. b) Must be passed over the railway track perpendicularly. c) Medium voltage overhead power line passing should be horizontal and should not be within railways area. d) Electricity pole or tower should be constructed far from railway at least 1.5 times of its height.			

Source: DPTSC website 2019.10.9. View <https://www.moee.gov.mm/mm/ignite/page/598>

We are investigating the case of 500 kV because it is not listed in the source table.

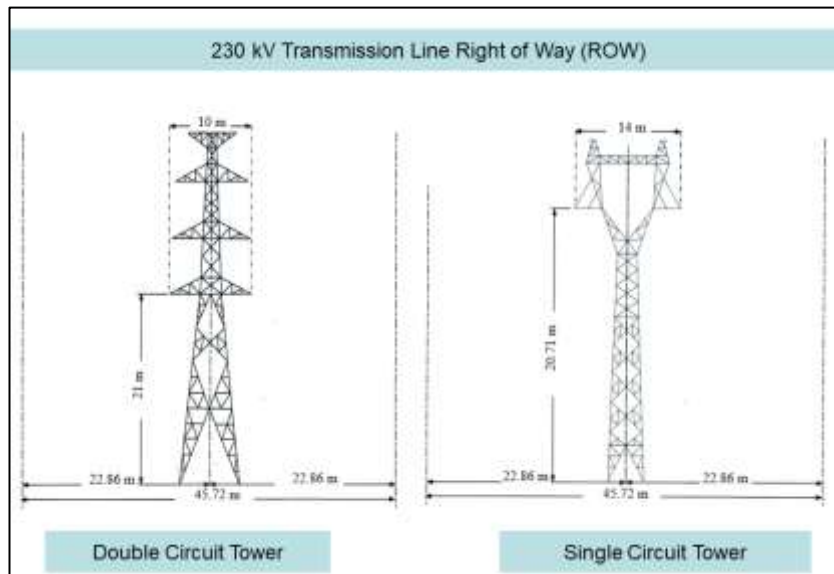
The minimum distance between the transmission line and the building is as shown in the following table. Since there is no description in the source in the case of 500kV, it will be clarified by hearing from DPTSC in the future.

**Table 3.2-6 Minimum Distance between Power Line and Building**

Sr.	Description	230kV	500kV
1.	Horizontal Distance	15.24 m (50 ft)	investigating
2.	Vertical Distance	4.88 m (16 ft)	investigating

Source: DPTSC website 2019.10.9. View <https://www.moee.gov.mm/mm/ignite/page/598>

We are investigating the case of 500 kV because it is not listed in the source table.



Source: MOEE

**Figure 3.2-1 Right of Way (ROW) for 230 kV Transmission Lines**

### 3.2.5 Tower Design

The general design specifications of tower are tabulated as follow.

**Table 3.2-7 Description of General Design Specifications of Towers**

Type	Size	Design
Suspension Tower	25 m x 25 m	Horizontal Angle: 0-5 degrees
Tension Tower	30 m x 30 m	Horizontal Angle: 0-15 degrees
Tension Tower	40 m x 40 m	Horizontal Angle: more than 15 degrees
Deed End Tower	40 m x 40 m	-

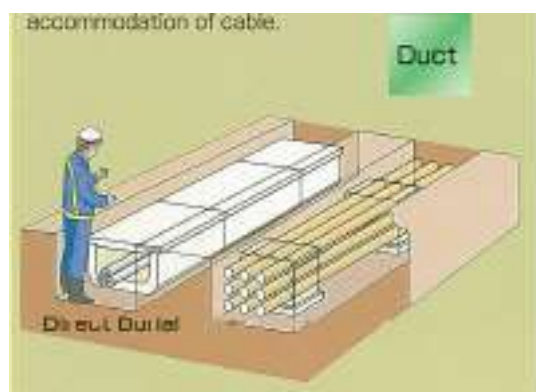
Source: IEE Study Team

### 3.2.6 Underground Transmission Line Design

There are, in general, two types of underground power transmission line system: direct burial system and pipeline burial system. Especially in urban areas where the road width is narrow, where there is heavy traffic, and where there are many residents by the side of the road, the pipe burial method lays the pipe after excavating the trench and allows it to be backfilled on the same day. Since it is possible to avoid excavation for a long period of time, the design will be promoted using a pipe burial method that can prevent traffic congestion and disruption of life.

The material used for duct pipes is high density polyethylene (HDPE), which is widely used in construction abroad and is relatively easy to purchase. The direct burial method and the pipeline burial method are shown in Figure 3.2-2.





Source: IEE Study Team

**Figure 3.2-2 Schematic Diagram of Direct Burial System and Pipeline Burial System**

The most appropriate method is selected in consideration of economic efficiency, construction period and surrounding environment. The evaluation was made in terms of workability, maintainability, and cost at the time of the accident (see Table 3.2-8).

**Table 3.2-8 Comparison table of direct burial method and management burial method**

Items	Direct burial	Pipe system
1 span distance	◎ No limit	◎ No limit
Necessity of shaft	Unnecessary	Unnecessary
Necessity of work belt	◎ Workday only	◎ Workday only
Workability	△ Backfilling is only possible after laying one span cable.	◎ Can be buried on the same day after laying the pipeline, regardless of the cable laying
Maintenance	○	◎ Cable can be replaced in case of cable accident or expansion
Cost (emergency)	△	◎
Comprehensive evaluation	○	◎

Note: ◎---Very good, ○----Good, △----Not suitable

Source: IEE Study Team

### 3.3 Construction Activities during Project

#### 3.3.1 Construction Activities for 500 kV Substation

A transmission substation acts as a connection between several transmission lines. A distribution substation acts as a middleman between the transmission substation and the electricity consumer, lowering the transmission voltage to an appropriate level for distribution to family homes and apartment buildings. The proposed project will construct a 500kV transmission substation and the general construction activities for this substation are as follow:

#### Civil Engineering/ Building work

- Removal of roots, embankment, leveling, and compaction at substation site
- Drilling and backfilling
- Gravel on the site, new protective fence and campus road
- 500kV and 230kV switchyard outdoor steel foundation
- Equipment stand and equipment support materials
- Equipment foundation work
- Oil pit of main transformer
- Drainage drain pit and drainage piping
- Cable pit construction
- Control building (including operation control room, switchboard room, office, work room, battery room, warehouse, hot water room, toilet, etc.)
- Guard house for security guards next to the main gate
- Air conditioning equipment for control buildings (air conditioners, ventilation equipment, etc.)
- Lights and power equipment for control buildings (distribution boards, outlets, etc.)
- Water supply facilities (wells, water storage facilities, sewage and septic tank facilities, etc.)
- Fire extinguishing equipment (fire extinguisher, smoke exhaust / ventilator, etc.)

### 3.3.2 Construction Activities for Transmission Lines

Generally, the construction of transmission lines includes four main activities as follow;

- Site Preparation
- Foundation Construction
- Structure Construction
- Wire-Stringing Operations

#### (1) Site Preparation

Tower locations are cleared of vegetation prior to construction of the towers. Access roads may need to be upgraded or new roads constructed to accommodate construction vehicles and equipment access to each tower site.

#### (2) Foundation Construction

Most structures have a concrete foundation. The size of the foundation depends on the type of structure and the terrain. Foundation construction begins with the auguring of holes for footings (four of lattice steel towers [LSTs] and one for tubular steel poles [TSPs]). For LSTs, each hole is usually 3 to 4 feet wide and 15 to 30 feet deep. TSPs require one hole that is up to 8 to 12 feet wide and 40 to 60 feet deep. Regardless of the structure type, foundations typically have a slight projection above the ground. After

the footing holes are excavated, they are reinforced with steel and then concrete is poured into the holes. Once the concrete has cured, crews can begin the construction of the structure itself.



Source: [https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files\\_8\\_26\\_14/\\_5TransmissionLineConstructionFactSheet.pdf](https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files_8_26_14/_5TransmissionLineConstructionFactSheet.pdf)

**Figure 3.3-1 Illustrative Photo for Construction of Transmission Line Foundation**

### **(3) Structure Construction**

Generally, structures are built from the ground up. Structures are assembled in sections near the new tower location and a crane is used to lift the sections into place. Crews then bolt the sections together. TSPs are either completely assembled near the tower location and then erected at once, or are assembled in sections. The method used is determined by terrain and available space next to the structure site. Tower erection is usually performed by crane.



Source: [https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files\\_8\\_26\\_14/\\_5TransmissionLineConstructionFactSheet.pdf](https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files_8_26_14/_5TransmissionLineConstructionFactSheet.pdf)

**Figure 3.3-2 Illustrative Photo for A Crane Carrying the Top Section of Tower for Installation**

### **(4) Wire-stringing Operations**

Wire stringing includes all activities associated with the installation of the primary conductors onto the transmission line structures. These activities include the installation of conductor, ground wire, insulators, stringing sheaves (rollers or travelers), vibration dampeners, weights, suspension and dead-end hardware assemblies for the entire length of the route. Wire stringing involves the following four operations:

**Stringing the pilot line to install the conductor.** A light-weight sock line (pilot line) is connected from tower to tower, threading the sock line through wire rollers attached to the insulators on each structure. A clam lock device secures the sock line in the rollers.

**Pulling.** The sock line is attached to a conductor pulling rope/cable, which is connected to a tensioning machine on a truck. The conductors are then pulled through by a puller machine. The puller and tensioner work together during the pulling operation to ensure that the conductor maintains the proper ground clearance at all times. Wire set-up sites or pulling stations, where the associated pulling machinery and equipment are staged, are located at intervals along the span.

**Sagging and dead-ending.** Once the conductor is pulled through the length of the line, the tensioner is then used to sag the conductors to the proper tension. Conductors expand and contract with changes in temperature (they are longest at high temperatures), so they need to be installed at the proper tension, such that they do not sag too low when temperatures are at a maximum. All phases (or bundled phases) between two towers must be sagged to the same tension.

**Splicing.** Once the conductor is pulled in and the proper tension of the conductor is reached, mid-span splicing is performed at dead-end tower locations to connect or splice segments together. Any temporary pulling splices are removed and replaced with permanent splices. Implosive sleeves may be used for splicing, which involves placing a layer of explosives around an aluminum sleeve. The layer of explosive is designed to create the required compression of the sleeve around the conductor. After splicing and sagging, conductors are affixed to dead-end towers.

**Clipping-in, spacers.** After the conductors are spliced and affixed to dead-end towers, they are “clipped in”, or attached to tangent towers. This process involves removing the rollers and replacing them with clamps and other final insulator hardware to secure the conductors to the insulators. Vibration dampeners, weights, and spacers between the conductors of a bundled phase are then installed. Once construction is completed, crews cleanup work areas and restore disturbed areas.



Source: [https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files\\_8\\_26\\_14/\\_5TransmissionLineConstructionFactSheet.pdf](https://www.cpuc.ca.gov/Environment/info/aspen/cltp/archive/Files_8_26_14/_5TransmissionLineConstructionFactSheet.pdf)

**Figure 3.3-3 Illustrative Photo for Pulling phase of a wire-stringing operation**

### 3.4 Selection of Alternatives

The alternative assessments are made based on five main categories (a) Environment (b) Social Consideration (c) Design (d) Cost estimate and (e) Urban Development factors comparison among zero option, new substation or not, and 500kV transmission line route.

#### 3.4.1 Zero Option

An alternatives assessment was made between Option-A (without the Project) and Option-B (with the Project). The results are shown in Table 3.4-1.

**Table 3.4-1 Results without and with the Project (Option A and B)**

Item	Option A (Without the implementation of NPTND Phase III Project)	Option B (With the implementation of NPTND Phase III Project)
Environment	Existing conditions are kept in natural condition. No impact on natural environment.	Existing trees within the Project area might be cut. Temporary impacts on water quality of some rivers and creeks along the proposed project area will occur due to construction works.
Social Consideration	Land acquisition and resettlement plan will not be required due to there being no land use. Economic development limitation can conduct to lack of power supply.	Land acquisition and resettlement plan will be required. More employment opportunities would be created.
Facility Development in Power Supply Sector	There will be potential limitation on the future urban development because the electricity supply will be insufficient.	There will be the potential for a positive contribution on the future urban development because there will be sufficient electricity. A greater volume of electricity could be provided and existing electricity supply will be improved.

Source: IEE Study Team

#### 3.4.2 Location Alternatives for Substation

An alternatives assessment was made between Option-A (upgrading the existing substation) and Option-B (construction of new substation). The results are shown in Table 3.4-2.

**Table 3.4-2 Results between Upgrading the Existing S/S (Option A) and Construction of New S/S (Option B)**

Item		Option A (Upgrading the Existing Substation)	Option B (Construction of New Substation)
Environmental issue	Air quality, noise and vibration	No site cleaning is required. So insignificant air quality, noise and vibration impacts on the environment will be occur if compared to the site cleaning of 25-32 ha substation.	Site cleaning will be required for construction of a new substation. Compared to Option A, significant air quality, noise and vibration impacts are expected due to the construction of the new substation and installation of new 500kV equipment.

Item		Option A (Upgrading the Existing Substation)	Option B (Construction of New Substation)
	Cutting trees and Site Clearance	No tree cutting is required. Some weed will have to be cleared for installation of new equipment.	Some tree cutting will be required for site cleaning. Approximately 25-32 ha of paddy field will have to be cleared for the construction of a new substation.
	Water pollution	Water quality impact on nearby fishpond is expected due to construction work.	There will be a greater water quality impact on nearby creeks and fishponds due to construction work compared to Option A.
Social issue	Land acquisition	There will be no requirement for land acquisition to upgrade the existing facilities.	A total area of approximately 25-32 ha of land will have to be acquired for the installation of 500kV substation.
	Livelihoods	There will be no impacts on the livelihoods of local people.	Because of the land requirement for substation, 25-32 ha of paddy fields need to be removed. Therefore, the livelihoods of local people would be affected, and local living standards would be improved due to the sufficient power supply.
	Local Economy	There will be no impacts on the local economy.	As new substation includes government housing, the local economic opportunities such as shops and vendors are expected.
Technical issue	Future Expansion	Future expansion cannot be undertaken due to land limitations.	With Option B, future expansion can be undertaken because there is a large amount of space for the construction of the new substation.

Source: IEE Study Team

### 3.4.3 Route Alternatives for 500kV Transmission Line (TL)

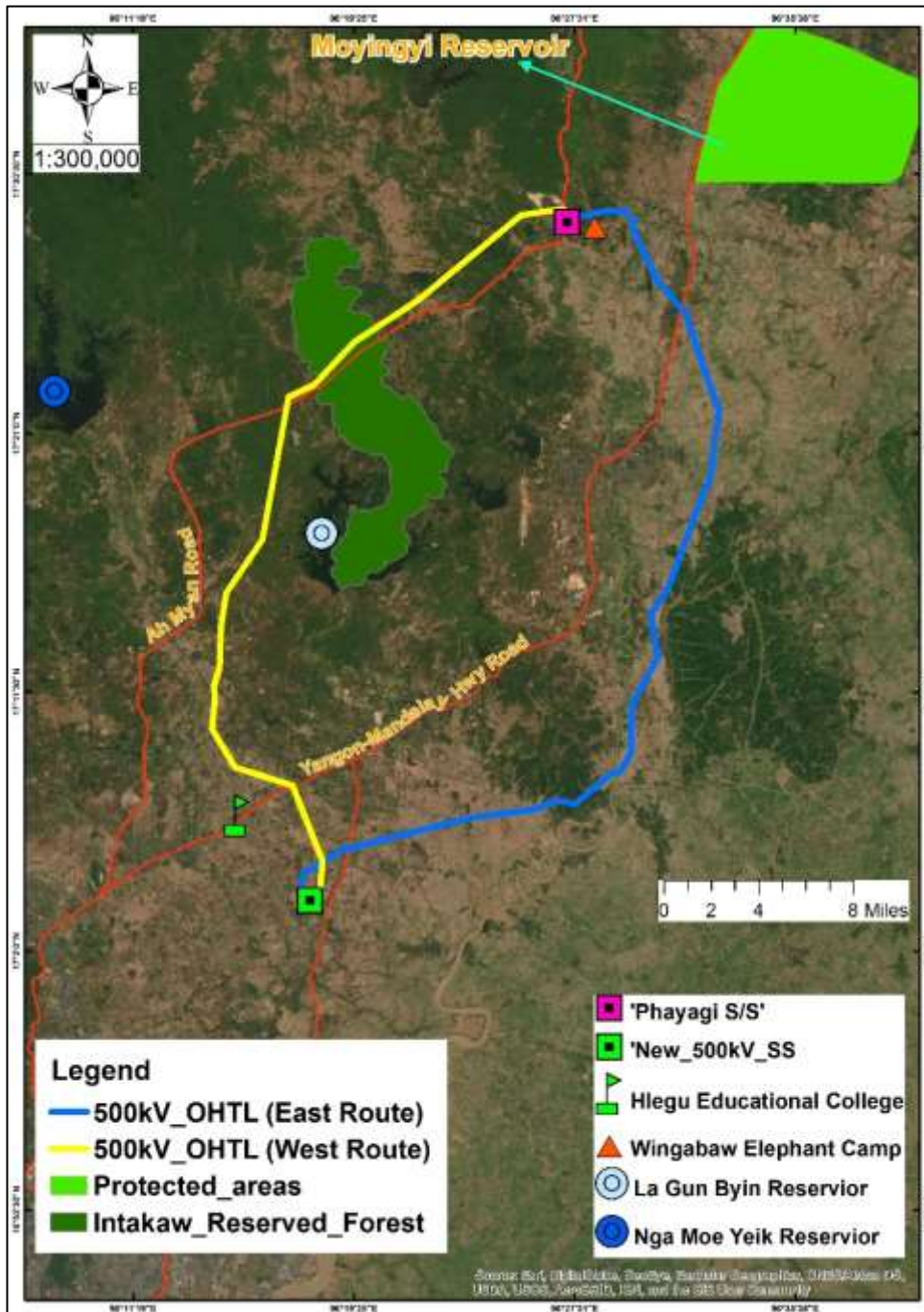
An alternatives assessment was made between Option-A (500kV TL in West route) and Option-B (500kV TL in East route). The results are shown in Table 3.4-3.

**Table 3.4-3 Route Alternatives for 500kV TL**

Dimension		Option A (500kV TL in West Route)	Option B (500kV TL in East Route)
Natural Environment	Air quality, noise and vibrations	Compared to Option B, there are more receptors such as houses on the route, and impacts on air quality, noise and vibration are anticipated.	Air quality, noise and vibration impacts are expected due to the construction work.
	Cutting Trees and Site Clearance	Compared to Option B, cutting of more trees and more land clearance will be required due to site conditions.	Trees within the alignment of TL are required to be cut down. Some land clearance will be required.

Dimension		Option A (500kV TL in West Route)	Option B (500kV TL in East Route)
	Natural Environment	TL alignment will cross Wingabaw Elephant Camp and Intagaw Reserved Forest.	Wingabaw Elephant Camp is located near the TL alignment.
Social Consideration	Traffic disruption and inconvenience to pedestrians, including access	Traffic along the No.2 Main Road, the Yangon-Mandalay Highway, is expected while transmission line facilities are being transported to the construction site.	Traffic along the No.2 Main Road, the Yangon-Mandalay Highway, is expected while transmission line facilities are being transported to the construction site.
	Impact on residential, commercial, government, and heritage structures	There are no significant impacts on residential, commercial, government and heritage structures except the underground transmission line construction area	There are no significant impacts on residential, commercial, government and heritage structures except the underground transmission line construction area

Source: IEE Study Team



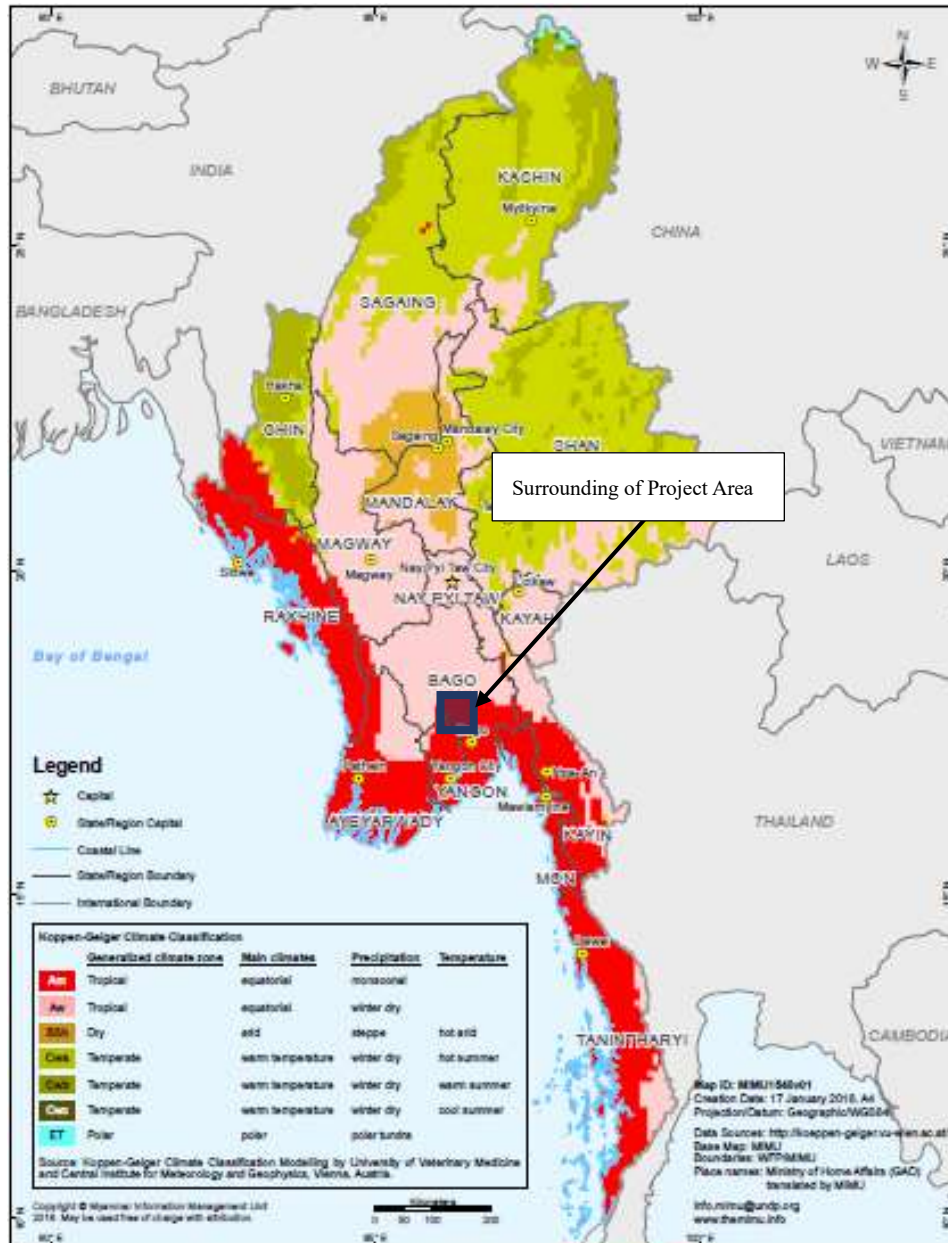
Source: IEE Study Team

**Figure 3.4-1 Route Alternatives for 500 kV Transmission Line**





According to Koppen-Geiger Climate Zones of Myanmar, the Project area has a tropical monsoon (Am) climate characterized by altering the rainy season (from May to October) and the dry season (from November to April). The Koppen-Geiger Climate Zones of Myanmar has been described in Figure 4.1-2 below.



Source: Myanmar Information Management Unit (MIMU)

**Figure 4.1-2 Climate Zone of Project Area**

From 2008 to 2017, the mean annual temperature is 27.6 °C for Yangon City and 27.5 °C for Bago City. For Yangon City, the mean monthly temperature is the highest in April about 30.7 °C and the lowest in January about 24.9 °C. There is a slight difference in the high mean monthly temperature with 30.8 °C in April and lowest with 24.4 °C in January. Except in January, the monthly mean temperatures for both regions are above 25.0 °C. The southwest monsoon wind is the main source of rain, and the both areas

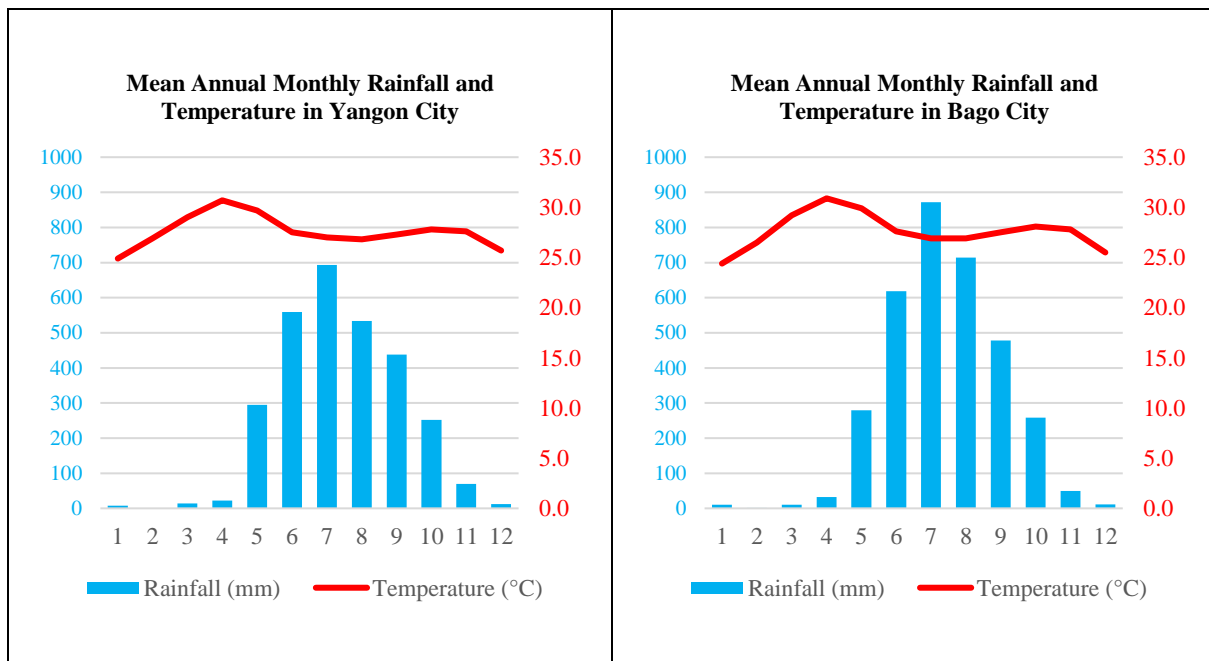
receive rain during the period from May to October. The average annual amount of rainfall is 241 mm in Yangon and 280 mm in Bago. Rainfall of both regions sharply decreases from November till April as shown in Table 4.1-1 and Figure 4.1-3. According to Köppen-Geiger classification: Am, the type of climate is tropical monsoon, which is characterized by alternating wet and dry seasons. The average relative humidity in Yangon is 77% during 2008-2017.

**Table 4.1-1 Mean Annual Monthly Rainfall and Temperature in Yangon City and Bago City (2009 – 2018 Average)**

City	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Yangon City	Mean Rainfall (mm)	8	0	14	22	295	559	693	534	438	252	70	12	241
	Mean Temp (°C)	24.9	26.9	29.0	30.7	29.7	27.5	27.0	26.8	27.3	27.8	27.6	25.7	27.6
Bago City	Mean Rainfall (mm)	10	1	10	32	279	618	872	714	478	258	50	11	278
	Mean Temp (°C)	24.4	26.5	29.2	30.9	29.9	27.6	26.9	26.9	27.5	28.1	27.8	25.5	27.6

Source: Myanmar Statistical Year Book (2018)

Source: Data of the Department of Meteorology and Hydrology, Kaba-aye Station, Yangon



Source: Myanmar Statistical Year Book (2018)

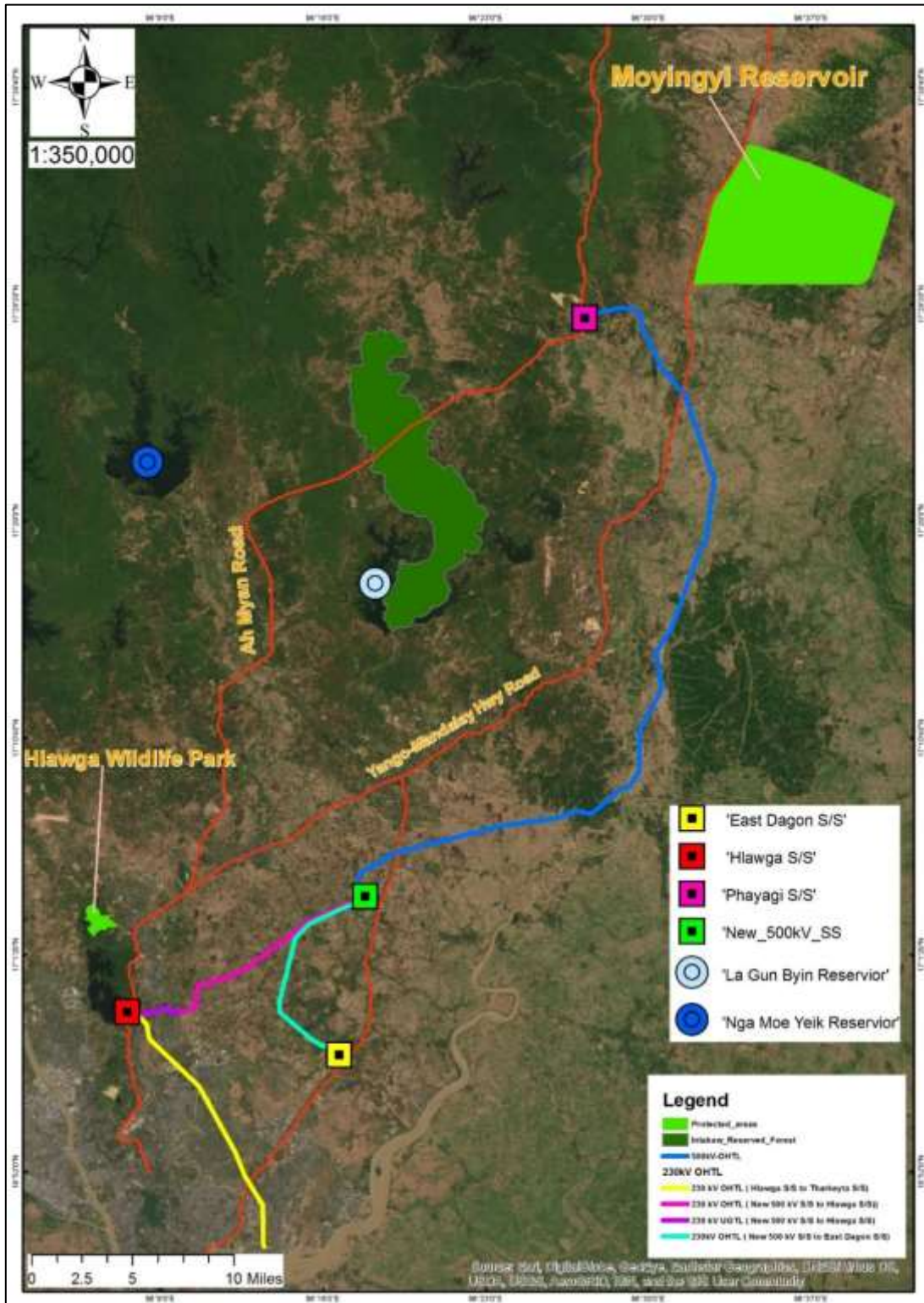
Source: Data of the Department of Meteorology and Hydrology, Kaba-aye Station, Yangon

**Figure 4.1-3 Graphs of Mean Annual Monthly Rainfall and Temperature in Yangon City and Bago City (2009-2018 Average)**

#### **4.1.2 Hydrological Situations**

The main river in the region of Project area is the Bago River and which is a tidal river in the region running between Hpayargyi Substation and Hlegu Substation. The Bago River has its source near Thikkyi in the Bago Yoma. The river flows down from north to south on the east-facing slope of Bago Yoma, which is approximately parallel to the Sittang River. When the river reaches Bago, it turns to the southwest and flows into the sea as the Yangon River. The total length of the river from the source to the mouth at the confluence of the Yangon River is about 260 km (162 miles) long. The Bago River at Bago Gauging Station is clearly influenced by tidal level during the period of low flows.

Around the Project area, there is one tidal creek namely: Pazundaung Creek (upstream as Ngamoeyeik creek) which flowing from north to south and enters the Yangon River.



Source: IEE Study Team

**Figure 4.1-4 Hydrological Situation around the Bago and Yangon Region**

### 4.1.3 Topography

The proposed transmission line will pass-through in Bago, Thanatpin and Kawa Townships in Bago

Region and Hlegu, Mingaladon, Dagon Myothit (East/South/North), North Okkalapa and Thaketa Townships in Yangon region.

**(1) Bago**

Bago township is located at the bottom of the Bago Yoma Range and the western part of the township is a highland area covered with forests. The township lengths 21 miles from east to west and 43 miles from north to south and has an altitude of about 30 m above sea level.

**(2) Thanatpin**

Thanatpin township has a low lying land topography and also has many wetland areas.

**(3) Kawa**

The topography of Kawa township is plain land and is situated on about 13.38 feet above sea level.

**(4) Hlegu**

Hlegu township has a flat-plain surface which is descended from North to South about 45.5 m above the sea level as the North-West and North area of the township is at the edge of the Bago Yoma Range end.

**(5) Mingalardon**

Ngweyar Mountain is situated in the western region of Mingalardon Township and it runs from South to North. Hlawga Lake is situated in the west near Shwe Pyi Thar Township. The rest of the township are plains.

**(6) Dagon Myothit (East/South/North)**

The topography of Dagon Myothit (East/South/North) Township is generally flat, lowland and clay type soil can be found in some areas. The altitude of the area is about 9 m above sea level.

**(7) North Okkalapa**

North Okkalapa has a plain landmass topography.

**(8) Thaketa**

Thaketa Township is located on the peninsula and it has a flat plain topography. Silty soil can be found in this township.

#### **4.1.4 Geological Features**

Studying the regional Geology and Lithology of the Project area, Myanmar Central Belt (MCB) exists between Indo-Burman Ranges and Shan Plateau. Sittaung Fault and Kabaw Fault are bounded in this area. Bago Yoma Range is sitting in the northwest (NW) of the Project area.

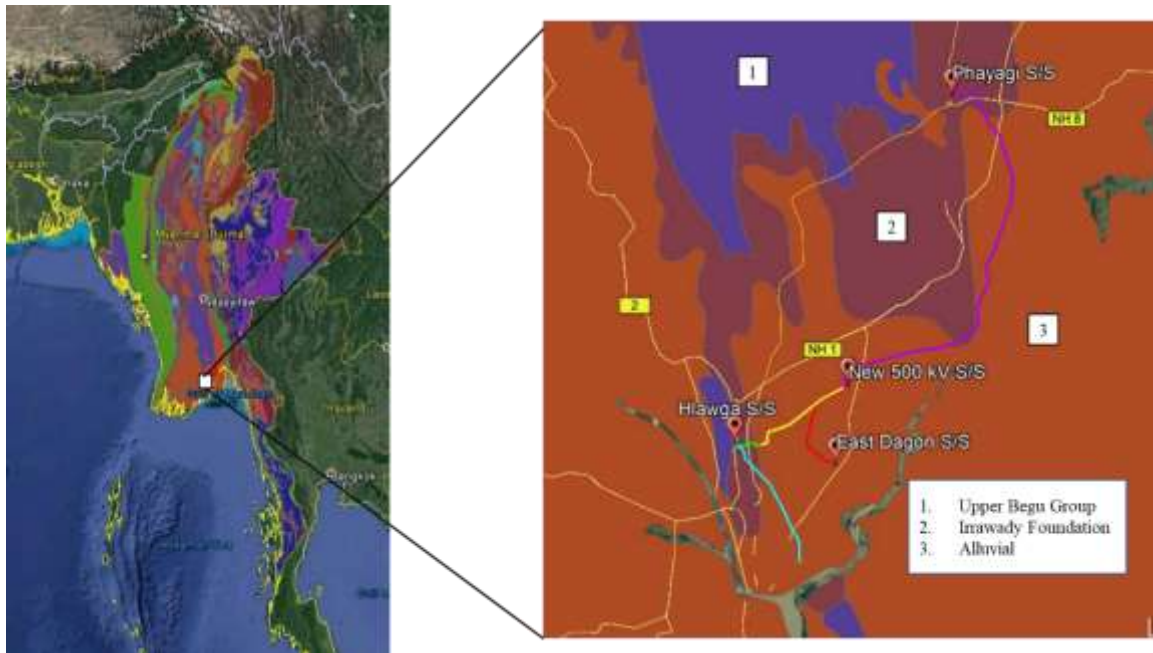


This area is in a North-South trending sediment deposited of Minbu Basin and Bago Yoma Sittaung Basin from the Early Miocene to Holocene -Recent age (Tertiary to Quaternary Period) in the Myanmar Central Belt of Myanmar. Mineral deposited of Minbu Basin is Pyawbwe, Kyaukkok, and Obogon Formation (upper Pegu Group) of Miocene in this area and also has an Alluvium deposit of Holocene and Irrawaddy formation of Miocene-Pliocene age in this place. All of the deposits were 23.7 Million Years Ago to the Present day. This is related to Sagaing Fault and also have Unconformity, Folds and Faults in Myanmar Central Belt. The Lithology of Mineral deposited of Sediments are Shale, Sandstone (Shallow Marine and Deltaic) of the Upper Bago Group, Sandstone, Siltstone, Clay, Conglomerates (Fluvial deposit) of Irrawaddy Formation and Silt and Clay of Recent Alluvial deposits of Holocene age. Most of the deposits are Sedimentary Rock in Myanmar Central Belt. Most of these are formed by Irrawaddy Formation and Recent Alluvial deposits. Table 4.1-2 shows the geological features of the region located near the proposed project area. Figure 4.1-5 shows a geological map in this area.

**Table 4.1-2 Geological Features of the Region Located near the Project Area**

Geological Location	Geological Basin	Geology Formation and Group		Lithology	Deposition Environment
Myanmar Central Belt	Minbu Basin	-	Alluvial	Clay and silt with trace sand	
			Irrawaddy Fm.	Sandstone, Siltstone, Clay, Conglomerates	Fluvial
		Upper Pegu Group	Obogon Fm.	Shale, Sandstone	Shallow marine
			Klyaukkok Fm.	Shale, Sandstone	Shallow marine, Deltaic
	Pegu Yoma Sittaung Basin	-	Pyawbwe Fm.	Shale, Sandstone	Shallow marine
			Alluvial	Clay and silt with trace sand	
		Irrawaddy Fm.	Sandstone, Siltstone, Clay, Conglomerates	Fluvial	

Source: Data from the Geology Department



Source: Geology Department

**Figure 4.1-5 Geological Map of Project Area**

#### **4.1.5 Soil Erosion**

In the Project area, the different varieties of the soil deposited are from the Central Basin of Minbu Basin (Bago Group) and Bago Yoma Sittaung Basin. The rocks mainly found in Bago group are located in the North and Northwest from the center of the project area. The soil mostly occurred in this area is an outcropping from the center of the Project area in the southwest of Bago Yoma Sittaung Basin. They are Alluvial soil and Irrawaddy Formation. The Project area is covered mainly with gravel, sand, silt and clay which grained size and color are in several kinds, and also have forest soil. Bago Group has yellow-brown forest soil and Irrawaddy Formation cover Recent Alluvial soil. Mostly in this area Soil erosion from North to South by wind and water depending on the weather.

#### **4.1.6 Flora/Fauna and Biodiversity**

##### **(1) Flora and Fauna lists in Project Related Townships**

##### **Flora and Fauna lists in Bago Township**

###### Flora

According to secondary data collection and the source of GAD department, there are 60 numbers of various tree species in Bago Township. Eight numbers of tree species are combined as one species and termed as vulnerable (VU), four numbers of species as endangered (EN) and three numbers of species as nearly threatened (NT) according to IUCN Red List (2019-3) in Bago Township. Total nine numbers of species are listed in protected tree species list, which is described in Union Minister Office, MONREC with letter no (127/2019). A list of tree species habituated in Bago township can be seen in Table 4.1-3.



Table 4.1-3 List of Tree Species in Bago Township

No	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
1	<i>Albizzia lebbek</i>	Kokko	Mimosaceae	Tree	NA	
2	<i>Albizzia odotatissima</i>	Thit mangyi	Fabaceae	Tree	NA	
3	<i>Albizzia procera</i>	Sit	Mimosaceae	Tree	NA	
4	<i>Amoora wallichii</i>	Aukchinasa ni	Meliaceae	Tree	LC	
5	<i>Anisoptera scaphula</i>	Kaunghmu	Dipterocarpaceae	Tree	EN	
6	<i>Anogeissus acuminata</i>	Yon	Combretaceae	Tree	NA	
7	<i>Artocarpus chaplasha</i>	Taung Peinne	Moraceae	Tree	NA	
8	<i>Bombax ceiba</i>	Let pan	Bombacaceae	Tree	NA	
9	<i>Calophyllum kunstleri</i>	Tharapi	Calophyllaceae	Tree	NA	
10	<i>Carallia brachiata</i>	Maniawga	Rhizophoraceae	Tree	NA	
11	<i>Castaneopsis species</i>	Thie e	-	Tree	-	
12	<i>Cedrela toona</i>	Thitkado	Meliaceae	Tree	LC	
13	<i>Cedrela serrata</i>	Taung Tama	Meliaceae	Tree	NA	
14	<i>Chukrasia tabularis</i>	Yinma	Meliaceae	Tree	LC	
15	<i>Cinnamomum iners</i>	Hman Thin	Lauraceae	Tree	LC	
16	<i>Cinnamomum inunctum</i>	Karawe	Lauraceae	Tree	NA	
17	<i>Cordia fragrantissima</i>	Sanda wa	Boraginaceae	Tree	NA	
18	<i>Dalbergia cultrata</i>	Yin daik	Fabaceae	Tree	NT	
19	<i>Dalbergia oliveri</i>	Tamalan	Fabaceae	Tree	EN	●
20	<i>Diospyros oblonga</i>	Thit khaya	Ebenaceae	Tree	NA	
21	<i>Diospyros pendula</i>	Magyi pway	Ebenaceae	Tree	NA	
22	<i>Dipterocarpus species</i>	Kanyin	Dipterocarpaceae	Tree	NA	●
23	<i>Dipterocarpus tuberculatus</i>	In	Dipterocarpaceae	Tree	NT	
24	<i>Duabanga grandiflora</i>	Myauk ngo	Lythraceae	Tree	LC	
25	<i>Eugenia species</i>	Tha byay	Myrtaceae	Tree	NA	
26	<i>Fagraea fragrans</i>	Anan	Gentianaceae	Tree	LC	
27	<i>Gardenia coronaria</i>	Yin gat	Rubiaceae	Tree	NA	
28	<i>Garuga pinnata</i>	Chin yoke	Burseraceae	Tree	NA	
29	<i>Gmelina arborea</i>	Ye ma ne	Lamiaceae	Tree	LC	
30	<i>Heritiera fomes</i>	Kanaso	Malvaceae	Tree	EN	●
31	<i>Lagerstroemia speciosa</i>	Pyin ma	Lythraceae	Tree	NA	●

No	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
32	<i>Lansea coromandelica</i>	Nabe	Anacardiaceae	Tree	NA	
33	<i>Madhuca longifolia</i>	Talaing gaung	Sapotaceae	Tree	NA	
34	<i>Mangifera caloneura</i>	Taw thayet	Anacardiaceae	Tree	NA	
35	<i>Melanorrhoea usitata</i>	Thitse	Anacardiaceae	Tree	NA	
36	<i>Mellettia pendula</i>	Thinwin	Fabaceae	Tree	NA	
37	<i>Mesua ferrea</i>	Gan gaw	Calophyllaceae	Tree	NA	
38	<i>Michelia champaca</i>	Saga wa	Magnoliaceae	Tree	LC	
39	<i>Myrtagyna rotundifolia</i>	Binga	Rubiaceae	Tree	NA	
40	<i>Paloquium polyanthum</i>	Peinne bo	Sapotaceae	Tree	NA	
41	<i>Parashorea stelata</i>	Thingadu	Dipterocarpaceae	Tree	NA	
42	<i>Pentace burmanica</i>	Kashit	Malvaceae	Tree	DD	
43	<i>Pentace graffithii</i>	Thit sho	Malvaceae	Tree	NA	
44	<i>Pentacme siamensis</i>	Ingyin	Dipterocarpaceae	Tree	NA	●
45	<i>Pinus species</i>	Htin yu	Pinaceae	Tree	-	●
46	<i>Protium settatum</i>	Tha di	Burseraceae	Tree	NA	
47	<i>Pterocarpus macrocarpus</i>	Padauk	Fabaceae	Tree	EN	
48	<i>Quercus species</i>	Thit cha	-	Tree	-	
49	<i>Sesbania paludosa</i>	Nyan	Fabaceae	Tree	NA	
50	<i>Shorea assamica</i>	Kyilan	Dipterocarpaceae	Tree	LC	
51	<i>Shorea obtusa</i>	Thit ya	Dipterocarpaceae	Tree	NT	
52	<i>Shorea thorelii</i>	Ka nyaung	Dipterocarpaceae	Tree	VU	
53	<i>Spondias pinnata</i>	Gwe	Anacardiaceae	Tree	NA	
54	<i>Swietenia floribunda</i>	Taung Thayet	Anacardiaceae	Tree	NA	
55	<i>Tectona grandis</i>	Kyun (Teak)	Verbenaceae	Tree	NA	●
56	<i>Terminalia chebula</i>	Phan kha	Combretaceae	Tree	NA	
57	<i>Terminalia tomentosa</i>	Taukkyan	Combretaceae	Tree	NA	
58	<i>Tetrameles nudiflora</i>	Baing	Tetramelaceae	Tree	LC	
59	<i>Xulocarpus molluccensis</i>	Kyana	Meliaceae	Tree	NA	
60	<i>Xylia xylocarpa</i>	Pyin ka do	Fabaceae	Tree	LC	●

Note 1: NA= Not Applicable, LC= Least Concerned, DD= Data Deficient, VU= Vulnerable, EN= Endangered, NT= Nearly Threatened

Note 2: ● = Protected tree species list in the whole country, Myanmar

Source: General Administration Departments of related township

## Fauna

Totally eight numbers of tree species were also found in list of fauna species in Bago Township. There are no threatened species occurred in this area. The fauna list of Bago Township can be seen in Table 4.1-4.

**Table 4.1-4 List of fauna in Bago Township**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Cuon alpinus</i>	Asiatic Wild Dog	Canidae	EN
2	<i>Bubalus arnee</i>	Asian buffalo/ water buffalo	Bovidae	EN
3	<i>Elephant species</i>	Elephant	Elephantidae	EN/VU
4	<i>Bos gaurus</i>	Gaun Indian bison	Bovidae	VU
5	<i>Lutra sumatrana</i>	Hairy-nosed Otter	Mustelidae	EN
6	<i>Neofelis nebulosa</i>	Leopard	Felidae	VU
7	<i>Monkey species</i>	Monkeys	-	-
8	<i>Sus scrofa</i>	Wild boar	Suidae	LC

Note: LC = Least Concerned, VU = Vulnerable, EN = Endangered

Source: General Administration Departments of related township

## Flora and Fauna in **Thanatpin** Township

### Flora

According to secondary data collection and the source of GAD department, there are ten numbers of various tree species in **Thanatpin** Township. Among ten species, only one specie is regarded as endangered (EN) according to IUCN Red List (2019-3) in **Thanatpin** Township. List of tree species habituated in **Thanatpin** township can be seen in Table 4.1-5.

**Table 4.1-5 List of Tree Species in Thanatpin Township**

No	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
1	<i>Acacia pennata</i>	Mimosaceae	Suboke gyi	Climber/Creeper	NA	
2	<i>Erythrina fusca</i>	Fabaceae	Kathit	Tree	NA	
3	<i>Tamarindus indica</i>	Caesalpiniaceae	Mangyi	Tree	NA	
4	<i>Albizia lebbek</i>	Mimosaceae	Kokko	Tree	LC	
5	<i>Ziziphus jujuba</i>	Rhamnaceae	Zi	Tree	LC	
6	<i>Mangifera indica</i>	Anacardiaceae	Thayet	Tree	DD	
7	<i>Cocas nucifera</i>	Arecaceae	Ohn	Tree	NA	

No	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
8	<i>Borassus flabellifer</i>	Arecaceae	Htan	Tree	EN	
9	<i>Psidium guajava</i>	Myrtaceae	Malaka	Small Tree	NA	
10	<i>Musa sapientum</i>	Musaceae	Nget pyaw	Herb	NA	

Note 1: NA= Not Applicable, LC= Least Concerned, DD= Data Deficient, VU= Vulnerable, EN= Endangered, NT= Nearly Threatened

Note 2: ● = Protected tree species list in the whole country, Myanmar

Source: General Administration Departments of related township, IUCN red list

## Fauna

There is a total of 15 fauna species in **Thanatpin** Township and they are not included in the list of threatened species. The fauna list of Bago Township can be seen in Table 4.1-6.

**Table 4.1-6 List of fauna species in Thanatpin Township**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Bandicota bengalensis</i>	Lesser Bandicoot Rat	Muridae	LC
2	<i>Fejervarya limnocharis</i>	Paddy frog	Dicroglossidae	LC
3	<i>Ptyas mucosa</i>	Indian Rat Snake	Colubridae	-
4	<i>Anguilliformes</i>	Eel	Actinopterygii	-
5	<i>Macrobrachium rosenbergil</i>	Fresh Water Prawn	Palaemonidae	-
6	<i>Brachyura</i>	Fresh Crab	Malacostraca	-
7	<i>Bubalus bubalis</i>	Water Buffalo	Bovidae	-
8	<i>Bos taurus</i>	Ox	Bovidae	-
9	<i>Gallus gallus domesticus</i>	Chicken	Phasianidae	-
10	<i>Anas platyrhynchos</i>	Duck	Anatidae	LC
11	<i>Sus scrofa scrofa Linnaeus</i>	Pig	Suidae	-
11	<i>Ovis aries</i>	Sheep	Bovidae	-
12	<i>Capra aegagrus hircus</i>	Goat	Bovidae	-
13	<i>Coturnix japonica domestica</i>	Quail	Phasianidae	-
14	<i>Canis lupus familiaris</i>	Dog	Canidae	-
15	<i>Felis catus</i>	Cat	Felidae	-

Note: LC = Least Concerned, VU = Vulnerable, EN = Endangered

Source: General Administration Departments of related township, IUCN red list

## Flora and Fauna lists in **Kawa** Township

### Flora

According to secondary data collection and the source of GAD department, there are twelve various tree species in Kawa Township. Among twelve species, only one specie is regarded as endangered (EN) according to IUCN Red List (2019-3). The list of tree species habituated in **Kawa** township can be seen in Table 4.1-7.

**Table 4.1-7 List of Tree Species in Kawa Township**

No	Scientific Name	Family	Local Name	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
1	<i>Albizia lebbek</i>	Mimosaceae	Kokko	Tree	LC	
2	<i>Lagerstroemia reginae</i>	Lythraceae	Pyin ma	Tree	NA	
3	<i>Baccaurea sapida</i>	Euphorbiaceae	Kanazo	Tree	NA	
4	<i>Ficus rumphii</i>	Moraceae	Nyaung	Tree	NA	
5	<i>Syzygium grande</i>	Myrtaceae	Thabye gyi	Tree	NA	
6	<i>Cocas nucifera</i>	Arecaceae	Ohn	Tree	NA	
7	<i>Borassus flabellifer</i>	Arecaceae	Htan	Tree	EN	
8	<i>Mangifera indica</i>	Anacardiaceae	Thayet	Tree	DD	
9	<i>Delonix regia</i>	Caesalpiniaceae	Sein pan	Tree	LC	
10	<i>Nypa fruticans</i>	Arecaceae	Dani	Small Tree	LC	
11	<i>Senna siamea</i>	Caesalpiniaceae	Mazali	Tree	NA	
12	<i>Eragrostis brownii</i>	Poaceae	Thaman myet	Grass	NA	

Note 1: NA= Not Applicable, LC= Least Concerned, DD= Data Deficient, VU= Vulnerable, EN= Endangered, NT= Nearly Threatened

Note 2: ● = Protected tree species list in the whole country, Myanmar

Source: General Administration Departments of related township, IUCN red list

### Fauna

There are totally eight numbers of fauna species were also found in Kawa Township and they are not included in the threatened species. The fauna list of Kawa Township can be seen in Table 4.1-8.

**Table 4.1-8 List of fauna species in Kawa Township**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Felis chaus</i>	Jungle Cat	Felidae	LC
2	-	Squirrels	Sciuridae	NA
3	-	Mongoose	Herpestidae	LC

No	Scientific Name	Common Name	Family	IUCN (2019-3)
4	-	Various kind of snakes	Serpentes	NA
5	-	Various kind of birds	-	NA
6	<i>Dendrocygna javanica</i>	Lesser Tree Duck	Anatidae	LC

Note: LC = Least Concerned, NA=Not Applicable

Source: General Administration Departments of related township, IUCN red list

According to GAD, there is no flora and fauna in Dagon Myo Thit (North), North Okkalapa and Thaketa Township.

### Flora and Fauna list in Hlegu Township

#### Flora

The total number of 10 tree species is founded in Hlegu Township, North Yangon District, Yangon Region. A tree species (*Dipterocarpus baudii*) is termed as vulnerable according to IUCN Red List (2019-3) and other tree species are not applicable (NA) and less concerned (LC). *Tectona grandis* (Kyun) can be found as protected tree species, which is protected by the Union Minister Office, MONREC described in letter no (127/2019). List of tree species that occurred in Hlegu township can be seen in Table 4.1-9.

**Table 4.1-9 List of Tree Species in Hlegu Township**

No.	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
1	<i>Carallia brachiata</i>	Maniawga	Rhizophoraceae	Tree	NA	
2	<i>Dipterocarpus baudii</i>	Ka nyin	Dipterocarpaceae	Tree	VU	
3	<i>Garuga pinnata</i>	Chin yoke	Burseraceae	Tree	NA	
4	<i>Gmelina arborea</i>	Ye ma ne	Lamiaceae	Tree	LC	
5	<i>Lagerstroemia tomentosa</i>	Leza	Lythraceae	Tree	NA	
6	<i>Microcos paniculata</i>	Mya ya	Malvaceae	Tree	LC	
7	<i>Protium settatum</i>	Tha di	Burseraceae	Tree	NA	
8	<i>Swintonia floribunda</i>	Taung Thayet	Anacardiaceae	Tree	NA	
9	<i>Tectona grandis</i>	Teak (Kyun)	Verbenaceae	Tree	NA	●
10	<i>Xylia xylocarpa</i>	Pyin ka doe	Fabaceae	Tree	LC	

Note 1: NA= Not Applicable, LC= Least Concerned, VU= Vulnerable

Note 2: ● = Protected tree species list in the whole country, Myanmar

Source: General Administration Departments of related township, IUCN red list

#### Fauna

There are total 6 numbers of fauna species in Hlegu Township area. *Manispenta dactyls* (Chinese

Pangolin) species are mostly found in this township. Among them, 3 numbers are included in the vulnerable species and two numbers in the endangered species and one in less concerned. The fauna list of Bago Township can be seen in Table 4.1-10.

**Table 4.1-10 List of fauna species in Hlegu Township**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Sus scrofa</i>	Wild boar	Suidae	LC
2	<i>Rusa unicolor</i>	Samban sambar deer	Cervidae	VU
3	<i>Cuon alpinus</i>	Dhole Asiatic Wild Dog	Canidae	EN
4	<i>Petinomys vordermanni</i>	Vordermann's flying squirrel (Shu pyan)	Sciuridae	VU
5	<i>Manispena dactyla</i>	Chinese pangolin	Manidae	CR
6	<i>Aceros nipalensis</i>	Rufous-necked hornbill (Aung Laung)	Bucerotidae	VU

Note 1: NA= Not Applicable, LC= Least Concerned, VU= Vulnerable, EN=Endangered

Source: General Administration Departments of related township, IUCN red list

#### Flora list in Mingalardon Township

The total 4 numbers of tree species were occurred in Mingalardon Township, North Yangon District, Yangon Region. All these species are not applicable (NA) to IUCH lists and less concerned (LC). One number of protected tree species listed by Myanmar as *Tectona grandis* was occurred in Mingalardon Township. List of tree species that occurred in Mingalardon township can be seen in Table 4.1-11.

**Table 4.1-11 List of Tree Species in Mingalardon Township**

No.	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)	Protected Tree Species List in Myanmar
1	<i>Sonneratia caseolaris</i>	Lamu	Lythraceae	Tree	LC	
2	<i>Nypa fruticans</i>	Dani	Arecaceae	Small Tree	LC	
3	<i>Tectona grandis</i>	Teak (Kyun)	Verbenaceae	Tree	NA	●
4	<i>Xylia xylocarpa</i>	Pyin ka do	Fabaceae	Tree	LC	

Note 1: NA = Not Applicable, LC = Least Concerned

Note 2: ● = Protected tree species list in Myanmar

Source: General Administration Departments of related township, IUCN red list

#### Flora list in Dagon Myothit (East) Township

The total 2 numbers of tree species, Dani (*Nypa fruticans*) and Lamu (*Sonneratia caseolaris*) species can be found in Dagon Myothit (East) Township and they are mangrove species. The list of tree species



that occurred in Dagon Myothit (East) township can be seen in Table 4.1-12..

**Table 4.1-12 List of Tree Species in Dagon Myothit (East) Township**

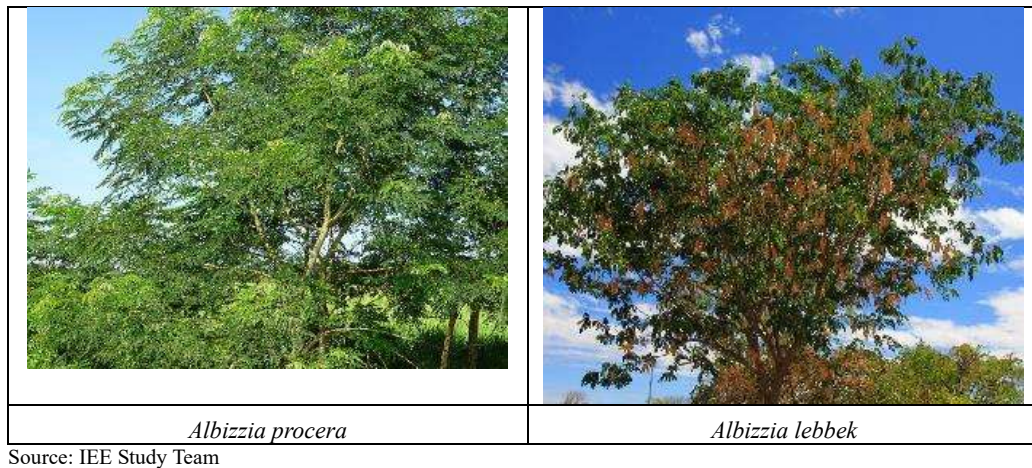
No.	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)
1	<i>Nypa fruticans</i>	Dani	Arecaceae	Small Tree	LC
2	<i>Sonneratia caseolaris</i>	Lamu	Lythraceae	Tree	LC

Note: LC = Least Concerned

Source: General Administration Departments of related township, IUCN red list

	
<i>Bombax ceiba</i>	<i>Tectona grandis</i>
	
<i>Michelia champaca</i>	<i>Pterocarpus macrocarpus</i>
	
<i>Dalbergia cultrata</i>	<i>Sonneratia caseolaris</i>





**Figure 4.1-6 Photos of Some Tree Species**

### Flora list in Dagon Myo Thit (South) Township

There are trees such as Banda, Khayar, Okhne and Bamboo in Dagon Myothit (South) Township and they are listed in the following table.

**Table 4.1-13 List of Tree Species in Dagon Myothit (East) Township**

No.	Scientific Name	Local Name	Family	Habit	IUCN (2019-3)
1	<i>Terminalia Catappa</i>	Banda	Combretaceae	Tree	NA
2	<i>Streblus Asper</i>	Okhne	Moraceae	Tree	NA
3	<i>Cordia Dichotoma</i>	Thanat	Boraginaceae	Tree	NA
4	<i>Agrwmone Mexican</i>	Khayar	Papaveraceae	Shrub	NA
5	-	Bamboo	-	Tree	-

Source: General Administration Departments of related township, IUCN red list

### (2) Protected Areas Near the Project Site

The Republic of The Union of Myanmar is a golden country, blessed with natural resources, unique ecosystems, and biodiversity richness. However, in recent decades, an increase in population, unsustainable overexploitation of natural resources had led to a steady decline of natural resources. To prevent such deplorable situations, Forest Department, under the administration of the Ministry of Natural Resources and Environmental Conservation, established protected areas to conserve precious natural resources and biodiversity of Myanmar. In the present, 40 protected areas were notified, covering 5.79% of the country's area<sup>1</sup>. The purposes of the establishment of protected areas are-

- To implement the National Environmental Protection and Biodiversity Conservation Policy;

<sup>1</sup> <https://myanmar.wcs.org/News/articleType/ArticleView/articleId/11293.aspx>

- To protect Ecosystems and the natural vegetation, Wildlife that thrives, Seasonal migratory animals, the native flora and fauna found only in Myanmar;
- To develop natural science research;
- And to implement the participatory management system in order to be more effective in the conservation of natural resources.

Moreover, the ‘Protected Areas System’ includes Nature Reserves and Wildlife Sanctuaries; these cannot be exploited.

### Hlawga Wildlife Park

Near the Hlawga substation, Hlawga Wildlife Park is located 35 km north of Yangon, and the area is 6.2 km<sup>2</sup>, including a wildlife park (3.1 km<sup>2</sup>), a mini-zoo (0.3 km<sup>2</sup>) and a buffer zone (2.7 km<sup>2</sup>). The Park was established in 1982 to establish an environmental education center near Yangon, to protect the forests and vegetative cover in the catchment of Hlawga Lake, to establish a representative collection of Myanmar indigenous wildlife species of mammals, reptiles and birds, and kept under as near as possible natural conditions in such a way that they can be readily viewed by visitors.

Hlawga Wildlife Park is an open zoo created in 1982 by the Forest Department in the proximity of Yangon with the objectives of providing environmental education facilities, protecting the forest and plant cover in the catchment of the Hlawga Lake, and establishing a representative collection of Myanmar indigenous plants and wildlife species. In 2010 the site passed to joint management of NWCD and private entities.

The site preserves three types of habitat: evergreen forests, mixed deciduous forests, and swamp forests. 108 tree species have been identified. Common tree species are *Dipterocarps*.

*Deciduous* species like teak (*Tectona grandis*) are also found. Barking deer, hog deer, and wild boar are the most common of the 12-mammal species from the retrieved checklist. The overpopulation of non-native macaques (*Macaca spp.*) is negatively influencing the ecological balance of the site. Resident and migratory birds are abundant inside the park, with 191 identified species.

The site is visited every year by more than 100,000 local tourists and 400 foreigners, mainly coming from Yangon City. Tourists can use park facilities (tea shops, picnic sites, recreation sites, aviary, mini-zoo, biodiversity museum, environmental education center, and chalets).

**Table 4.1-14 List of Bird Species in Hlawga Wildlife Park, Yangon**

No	Scientific Name	Common Name	Family	IUCN
1	<i>Acridotheres tristis</i>	Common Myna	STURNIDAE	LC
2	<i>Aegithina tiphia</i>	Common Iora	AEGITHINIDAE	LC
3	<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck	ANTIDAE	LC
4	<i>Anastomus oscitans</i>	Asian Openbill	PODICIPEDIDAE	LC

No	Scientific Name	Common Name	Family	IUCN
5	<i>Aviceda leuphotes</i>	Black Baza	ACCIPITRIDAE	LC
6	<i>Bubulcus coromandus</i>	Eastern Cattle Egret	ARDEIDAE	NE
7	<i>Centropus sinensis</i>	Greater Coucal	CUCULIDAE	LC
8	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	NECTARINIIDAE	LC
9	<i>Coracias benghalensis</i>	Indian Roller	CORACIIDAE	LC
10	<i>Coracina melaschistos</i>	Black-winged Cuckooshrike	CAMPEPHAGIDAE	NE
11	<i>Corvus splendens</i>	House Crow	CORVIDAE	LC
12	<i>Crypsirina temia</i>	Racket-tailed Treepie	CORVIDAE	LC
13	<i>Cypsiurus balas</i>	Asian Palm Shwift	APODIDAE	LC
14	<i>Dendrocygna javanica</i>	Lesser Whistling Duck	ANTIDAE	LC
15	<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker	DICAEIDAE	LC
16	<i>Dicrurus leucophaeus</i>	Dusky Warbler	DICRURIDAE	LC
17	<i>Dicrurus leucophaeus</i>	Hair-crested Drongo	DICRURIDAE	LC
18	<i>Dicrurus macrocercus</i>	Black Drongo	DICRURIDAE	LC
19	<i>Elanus caeruleus</i>	Black-shouldered Kite	FALCONIDAE:	LC
20	<i>Eumyias thalassina</i>	Verditer Flycatcher	MUSCICAPIDAE	LC
21	<i>Garrulax leucolophus</i>	White-crested Laughingthrush	LEIOTHRICHIDAE	LC
22	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	ALCEDINIDAE	LC
23	<i>Hirundo rustica</i>	Barn Swallow	HIRUNDINIDAE	LC
24	<i>Lanius cristatus</i>	Brown Shrike	LANIIDAE	LC
25	<i>Megalaima haemaccephala</i>	Coppersmith Barbet	RAMPHASTIDAE	LC
26	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater	MEROPIDAE	LC
27	<i>Metopidius indicus</i>	Bronze-winged Jacana	JACANIDAE	LC
28	<i>Oriolus chinensis</i>	Black-naped Oriole	ORIOOLIDAE	LC
29	<i>Orthotomus sutorius</i>	Common Tailorbird	CISTICOLIDAE	LC
30	<i>Pandion baliaetus</i>	Osprey	CORACIIDAE	NE
31	<i>Pbalacrocorax niger</i>	Little Cormorant	PHALACROCORACIDAE	NE
32	<i>Pericrocotus cantonensis</i>	Swinhoe's Minivet	CAMPEPHAGIDAE	LC
33	<i>Pericrocotus divaricatus</i>	Ashy Minivet	CAMPEPHAGIDAE	LC
34	<i>Phylloscopus fuscatus</i>	Dusky Warbler	PHYLLOSCOPIIDAE	LC
35	<i>Puff-throated Babbler</i>	Pellorneum ruficeps	PELLORNEIDAE	LC
36	<i>Pycnonotus blanfordi</i>	Streak-eared Bulbul	PYCNONOTIDAE	LC
37	<i>Pycnonotus cafer</i>	Red-vented Bulbul	PYCNONOTIDAE	LC
38	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	PYCNONOTIDAE	LC
39	<i>Pycnonotus melanicterus</i>	Black-crested Bulbul	PYCNONOTIDAE	LC

No	Scientific Name	Common Name	Family	IUCN
40	<i>Streptopelia chinensis</i>	Spotted Dove	COLUMBIDAE:	NE
41	<i>Streptopelia tranquebarica</i>	Red Collared Dove	COLUMBIDAE:	LC
42	<i>Tachybaptus ruficollis</i>	Little Grebe	PODICIPEDIDAE	NE
43	<i>Treron phoenicoptera</i>	Yellow-fronted Green Pigeon	COLUMBIDAE:	NE
44	<i>Turdoides gularis</i>	White-throated Babbler	TIMALIIDAE	LC

Source: Announcement letter from MONREC

**Table 4.1-15 List of Mammal Species in Hlawga Wildlife Park, Yangon**

No.	Scientific Name	Common Name	Family	IUCN
1	<i>Panolia eldii</i>	Eld Deer	CERVIDAE	EN
2	<i>Hyelaphus porcinus</i>	Golden Deer	CERVIDAE	EN
3	<i>Rhesus macaque</i>	Monkey	CERCOPITHECIDAE	LC
4	<i>Manis javanica</i>	Pangolin	MANIDAE	CR

Source: Announcement letter from MONREC

**Table 4.1-16 List of Reptile Species in Hlawga Wildlife Park, Yangon**

No.	Scientific Name	Common Name	Family	IUCN
1	<i>Bungarus fasciatus</i>	Kraits	ELAPIDAE	LC
2	<i>Varanus albigularis</i>	Monitor Lizard	VARANIDAE	LC
3	<i>Naja kaouthia</i>	Cobra	ELAPIDAE	LC
4	<i>Python bivittatus</i>	Burmese Python	PYTHONIDAE	VU

Source: Announcement letter from MONREC

There are many numbers of flora in Hlawga Wildlife Park. *Tenctona grandis* (Teak), *Lagerstroemia speciosa* (Pyin ma), *Pterocarpus macrocarpus* (Thit Padauk) and *Xylia xylocarpa* (Pyin ka doe) are the protected tree species according to Notification Letter No. (127/2019) from MONREC. *Shorea oblongifolia* (Thit ya), *Anisoptera scaphula* (Kaung mu), *Dipterocarpus grandifloras* (Kanyin) and *Dipterocarpus tuberculatus* (In) species are listed in IUCN Red List (2019-3) version.

**Table 4.1-17 List of Some Flora in Hlawga Wildlife Park in Yangon**

No	Scientific Name	Local Name	Family	Habit	IUCN
1	<i>Albizia procera</i>	Sit	Mimosaceae	Tree	LC
2	<i>Anisoptera scaphula</i>	Kaung mu	Dipterocarpaceae	Tree	EN
3	<i>Anogeissus acuminata</i>	Yon	Combretaceae	Tree	NE
4	<i>Anthocephalus cadamba</i>	Ma U let tan she	Rubiaceae	Tree	NE
5	<i>Bambusa Polymorpha</i>	Kya thaung	Poaceae	Bamboo	NE
6	<i>Carallia brachiata</i>	Maniawga	Rhizophoraceae	Tree	NE
7	<i>Cephalostachy pergracile</i>	Tin	Poaceae	Bamboo	NE

No	Scientific Name	Local Name	Family	Habit	IUCN
8	<i>Dipterocarpus grandiflorus</i>	Kanyin	Dipterocarpaceae	Tree	EN
9	<i>Dipterocarpus tuberculatus</i>	In	Dipterocarpaceae	Tree	NT
10	<i>Homalium tomentosum</i>	Myauk chaw	Salicaceae	Tree	NE
11	<i>Lagerstroemia speciosa</i> *	Pyin ma	Lythraceae	Tree	NE
12	<i>Pentacme siamensis</i>	Ingyin	Dipterocarpaceae	Tree	LC
13	<i>Pterocarpus macrocarpus</i> *	Thit Padauk	Fabaceae	Tree	EN
14	<i>Shorea oblongifolia</i>	Thit ya	Dipterocarpaceae	Tree	CR
15	<i>Simarouba gluca</i>	Sithapyay	Simaroubaceae	Tree	NE
16	<i>Sterculia campanulata</i>	Shaw pyar	Malvaceae	Tree	NE
17	<i>Swintonia floribunda</i>	Taung tha yet	Heliconiaceae	Tree	NE
18	<i>Tectona grandis</i> *	Kyun (Teak)	Verbenaceae	Tree	NE
19	<i>Terminalia bellerica</i>	Thit seint	Combretaceae	Tree	NE
20	<i>Terminalia chebula</i>	Phan kha	Bombacaceae	Tree	NE
21	<i>Terminalia tomentosa</i>	Htuk kyant	Combretaceae	Tree	NE
22	<i>Xylia xylocarpa</i> *	Pyin ka doe	Mimosaceae	Tree	NE

Note: \* = Protected Tree Species in The Whole Region of Myanmar

Source: Announcement letter from MONREC

### Moeyungyi Wetland Sanctuary

Another protected area, Moeyungyi Wetland Sanctuary is located near the Hpayargyi Substation. Moeyungyi Wetland Sanctuary is one of the RAMSAR site in Myanmar, which is located between Bago Township and Waw Township, about 70 miles from Yangon. It occupies an area of 103.6 square kilometers (40 sq.-mi).

The area was originally constructed as a reservoir to provide water to the Bago-Sittaung canal (linking the Bago and Sittaung rivers) for transport of timber by boat. However, the site now functions as a source of fresh water for downstream areas where rice cultivation takes place. It floods in the wet season (May-October), and from October to March hosts over 20,000 migratory water birds. These include the globally threatened Baer's Pochard *Aythya baeri*, Sarus Crane *Grus antigone* and Greater Spotted Eagle *Aquila clanga*, as well as >1% of the regional population of the Northern Pintail *Anas acuta*. The site is also important for supporting the vulnerable Burmese Eyed Turtle *Morenia ocellata*. Moeyungyi is a vital shelter for both resident and migratory waterfowls. A census at Moeyungyi revealed that there are 135 species of water birds including 70 species of migrants.

**Table 4.1-18 Bird Species List in Moeyungyi Wildlife Sanctuary**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Accipiter badius</i>	Shikra	Accipitridae	NA

No	Scientific Name	Common Name	Family	IUCN (2019-3)
2	<i>Acridotheres fuscus</i>	Jungle Myna	Sturnidae	LC
3	<i>Acridotheres grandis</i>	White-vented Myna	Sturnidae	LC
4	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	LC
5	<i>Acrocephalus aedon</i>	Thick-billed Warbler	Acrocephalidae	LC
6	<i>Acrocephalus agricola</i>	Paddy-field Warbler	Acrocephalidae	LC
7	<i>Acrocephalus bistrigiceps</i>	Black browed reed Warbler	Acrocephalidae	LC
8	<i>Acrocephalus concinens</i>	Blunt Winged Warbler	Acrocephalidae	LC
9	<i>Acrocephalus orientalis</i>	Oriental Reed Warbler	Acrocephalidae	LC
10	<i>Actitis hypoleucos</i>	Common Sandpiper	Scolopacidae	LC
11	<i>Aegithina tiphia</i>	Common Iora	Aegithinidae	LC
12	<i>Alauda gulgula</i>	Oriental Skylark	Alaudidae	LC
13	<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	LC
14	<i>Amauornis phoenicurus</i>	White-breasted Waterhen	Rallidae	LC
15	<i>Anas acuta</i>	Northern Pintail	Anatidae	LC
16	<i>Anas poecilorhyncha</i>	Spot-billed Duck	Anatidae	LC
17	<i>Anas querquedula</i>	Garganey	Anatidae	LC
18	<i>Anastomus oscitans</i>	Asian Openbill	Ciconiidae	LC
19	<i>Anhinga melanogaster</i>	Oriental Dater	Anhingidae	NT
20	<i>Anthus cervinus</i>	Red-throated Pipit	Motacillidae	LC
21	<i>Anthus rufulus</i>	Paddy field Pipit	Motacillidae	LC
22	<i>Ardea cinerea</i>	Grey-Heron	Ardeidae	LC
23	<i>Ardea purpurea</i>	Purple-Heron	Ardeidae	LC
24	<i>Ardeola bacchus</i>	Chinese Pond-Heron	Ardeidae	LC
25	<i>Ardeola grayi</i>	Indian pond Heron	Ardeidae	LC
26	<i>Ardeola speciosa</i>	Javan Pond -Heron	Ardeidae	LC
27	<i>Artamus fuscus</i>	Ashy Wood Swallow	Artamidae	NA
28	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	LC
29	<i>Casmerodius albus</i>	Great Egret	Ardeidae	LC
30	<i>Centropus bengalensis</i>	Lesser Coucal	Cuculidae	LC
31	<i>Centropus sinensis</i>	Greater Coucal	Cuculidae	LC
32	<i>Charadrius dubius</i>	Little Ringed Plover	Charadriidae	LC
33	<i>Charadrius leschenaultii</i>	Greater Sand-Plover	Charadriidae	LC
34	<i>Charadrius mongolus</i>	Lesser Sand-Plover	Charadriidae	LC
35	<i>Chlidonias hybridus</i>	Whiskered Tern	Laridae	LC

No	Scientific Name	Common Name	Family	IUCN (2019-3)
36	<i>Chlidonias leucopterus</i>	White-winged Tern	Laridae	LC
37	<i>Circus aeruginosus</i>	Western Marsh-Harrier	Accipitridae	NA
38	<i>Circus cyaneus</i>	Hen-Harrier	Accipitridae	LC
39	<i>Circus melanoleucos</i>	Pied Harrier	Accipitridae	LC
40	<i>Circus spilonotus</i>	Eastern Marsh-Harrier	Accipitridae	LC
41	<i>Cisticola juncidis</i>	Zitting Cisticola	Cisticolidae	LC
42	<i>Columbia livia</i>	Rock Pigeon	Columbidae	NA
43	<i>Copsychus saularis</i>	Oriental Magpie Robin	Muscicapidae	LC
44	<i>Corvus splendens</i>	House crow	Corvidae	LC
45	<i>Cypsiurus babs</i>	Asian palm-Swift	Apodidae	LC
46	<i>Delichon dasypus</i>	Asian House Martin	Hirundinidae	LC
47	<i>Dendrocygna javanica</i>	Lesser Whistling - Duck	Anatidae	LC
48	<i>Dendronanthus indicus</i>	Forest Wagtail	Motacillidae	LC
49	<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker	Dicaeidae	LC
50	<i>Dicrurus macrocercus</i>	Black Dongo	Dicruridae	LC
51	<i>Egretta garzetta</i>	Little Egret	Ardeidae	LC
52	<i>Elanus caeruleus</i>	Black-Shouldered Kite	Accipitridae	LC
53	<i>Ficedula parva</i>	Red-throated Flycatcher	Muscicapidae	LC
54	<i>Fulica atra</i>	Common coot	Rallidae	LC
55	<i>Gallinula cinerea</i>	Watercock	Rallidae	LC
56	<i>Gallinago gallinago</i>	Common Snipe	Scolopacidae	LC
57	<i>Gallinula chloropus</i>	Common Moorhen	Rallidae	LC
58	<i>Gallirallus striatus</i>	Salty-breasted Rail	Rallidae	LC
59	<i>Gcomantis merulinus</i>	Plaintive Cuckoo	Cuculidae	LC
60	<i>Glareola maldivarum</i>	Oriental Pratincole	Glareolidae	LC
61	<i>Grus antigone</i>	Sarus Crane	Gruidae	VU
62	<i>Halycon pileala</i>	Black-capped Kingfisher	Alcedinidae	LC
63	<i>Halycon smyrnensis</i>	White-throated Kingfisher	Alcedinidae	LC
64	<i>Himantopus himantopus</i>	Black winged Stilt	Recurvirostridae	LC
65	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae	LC
66	<i>Hirundo striolata</i>	Straited Swallow	Hirundinidae	NA
67	<i>Hirundo tabitica</i>	Pacific Swallow	Hirundinidae	NA
68	<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana	Jacanidae	LC
69	<i>Ictinaetus malayensis</i>	Black Eagle	Accipitridae	LC



No	Scientific Name	Common Name	Family	IUCN (2019-3)
70	<i>Ixobrychus cinnamoneus</i>	Cinnamon Bitten	Ardeidae	NA
71	<i>Ixobrychus sinensis</i>	Yellow Bittern	Ardeidae	LC
72	<i>Lanius cristatus</i>	Brown Shrike	Laniidae	LC
73	<i>Lanius schach</i>	Long-tailed Shrike	Laniidae	LC
74	<i>Larus brunnecephalus</i>	Brown-headed Gull	Laridae	LC
75	<i>Leptoptilos javanicus</i>	Lesser adjutant stork	Ciconiidae	VU
76	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Estrildidae	LC
77	<i>Lonchura striata</i>	White-rumped Munia	Estrildidae	LC
78	<i>Megalurus palustris</i>	Striated Grassbird	Locustellidae	LC
79	<i>Merops orientalis</i>	Green Bee-eater	Meropidae	LC
80	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Meropidae	LC
81	<i>Mesophoyx intermedia</i>	Intermediate Egret	Ardeidae	NA
82	<i>Metopidius indicus</i>	Bronze-winged Jacana	Jacanidae	LC
83	<i>Milvus mgrans</i>	Black-Kite	Accipitridae	NA
84	<i>Motacil flava</i>	Yellow Wagtail	Motacillidae	LC
85	<i>Motacil citreola</i>	Citrine Wagtail	Motacillidae	LC
86	<i>Motacill alba</i>	White Wagtail	Motacillidae	LC
87	<i>Motacill cinerea</i>	Grey Wagtail	Motacillidae	LC
88	<i>Mycteria leucocephala</i>	Painted Stork	Ciconiidae	NT
89	<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	Anatidae	LC
90	<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Ardeidae	LC
91	<i>Oriolus chinensis</i>	Black-naped Oriole	Oriolidae	LC
92	<i>Orthotomus sutorius</i>	Common Tailorbird	Cisticolidae	NA
93	<i>Passer domesticus</i>	House sparrow	Passeridae	LC
94	<i>Passer montanus</i>	Eurasian Tree-Sparrow	Passeridae	LC
95	<i>Pelecanus philippensis</i>	Spot-billed Pelican	Pelecanidae	NT
96	<i>Phalacrocorax carbo</i>	Great Cormorant	Phalacrocoracidae	LC
97	<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	LC
98	<i>Phylloscopus fuscatus</i>	Dusky Warbler	Phylloscopidae	LC
99	<i>Plegadis falcinellus</i>	Glossy Ibis	Threskiornithidae	LC
100	<i>Ploceus hypoxanthus</i>	Asian Golden Weaver	Ploceidae	NT
101	<i>Ploceus manyar</i>	Streaked Weaver	Ploceidae	LC
102	<i>Ploceus philippinus</i>	Baya Weaver	Ploceidae	LC
103	<i>Pluvialis fulva</i>	Pacific Golden Plover	Charadriidae	LC

No	Scientific Name	Common Name	Family	IUCN (2019-3)
104	<i>Porphyrio porphyrio</i>	Purple Swampphen	Rallidae	LC
105	<i>Porzana fusca</i>	Ruddy-breasted Crake	Rallidae	LC
106	<i>Prinia inornata</i>	Plaing Prinia	Cisticolidae	LC
107	<i>Pycnonotus blanfordi</i>	Streak-eared Bulbul	Pycnonotidae	LC
108	<i>Pycnonotus cafer</i>	Red-Vented Bulbul	Pycnonotidae	LC
109	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Pycnonotidae	LC
110	<i>Rallus aquaticus</i>	Water Rail	Rallidae	LC
111	<i>Riparia paludicola</i>	Plain Martin	Hirundinidae	LC
112	<i>Riparia riparia</i>	Common sand Martin	Hirundinidae	NA
113	<i>Saxicola caprata</i>	Pied Bushchat	Muscicapidae	LC
114	<i>Saxicola leucura</i>	White tailed Stonechat	Muscicapidae	LC
115	<i>Saxicola maura</i>	Siberian Stonechat	Muscicapidae	LC
116	<i>Sterna acuticauda</i>	Black-bellied Tern	Laridae	EN
117	<i>Sterna albifrons</i>	Little Tern	Laridae	EN
118	<i>Sterna hirundo</i>	Common Tern	Laridae	LC
119	<i>Streptopelia chinensis</i>	Spotted dove	Columbidae	NA
120	<i>Streptopelia teanquebarica</i>	Red Collared-Dove	Columbidae	NA
121	<i>Sturnus contra</i>	Asian Pies Starling	Sturnidae	LC
122	<i>Sturnus malabricus</i>	Chestnut-tailed Starling	Sturnidae	LC
123	<i>Sturnus sinensis</i>	White Shoulder Sterling	Sturnidae	LC
124	<i>Tachybaptus ruficollis</i>	Little Grebe	Podicipedidae	LC
125	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	Threskiornithidae	NT
126	<i>Todorna ferruginea</i>	Ruddy Shelduck	Anatidae	NA
127	<i>Tringa erythropus</i>	Spotted Redshank	Scolopacidae	LC
128	<i>Tringa glareola</i>	Wood Sandpiper	Scolopacidae	LC
129	<i>Tringa ochropus</i>	Green Sandpiper	Scolopacidae	LC
130	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Scolopacidae	LC
131	<i>Tringa totanus</i>	Common Redshank	Scolopacidae	LC
132	<i>Turdoides gularis</i>	White-throated Babbler	Leiothrichidae	LC
133	<i>Vanellus cinereus</i>	Grey-Headed Lapwing	Charadriidae	LC
134	<i>Vanellus indicus</i>	Red-Wattled Lapwing	Charadriidae	LC

Note: NA = Not Applicable, LC = Least Concerned, VU = Vulnerable, EN = Endangered, NT = Nearly Threatened

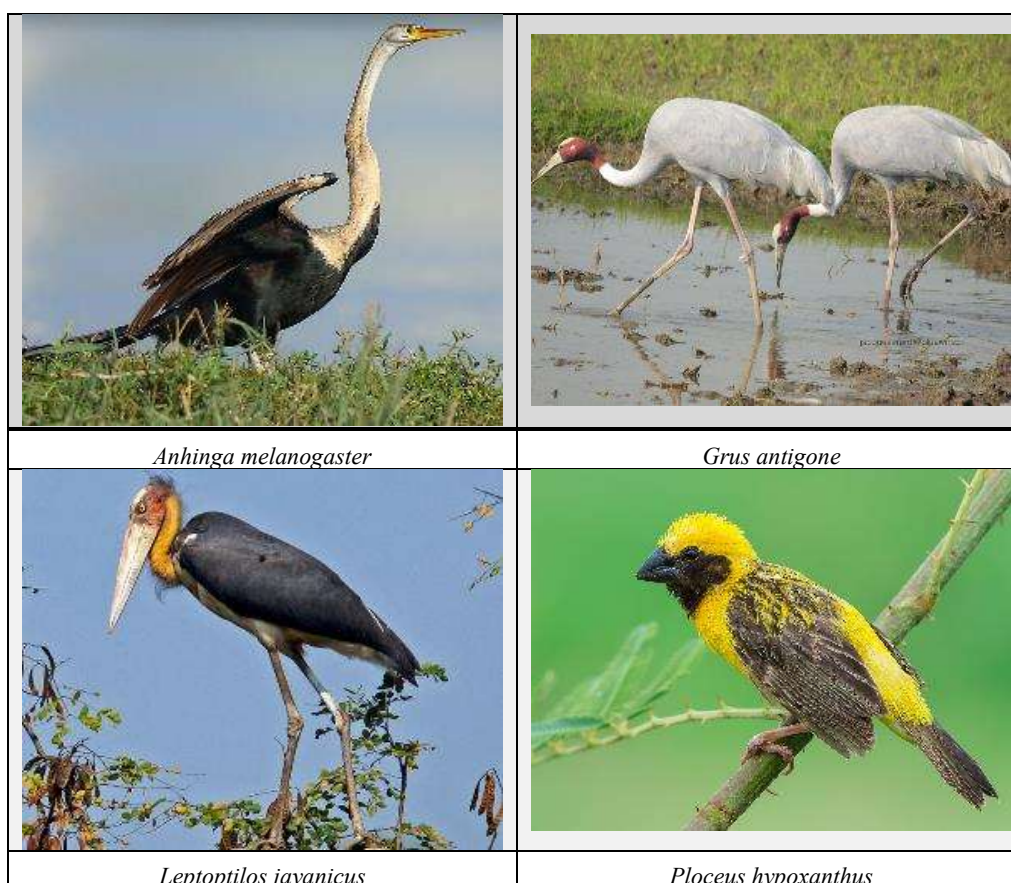
Source: District Forest Management Plan (DFMP), Forest Department, Bago Region

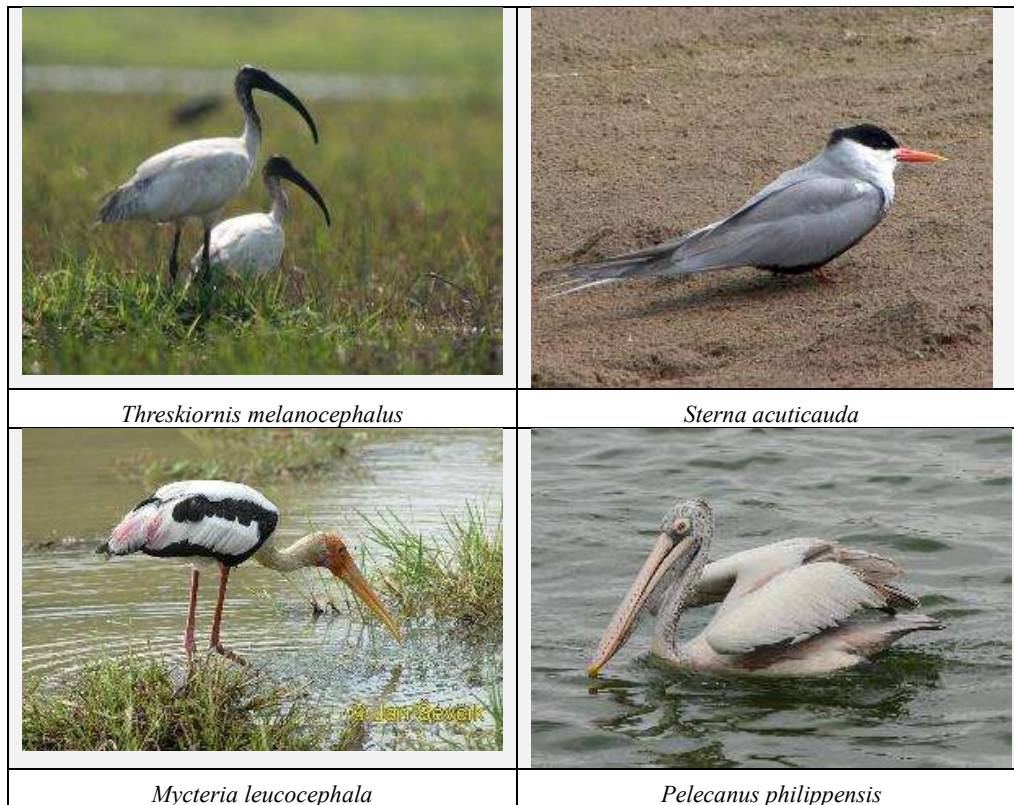
**Table 4.1-19 List of Endangered, Vulnerable and Nearly Threatened Bird Species in Moeyungyi Wildlife Sanctuary**

No	Scientific Name	Common Name	Family	IUCN (2019-3)
1	<i>Anhinga melanogaster</i>	Oriental Dater	Anhingidae	NT
2	<i>Grus antigone</i>	Sarus Crane	Gruidae	VU
3	<i>Leptoptilos javanicus</i>	Lesser adjutant stork	Ciconiidae	VU
4	<i>Mycteria leucocephala</i>	Painted Stork	Ciconiidae	NT
5	<i>Pelecanus philippensis</i>	Spot-billed Pelican	Pelecanidae	NT
6	<i>Ploceus hypoxanthus</i>	Asian Golden Weaver	Ploceidae	NT
7	<i>Sterna acuticauda</i>	Black-bellied Tern	Laridae	EN
8	<i>Sterna albifrons</i>	Little Tern	Laridae	EN
9	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	Threskiornithidae	NT

Note: VU = Vulnerable, EN = Endangered, NT = Nearly Threatened

Source: District Forest Management Plan (DFMP), Forest Department, Bago Region





Source: IEE Study Team

**Figure 4.1-7 Bird species in Moe Yon Gyi Wildlife Sanctuary****(3) Reserved Forests near the Project Site**

The Forest Department has a long-standing goal to increase the area of Reserve Forests (as well as Protected Public Forests) to 30% of the land area of Myanmar. This goal was first stated in the 1995 Forest Policy and has since been repeated in other policy documents such as the National Forestry Master Plan 2001-02 to 2030-31, and Myanmar's "Intended Nationally Determined Contribution" to the UNFCCC (now the NDC).

Generally, reserved forest, owned by the State, includes forest managed, by the State, for teak and other hardwood extraction. The Forest Law (1992) identifies the following types of land, which falls under the authority of the Forest Department; these are the land areas classified as "Reserved Forest":

- a) commercial reserved forest;
- b) local supply reserved forest;
- c) watershed or catchment protection reserved forest;
- d) environment and biodiversity conservation reserved forest;
- e) other categories of reserved forest.

The Forest Law provides the option for the Minister of Forestry to declare land outside the forest reserve

as “Protected Public Forest”, among others, for the purpose of “conservation for sustainable production”. ‘Forest Land’ is therefore defined in the current Forest Law as ‘Reserved Forest’ and ‘Protected Public Forest’.

### Intagaw Forest

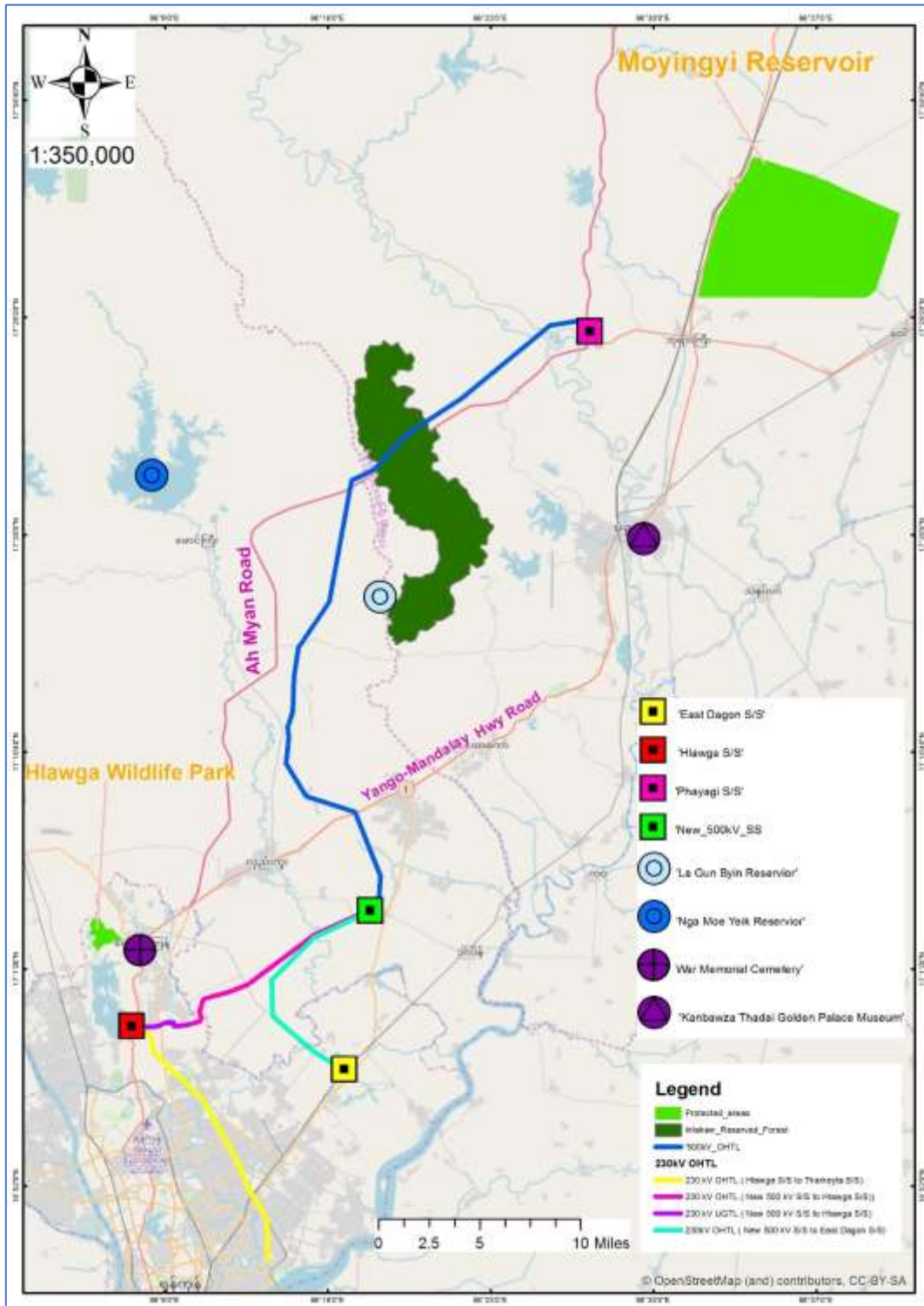
Two reserved forests, Intagaw (about 102 square kilometer) and Salu (about 285 square kilometer) are located near the Project site. Both of the reserved forests are located in Bago region (see Table 4.1-20). The transmission pipeline will pass in the Intagaw Reserved Forest Area of Pegu Township. Bamboo, rattan and vulnerable tree species are rich in Pegu Township Reserved Forest Areas. Intagaw RF is Mixed Deciduous Forest type and Dipterocarps species and vulnerable bamboo species are well growth in this area. Soil type in this area is ferrasol (FAO) and lateritic (Land Use) and then vulnerable tree species and bamboo species can well growth in this soil type. Intagaw RF is the watershed area of La Gun Byin Dam and Zalat Htaw Dam. *Tectona grandis* (Teak), *Xylia xylocarpa* (Pyin ka doe), *Lagerstroemia speciosa* (Pyin ma), *Anogeissus accuminata* (Yon), *Homalium tomentosum* (Myauk chaw), *Terminalia tomentosa* (Htauk kyant) and *Terminalia chebula* (Phan kha) species, bamboos and rattan species are more growth in Mixed Deciduous Forest type. Total area of Intagaw Reserved Forest has in 18692 Acre according to the record from Pegu Township Forest Department. Now, private forestry business plantation and community forestry plantation are improved in this reserved forest. So, the habitat of natural forest area does not have in this reserved forest area and natural vegetation are a little amount in reserved forest. A little amount of some fauna species has in Intagaw RF area but endangered and extinct species according to IUCN ranking system do not find in in this area.

**Table 4.1-20 Land Use Condition of Intagaw Reserved Forest**

No.	Land Use Item	Area (Acre)
1	Forest Department to Agricultural Department (Rubber) Transfer Area	15457
2	Current Reserved Forest Area	3235
4	Private Rubber Plantation in Reserved Forest Area	608
5	Private Hardwood Plantation in Reserved Forest Area	1717
6	Community Forestry Plantation in Reserved Forest Area	115.24
7	Remaining Area in Reserved Forest Area	794
8	Total Reserved Forest Area	18692

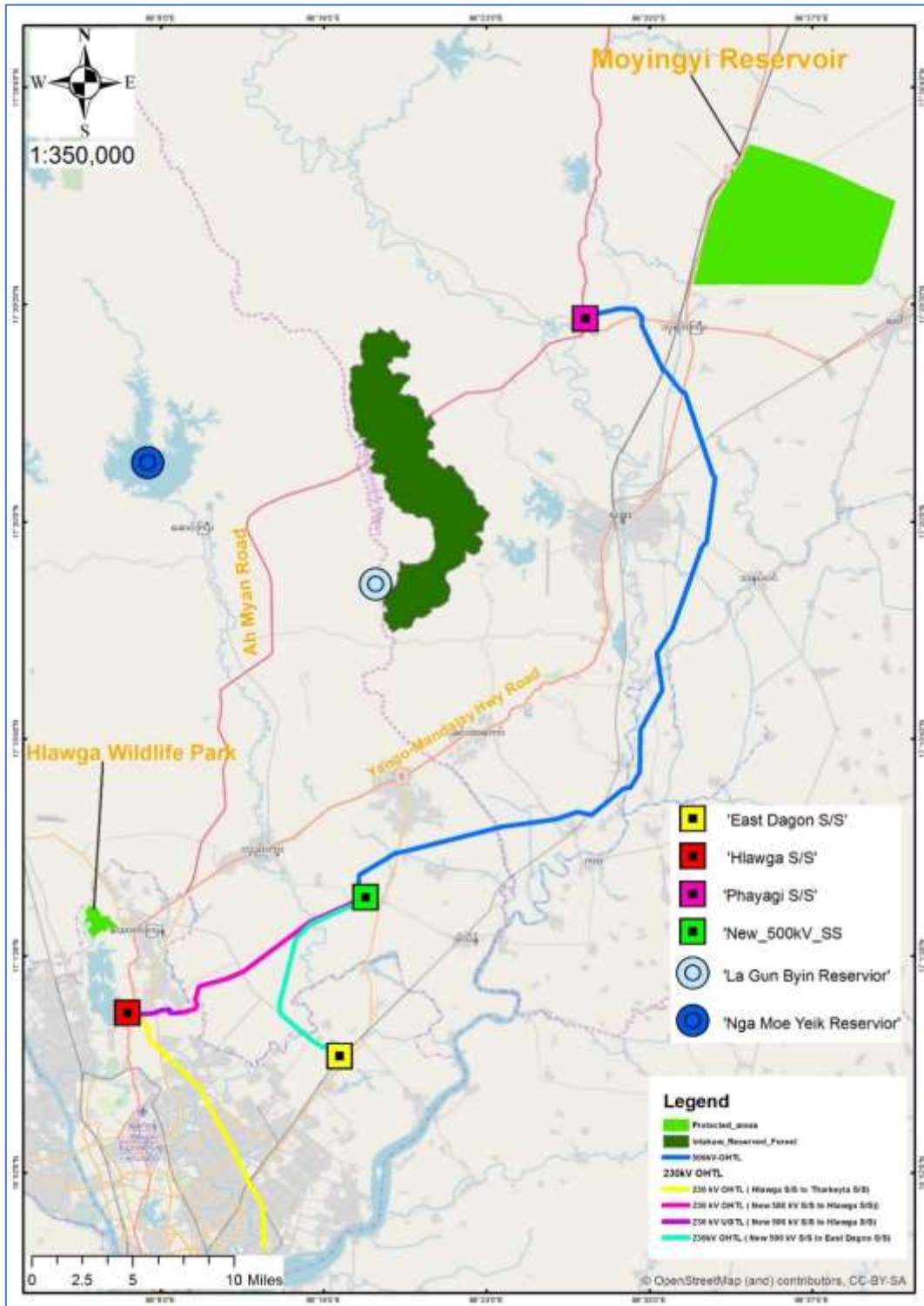
Note: Source from Pegu Township Forest Department





Source: IEE Study Team

**Figure 4.1-8 Proposed Power Transmission Line Route in the West (Option A)**



Source: IEE Study Team

**Figure 4.1-9 Proposed Power Transmission Line Route in the East (Option B)**

#### **4.1.7 Natural Hazards**

##### **(1) Bago**

River floods are frequently occurring in Bago because the township is located in the lowland. In Bago, minimum alert water level is 880 centimeters.

##### **(2) Thanatpin**

Thanatpin township is located between Sagaing river (front) and Bago river (west) and flooding can often occur during the rainy season. The alert water level of Bago-Sittaung canal which connect Bago river is 750 centimeters.

##### **(3) Kawa**

Kawa township is located near the Bago river and Sittaung river and flood disasters can occur.

##### **(4) Dagon Myothit (East/North/South)**

Dagon Myothit (East) township, which has the temperate weather, is located in the eastern part of Yangon and Nga-Moe-Yeik creek is flowing across the region. Therefore, flood and sometime storms can occur in the wards near the Nga-Moe-Yeik creek at the boundaries of the township during the rainy season. Natural disaster does not usually occur in North Dagon.

##### **(5) Mingaladon and Hlegu Township**

Mingaladon and Hlegu Townships are the mainland which have unbalanced weather and are situated at lower ground, so that no unusual natural hazards can occur in the region except common disasters such as fire and flood.

##### **(6) North Okkalapa**

Natural disaster such as flood, storm and so on can occur since North Okkalapa is in coastal region. However, there was no occurrence natural disaster in North Okkalapa township.

##### **(7) Thaketa**

Storm like Nargit and natural disasters such as flooding can occur in Thaketa as it is close to the coastal areas which is surrounded by rivers. The hazard cases happened in Yangon Region and Bago Region during 2015 to 2018 are as shown in Table 4.1-21.



**Table 4.1-21 Hazard Cases in Yangon Region and Bago Region during 2015 to 2018**

States and Regions	Year	Events	Case	No. of Death (Person)	No. of Victims (Household)	No. of Victims (Person)
Yangon Region	2015-2016	Fire	15	-	121	535
		Flood	6	-	3,761	14,246
		Storm	3	-	117	555
		Earthquake	-	-	-	-
		Riverbank Erosion	-	-	-	-
		Landslide	-	-	-	-
		Thunder Lighting Stroke	1	1	-	-
		Conflict	-	-	-	-
		Others	-	-	-	-
		Total	25	1	3,999	15,336
	2016-2017	Fire	26	10	279	1,455
		Flood	5	1	1,957	6,221
		Storm	11	-	123	518
		Earthquake	1	-	6	29
		Riverbank Erosion	6	-	97	422
		Landslide	-	-	-	-
		Thunder Lighting Stroke	3	3	-	-
		Conflict	-	-	-	-
		Others	3	-	4	113
		Total	55	14	2,466	8,758
	2017-2018	Fire	37	2	370	1,576
		Flood	2	-	103	374
		Storm	10	-	447	2,297
		Earthquake	-	-	-	-
		Riverbank Erosion	12	-	242	983
		Landslide	1	-	1	6
		Thunder Lighting Stroke	4	5	-	-
		Conflict	-	-	-	-
		Others	6	-	-	29
		Total	72	7	1,163	5,265

States and Regions	Year	Events	Case	No. of Death (Person)	No. of Victims (Household)	No. of Victims (Person)
Bago Region	2015-2016	Fire	22	-	129	511
		Flood	8	-	3,587	31,622
		Storm	46	-	1,335	4,943
		Earthquake	-	-	-	-
		Riverbank Erosion	8	-	702	3,133
		Landslide	-	-	-	-
		Thunder Lighting Stroke	20	21	-	-
		Conflict	-	-	-	-
		Others	-	-	-	-
		Total	104	21	5,753	40,209
	2016-2017	Fire	51	2	156	606
		Flood	23	4	15,578	53,397
		Storm	106	4	4,605	16,708
		Earthquake	-	-	-	-
		Riverbank Erosion	16	-	450	1,845
		Landslide	-	-	-	-
		Thunder Lighting Stroke	11	12	-	-
		Conflict	-	-	-	-
		Others	-	-	-	-
		Total	207	22	20,789	72,556
	2017-2018	Fire	64	11	109	543
		Flood	37	-	8,900	38,110
		Storm	146	5	2,402	8,089
		Earthquake	-	-	-	-
		Riverbank Erosion	49	-	2,214	10,339
		Landslide	-	-	-	-
		Thunder Lighting Stroke	17	16	-	-
		Conflict	-	-	-	-
		Others	2	3	4	11
		Total	315	35	13,629	57,092

Source: Statistical Year Book

## 4.2 Social Conditions

### 4.2.1 Population

According to the October 2018 Township General Administration Office, Dagon Myothit (East, South, and North) District Data, there are about 157,785 people in Dagon Myothit (East), 155,611 people in Dagon Myothit (South) and 92,774 people in Dagon Myothit (North), 234,229 people in Hlegu, 257,250 people in Mingalardon, 436,022 people in Bago, 135,913 people in North Okkalapa, 114,202 people in Thaketa, 30,185 people in Thanapin and 46,242 people in Kawa Township. The detailed information is described in the following Table 4.2-1.

**Table 4.2-1 Population in Project Related Townships**

District	Township	Total (Male/Female)				Total (Urban/Rural)			Households
		Male	Female	Total	Sex Ratio	Urban	Rural	Urban Population (%)	
Bago District	Bago	209,429	230,194	439,622	1:0.9	220,487	219,135	50.15%	115,440
	Thanatpin	8,037	85,359	165,738	1:1.06	18,110	147,628	10.9%	30,185
	Kawa	106,486	111,118	217,604	1:1.04	20,499	197,105	9.42%	46,242
Northern District (Yangon)	Hlegu	117,731	121,727	239,458	1:1.0	38,757	200,701	16.1%	51,536
	Mingalardon	120,255	143,543	263,798	1:1.2	149,897	113,901	56.9%	53,780
Eastern District (Yangon)	Dagon Myothit (East)	81,318	90,959	172,277	1:1.11	162,551	9,726	94.4%	39,284
	Dagon Myothit (North)	93,951	104,792	198,743	1:1.11	198,743	-	100%	39,953
	Dagon Myothit (South)	156,263	169,523	325,886	1:1.08	325,886	-	100%	59,725
	North Okkalapa	137,709	152,219	289,928	1:1.10	289,928	-	100%	65,669
	Thaketa	104,024	111,672	215,696	1:1.1	215,696	-	100%	45,806

Source: General Administrative Departments of related townships

### 4.2.2 Ethnicity

The races residing in Dagon Myothit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myothit (North), Dagon Myothit (South), Thaketa, Thanatpin and Kawa townships are shown in Table 4.2-2. Most of the people who live in the township are Bamar.

**Table 4.2-2 Races in Project Related Townships**

No	Races	Townships									
		Bago District			Northern District (Yangon)		Eastern District (Yangon)				
		Bago	Thanatpin	Kawa	Hlegu	Mingalardon	Dagon Myoithit (East)	Dagon Myoithit (North)	Dagon Myoithit (South)	North Okkalapa	Thaketa
1	Kachin	115	5	1	36	519	107	366	824	267	792
2	Kayah	104	-	-	2	221	18	75	35	52	706
3	Kayin	16,329	13	4,524	12,231	3,839	2,004	4,489	3,474	3,650	1,807
4	Chin	463	-	-	600	2,352	1,236	3,146	709	218	840
5	Mon	5,517	30	22	239	1,642	370	893	765	1118	1,886
6	Bamar	360,116	159,412	208,592	222,421	247,899	162,140	183,236	287,146	271,770	174,889
7	Rakhine	793	2	19	388	3,126	2,855	2,931	4,600	2,791	5,436
8	Shan	822	4	6	125	504	310	784	208	327	861
9	Pa.Oh	1,574	1	-	-	-	-	-	-	-	-
10	Palaung	5,568	-	-	-	-	-	-	-	-	-
11	Danu	2,837	-	-	-	-	-	-	-	-	-
12	Taung Yoe	2,156	-	-	-	-	-	-	-	-	-
13	Kayan	2,205	-	-	-	-	-	-	-	-	-
14	Foreigners	10,221	-	-	3,222	3696	3,237	2,545	28,125	9,292	6,688
15	Others	793	-	-	194	-	-	20	-	444	21,791
Total		439,622	159,467	213,164	239,458	263,798	213,164	213,164	325,886	289,928	289,928

Source: General Administrative Departments of related townships

### 4.2.3 Religion

The different kinds of religion present in Dagon Myoithit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myoithit (North), Dagon Myoithit (South), Thaketa, Thnanatpin and Kawa. Townships are shown in Table 4.2-3. More than 90% of the people living in the township are Buddhists.

**Table 4.2-3 Religion in Project Related Townships**

District	Township	Religion	Buddhist	Christian	Hindu	Islam	Others	Total
Bago District	Bago	Number	411,380	17,135	6,137	2,925	2,045	439,622
		Percentage	93.5	3.8	1.39	0.66	0.46	
	Thanatpin	Number	159,467	1	5,547	652	71	165,738
		Percentage	96.2	0.0006	3.34	0.39	0.04	
	Kawa	Number	210,015	32	1224	88	-	217,604
		Percentage	96.5	0.01	0.56	0.04	-	
Northern District (Yangon)	Hlegu	Number	227,310	9,243	724	1,678	503	239,458
		Percentage	94.9%	3.85%	0.3%	0.7%	0.2%	
	Mingalardon	Number	252,156	4,339	3,232	4,071	-	263,798
		Percentage	95.5	1.64	1.23	1.5	-	
		Percentage	93.5	3.8	1.39	0.66	0.46	
	Eastern District (Yangon)	Dagon Myothit (East)	Number	167,201	2,167	1,612	1,279	18
Percentage			97.0%	1.3%	0.9%	0.7%	0.01%	
Dagon Myothit (North)		Number	184,671	11,565	959	1,548	-	198,743
		Percentage	93	5.8	0.5	0.8	-	
Dagon Myothit (South)		Number	298,751	225	6,513	20,397	-	325,886
		Percentage	91.6	0.06	1.9	6.3	-	
North Okkalapa		Number	276,565	4,478	2,563	5,873	449	289,928
		Percentage	95.3	1.5	0.8	2.02	0.15	
Thaketa		Number	184,675	4,121	4,066	22,834	-	215,696
	Percentage	85.6	1.9	2.2	10.5	-		
	Percentage	96.5	0.01	0.56	0.04	-		

Remark: The total number in each township is different from the total population which is mentioned in Table 4.2-1 because of the limitation of data collection.

Source: General Administrative Departments of related townships

#### 4.2.4 Land Use

Land use in Dagon Myothit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myothit (North), Dagon Myothit (South), Thaketa is shown in Table 4.2-4 and. According to the township profile from General Administration Department 2018, Dagon Myothit (East, North, South), North Okkalapa and Thaketa mainly use their lands for urban lands. Hlegu the majority of its land for agriculture and Mingalardon for others. Besides, Forest Area occupies most of the land use in Bago Township while Thanatpin uses the majority of its land for agriculture.

**Table 4.2-4 Land Use of Bago District of Bago Region and Northern District of Yangon Region**

No	Type of Land	Bago District						Northern District (Yangon)			
		Bago		Thanatpin		Kawa		Hlegu		Mingalardon	
1	Net Agricultural Land Area	205422	28.6%	160487	65.1%	199854	48.2%	150937	31.3%	4285	16.1%
2	Unused Land area	-	-	-	-	403	0.1%	12673	2.62%	53	0.2%
3	Grazing Land	5189	0.7%	6404	2.6%	522	0.1%	2247	0.47%	-	-
4	Industrial Land	1820	0.3%	21	<0.1%	79	<0.1%	28	0.005%	54	0.2%
5	Urban Land	12293	1.7%	441	0.2%	200	<0.1%	1139	0.24%	3983.189	14.9%
6	Rural Land	8807	1.2%	7643	3.1%	12438	3.0%	4282	0.9%	3431.11	12.9%
7	Others	38857.4	5.4%	71404	29.0%	530	0.1%	105960	21.9%	7526.301	28.2%
8	Forest Area	395842	55.1%	-	-	-	-	-	-	-	-
9	Wild Forest	-	-	-	-	-	-	-	-	-	-
10	Wild Land	945	0.1%	-	-	6273	1.5%	-	-	174	0.7%
11	Non-agricultural Land	58789	8.2%	-	-	-	-	-	-	-	-
12	Sanctuary/ Cemetery Land Area	-	-	-	-	679	0.2%	89666	18.6%	7175	26.9%
13	Ponds Area	-	-	-	-	798	0.2%	-	-	-	-
14	Land Area used for railroads	-	-	-	-	174	<0.1%	-	-	-	-
15	River and Creeks Area	-	-	-	-	184461	44.5%	-	-	-	-
16	Land Area used for dams	-	-	-	-	5540	1.3%	-	-	-	-
17	Land Area used for roads	-	-	-	-	2594	0.6%	-	-	-	-
	Total	717862.4	100%	246400	100%	414545	100%	482884	100%	26681.6	100 %

Source: General Administrative Departments of related townships

**Table 4.2-5 Land Use of Eastern District of Yangon Region**

No	Type of Land	Eastern District (Yangon)									
		Dagon Myothit (East)		Dagon Myothit (North)		Dagon Myothit (South)		North Okkalapa		Thaketa	
1	Net Agricultural Land Area	1,831	8.0%	50	0.8%	5338	27%	37.824	0.6%	-	-
2	Unused Land area	1,039	5.0%	-	-	-	-	-	-	-	-
3	Grazing Land	-	-	-	-	-	-	-	-	-	-
4	Industrial Land	130	1.0%	25	0.4%	236	1%	2014.429	30.5%	160	5.0%
5	Urban Land	14,634	65.0%	6418	98.8%	11,534	59%	4514.272	68.3%	2866.105	90.0%
6	Rural Land	481	2.0%	-	-	-	-	-	-	-	-
7	Others	4,380	19.0%	-	-	-	-	40.457	0.6%	131.895	4.2%
8	Forest Area	-	-	-	-	-	-	-	-	-	-
9	Wild Forest	-	-	-	-	-	-	-	-	-	-
10	Wild Land	-	-	-	-	-	-	-	-	-	-

No	Type of Land	Eastern District (Yangon)									
		Dagon Myothit (East)		Dagon Myothit (North)		Dagon Myothit (South)		North Okkalapa		Thaketa	
11	Non-agricultural Land	-	-	-	-	2441	13%	-	-	-	-
12	Sanctuary/Cemetery Land Area	-	-	-	-	-	-	-	-	-	-
13	Ponds Area	-	-	-	-	-	-	-	-	-	-
14	Land Area used for railroads	-	-	-	-	-	-	-	-	-	-
15	River and Creeks Area	-	-	-	-	-	-	-	-	-	-
16	Land Area used for dams	-	-	-	-	-	-	-	-	-	-
17	Land Area used for roads	-	-	-	-	-	-	-	-	-	-
	Total	22,495	100%	6493	100%	19,549	100%	6607	100%	3185	100%

Source: General Administrative Departments of related townships

#### 4.2.5 Water Usage

The sources of drinking water and non-drinking water in Dagon Myothit (East), Hlegu, Mingalardon, Bago, North Okkalapa, Dagon Myothit (North), Dagon Myothit (South), Thaketa, Thanatpin, and Kawa are shown in Table 4.2-6 and Table 4.2-7 respectively.

**Table 4.2-6 Source of Drinking Water in Project Related Townships**

Township	Main Source of Drinking Water	Tap water/piped	Tube well, borehole	Protected well/spring	Bottled/ purified water	Total Improved Water Sources	Unprotected well/spring	Pool/ pond/ lake	River/ stream/ canal	Waterfall/ rainwater	Other	Total Unimproved Water Sources	Total
Bago	Number	5327	50399	10394	10776	76896	7772	18673	2088	233	1470	30236	<b>107132</b>
	%	5.0	47.0	9.7	10.1	71.8	7.3	17.4	1.9	0.2	1.4	28.2	<b>100%</b>
Thanatpin	Number	32,527	2	183	887	299	30,968	16	40	121	10	1	<b>32,527</b>
	%	50.0	<0.1	0.3	1.4	0.5	47.6	<0.1	0.1	0.2	<0.1	<0.1	<b>100%</b>
Kawa	Number	46,075	45	1,135	679	123	44,018	17	4	52	-	2	<b>46,075</b>
	%	50.0	<0.1	1.2	0.7	0.1	47.8	<0.1	<0.1	0.1	-	<0.1	<b>100%</b>
Hlegu	Number	1929	24505	3893	4750	35077	7227	13321	1472	137	789	22946	<b>58023</b>
	%	3.4	42.2	6.7	8.2	60.5	12.5	23.0	2.4	0.2	1.4	39.5	<b>100%</b>
Mingalardon	Number	15140	20353	16437	8884	60814	3229	169	44	*	2042	5489	<b>66298</b>
	%	22.8	30.7	24.8	13.4	91.7	4.9	0.3	0.1	<0.1	3.0	8.3	<b>100%</b>



Township	Main Source of Drinking Water	Tap water/piped	Tube well, borehole	Protected well/spring	Bottled/ purified water	Total Improved Water Sources	Unprotected well/spring	Pool/ pond/ lake	River/ stream/ canal	Waterfall/ rainwater	Other	Total Unimproved Water Sources	Total
Dagon Myothit (East)	Number	3,244	13,132	48	13,149	29,573	136	3,491	158	24	531	4,340	<b>33,913</b>
	%	9.6	38.7	0.1	38.8	87.2	0.4	10.3	0.4	0.1	1.6	12.8	<b>100%</b>
Dagon Myothit (North)	Number	7847	11043	56	22981	41927	*	538	*	37	199	777	<b>85405</b>
	%	18.4	25.9	0.1	53.8	98.2	< 0.1	1.2	< 0.1	0.1	0.5	1.8	<b>100%</b>
Dagon Myothit (South)	Number	9,646	21,566	115	36,407	67,734	39	7,893	*	79	1,229	9,250	<b>76,984</b>
	%	12.5	28.0	0.2	47.3	88.0	0.1	10.2	<0.1	0.1	1.6	12.0	<b>100%</b>
North Okkalapa	Number	40429	4360	201	19214	64204	*	175	-	22	343	552	
	%	62.4	6.7	0.3	29.7	99.1	< 0.1	0.3	-	< 0.1	0.6	0.9	
Thaketa	Number	5132	5,429	48	31,329	41,938	*	3,177	*	195	122	3,518	<b>90888</b>
	%	11.4	11.9	0.1	68.9	92.3	<0.1	7.0	<0.1	0.4	0.3	7.7	<b>100%</b>

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census", October 2017

**Table 4.2-7 Source of Drinking Water in Project Related Townships**

Township	Main Sources of Water for non-	Tap water/piped	Tube well, borehole	Protected well/spring	Unprotected well/spring	Pool/ pond/ lake	River/ stream/ canal	Waterfall/ rainwater	Bottled/ purifier water	Other	Total
Bago	Number	6951	67061	8804	7788	11483	3091	122	74	1758	<b>107132</b>
	%	6.5	62.6	8.2	7.3	10.7	2.9	0.1	0.1	1.6	<b>100%</b>
Thanatpin	Number	32,527	21	1,684	259	349	29,103	1,103	2	2	<b>65,054</b>
	%	50.0	< 0.1	2.6	0.4	0.5	44.7	1.7	< 0.1	< 0.1	<b>100%</b>
Kawa	Number	46,075	51	1,880	630	155	43,322	28	1	1	<b>92,150</b>
	%	50.0	0.1	2.0	0.7	0.2	47.0	< 0.1	< 0.1	< 0.1	<b>100%</b>
Hlegu	Number	2441	31922	3306	7186	10314	1925	99	99	731	<b>58023</b>
	%	4.2	55.0	5.7	12.4	17.8	3.3	0.2	0.2	1.3	<b>100%</b>
Mingalardon	Number	19633	20975	19437	3684	187	110	-	124	2153	<b>66303</b>
	%	29.6	31.6	29.3	5.6	0.3	0.2	-	0.2	3.2	<b>100%</b>

Township	Main Sources of Water for non-	Tap water/piped	Tube well, borehole	Protected well/spring	Unprotected well/spring	Pool/ pond/ lake	River/ stream/ canal	Waterfall/ rainwater	Bottled/ purifier water	Other	Total
Dagon Myothis (East)	Number	5,405	24,039	81	136	3,395	208	*	37	611	<b>33,912</b>
	%	15.9	70.9	0.2	0.4	10.0	0.6	< 0.1	0.1	1.8	<b>100%</b>
Dagon Myothis (North)	Number	14609	26901	145	*	644	*	-	43	357	<b>42699</b>
	%	34.2	63.0	0.3	< 0.1	1.5	< 0.1	-	0.1	0.8	<b>100%</b>
Dagon Myothis (South)	Number	19,324	49,845	278	45	5,214	*	*	114	2,148	<b>76,968</b>
	%	25.1	64.7	0.4	0.1	6.8	< 0.1	< 0.1	0.1	2.8	<b>100%</b>
North Okkalapa	Number	55,662	7,853	477	31	256	-	-	130	130	<b>64539</b>
	%	15.9	70.9	0.2	0.4	10.0	0.6	< 0.1	0.1	1.8	<b>100%</b>
Thaketa	Number	12,642	31,055	117	*	1,352	*	*	139	129	<b>45416</b>
	%	27.8	68.3	0.3	< 0.1	3.0	< 0.1	< 0.1	0.3	0.3	<b>100%</b>

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census", October

#### 4.2.6 Local Economy and Livelihood

The main sources of livelihood in the townships are trading, factory and official employment in the government. The sources of livelihood sector are shown in Table 4.2-8.

**Table 4.2-8 Existing Status of Local Livelihoods in Project Related Townships**

Township	Type of Workers (Person)									
	Government Staff	Service Staff	Agriculture	Livestock	Trader	Factory	Marine Works	Odd Job	Others	Total
Bago	7,517	18,381	26,858	608	15,778	35,030	-	15,806	113,142	<b>233,120</b>
	3.2%	7.8%	11.5%	0.26%	6.7%	15.2%	-	6.7%	48.5%	<b>100%</b>
Thanatpin	351	15	27,681	5,437	3,665	211	36,903	7,399	-	<b>84,823</b>
	0.41%	0.01%	32.6%	6.4%	4.3%	0.2%	43.5%	8.65%	-	<b>100%</b>
Kawa	5,494	3	43,060	41,085	5,971	556	-	10,571	48,493	<b>155,233</b>
	3.53%	0.001%	27.7%	26.4%	3.84%	0.35%	-	6.8%	31.2%	<b>100%</b>
Hlegu	4,260	3,598	26,404	46,210	464	1,732	170	48,132	17,859	<b>148,851</b>

Township	Type of Workers (Person)									
	Government Staff	Service Staff	Agriculture	Livestock	Trader	Factory	Marine Works	Odd Job	Others	Total
	2.8%	2.4%	17.7%	31%	0.3%	1.16%	0.01%	32.3%	12%	100%
Mingalardon	40,732	6,100	2,841	153	25000	7300	15	22000	25000	129,141
	31.5%	4.72%	2.2%	0.12%	19.4%	5.7%	1.2%	17%	19.4%	100%
Dagon Myothit (East)	21,955	16,830	5,381	5,994	30,328	26,040	-	22,372	-	128,900
	17%	13%	4.2%	4.7%	23.5%	20.2%	-	17.4%	-	100%
Dagon Myothit (North)	39,195	26,130	3,920	9,146	19,598	169,885	-	9,146	6,533	130,653
	30%	19.9%	3%	7.6%	15%	25%	-	7%	5%	100%
Dagon Myothit (South)	2,940	-	70	460	12,029	182,605	10	9,279	6,792	214,185
	1.3%	-	0.03%	0.2%	5.6%	85.2%	0.004%	4.3%	3.3%	100%
North Okkalapa	5,087	123,102	-	-	5,850	18,821	-	89,783	2,035	244,678
	2.07%	50.3%	-	-	2.39%	7.6%	-	36.6%	0.83%	100%
Thaketa	12,250	39,455	-	-	30,503	7,145	-	50,495	23,358	163,206
	7.5%	24.1%	-	-	18.6%	4.3%	-	30.9%	14.3%	100%

Source: General Administrative Departments of related townships

## 4.2.7 Social Infrastructure and Service

### (1) Health Facilities

Table 4.2-9 shows the buildings serviced for health problem of the residents in project related townships. The data are derived from the township data published by General Administration Department in 2018. According to the data, most of big infrastructures for the health care facility are supported by the Myanmar government and minor facility like clinic are greatly established by the private sector.

**Table 4.2-9 List of Health Facilities**

District	Township	Hospital		Clinic		Rural Public Health Department (Gov.)	Rural Public Health Sub-department (Gov.)	Total
		Gov	Private	Gov	Private			
Bago District	Bago	5	5	1	132	45	8	<b>196</b>
	Thanatpin	89	0	0	9	7	28	<b>133</b>
	Kawa	7	0	0	12	27	23	<b>69</b>
Northern District (Yangon)	Hlegu	5	0	0	22	12	37	<b>76</b>
	Mingalardon	5	0	0	11	5	26	<b>47</b>
Eastern District (Yangon)	Dagon Myothit (East)	2	0	0	48	4	4	<b>58</b>
	Dagon Myothit (North)	1	6	3	0	0	0	<b>10</b>
	Dagon Myothit (South)	2	0	4	71	2	9	<b>88</b>
	North Okkalapa	2	0	0	25	4	4	<b>35</b>
	Thaketa	1	0	3	0	0	0	<b>4</b>

Source: General Administrative Departments of related townships

## (2) Education

In Myanmar, there are two levels of the education system; higher education – university or college and basic education – elementary to high school. The distribution of educational buildings in the Project related townships is expressed in Table 4.2-10 below. Most schools are upper elementary and primary schools ran by the government and monastic education also supports in a great role to fill the gap in the education of children from unaffordable families.

**Table 4.2-10 Government and Private Educational Buildings in Project Related Townships**

District	Township	University/ College	B.E.H.S	B.E.H.S (Branch)	B.E.M.S	B.E.M.S (Branch)	Upper Elementary Schools	B.E.P.S	Nursery School	Monastery Education	Total
Bago District	Bago	1	21	12	10	63	119	5	10	28	<b>269</b>
	Thanatpin	0	11	8	15	16	1	1	7	1	<b>60</b>

District	Township	University/ College	B.E.H.S	B.E.H.S (Branch)	B.E.M.S	B.E.M.S (Branch)	Upper Elementary Schools	B.E.P.S	Nursery School	Monastery Education	Total
	Kawa	0	14	24	21	2	2	1	10	12	<b>86</b>
Northern District (Yangon)	Hlegu	3	11	10	6	17	30	110	4	20	<b>211</b>
	Mingalardon	0	9	3	7	6	2	25	24	22	<b>98</b>
Eastern District (Yangon)	Dagon Myothit (East)	1	5	1	3	1	6	15	0	11	<b>43</b>
	Dagon Myothit (North)	0	5	0	1	0	1	24	15	1	<b>47</b>
	Dagon Myothit (South)	2	8	0	11	6	6	12	1	16	<b>62</b>
	North Okkalapa	2	7	4	8	0	0	45	6	10	<b>82</b>
	Thaketa	0	6	1	6	1	1	45	9	9	<b>78</b>

Source: General Administrative Departments of related townships

### (3) Religious Buildings

Myanmar is already known as a Buddhism nation because most of the people in Myanmar are Buddhists, although there are other different religions in the country. According to the data in the following Table 4.2-11, the most religious buildings are monasteries where Buddhist monks are residing in the monasteries for dispatching the essence of Buddha's sermons and instructions to the lay people.

**Table 4.2-11 List of Religious Buildings in Related Townships in Project Related Townships**

District	Township	Pagoda	Stupa	Temple	Monastery	Nunnery	Chapel	Church	Mosque	Hindu Temple	Chinese Temple	Total
Bago District	Bago	10	68	-	689	92	20	17	13	29	3	<b>863</b>
	Thanatpin	7	0	0	163	2	1	0	4	25	1	<b>203</b>
	Kawa	1	32	0	220	0	4	6	1	6	0	<b>270</b>
Northern District (Yangon )	Hlegu	8	342	0	649	133	36	41	5	7	2	<b>1,223</b>
	Mingalardon	22	100	0	468	168	104	3	5	5	0	<b>875</b>
Eastern District (Yangon )	Dagon Myothit (East)	0	1	0	230	19	0	0	1	1	0	<b>252</b>
	Dagon Myothit (North)	1	7	0	54	5	35	1	0	1	0	<b>104</b>

District	Township	Pagoda	Stupa	Temple	Monastery	Nunnery	Chapel	Church	Mosque	Hindu Temple	Chinese Temple	Total
	Dagon Myothit (South)	0	3	0	142	50	32	1	0	7	1	236
	North Okkalapa	1	23	0	294	84	98	2	1	3	1	507
	Thaketa	0	3	0	214	5	53	2	9	3	1	290

Source: General Administrative Departments of related townships

#### (4) Transportation and Access Road

The transportation routes that exist closely around the Project area. The related main roads are Yangon-Mandalay expressway, Yangon-Mandalay highway, No.2 main road, No.3 main road and No.7 road. The two main roads that connect from Hpayargyi Substation to Yangon City are Yangon-Mandalay expressway in the west and Yangon-Mandalay highway in the east. The proposed new substation in Hlegu can be reached from the Yangon City by using No.2 main road. The 230kV transmission line that is the combination of overhead and underground lines which connect between Hlawga Substation and proposed new substation in Hlegu will pass across the No.7 road, No.3 main road and Yangon-Mandalay expressway.

The Yangon-Mandalay highway, No. 2 and No.3 main roads are paved with asphalt while Yangon-Mandalay expressway and No. 7 road is paved with concrete. The majority of the pavement is made with concrete because concrete is relatively inexpensive and there are insufficient asphalt factories which provide good-quality asphalt.

Major public transportation modes in Dagon Myothit (East) and Dagon Myothit (South) Townships are bus, motorcar, taxi and railway which are located in land area. Approximately 100 bus lines are running throughout the Yangon City, more than 2 million commuters daily across the city of 5.2 million people. The Yangon-Mandalay railway is located within the Project area. The Project site is between Lay Daung Kan Railway Station and Dar Pein Railway Station.

#### 4.2.8 Cultural Heritage

Two cultural heritage sites designed by Myanmar Government; namely Kanbawzathadi Palace and Htaunt Kyant War Memorial Cemetery are located near the Project area.

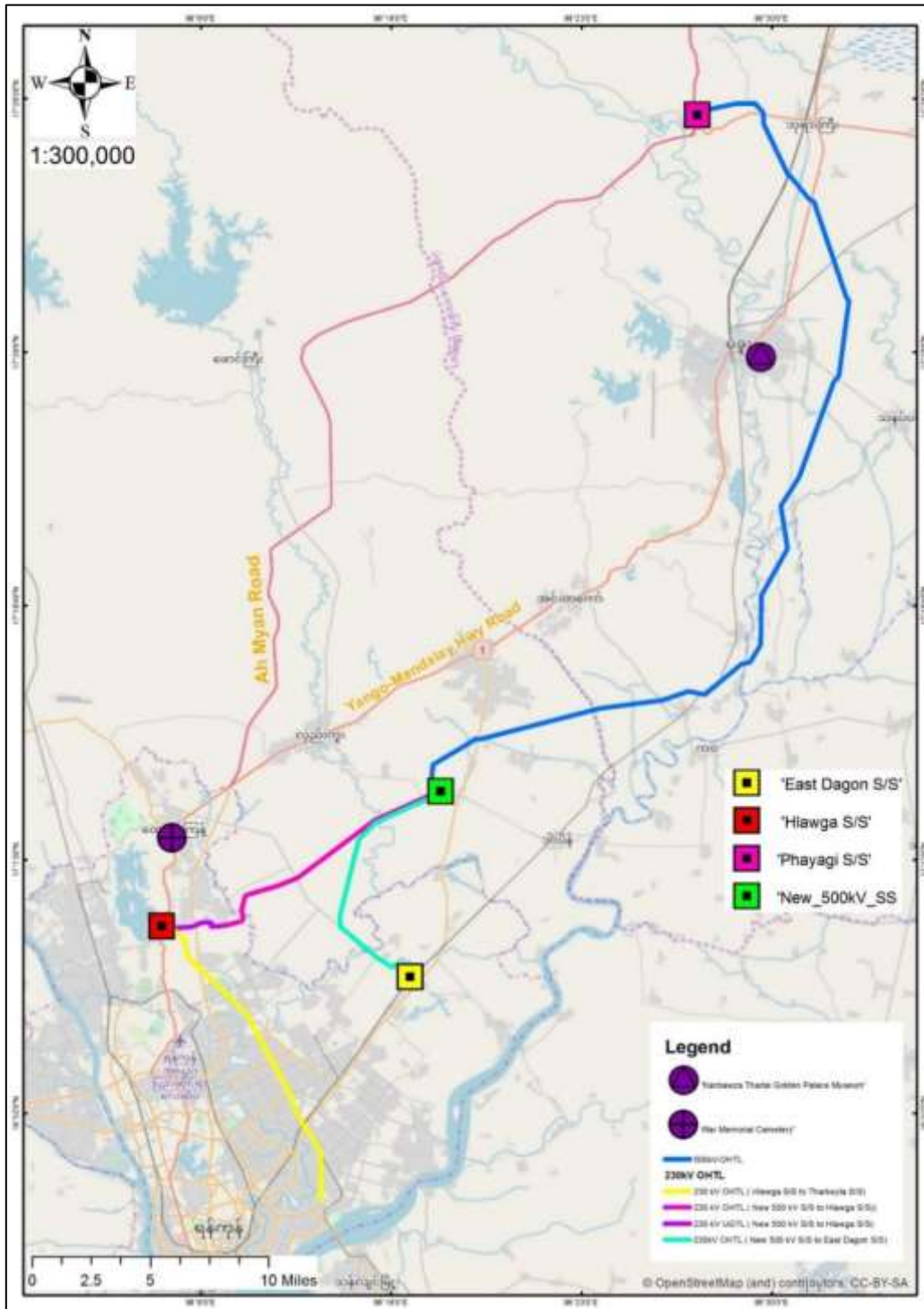
##### (1) Kanbawzathadi Palace

Kanbawzathadi Golden Palace in Bago is a reconstruction of the original Royal palace of the second half of the 16th century. The original palace, built for King Bayinnaung in 1556, consisted of 76 apartments and halls. It was burned down in 1599. It was reconstructed in 1990 and finished in 1992.

**(2) Htaunt Kyant War Memorial Cemetery**

The Htaunt Kyant War Memorial Cemetery is located approximately 6 km from Hlawga Substation in Htaunt Kyant Village in Migalardon Township. The cemetery was opened in 1951 and the remains of Commonwealth soldiers who died in Meiktila, Akyab (Sittwe), Mandalay, and Sahmaw were transferred here and the graves are grouped together by these battles. A large number of the 27,000 names of Commonwealth soldiers are in the Indian Army and African soldiers who fought and died in Burma.

There is no cultural heritage site designed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) or the Myanmar government in other regions; Dagon Myothit (East), Dagon Myothit (South) and Hlegu Township. The location of cultural heritage near the Project site are shown in the figure.



Source: IEE Study Team

**Figure 4.2-1 Location of Cultural Heritage around Project Area**

#### 4.2.9 Landscape

The Project site chosen for construction of a new substation and its surrounding area is in flat plain and typical rural landscapes of urban neighborhood. By analyzing from Google map, there is a reserved forest, namely Intagaw Forest, some creeks and streams, and cultivated paddy and crop fields along the



proposed 500kV OH line from existing Hpayargyi S/S to proposed new S/S. Other proposed 230kV OH line from proposed new S/S to existing Dagon Myothit (East) S/S and 230kV (combination of OH and UG) line from new S/S to Hlawga S/S are located at the outskirts of Yangon urban area where most of the lands passed by the proposed transmission lines are cultivated lands for paddy and seasonal crops. However, 230kV UG line will pass through the residential blocks in Shwe Nanthar village tract and Bochan street to connect to Hawga S/S.

Therefore, most of the area along a 500kV OH line, 230kV lines are covered with green spaces such as forest, cultivated lands and other forests near river and creek banks and residential areas in the outskirts area of Yangon.

## CHAPTER 5: IMPACT ASSESSMENT METHODOLOGY AND PRELIMINARY IMPACT ASSESSMENT

### 5.1 Impact Assessment Methodology

#### 5.1.1 Project Area of Influence

Baseline data and environmental and social risks and impacts have been identified in the context of the Project Area of Influence (PAoI). The PAoI was identified considering IFC PS1 guidance and encompassed:

- (a) The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- (b) Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- (c) The cumulative impact that results from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned, or reasonably defined developments at the time the risks and impacts identification process is conducted.

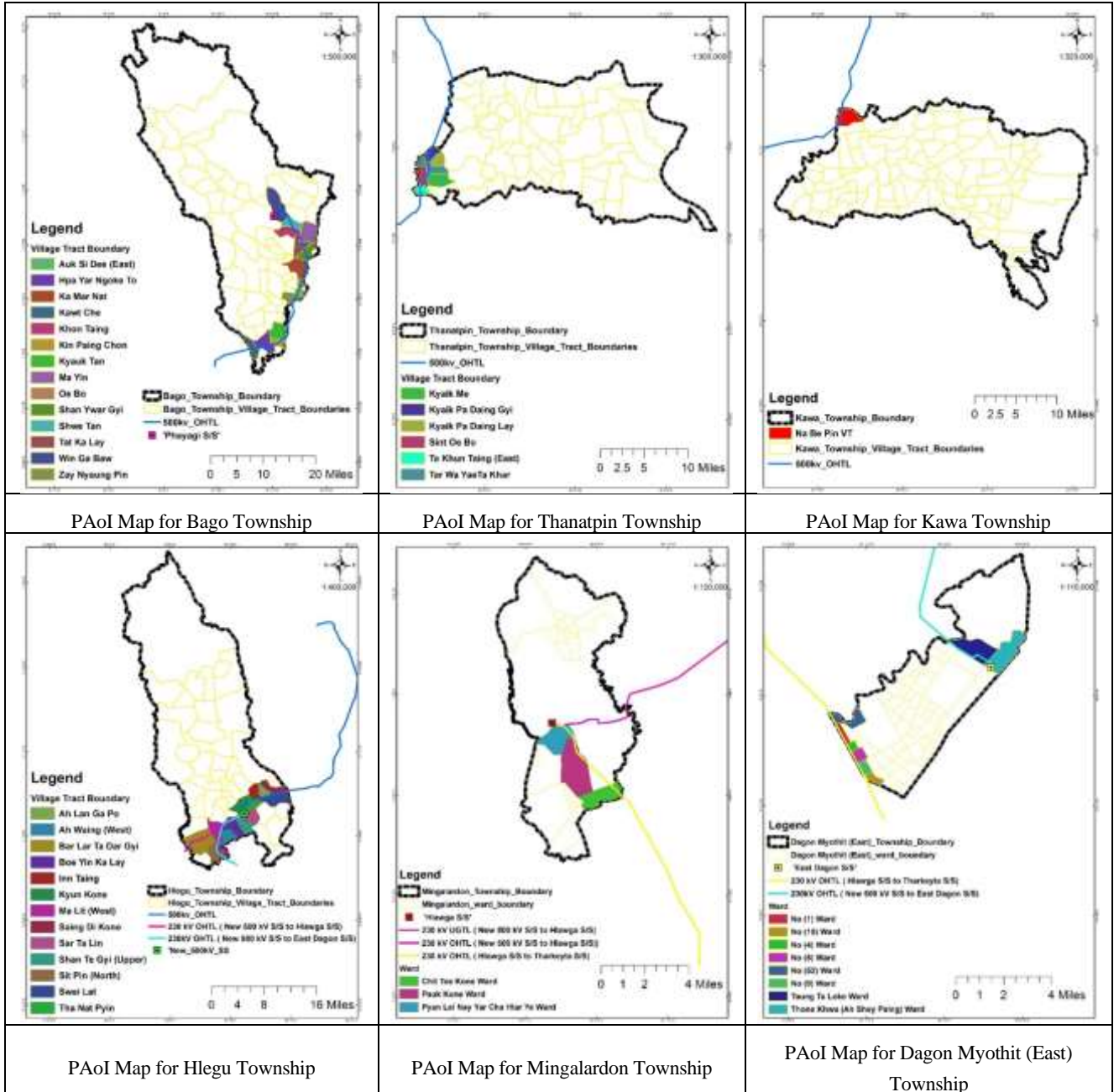
In the definition of PAoI from the environmental and social perspective, the ten (10) townships (with a total of 32 wards and 33 village tracts) as indicated in Table 5.1-1 have been considered.

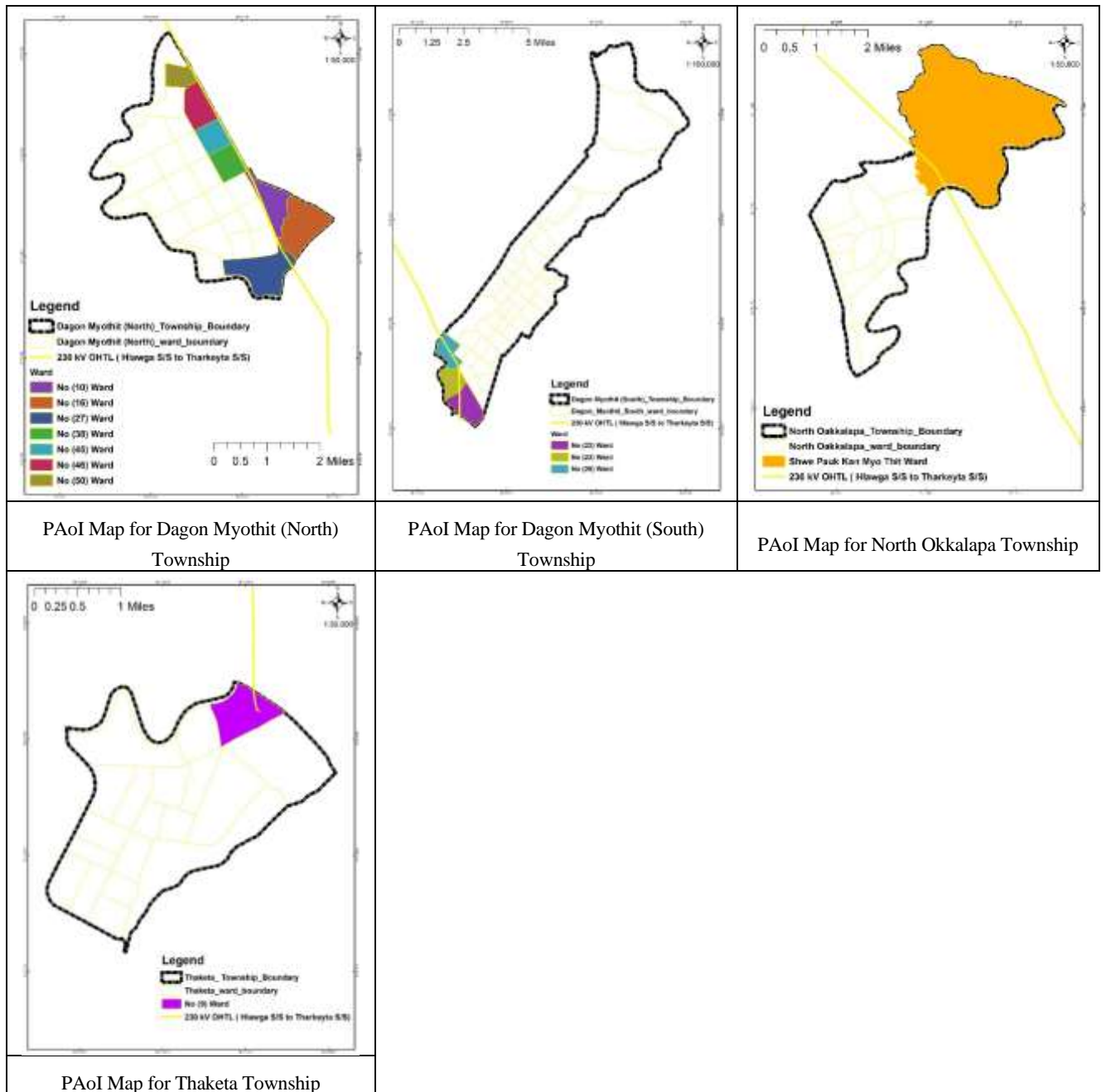
**Table 5.1-1 Project Area of Influence**

No.	District	Township	Village Tracts/ Wards
1.	Bago District, Bago Region	Bago	Auk Si Dee (East), Hpa Yar Ngoke To, Ka Mar Nat, Kawt Che, Khon Taing, Kin Paing Chon, Kyauk Tan, Ma Yin, Oe Bo, Shan Ywar Gyi, Shwe Tan, Tat Ka Lay, Win Ga Baw, Zay Nyaung Pin
		Thanatpin	Kyaik Me, Kyaik Pa Daing Gyi, Kyaik Pa Daing Lay, Sint Oe Bo, Ta Khun Taing (East), Tar Wa Yae Ta Khar
		Kawa	Na Be Pin
2.	Northern District, Yangon Region	Hlegu	Ah Lan Ga Po, Bar Lar Ta Dar Gyi, Boe Yin Ka Lay, Inn Taing, Kyun Kone, Ma Lit (West), Saing Di Kone, Sar Ta Lin, Shan Te Gyi (Upper), Sit Pin (North), Swei Lat, Tha Nat Pyin
		Mingalardon	Chit Tee Kone , Pauk Kone , Pyan Lei Nay Yar Cha Htar Ye
3.	Eastern District, Yangon Region	Dagon Myothit (East)	No.1 Ward, No. 4 Ward, No. 5 Ward, No. 9 Ward, No. 10 Ward, No. 52 Ward, Taung Ta Loke, Thone Khwa (Ah Shey Paing)

	Dagon Myothit (North)	No. 10 Ward, No. 16 Ward, No. 27 Ward, No. 38 Ward, No. 45 Ward, No. 46 Ward, No. 50 Ward
	Dagon Myothit (South)	No. 22 Ward, No. 23 Ward, No. 26 Ward
	North Okkalapa	Shwe Pauk Kan Myo Thit
	Thaketa	No. 9 Ward

Source: IEE Study Team





Source: IEE Study Team

**Figure 5.1-1 Map of Project Area of Influence (PAoI)**

### 5.1.2 Scope of Assessment

In order to assess potential environmental, social, and health impacts, the conceivable adverse effects on environmental, social, and health impacts by the Project, the scope was initially identified based on the Project description and overall environmental and social conditions in the surrounding area. The assessment will be implemented in all three stages- construction, operation, and closure stages of the Project.

### **5.1.3 Geographical Scope**

According to Article 25 of EIA Procedure Notification No.616/2015, the following conservation areas are categorized as sensitive environmental and conservation areas required for special consideration to conserving the areas.

- (1) Forest conservation area (including biodiversity reserved area)
- (2) Public forest
- (3) Park (including marine parks)
- (4) Mangrove swamp
- (5) Any other sensitive coastal area
- (6) Wildlife sanctuary
- (7) Scientific reserve
- (8) Nature reserve
- (9) Geophysical significant reserve
- (10) Protected cultural heritage area
- (11) Protected archeological area or area of historical significance

Since the proposed Project is to construct and facilitate the transmission lines and substations, the study area is located along the transmission route and surrounding areas of substations, and these areas are positioned within the Bago and Yangon Regions. The area where the impacts will be assessed is set within the 200 m on both sides of transmission routes and within 300 m from the boundaries of substations area. The above-stated conservation areas are NOT expected to exist in the area of the Project.

### **5.1.4 Temporal Scope**

The temporal scope of the IEE study with regard to the construction phase will be the whole period of the construction stage. For the operational phase, the temporal scope relates to beyond the starting of the power line operation.

### **5.1.5 Terms of Reference for Investigation of Environmental and Social Impacts**

The expected potential adverse impacts are listed below. The impacts of the following items are investigated and assessed, and a management framework, including mitigation measures, management plan, and monitoring plan will be established in the IEE study.

1. Health and Safety
2. Socio-Economic
3. Emergency Response
4. Construction activities (Air, Water, Solid Waste, Noise, and Vibrations)

For the above, a brief description of adverse impacts and the approach for the evaluation are summarized in Table 5.1-2.

**Table 5.1-2 Brief Description of Adverse Impacts and Approach for Evaluation**

Type	Potential Adverse Impacts and Approach
Pollution Control	This project (new/expanded substation and 230kv/500kV transmission line) itself does not cause serious adverse impacts and, in particular, there might be no impact during the operation stage. Even at the construction stage, the impact is limited.
Natural Environment	Area for the project development is limited and it is not a special area (e.g. paddy field and/or areas not currently in use). To err on the side of caution, a Flora and Fauna survey will be conducted as a baseline survey through the IEE study.
Social Environment	There will be no or limited resettlement because transmission line routes can avoid residence areas. The expansion of the existing Hlawga has no social impact. The new substation in east Dagon was originally the planned area for Yangon Amata Smart and Eco City, which will be handed over from YCDC.

Source: IEE Study Team

### 5.1.6 Terms of Reference for Baseline Survey

The baseline survey is implemented to collect the necessary data and information about environmental conditions that are required to assess the environmental impact of substations and transmission lines. Moreover, the survey data collected will be utilized to evaluate the current situation and predict future perspectives and serve as baseline levels for comparison in the future. The outline of the field survey for environmental monitoring in this project is described in Table 5.1-3.

**Table 5.1-3 Outline of Environmental Baseline Survey**

No.	Item	Survey Items	Methodology
1	Air Quality	1) PM2.5, 2) PM10, 3) NO <sub>2</sub> , 4) SO <sub>2</sub> , 5) Ozone, 6) Wind Speed & Direction	Using Haz-Scanner (US EPA approved)
2	Water Quality	1) Temp., 2) pH, 3) EC, 4) BOD <sub>5</sub> , 5) COD <sub>CrO</sub> , 6) Oil & Grease, 7) Total Coliform, 8) TN, 9) TP, 10) TSS, 11) Cr-Total, 12) Cd, 13) As, 14) Zn, 15) Pb, 16) Hg, 17) Cu, 18) Fe, 19) Mn	Using reliable laboratory in Yangon
3	Soil Quality	1) Cr-Total, 2) Cd, 3) As, 4) Zn, 5) Pb, 6) Hg, 7) Cu, 8) Fe, 9) Mn	Using reliable laboratory in Yangon
4	Noise and Vibrations	Noise Level (LAeq dB) Vibration (dBs)	International standard method

Source: IEE Study Team

### 5.1.7 Impact Assessment Methodology for IEE Study

The assessment of the environmental and social impacts, OHS, CHS and emergency risks will be based on the following:

- Proposed design and facilities of the Project,
- Construction method,
- Construction materials,

- General Environmental, Health and Safety (EHS) Guidelines and EHS Guidelines for Electric Power Transmission and Distribution,
- Other related IEE/ EIA reports,
- Comments from public, stakeholders and Public Consultation Meetings (PCMs), and
- Data collected during the field survey, predictions on and assessment of environmental and social impacts.

**(1) Assessing Significance**

Impacts are described in terms of ‘*significance*’. *Significance* is a function of the *magnitude* of the impact and the *likelihood* of the impact occurring. Impact magnitude (sometimes termed severity) is a function of indicators such as the extent, duration and intensity of the impact. The criteria used to determine magnitude for environmental and social impacts are described in Table 5.1-4.

**Table 5.1-4 Magnitude Criteria for Environmental and Social Impacts**

Impact Magnitude		Score
Extent	On-site – impacts that are limited to the boundaries of the development site.	1
	Local – impacts that affect an area in a radius of 20km around the development site.	2
	Regional – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ ecosystem.	3
	National – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.	4
Duration	Temporary – impacts are predicted to affect on resource/ receptor intermittently (< 1 month)	1
	Short-term – impacts are predicted to affect resource/ receptor over short duration (≤ 2 yr), period of impact occurrence is less than the Project period.	2
	Long-term – impacts are predicted to effect on resource/ receptor in long term duration (> 5 yr or < 10 yr); period of impact occurrence is same as the Project period.	3
	Permanent – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	4
Intensity	BIOPHYSICAL ENVIRONMENT: Intensity can be considered in terms of the sensitivity of the biodiversity receptor (i.e. habitats, species or communities).	
	Negligible – the impact on the environment is not detectable.	1
	Low – the impact affects the environment in such a way that natural functions and processes are not affected.	2
	Medium – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.	3
	High – where natural functions or processes are altered to the extent that they will temporarily or permanently cease.	4
Where appropriate, national and/or international standards are to be used as a measure of the impact.		

SOCIO-ECONOMIC ENVIRONMENT: Intensity can be considered in terms of the ability of people/communities affected by the Project to adapt to changes brought about by the Project.	
Negligible – there is no perceptible change to people’s livelihood.	1
Low - people/communities are able to adapt with relative ease and maintain pre-impact livelihoods. (or) Few people/communities get benefits from infrastructure development and employment in facilities or workplace.	2
Medium – people/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. (or) A large number of people/communities get benefits from infrastructure development and employment in the facilities.	3
High - affected people/communities will not be able to adapt to changes or continue to maintain pre-impact livelihoods.	4

Source: IEE Study Team

For OHS, CHS and emergency risks, the *Magnitude* of the impact occurring will be assessed and evaluated via three (3) factors – intensity, duration, and legal requirement, as described in Table 5.1-5.

**Table 5.1-5 Magnitude Criteria for OHS, CHS and Emergency Risks**

Impact Magnitude		Score
Intensity	Negligible – Minor injury requiring first aid treatment	1
	Low – Non-permanent injury requiring single occurrence of medical treatment	2
	Medium – Serious or permanent injury requiring multiple medical treatments or hospitalization	3
	High – Injury/illness resulting in immediate loss of life	4
Duration	Temporary – Immediately reversible (eg.1 day)	1
	Short-term – Short term (eg.1 week)	2
	Long-term – Long term (e.g. more than 1 month)	3
	Permanent – impacts that cause a permanent change in the wellbeing of the affected person	4
Legal Requirement	Negligible – Standard values & regulations not required	1
	Low – Standard values & regulations requires mitigation measures to be in place	2
	Medium – Non-compliance with standard values & regulations in some sectors but most are compliant	3
	High – Non-compliance & exceeding standard values & regulation	4

Source: IEE Study Team

The level of magnitude is determined based on the total score interval which is obtained by summing of the score of each component as shown in Table 5.1-6.

**Table 5.1-6 Rating for Impact Magnitude**

Total Score Interval	Magnitude
1 - 3	Negligible



Total Score Interval	Magnitude
4 - 6	Low
7 - 9	Medium
10 - 12	High

Source: IEE Study Team

The likelihood of an impact is qualified through a statement on the degree of occurrence. The prediction for a degree of occurrence is a function of uncertainties, for example, where information is insufficient to assess the impact. The likelihood of an impact is categorized in Table 5.1-7.

**Table 5.1-7 Rating for Impact Likelihood**

<i>Likelihood - the likelihood that an impact will occur</i>	
<b>Unlikely</b>	The impact is unlikely to occur.
<b>Occasional</b>	The impact is likely to occur sometimes.
<b>Likely</b>	The impact is likely to occur under most conditions.
<b>Definite</b>	The impact will occur.

Source: IEE Study Team

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance as below.

**Table 5.1-8 Risk Based Impact Assessment Matrix**

LIKELIHOOD \ MAGNITUDE	Unlikely	Occasional	Likely	Definite
Negligible	Negligible	Negligible	Minor	Minor
Low	Negligible	Minor	Moderate	Moderate
Medium	Minor	Moderate	Moderate	Major
High	Moderate	Moderate	Major	Major

Source: IEE Study Team

**Table 5.1-9 Significance Color Scale**

Negative ratings		Positive ratings	
Negligible	D	Negligible	D
Minor	C-	Minor	C+
Moderate	B-	Moderate	B+
Major	A-	Major	A+

Source: IEE Study Team

The risk level is indicated by a color code, with the green denoting negligible and red denoting major/very significant impact. The moderate/significant impact is identified by yellow zone and minor/insignificant impact is identified by gold zone. (See Table 5.1-9).

**(2) Considerations for Impact Mitigation**

The IEE team have employed the principles and hierarchy in the same Draft Myanmar EIA Guidelines (2017) in addressing the impacts identified. These principles and hierarchy are provided below.

1. Avoidance and prevention – choosing technologies or materials that will not generate the impact,
2. Minimization and reduction – lowering the effect of the impact by lessening the use of impact-producing equipment or performance of the activity,
3. Rehabilitation – ameliorate the affected environment,
4. Offset or compensation – compensate or offset impacts which are deemed unavoidable to achieve no net loss.

**5.2 Preliminary Impact Assessment**

The preliminary impact assessment is the first step in addressing the key environmental and social impacts of the Project. The preliminary assessment of anticipated potential impacts on environment, society and health was conducted. The summary of preliminary impact assessment results is tabulated in the following Table 5.2-1.

**Table 5.2-1 Results of Preliminary Impact Assessment**

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Air Pollution	Exhaust gas emissions		C-		OS: The main source of air pollution will be the exhaust gas emission from vehicle movements. Therefore, the significance of impact can be assessed as minor.
		PM, Dust and exhaust gas emissions	B-		B-	CS/CLS: The principal source of potential air pollutant will be dust from construction/ demolition works. The exhaust gases (SO <sub>2</sub> , NO <sub>2</sub> & PM <sub>10</sub> ) will be emitted from the construction vehicles, generators and machinery. Therefore, the significance of impact can be assessed as moderate.
	Water Pollution	Domestic wastewater & storm water		B-		OS: Wastewater may be generated from the staff housing, toilets, canteen etc. Therefore, the significance of impact can be assessed as moderate.
			C-		C-	CS/CLS: Wastewater may be generated from the site cleaning activities, temporary toilets, etc. Stormwater runoff passed through the construction sites may contain muddy water, suspended sediments and construction materials. Therefore, the significance of impact can be assessed as minor.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Noise and Vibration	Noise level		B-		OS: Noise from the operation of transformers will be in the form of buzzing and humming which will be felt only up to 15 to 50 m from the substation area. Noise from overhead transmission lines will be from corona phenomenon which is the ionization of the air around the conductors as cracking or hissing noise. Therefore, the significance of impact can be assessed as moderate.
		Noise level	B-		B-	CS/CLS: During Construction and Closing Stage, the major sources of noise and vibration will be construction equipment and vehicle movement. Therefore, the significance of impact can be assessed as moderate.
Solid Waste	Managements of waste disposal			B-		OS: If there have replacement in existing old equipment and devices and others, such as transformers, it would generate the used coolant oil, oil contaminated metal scraps, rag and soil, and expired standby batteries. Non-hazardous solid wastes such as paper, food waste, plastic bags, drink cans, etc. may be generated from staff housing. Therefore, the significance of impact can be assessed as moderate.
			C-		C-	CS/CLS: Less amount of hazardous wastes (such as used car batteries, broken glass, broken light fixtures, engine oil, etc.) and non-hazardous wastes (such as debris, concrete, metal, timber, etc. and pieces of iron, electric wire, empty package of material, etc.) may be generated from construction/ demolishing activities. Therefore, the significance of impact can be assessed as minor.
Soil Contamination	Spill/ leakage of hazardous materials/waste and fuel			B-		OS: In operation stage, soil contamination in and around the Project area may probably occur due to the direct discharging of wastewater (domestic) onto the soil, spillage/leakage of oil and fuel from on-site storage. Therefore, the significance of impact can be assessed as moderate.
			B-		B-	CS/CLS: Oil spillage may arise from transferring oil to the machine, equipment or vehicle or from equipment, machinery and vehicle during maintenance works. Therefore, the significance of impact can be assessed as moderate.
Offensive Odor	Odor emission			C-		OS: Offensive odor may be generated due to the improper management of sewage and domestic waste from staff housing etc. Therefore, the significance of impact can be assessed as minor.
			D		D	CS/CLS: There is no use of materials and facility which cause offensive odors. Therefore, the significance of impact can be assessed as negligible.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Ground Subsidence	Withdraw of groundwater/ use of heavy machines	D	D	D	CS/OS/CLS: In substation area, much amount of groundwater will not be withdrawn during construction and operation stage. Moreover, heavy machines will not be used for long time. Therefore, the significance of impact can be assessed as negligible.
	Sediment	Wastewater discharge	D	D	D	CS/OS/CLS: Wastewater drainage including heavy metals or high -level organic substances will not be discharged into the water body. Therefore, the significance of impact can be assessed as negligible.
Natural Environment	Protected area Flora and Fauna, Ecosystem Topography and Geography	Site cleaning and other construction activities	C-	C-	C-	CS/CLS /OS: There will be no forest and wildlife park passed through by the transmission line. There will be only vegetation clearing along the ROW. There will be no impact on topography & geography. There are nine flyways that migratory birds take around the world, and Myanmar has two of them. They are the Central Asian Flyway, and the East Asian Australasian Flyway. These two paths include the Mottama gulf, Indawgyi Lake, Moe Yoon Gyi Wetland, Inle Lake, and Mein Mahla Kyun. However, detailed flyways haven't found yet. Therefore, the significance of impact can be assessed as minor.
	Hydrological conditions		D	D	D	CS/OS/CLS: The proposed Project will not include the activities that may cause hydrological conditions changes. Therefore, the significance of impact can be assessed as negligible.
Social Environment	Involuntary Resettlement and Land Acquisition	Land acquisition and resettlement	B-	B-	B-	CS/OS/CLS: Permanent land of approximately 32.37ha (80 acre) has to be acquired for construction of substation. The total area of tower bases along the transmission line has to be acquired for installation of transmission lines to following the appropriate rule. Therefore, the significance of impact can be assessed as moderate.
	Local Economy and Livelihood	Local Economy		A+		OS: The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City. Therefore, the significance of impact can be assessed as major.
			C-		C-	CS/CLS: The Project will temporarily in sales of local shops and vendors, etc. during the construction of towers transmission lines. Therefore, the significance of impact can be assessed as minor.
	Livelihood		B-		OS: The alternation in livelihoods will occur for the PAPs which lands are permanently acquired. Therefore, the significance of impact can be assessed as moderate.	

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
			B+		B+	CS/CLS: During the construction phase, a lot of job opportunities will be created as most of general construction labor work force will be derived from the local population. Therefore, the significance of impact can be assessed as moderate.
Existing social infrastructures and services	Accessibility			D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as negligible.
			B+		B+	CS/CLS: The project will not relocate houses based on the current plan. Accessibility of social infrastructure/services will be affected due to the increase of construction vehicles. Therefore, the significance of impact can be assessed as moderate.
Social Institutions	Traffic congestion			D		OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as minor.
			B-		B-	CS/CLS/OS: Due to the traffic congestion impact on social infrastructure and services, the community near the Project area will be affected. Therefore, the significance of impact can be assessed as moderate.
Landscape and Greening	Effects on landscape and greening	D	D	D	CS/CLS/OS: The transmission line will mostly cross the agriculture land and rural road in rural area and go along the road in the urban area. Therefore, the significance of impact can be assessed as minor.	
Indigenous and Ethnic People	Effects on indigenous and ethnic people	D	D	D	CS/CLS/OS: No indigenous and minority people are around the Project site. Therefore, the significance of impact can be assessed as minor.	
Land use and local resources	Effects on land use and local resources	D	D	D	CS/CLS /OS: There will not have impacts on land use & local resources. Therefore, the significance of impact can be assessed as minor.	
Conflict of interests within the region	Causes of conflict of interests	D	D	D	CS/CLS /OS: There may not have conflict of interests within the region. Therefore, the significance of impact can be assessed as minor.	
Cultural Heritage	Effects on cultural heritage	D	D	D	CS/CLS/OS: The impacts on the cultural heritage such as Taukkyan war ceremony and Kanbawzathadi palace are negligible as this place are approximately 6km and 5km from the Project site. Therefore, the significance of impact can be assessed as minor.	
Gender Discrimination	Effects on gender	D	D	D	CS/CLS/OS: The Project will not make any impact of gender discrimination. Therefore, the significance of impact can be assessed as minor.	

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Children's Right	Effects on children's right	D	D	D	CS/CLS/OS: The Project will not induce any impact of children's right. Therefore, the significance of impact can be assessed as minor.
Social Environment	Involuntary Resettlement and Land Acquisition	Land acquisition and resettlement	B-	B-	B-	CS/OS/CLS: Permanent land of approximately 32.37ha (80 acre) has to be acquired for construction of substation. The total area of tower bases along the transmission line has to be acquired for installation of transmission lines to following the appropriate rule. Therefore, the significance of impact can be assessed as moderate.
	Local Economy and Livelihood	Local Economy			A+	OS: The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City. Therefore, the significance of impact can be assessed as major.
				C-		C-
		Livelihood			B-	OS: The alternation in livelihoods will occur for the PAPs which lands are permanently acquired. Therefore, the significance of impact can be assessed as moderate.
				B+		B+
	Existing social infrastructures and services	Accessibility			D	OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as negligible.
				B-		B-
	Social Institutions	Traffic congestion			D	OS: No further impact is expected during operation phase. Therefore, the significance of impact can be assessed as minor.
			B-		B-	CS/CLS/OS: Due to the traffic congestion impact on social infrastructure and services, the community near the Project area will be affected. Therefore, the significance of impact can be assessed as moderate.

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
	Landscape and Greening	Effects on landscape and greening	D	D	D	CS/CLS/OS: The transmission line will mostly cross the agriculture land and rural road in rural area and go along the road in the urban area. Therefore, the significance of impact can be assessed as minor.
	Indigenous and Ethnic People	Effects on indigenous and ethnic people	D	D	D	CS/CLS/OS: No indigenous and minority people are around the Project site. Therefore, the significance of impact can be assessed as minor.
	Land use and local resources	Effects on land use and local resources	D	D	D	CS/CLS /OS: There will not have impacts on land use & local resources. Therefore, the significance of impact can be assessed as minor.
	Conflict of interests within the region	Causes of conflict of interests	D	D	D	CS/CLS /OS: There may not have conflict of interests within the region. Therefore, the significance of impact can be assessed as minor.
	Cultural Heritage	Effects on cultural heritage	D	D	D	CS/CLS/OS: The impacts on the cultural heritage such as Taukkyan war ceremony and Kanbawzathadi palace are negligible as this place are approximately 6km and 5km from the Project site. Therefore, the significance of impact can be assessed as minor.
	Gender Discrimination	Effects on gender	D	D	D	CS/CLS/OS: The Project will not make any impact of gender discrimination. Therefore, the significance of impact can be assessed as minor.
	Children's Right	Effects on children's right	D	D	D	CS/CLS/OS: The Project will not induce any impact of children's right. Therefore, the significance of impact can be assessed as minor.
Occupational Health and Safety (OHS)	Air Pollution, Noise exposure, Heat exposure, Work Place Injuries, Exposure to Hazardous materials, Others	Managements of OHS		B-		OS: Workplace injuries Workplace injuries are far too common on the job, and the majority of such random events can happen to anyone and at any time. Not only is it the employer's responsibility to ensure a safe work environment, but each employee also has a responsibility to themselves to exercise caution when on the job. Exposure to radiation Engineers, electricians and overhead line workers are most exposed to electrical hazards. Electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines, such as through electrical installation and repairs, testing of fixtures and equipment and inspection and maintenance activities. Other Accidents

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>Unforeseen accidents such as road and traffic accidents, emergencies such as fires, explosions, heavy rain and flooding, earthquakes with loss of human life and damage to structures and facilities could have a high impact on the safety and health of the employees.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
			B-			<p>CS/CLS: There is a possibility of air pollution, noise pollution, heat exposures, exposure to hazardous materials, etc. during the construction and closure stages. Moreover, the possibility of accidents and incidents is expected to occur more or less.</p> <p>In order to prevent the occurrence of accidents and incidents, working conditions during the construction and closing stages shall be managed by the Contractor based on OHS training stipulated in international guidelines, such as EHS Guidelines by the IFC.</p> <p>The Contractor shall prepare and implement appropriate mitigation measures under the respective impact assessment. Especially during the hot season, countermeasures for intense heat should be well prepared and announcements must be made for the prevention of heat stroke. In addition, accommodation for workers must be arranged to provide safe resting places for them.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
Community Health and Safety	Impact on Public Health and Community, Electrocutation, electromagnetic field, Public Safety, Public Security and Others	Managements of CHS			B-	<p>OS: Public Health and Community</p> <p>Improvement in the power distribution may create a stable and efficient electric power supply resulting in an upgrading of social infrastructures and services as well as the living condition of people. Electromagnetic fields from operation and overhead high voltage AC transmission lines can lead to incidences of health effects, including child leukemia, miscarriages, nausea, depression, loss of libido, and infertility.</p> <p>Public Safety</p> <p>Impacts on public safety consist of traffic accidents and incidents due to vehicle movement (supply of machines, raw materials, ferry services, etc.). In the operation phase, transmission lines present a risk of electrocution due to direct contact with high-voltage equipment and lines and also induced voltages, especially in the case of tools, vehicles and farm machinery that transit beneath transmission lines. Humans and farm animals can also risk electrocution or nuisance shock</p>



Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>when inadequate grounding at substations energizes metal objects, such as stock tanks, outside substation grounds. The collapse of transmission towers during storms is also included in electrocution causes.</p> <p>Public security and others</p> <p>The effects of power-line frequency electromagnetic fields (EMF) in humans are relatively high-level EMFs from overhead high-voltage AC transmission lines, and equipment too can lead to an increased incidence of adverse health effects including childhood leukemia and miscarriages. Moreover, Corona and induced electromagnetic fields from the operation of high voltage transmission lines can also produce electromagnetic interference or electrical noise on the community, which affects the functioning of electronic and telecommunications equipment. "Jitter" in television screens and computer monitors can result from electromagnetic interference.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
		Managements of CHS	C-		C-	<p>CS/CLS: There is a possibility of air pollutant emissions, including dust due to the operation of construction machines and vehicles, as well as construction work, which might cause some adverse effects on respiratory organs. Impacts on public health and communities, the dusty conditions of the construction site, exhaust gases from the machinery &amp; vehicles, the discharge of site-generated waste water, the generation of construction waste, demolition debris, domestic wastes, hazardous wastes, and the noise generated by construction machinery may affect the surrounding community.</p> <p>These impacts shall be managed by the construction contractor through provision of safety education and training for workers based on the OHS training stipulated in the international guidelines such as EHS Guidelines by IFC.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
Emergency Risks	Fire	Managements of Fire Prevention		B-		<p>CS/OS/CLS:</p> <p>In the operation stage, there will be a risk of potential fire accidents from the substation and transmission lines. At the substation, transformer explosions and fires can result from a breakdown of insulation due to over-current, over-voltage or short circuit. Degradation of insulation, like decay of transformer oil due to moisture or aging or decomposition, is another cause of fire in substations. Once the insulation drops</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>below a threshold value an electric arc is generated. The temperature of the oil increases and oil decomposes, leading to generation of ignitable gases and pressurization of the oil tank, which may lead to explosion of transformer.</p> <p>The most common causes of fire in transmission lines are weather-related events such as thunderstorms and strong winds etc. that cause damage to lines and equipment attached to them. Once the equipment is damaged or downed, wires may contact trees and other combustible materials resulting in sparks, smoke and fires. In other cases, animal or human contact, equipment failures and conductor slaps can also create fire hazards in transmission lines.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>
		Managements of Fire Prevention	C-		C-	<p>CS/OS/CLS: In the construction and closing stages, although the construction and closure works for the proposed project will contain large-scale work using fire-arms and explosives, the risk of fire accidents could be considered low. However, the risks are inevitable because some activities taken by the workers, such as smoking and cooking, could lead to fire accidents in the proposed project. To eliminate the risks of fire accidents, the behavior of the workers shall be managed by the construction contractor through provision of safety education and training for workers based on the OHS training stipulated in international guidelines such as the EHS Guidelines by IFC.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
	Flood	Managements of Flood Prevention	C-	C-	C-	<p>CS/OS/CLS: Heavy rains, overflowing of canals, flooding, etc. during heavy storms, cyclones, rainfall, unexpected weather conditions, etc. may cause flooding in and around the project sites. In the construction, operation and closing stages, the risk of flood occurrence is considered very low because the project area is located in a low flood zone and will be constructed to satisfy the level requirements for flood prevention.</p> <p>Therefore, the significance of impact can be assessed as minor.</p>
	Earthquake	Managements of Earthquake Prevention	B-	B-	B-	<p>CS/OS/CLS: Foundations of equipment, depending on their depths and dimensions, can collapse due to overturning moments because the depth and foundation weight of these foundations are insufficient for resistant moments.</p> <p>Bolts for connecting steel structures to foundations may not have enough shear strength to transfer loads to foundations and break after seismic loads.</p>

Category	Assessment Item	Items	Assessment Phase			Sources of the Impacts and reason for the Evaluation
			CS	OS	CLS	
						<p>Parts which connect electrical parts to structural supports can be insufficient and become damaged due to earthquake loads.</p> <p>Insulator and electrical parts made of porcelain may break after earthquake loads and due to internal materials, casing thickness and joint connection systems with other parts.</p> <p>Therefore, the significance of impact can be assessed as moderate.</p>

Source- IEE Study Team

## CHAPTER 6: FIELD SURVEY

### 6.1 Outlines of Monitoring Plan

To assess the impact on the operation and construction and closing stage of the Project to the surrounding environment, air quality, water quality, soil quality, and noise & vibration and had been monitored from 8<sup>th</sup> January to 9<sup>th</sup> January 2020 as described in Table 6.1-1 below.

**Table 6.1-1 Outlines of Field Survey**

Air Quality	Survey Parameter	1) PM <sub>2.5</sub> , 2) PM <sub>10</sub> , 3) NO <sub>2</sub> , 4) SO <sub>2</sub> , 5) Ozone, 6) Wind Speed & Wind Direction
	Survey Period	8 <sup>th</sup> – 9 <sup>th</sup> January, 2020
	Number of Survey point	at one point and 24 consecutive hours for one day
	Location	1 Point (at the Dagon Myothit (East) 500kV Substation Project boundary)
Water Quality	Survey Parameter	1) Water Temperature 2)pH 3) EC 4) Biochemical Oxygen Demand (BOD <sub>(5)</sub> ) 5) Chemical Oxygen Demand (COD <sub>(Cr)</sub> ) 6) Oil and grease, 7) Total coliform, 8) Total Nitrogen, 9)Total Phosphorus, 10)Total Suspended Solids, 11) Chromium total, 12) Cadmium, 13)Arsenic, 14)Zinc, 15) Lead, 16) Mercury, 17) Copper, 18) Iron, 19)Manganese
	Survey Period	8 <sup>th</sup> January 2020
	Number of Sampling points	Sampling at one point
	Location	Taking water samples from Nga Moe Yeik Creek near the new substation area
Soil Quality	Survey Parameter	1) Chromium Total, 2) Cadmium, 3) Arsenic, 4) Zinc, 5) Lead, 6) Mercury, 7) Copper, 8) Iron, 9) Manganese
	Survey Period	8 <sup>th</sup> January 2020
	Number of Sampling points	Sampling at one point
	Location	At the Project boundary of the new substation
Noise Level	Survey Parameter	L <sub>L,Aeq</sub> (dB)
	Survey Period	8 <sup>th</sup> – 9 <sup>th</sup> January, 2020
	Number of Survey point	At one point and 24 consecutive hours for one day
	Location	1 Point
Vibration Level	Survey Parameter	L <sub>v10</sub> (dB)
	Survey Period	8 <sup>th</sup> – 9 <sup>th</sup> January, 2020
	Number of Survey point	At one point and 24 consecutive hours for one day
	Location	1 Point

Source: IEE Study Team

## 6.2 Air Quality

The survey of air quality, AQ 1, have been monitored in one location at the Project boundary of the new substation. The air quality location, AQ 1 have been chosen by considering the closest receptor from the new Substation area as a representative point with other places including the route of transmission line and in order to avoid emission from normal life activities of houses. Baseline air quality and meteorology survey have been conducted in the dry season for 24 hours to know the current air quality of the Project area. Table 6.2-1 shows the outline of the air quality field survey.

**Table 6.2-1 Outlines of Air Quality Field Survey**

Survey Period	Survey Item	Parameters	Number of Point	Duration	Survey Methodology
From 8 <sup>th</sup> January – 9 <sup>th</sup> January 2020	Air Quality	PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , SO <sub>2</sub> , Ozone, Wind Speed & Wind Direction	1 point (AQ 1)	24 hrs.	On-site measurement by Haz-Scanner Environmental Perimeter Air Station (EPAS)

Source: IEE Study Team

### (1) Survey Items

The parameters for air quality survey were PM10, PM2.5, NO2, SO2, Ozone and the parameters for the meteorology survey were wind speed and wind direction.

### (2) Survey Location

The location of air quality survey point is shown in Table 6.2-2. The detail of the survey point is described below. The locations of the air quality survey points are shown in Figure 6.2-1.

**Table 6.2-2 Location of Air Quality Field Survey**

Survey Point	Coordinates	Description of Survey Point
AQ 1	N: 17° 3'41.28", E: 96°17'54.44"	At the boundary of the new substation area.

Source: IEE Study Team



Remark: **N** North **NNE** North-Northeast **NE** Northeast **ENE** East-Northeast **E** East **ESE** East-Southeast **SE** Southeast **SSE** South-Southeast **S** South **SSW** South-Southwest **SW** Southwest **WSW** West-Southwest **W** West **WNW** West-Northwest **NW** Northwest **NNW** North-Northwest

Source: IEE Study Team

**Figure 6.2-1 Location of Air Quality Survey Plan at AQ 1**

**AQ-1**

AQ-1 is located at the boundary of New Hlegu 500 kV Substation which is located in the Sar Ta Lin Village of the Hlegu Township. It is surrounded by farmland and fish ponds in all four cardinal directions. The residential areas are found in the east, south and south-west of the site. The nearest access road is the Hlegu-Dar Pein Road located beside the Project site in the south. It is connected to the No.2 Main Road in the east of the Project site. The garment factory is located at the Northeast of the Project site and the brick manufacturing process are operated at the South-Southeast of the Project site.

**(3) Survey Period**

Air quality and meteorology survey were conducted 1 day from 8 January 2020 – 9 January 2020.

**(4) Survey Method**

Survey of meteorology and air quality (PM10, PM2.5, NO2, SO2, and Ozone) were conducted by referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner EPAS was used to collect ambient air pollutants. The EPAS measures automatically every one minute and directly reads and records onsite for NO2, SO2, PM2.5 and PM10. The equipment of meteorological and air quality survey is shown in Figure 6.2-2.

**(5) Survey Results**

The 24 hours average value of air quality survey results of PM10, PM2.5, NO2, SO2, and Ozone during the dry season is described in Table 6.2-3. As shown in Table 6.2-3, the value of NO2 is under the NEQG guideline values. However, the value of SO2, PM2.5 PM10 and ozone at the monitoring point is higher than the National Environmental Quality Emission Guideline (NEQG) value. The survey photos for air quality monitoring are shown in Figure 6.2-2.

**Table 6.2-3 Air Quality Survey Result (Daily Average)**

Date	NO2	PM2.5	PM10	SO2	Ozone
	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
02 ~ 03 May, 2019	70.11	55.14	75.67	200.83	108.63
One Day Average Value	70.11	55.14	75.67	200.83	108.63
NEQG Guideline Value	200 (1- hour)	25 (24- hours)	50 (24- hours)	20 (24- hours)	100 (8-hours)

NEQG: National Environmental Quality Emission Guideline (MJTD)  
Note: The value in red color shows the value which is higher than NEQG  
Source: IEE Study Team



Source: IEE Study Team

**Figure 6.2-2 Air Quality Monitoring at AQ 1**

Possible emission sources for PM2.5 and PM10 are affected from natural origin such as dust from

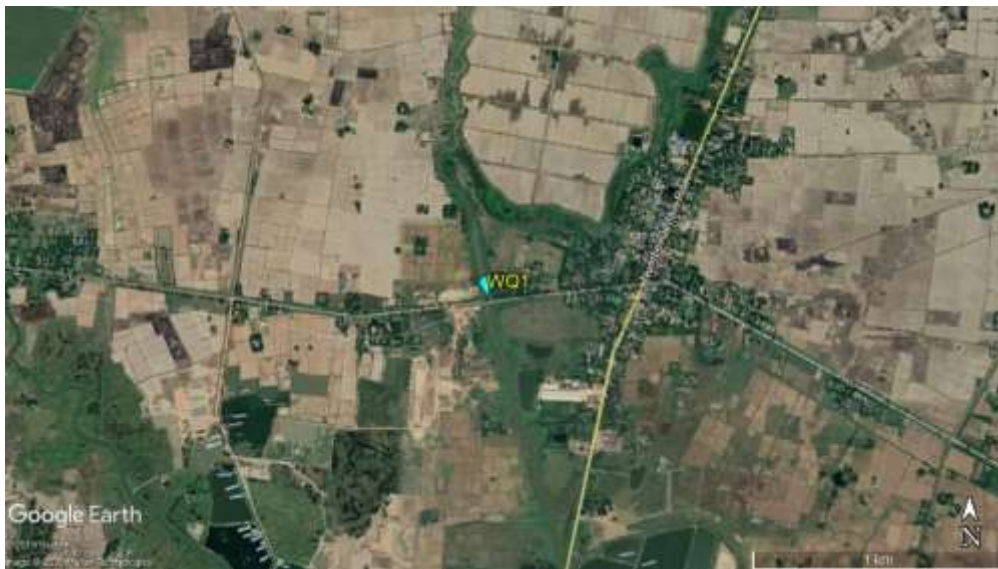
unpaved land area around the Project area, transportation around the Hlegu - Dar Pein Road and dust emissions from the brick manufacturing process.

Possible emission sources for SO<sub>2</sub> are affected from the combustion of fuel for vehicles from nearby roads and operation activities from brick manufacturing process.

The value of Ozone is slightly higher than the guideline values. Ozone forms near the ground when pollutants (emitted by sources such as cars and burning) react chemically in sunlight. Ozone pollution is more likely to form during warmer months. Possible emission sources are affected from vehicles from nearby roads and from the brick manufacturing process.

### 6.3 Water Quality

The field survey of the water quality was conducted at one location, named WQ 1, and it have been monitored around the Project area in the dry season. WQ 1 was collected from Sar Ta Lin Creek over a small bridge along Hlegu-Dar Pein Road which is considered as the closest water receiving a body near the Project area. Location of sampling points for water quality survey is shown in Figure 6.3-1.



Source: Google Earth

**Figure 6.3-1 Location of Sampling Points of Water Quality at WQ 1**

#### (1) Survey Items

Water quality sampling was carried out at one location. Survey items for water quality sampling points are summarized in Table 6.3-1.

**Table 6.3-1 Survey Items for Water Quality**

No.	Parameters	WQ 1	Remarks
1	Water Temperature	○	On-site measurement
2	pH	○	On-site measurement
3	Electrical Conductivity	○	On-site measurement
4	Biochemical Oxygen Demand (BOD (5))	○	Laboratory analysis
5	Chemical Oxygen Demand (COD (Cr))	○	Laboratory analysis
6	Oil and Grease	○	Laboratory analysis
7	Total Coliform	○	Laboratory analysis

No.	Parameters	WQ 1	Remarks
8	Total Nitrogen	○	Laboratory analysis
9	Total Phosphorous	○	Laboratory analysis
10	Suspended Solids (SS)	○	Laboratory analysis
11	Chromium (Total)	○	Laboratory analysis
12	Cadmium	○	Laboratory analysis
13	Arsenic	○	Laboratory analysis
14	Zinc	○	Laboratory analysis
15	Lead	○	Laboratory analysis
16	Mercury	○	Laboratory analysis
17	Copper	○	Laboratory analysis
18	Iron	○	Laboratory analysis
19	Manganese	○	Laboratory analysis

Source: IEE Study Team

## (2) Description of Sampling Location

The outline of sampling points is mentioned in Table 6.3-2.

**Table 6.3-2 Outline of Sampling Points**

No.	Station	Detailed Information
1	WQ 1	Coordinate - N- 17° 3'38.06", E- 96°18'9.80"
		Location – at Sar Ta Lin Creek on Hlegu-Dar Pein Road
		Survey Item – Surface water sampling.

Source: IEE Study Team

### WQ 1

WQ 1 was collected at the Sar Ta Lin Creek from the small bridge on Hlegu-Dar Pein Road. The new substation project area is in the West-Northwest WQ 1. The Garment factory is located in the East-Northeast of WQ 1. The water quality of this survey point might be influenced by the surrounding area such as nearby residential housing, irrigation canals, paddy fields and fish ponds.

## (3) Survey Period

Water quality survey was conducted on 8 January 2020 during the dry season. The sampling time is shown in Table 6.3-3.

**Table 6.3-3 Sampling Time of Water Quality at WQ 1**

No.	Station	Sampling Time
1	WQ 1	8 Jan 2020 09:34

Source: IEE Study Team

## (4) Survey Method

All water samples were collected with cleaned sampling bottles and analyzed by the following standard method as shown in Table 6.3-4. All samples were kept in iced boxes keeping at 2-4° C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument “Horiba, U-52”.



**Table 6.3-4 Analytic Method for Water Quality**

No.	Parameter	Method
1	Water Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	EC	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
4	BOD (5)	APHA 5210 B (5 Days BOD Test)
5	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)
7	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)
9	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)
10	Suspended Solids	APHA 2540 D (Dry at 103-105°C Method)
11	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
12	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
14	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
15	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
16	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
18	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
19	Manganese	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)

Source: IEE Study Team

### (5) Survey Results

Results of water quality survey are summarized in Table 6.3-5. The water quality results were compared with the guideline value of the effluents in Electric Power Transmission and Distribution sector in the National Environmental Quality (Emission) Guidelines (NEQG) in Myanmar.

As the comparison with the NEQG guideline value, the results of total coliform and iron exceeded the NEQG guideline values.

As for the result of total coliform of surface water, results at the surface water monitoring point (WQ 1) during the dry season exceeded the target value due to two expected reasons; i) natural bacteria existed because there are various kinds of vegetation and creature such as birds and small animals and ii) delivered from upstream area such as natural origin and wastewater from the residence.

As for the result of iron, the result at the surface water monitoring point (WQ 1) exceeded the target value. The possible reasons may be due to the influence of natural origin (iron can reach out from soil by run-off). In Yangon, soil is naturally rich in iron.

**Table 6.3-5 Water Quality Survey Results**

No.	Parameters	Unit	WQ 1	NEQG Guideline Value
1	Water Temperature	°C	25.23	-
2	pH	-	6.67	-
3	Electrical Conductivity	m <sup>3</sup> /cm	0.11	-
4	BOD (5)	mg/L	5.53	30
5	COD (Cr)	mg/L	25	125
6	Oil and Grease	mg/L	< 3.1	10
7	Total Coliform	MPN/100ml	92,000	400

No.	Parameters	Unit	WQ 1	NEQG Guideline Value
8	Total Nitrogen (T-N)	mg/L	3.1	10
9	Total Phosphorous (T-P)	mg/L	0.165	2
10	Suspended Solid (SS)	mg/L	84.00	50
11	Chromium	mg/L	0.018	0.5
12	Cadmium	mg/L	≤ 0.002	0.1
13	Arsenic	mg/L	≤ 0.01	0.1
14	Zinc	mg/L	0.08	2
15	Lead	mg/L	≤ 0.002	0.1
16	Mercury	mg/L	≤ 0.002	0.01
17	Copper	mg/L	≤ 0.002	0.5
18	Iron	mg/L	13.212	3.5
19	Manganese	mg/L	0.718	-

Note: The value in red color shows the value which is higher than NEQG

Note: Blue color in the target value is for the effluents in Electric Power Transmission and Distribution sector.

Note: Target values are taken from NEQG Guideline for General Wastewater.

Source: IEE Study Team



Source: IEE Study Team

**Figure 6.3-2 Water sampling at WQ 1**

## 6.4 Soil Quality

Soil quality was measured to know the soil contamination condition of the Project area. The sampling was collected at one location at the boundary of the Project site, SQ 1. Soil quality sampling was conducted on 8th January 2020.

### (1) Survey Items

Soil quality sampling was carried out at one location. Survey items and sampling points are summarized in Table 6.4-1.

**Table 6.4-1 Survey Items for Soil Quality**

No.	Parameters	SQ 1	Remarks
1	Chromium (Cr)	○	Laboratory analysis
2	Cadmium (Cd)	○	Laboratory analysis
3	Arsenic (As)	○	Laboratory analysis

No.	Parameters	SQ 1	Remarks
4	Zinc (Zn)	○	Laboratory analysis
5	Lead (Pb)	○	Laboratory analysis
6	Mercury (Hg)	○	Laboratory analysis
7	Copper (Cu)	○	Laboratory analysis
8	Iron (Fe)	○	Laboratory analysis
9	Manganese (Mn)	○	Laboratory analysis

Source: IEE Study Team

## (2) Survey Location

The locations of soil quality survey points are shown in Table 6.4-2. The detail of each survey point is described below. The locations of the soil quality survey points are shown in Figure 6.4-1.

**Table 6.4-2 Location of Soil Quality Survey**

Survey Point	Coordinates	Description of Survey Point
SQ 1	N: 17° 3'41.28", E: 96°17'54.44"	At the boundary of the new substation project area.

Source: IEE Study Team



Source: Google Earth

**Figure 6.4-1 Location of Soil Quality Survey Point at SQ 1**

## (3) Survey Period

Soil and sediment quality survey was conducted on 8 January 2020 during dry season and sampling time is shown in Table 6.4-3.

**Table 6.4-3 Sampling Date and Time of Soil at SQ 1**

No.	Station	Sampling Time
1	SQ 1	8 Jan 2020 10:00

Source: IEE Study Team

## (4) Survey Method

Soil samples were applied with the standard agricultural sampler (soil auger) was applied. The sampler

is a stainless-steel tube that is sharpened on one end and fitted with a long, T-shaped handle. This tube is approximately three inches inside diameter. In order to refrain from contamination, about 30cm of top soil were removed by the sampler before sampling. The sampling is firstly taken from five places as one center point with four different directions whereas four different places are 10m away from center point. Then collected samples from five places were mixed and taken about 1kg in cleaned plastic bag. Chemical preservation of samples was not applied because it is generally not recommended by standard method. Samples were cooled in an ice box which temperature was under 4°C. Samples were protected from sunlight to minimize any potential reaction.

**Table 6.4-4 Analytic Method for Sediment Quality**

No.	Parameter	Method
1	Chromium	SM 2012:3120B ICP-OES
2	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP))
3	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP))
4	Zinc	Atomic Absorption Spectroscopy (AAS)
5	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP))
6	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP))
7	Copper	SM 2012:3120B ICP-OES
8	Iron	SM 2012:3120B ICP-OES
9	Manganese	SM 2012:3120B ICP-OES

Source: IEE Study Team

## (5) Survey Results

The result of soil quality analysis is presented in below table. All parameters showed significantly lower levels than the examined standards in Vietnam and Thailand. Therefore, the soil qualities of project surrounding area are good condition.

**Table 6.4-5 Results of Soil Quality Survey at SQ**

No.	Parameter	Unit	SQ 1	Environmental Standard	
				Vietnam (Industrial land)	Thailand (Not for habitat or agriculture)
1	Arsenic (As)	mg/kg	≤ 0.34	12	27
2	Cadmium (Cd)	mg/kg	≤ 0.068	10	810
3	Chromium (Cr)	mg/kg	50.7	-	640
4	Copper (Cu)	mg/kg	20.8	100	-
5	Iron (Fe)	mg/kg	1.7%	-	-
6	Lead (Pb)	mg/kg	6.052	300	750
7	Manganese (Mn)	mg/kg	355.8	-	32,000
8	Mercury (Hg)	mg/kg	≤ 0.068	-	610
9	Zinc (Zn)	mg/kg	0.66	300	-

Source: Vietnam: QCVN 03:2008/BTNMT, “industrial land” class, Thailand: Notification of National Environmental Board No. 25, B.E. (2004), “other purpose” class

Note: The remaining laboratory results are to be attained from DOWA Lab and Government Lab.

Source: IEE Study Team



Source: IEE Study Team

**Figure 6.4-2 Soil Quality Monitoring at SQ 1**

## 6.5 Noise and Vibration Level

The survey of noise and vibration level, NV 1, has been monitored one location at the Project boundary of the new substation. Baseline noise and vibration level survey have been conducted in the dry season for 24 hours to know the noise and vibration levels near the surrounding environment. Noise and vibration levels had been monitored from 8th January – 9th January 2020. Table 6.5-1 shows the outline of the noise and vibration level survey.

**Table 6.5-1 Outlines of Noise and Vibration Level Survey**

Survey Date	Survey Item	Parameters	Number of Points	Duration	Survey Methodology
From 8 <sup>th</sup> January – 9 <sup>th</sup> January, 2020	Noise Level	$L_{Aeq}$ (dB)	1 (NV 1)	24 hours	On-site measurement by “Rion NL-42 sound level meter”
From 8 <sup>th</sup> January – 9 <sup>th</sup> January, 2020	Vibration Level	$L_{v10}$ (dB)	1 (NV 1)	24 hours	On-site measurement by “Vibration Level Meter- VM-53A”

Source: IEE Study Team

### (1) Survey Items

The noise and vibration level survey items are shown in Table 6.5-2.

**Table 6.5-2 Survey Parameters for Noise and Vibration Level**

No.	Item	Parameter
1	Noise	A-weighted loudness equivalent ( $L_{Aeq}$ )
2	Vibration	Vibration level, vertical, percentile ( $L_{v10}$ )

Source: IEE Study Team

### (2) Survey Location

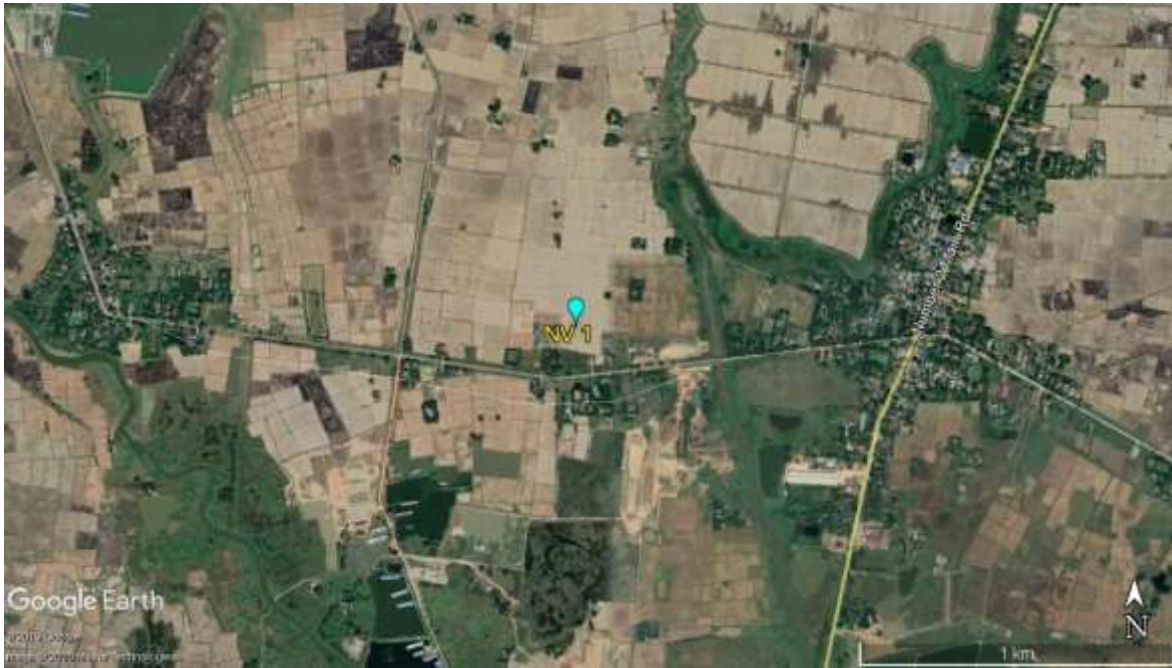
The locations of noise and vibration level points are shown in Table 6.5-3. The detail of survey point is described below. The location of the noise and vibration survey points are shown in Figure 6.5-1.

**Table 6.5-3 Location of Noise and Vibration Survey Points**

Survey Point	Coordinates	Description of Survey Point
NV 1	N: 17° 3'40.88", E: 96°17'55.89"	At the boundary of the new substation project area.

Source: IEE Study Team





Source: Google Earth

**Figure 6.5-1 Location of Noise and Vibration Level Survey Points at NV 1**

### **NV 1**

NV 1 is located at the boundary of New Hlegu 500 kV Substation which is located in the Sar Ta Lin Village of the Hlegu Township. It is surrounded by farmland and fish ponds in all four cardinal directions. The residential areas are found in the east, south and south-west of the site. The nearest access road is the Hlegu-Dar Pein Road located beside the Project site in the south. It is connected to the No.2 Main Road in the east of the Project site.

#### **(3) Survey Period**

Noise and vibration level survey were conducted 24 hours from 8th January 2020 – 9th January 2020.

#### **(4) Survey Method**

Noise level was measured by “Rion NL-42 sound level meter” and automatically recorded every 10 minutes in a memory card. The vibration level meter, VM-53A (Rion Co. Ltd., Japan), accompanied by a 3-axis accelerometer PV-83C (Rion Co. Ltd.), was placed on solid soil ground. Vertical vibration (Z axis), Lv, was measured every 10 minutes within the adaptable range of (10-70) dB at NV-1 recorded to a memory card. The measurement period of noise and vibration was 24 hours. The status of the noise and vibration level survey on NV-1 is shown in Figure 6.5-4.

#### **(5) Survey Results**

##### **Noise Results**

Noise measurement results are separated daytime (07:00 to 22:00) and night time (22:00 to 07:00) time frames respectively for NV-1. Noise measurement was carried out for one location on a 24-hour basis. The survey results are summarized in Table 6.5-4. Hourly noise level survey results for NV-1 are shown in Table 6.5-5. Figure 6.5-2 showed the results of noise level (LAeq) at NV-1. Comparing with the guideline value of noise level prescribed in NEQG Guidelines value, the day time results of NV-1 was under the guideline values and the night time results of NV-1 was slightly higher than the guideline value.

**Table 6.5-4 Results of Noise Levels (LAeq) Monitoring at NV 1**

Date	(Residential, Institutional, Education) Equivalent Noise Level (LAeq, dB)	
	Day Time (7:00 AM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
8 – 9 January, 2020	46	46
Target Value	55	45

Note: The value in red color shows the value which is higher than NEQG

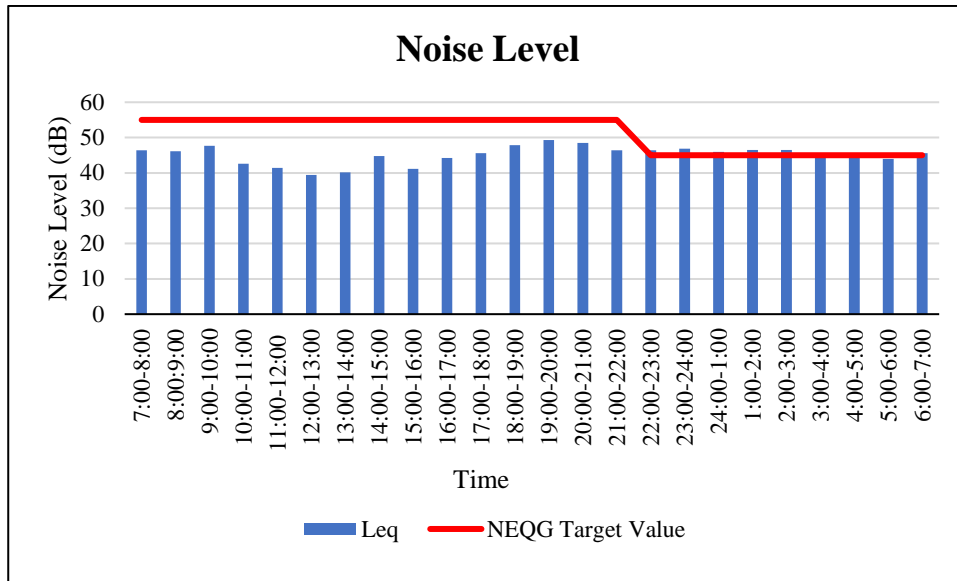
Note: Target value is applied to the noise level in the NEQG Guideline (Dec 2015), Myanmar

Source: IEE Study Team

**Table 6.5-5 Hourly Noise Level (LAeq) Survey Results at NV-1**

Date	Time	(LAeq, dB)	(LAeq, dB) Each Category	(LAeq, dB) Target Value	Remark
8 – 9 January, 2020	7:00-8:00	46	46	55	
	8:00-9:00	46			
	9:00-10:00	48			
	10:00-11:00	43			
	11:00-12:00	41			
	12:00-13:00	39			
	13:00-14:00	40			
	14:00-15:00	45			
	15:00-16:00	41			
	16:00-17:00	44			
	17:00-18:00	46			
	18:00-19:00	48			
	19:00-20:00	49			
	20:00-21:00	49			
	21:00-22:00	46			
	22:00-23:00	46	46	45	
	23:00-24:00	47			
	24:00-1:00	46			
	1:00-2:00	47			
	2:00-3:00	46			
3:00-4:00	45				
4:00-5:00	45				
5:00-6:00	44				
6:00-7:00	46				

Source: IEE Study Team



Source: IEE Study Team

**Figure 6.5-2 Results of Noise Levels (L<sub>Aeq</sub>) Survey at NV-1**

**Vibration Results**

Vibration monitoring results are separated daytime (07:00 to 19:00), evening time (19:00 to 22:00) and night time (22:00 to 07:00) time frames respectively for NV-1. Vibration measurement was carried out for one location on a 24-hour basis. The results of vibration level (L<sub>v10</sub>) monitoring at NV-1 is shown in Table 6.5-6. The results of hourly vibration level survey for NV-1 is summarized in Table 6.5-7 and Figure 6.5-3. There is no guideline value for vibration level in Myanmar’s NEQG as well as Southeast Asia and International organizations such as WHO and IFC. Therefore, the value of vibration level is compared with the target value of Thilawa Special Economic Zone B which is set based on the Japanese standard. By comparing with the target vibration level in operation stage in EIA report for Thilawa Special Economic Zone development project Zone B, all of results were under the target values.

**Table 6.5-6 Results of Vibration Levels (L<sub>v10</sub>) Monitoring at NV 1**

Date	(Residential areas)		
	Equivalent Vibration Level (L <sub>v10</sub> , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
3 – 4 May 2019	31	28	26
Target Value	65	65	60

Note: Target value is applied to the vibration level during the construction stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone B).

Source: IEE Study Team

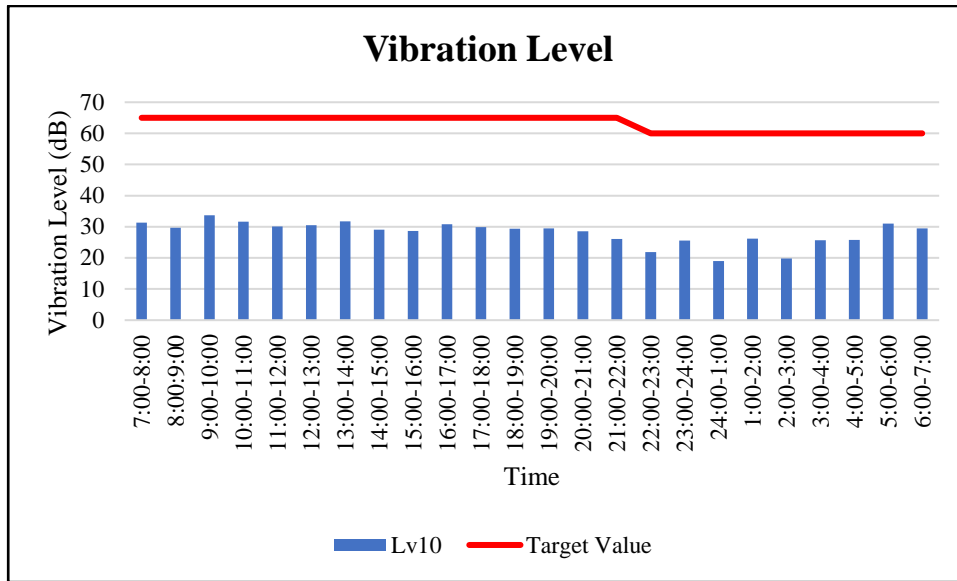
**Table 6.5-7 Results of Hourly Vibration Levels (L<sub>v10</sub>) Survey at NV-1**

Date	8-9 January, 2020	(L <sub>v10</sub> , dB) Each Category	(L <sub>v10</sub> , dB) Target Value	Remark
Time	L <sub>v10</sub>			
7:00-8:00	31	31	65	
8:00-9:00	30			



Date	8-9 January, 2020	(Lv10, dB)	(Lv10, dB)	Remark
Time	Lv10	Each Category	Target Value	
9:00-10:00	34			
10:00-11:00	32			
11:00-12:00	30			
12:00-13:00	30			
13:00-14:00	32			
14:00-15:00	29			
15:00-16:00	29			
16:00-17:00	31			
17:00-18:00	30			
18:00-19:00	29			
19:00-20:00	29	28	65	
20:00-21:00	29			
21:00-22:00	26			
22:00-23:00	22	26	60	
23:00-24:00	26			
24:00-1:00	19			
1:00-2:00	26			
2:00-3:00	20			
3:00-4:00	26			
4:00-5:00	26			
5:00-6:00	31			
6:00-7:00	29			

Source: IEE Study Team



Source: IEE Study Team

Figure 6.5-3 Results of Vibration Levels (Lv10) Survey at NV 1



Source: IEE Study Team

Figure 6.5-4 Noise and Vibration Level Monitoring at NV 1

## CHAPTER 7: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS

### 7.1 Pollution

#### 7.1.1 Air Pollution

##### (1) Forecast Item

- Dust and exhaust gas generated from the construction or closing (demolition) activities.
- Exhaust gas generated from the usage of machines/vehicles for maintenance activities during the operation stage.

##### (2) Forecast Area

- The area examined to forecast the impact was set in and around 1 km radius of the substation area and 500 m distance on both sides from the transmission line route.

##### (3) Forecast Period

- The forecast period for the construction/closing stage was set throughout the construction/closing stage of the proposed project.
- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

##### (4) Forecast Method

The impact forecast for air pollution was conducted as follows:

- To examine the impact of air pollution during the construction/closure stage by considering the construction/ demolition methods and schedule, the features of the Project site, and air quality management controls.
- To examine the impact of air pollution during the operation stage by considering the operation and maintenance activities.

The assessment could rely on the field visit to the Project area and existing surrounding conditions and mitigation measures that are using at General and Specific EHS guidelines.

##### (5) Forecast Results

##### Forecast Results in Construction/Closing Stage

The following Table 7.1-1 tabulated the general construction activities of the project site.

**Table 7.1-1 General Construction Activities of Project Site**

No.	Item	Description/ Activities
1	Workshop	<u>Construction Work</u> Earth work, RC work for foundation, Cable Distribution Network installation, Tower & Poles work, Circuit breaker, Steel structure work, Installation of Gantry Crane, Power Grid interconnection, Masonry work, Others.
2	Foundation	<u>Tower Foundation</u> Excavation & Lean concrete, Formwork & steel rebar, Concrete placing, Backfilling <u>Overhead Transmission Line Foundation</u> Excavation & Lean concrete, Formwork & steel rebar, Concrete placing, Backfilling

No.	Item	Description/ Activities
		<p><u>Lighting poles</u> Foundation work, Steelwork</p> <p><u>Lighting Masts</u> Foundation work, Steelwork</p> <p><u>Power, Voltage and Current Transformer Foundation</u> Excavation &amp; Lean concrete, Formwork &amp; steel rebar, Concrete Placing, Backfilling</p> <p><u>Sub-Building (Generator, etc.)</u> Earthwork, RC work, Steel structure work, Masonry and Plastering work, Finishing work</p> <p><u>Office Building</u> Earthwork, RC work for a foundation, RC work for the ground floor, RC work for Roof floor, Masonry work, Plastering work, Door and window work, Waterproofing work, Tile and stonework, Painting work, Ceiling, and partition work, Interior finishing work</p> <p><u>Water tank and Pump / Storage room</u> Soil Excavation, Lean concrete, Formwork, Rebar work, Concrete, Soil backfilling, Waterproof work, the Steel structure for pump room</p> <p><u>Water drainage</u> Stormwater drainage, wastewater drainage</p> <p><u>Road</u> Excavation, Backfilling, Aggregate base coarse, Concrete pavement, Install curb</p> <p><u>Fence and Gate</u> Fence, Main gate</p>
3	Mechanic works	Water supply pipe system, Wastewater pipe system, Firefighting pipe system, Pump room, Sanitary ware, Firefighting equipment, Air conditioner system
4	Electric works	Lighting projection works, Earthing system, Power energizing,

The principal source of potential air quality impacts during the construction and closing stages will be dust. At the construction stage, firstly, it will be generated from site preparation for both substation and transmission lines. The activities like site cleaning and leveling during site preparation could generate dust and particulate matter (PM<sub>10</sub>). Moreover, dust could be also generated from transportation of construction material, movement of vehicles and machinery, and excavation activities during the construction of tower foundation and underground transmission lines. The exhaust gases (SO<sub>2</sub>, NO<sub>2</sub>, etc.) could also be emitted from the construction vehicles, machinery and generators used in the construction site.

It is not expected that significant impact will occur on local residents or that emissions will not exceed regulatory permissible ground-level concentrations as the residential area are far from the construction site except the underground transmission lines construction area. As the underground transmission lines will be constructed along the road within the residential area, the necessary mitigation measures will be required especially for that area. All air emission impacts will be of temporary in nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression measures, regular maintenance of vehicles and use of high-quality fuel etc.

The air pollution at closing stage is also the same as construction but the demolition activities could generate more dust than construction activities. Therefore, proper mitigation measures are required to control dust.

## Forecast Results in Operation Stage

The main source of air pollution will be exhaust gas emission from the vehicular movement during the operation stage. The exhaust gas could be generated from vehicles and machinery using for maintenance purpose. However, as the substation and transmission areas are far from the residential area, it is not expected that significant impact will occur on local residents. Dust could be also generated from movement of vehicles and maintenance of underground transmission lines which will include excavation works. The impact might occur only in sometimes and it will not be significant.

### 7.1.2 Water Pollution

#### (1) Forecast Item

- Construction runoff and domestic wastewater generated from the construction or closing (demolition) activities.
- Domestic wastewater generated from the staff housings and surface runoff passed through the substation area.

#### (2) Forecast Area

- The area examined to forecast the impact was set in and around 100 m radius of the Project area.

#### (3) Forecast Period

- The forecast period for the construction/closing stage was set throughout the construction/closing stage of the proposed project.
- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

#### (4) Forecast Method

The impact forecast for water pollution was conducted as follows:

- To examine the impact of water pollution during the construction/closure stage by considering the construction/ demolition methods and schedule, the features of project site, and water quality management controls.
- To examine the impact of water pollution during the operation stage by considering the sewage management controls of staff housings.

The assessment could rely on field visit to the Project area and existing surrounding conditions and mitigation measures that are using at General and Specific EHS guidelines.

#### (5) Forecast Results

##### Forecast Results in Construction/Closing Stage

Potential sources of water quality impact associated with the proposed construction activities at the works areas of the Project have been identified and include:

- construction site runoff and drainage
- general construction activities
- sewage effluent produced by on-site workforce.

##### Construction site runoff and drainage

During site clearance, runoff and drainage from the works area would be the main sources of potential water quality impact. Site runoff and drainage may contain increased loads of suspended solids and

contaminants. Potential sources of pollution from site drainage include runoff and erosion from exposed soil surfaces, earth working areas and stockpiles; release of grouting and cement materials with rain wash; wash water from dust suppression sprays; and fuel and lubricants from maintenance of construction vehicles and mechanical equipment. Site runoff and drainage from the works area on the upper hillslope, if uncontrolled, could enter the drainage culvert.

#### General Construction activities

On-site construction activities may cause water pollution from the following:

- Uncontrolled discharge of debris and rubbish such as packaging, construction materials and refuse etc. and
- Spillages of liquid stored on-site, such as oil, diesel and solvents etc.

#### Sewage effluent

Domestic sewage would be generated from the workforce during the construction phase. Temporary toilets will be provided for the site workers. The Contractor will have the responsibility to ensure that temporary toilets are used and properly maintained, and that contractor are employed to collect and dispose of the waste off-site at approved locations. Therefore, no adverse water quality impacts are anticipated.

The impact can be only occurred occasionally during the activities and its magnitude will be low in nature. Necessary mitigation measures will help the impact to be reduced.

#### **Forecast Results in Operation Stage**

Domestic wastewater could be generated from the staff housing area of the substation during operation stage. The impact will be significant to the surrounding water body without proper mitigation measures. Therefore, the proper design of drainage system should be included in the substation area and the regular maintenance of the drainage should be conducted as per necessary.

#### **7.1.3 Noise and Vibration**

##### **(1) Forecast Item**

- Noise and vibration generated from the construction or closing (demolition) activities
- Noise and vibration generated from the operation of substation.

##### **(2) Forecast Area**

- The area examined to forecast the impact was set at the boundary of the substation and 500 m distance on both sides from the transmission line route.

##### **(3) Forecast Period**

- The forecast period for the construction/closing stage was set throughout the construction/closing stage of the proposed project.
- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

##### **(4) Forecast Method**

The impact forecast for noise and vibration was conducted as follows:

- To examine the impact of noise and vibration during the construction/closure stage by considering the construction/ demolition activities, noise and vibration level baseline results, compared to the noise and vibration target levels.

- To examine the impact of noise and vibration during the operation stage by considering the noise and vibration level baseline results, compared to the noise and vibration target levels and noise level management controls.

The assessment could rely on the design and facilities of substation, existing surrounding conditions and mitigation measures according to General and Specific EHS guidelines of IFC.

**(5) Forecast Results**

**Forecast Results in Construction/Closing Stage**

During Construction and Closing Stage, the major sources of noise and vibration will be construction equipment and vehicle movement.

Operation of Construction Equipment

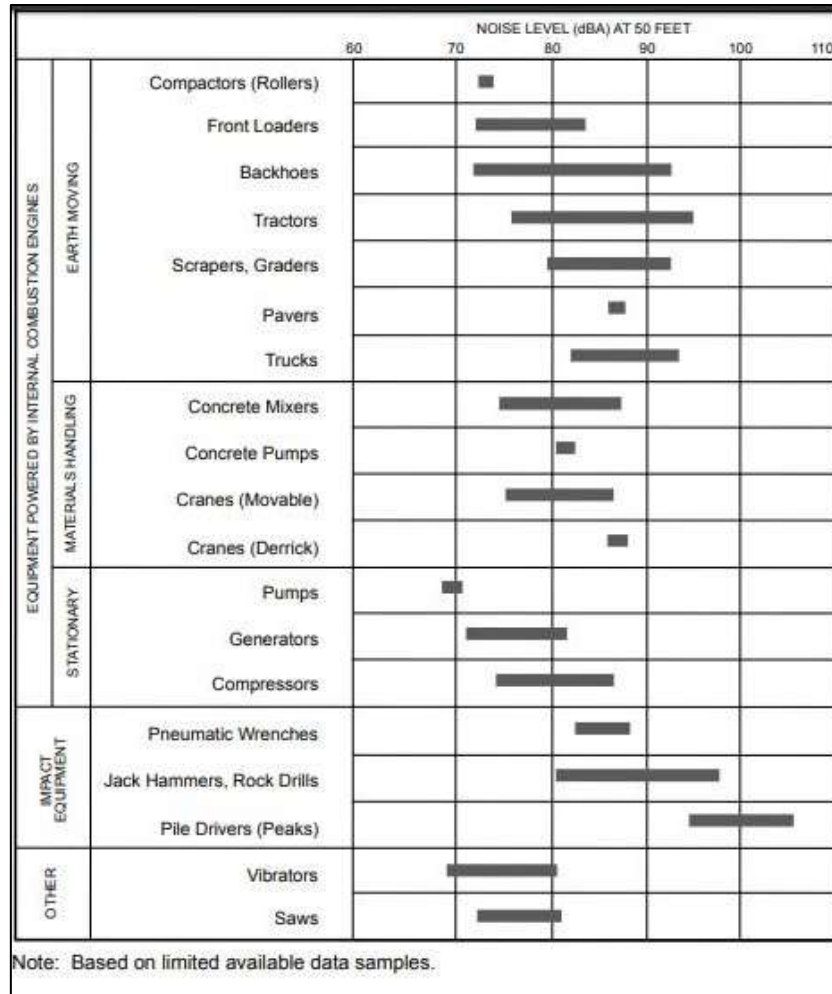
Construction equipment can be generally grouped into three (3) main categories – Heavy Equipment, Stationary Equipment and Impact Equipment. Table 7.1-2 described the types of machineries and operation hours of each machine.

**Table 7.1-2 Types of Machineries and their Operation Hours**

No	Machine	Size	Total hours to use
1	Roller	25 Ton	240
2	Excavator	21 Ton	560
3	Excavator	13 Ton	120
4	Grader	120 hp	16
5	Bulldozer	80 hp	25
6	Dump Truck	8 Ton	1,200
7	Generator	20 kVA	1,440

Source: IEE Study Team

According to US Environmental Protection Agency, the noise levels of typical construction equipment are shown in Figure 7.1-1.



Source: United States Environmental Protection Agency 1971

**Figure 7.1-1 Noise Levels of Typical Construction Equipment**

The impact is expected to be significant but short term experienced only in cases where mechanized equipment is used. Moreover, there will be rare to have a direct impact to local residents as the construction site are far from the residential areas. However, the noise and vibration impact should be careful at the underground transmission lines construction as it will be conducted within the residential area. Necessary mitigation measures will be prescribed for those impacts to reduce its significant level to be reduced.

**Forecast Results in Operation Stage**

The noise generation during operational phase can be from two sources as below.

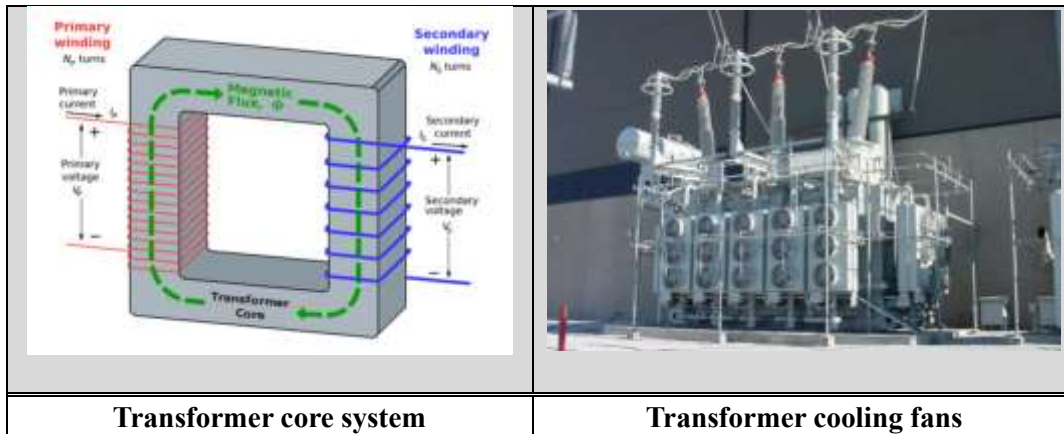
- Noise from the operation of transformers will be in the form of buzzing and humming which will be felt only up to 15 to 50 m from the substation area.
- Noise from overhead transmission lines will be from corona phenomenon which is the ionization of the air around the conductors as cracking or hissing noise particularly during rain or fog.

Noise Level from Each Source

Noise pollution especially occurred from transformers magnetostriction which can emit a continuous 120 hertz hum with harmonics when connected to 60 Hz circuits. The fundamental frequency is the “hum” which annoys people primarily because of its continuous nature. A phenomenon,



magnetostriction occurs when a strip of iron which is located in transformer core system is magnetized to change iron's physical dimensions. Transformer cores are constructed by stacking layers of thin iron laminations, separated from its neighbors by a thin non-conducting layer of insulation. When the core becomes magnetized, the magnetic field acts between the adjacent plates, stretching and squeezing the adhesive and insulation between them. The vibration of these layers can produce the humming noise. Moreover, the load noise in transformer is produced by axial and radial vibration of the windings. It can also be caused by vibrations in the transformer tank walls and magnetic shields due to the electromagnetic forces produced by the load currents. Noise produced by cooling fans usually contribute more to the total noise for transformers of smaller rating. For purposes of reference, transformer core system and sound levels are described in the Figure 7.1-2 and Figure 7.2-3 below.



Source: <https://testguy.net/content/259-Transformer-Humming-Noise-Explained>

**Figure 7.1-2 Main Noise from Transformer Operation**

kVA	Liquid-Filled Transformers		Dry-Type Transformers	
	Self-Cooled Rating (OA)	Forced-Air Cooled Rating (FA)	Self-Cooled Rating (AA)	Forced-Air Cooled Rating (FA)
300	55	..	58	67
500	56	67	60	67
750	58	67	64	67
1000	58	67	64	67
1500	60	67	65	68
2000	61	67	66	69
2500	62	67	68	71
3000	63	67	68	71
3750	64	67	70	73
5000	65	67	71	73
6000	66	68	72	74
7500	67	69	73	75
10000	68	70	..	76

Source: <http://www.transmission-line.net/2011/07/transformers-audible-sound-levels-basic.html>

**Figure 7.1-3 Transformer Audible Sound Levels**

Corona noise which is the most common noise associated with transmission lines hearing as a crackling or hissing sound can be generated only in 350- 500 kV and above high voltage. This phenomenon is an electrical discharge brought on by the ionization of a fluid such as air surrounding a conductor that is electrically discharged. During relatively dry conditions, corona noise typically results in continuous noise levels of 40 to 50 dBA in close proximity to the transmission line such as at the edge of the ROW. Moreover, corona noise levels typically increase during wet or high humidity conditions. Depending on conditions, wet weather corona noise levels could increase to 50 to 60 dBA and could increase to over 60 dBA under some conditions. The relationship between rainfall intensity and corona noise is described below.

**Table 7.1-3 Relationship between rainfall intensity and audible corona noise**

Rainfall intensity(mm/hr)	0.1	0.5	0.9	2.3	6.6	31.9
Audible Noise[dB(A)]	41.3	43.4	44.2	44.9	48.1	52.0

Source: <http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based Environmental-Study-8-Noise.pdf>

The impact will occur during the whole operation but its magnitude will be low as it will be controlled within the substation area. Necessary mitigation measures will be prescribed for those impacts to be reduced.

#### 7.1.4 Waste

##### (1) Forecast Item

- The hazardous wastes such as rag contaminated with chemicals, petrol oil, diesel oil, paint, thinner and epoxy generated from the finishing works, operation and maintenance works.
- The non-hazardous wastes such as construction debris and domestic wastes.

##### (2) Forecast Area

- The area examined to forecast the impact was set at in and around the substation and 100 m distance on both sides from the transmission line route.

##### (3) Forecast Period

- The forecast period for the construction/closing stage was set throughout the construction/closing stage of the proposed project.
- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

##### (4) Forecast Method

The impact forecast for wastes disposal will be conducted as follows:

- To examine the impact of hazardous and non-hazardous wastes during the construction and closure stage by considering the construction/closing work plan for the proposed project.
- To examine the impact of hazardous and non-hazardous wastes during the operation stage by considering the operation work plan for the proposed project.

The assessment could rely on the proposed design and facilities of the substation, and existing surrounding conditions and mitigation measures.

##### (5) Forecast Results

###### Forecast Results in Construction/Closing Stage

Both hazardous and general solid waste can generate from construction and demolition activities. Some example of the activities which will generate hazardous waste are as follow:

- Cement storage bags and other packets from materials used during construction.
- Containers of oil and grease or other chemicals used in excavation, repair and maintenance and transportation activities

The impact might be significant as the waste are hazardous but it can be controlled by proper mitigation measures such as providing proper storage, recording of used chemicals, disposal at proper dumping site with the authorities of relevant organization, etc.

Solid waste of domestic nature would also be generated in the temporary labor sheds at the construction site but it will be not likely to be significant in volume. Construction debris and wastes generated during

the construction phase would also include general waste scrap iron, steel, wooden frames, piping, and other solid wastes. Proper waste management system including segregation, recycling, etc. should be provided to reduce the impact to be insignificant.

### **Forecast Results in Operation Stage**

The Project will utilize the relevant electric equipment during Operation Stage. Improper storage and handling of wastes may pose high risks to the quality of air, water and soil as well as health of workers. Hazardous waste could be generated from the oil and grease or other chemical containers during the miniatous or rehabilitation activities of existing equipment within the substation. General solid waste including organic waste could be generated on daily basis from staff housing areas within the substation. The impact will occur definitely and be significant but it can be controlled and mitigated with the proper waste management system during operation stage.

#### **7.1.5 Soil Contamination**

##### **(1) Forecast Item**

- Possibility of soil contamination as a result of construction, operation and closing activities.

##### **(2) Forecast Area**

- The area considered to forecast the impact was set in and around the substation and ROW of transmission line.

##### **(3) Forecast Period**

- The forecast period for the construction/closing stage was set throughout the construction/closing stage of the proposed project.
- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

##### **(4) Forecast Method**

The impact forecast for soil contamination was conducted as follows:

- In the construction/closing stage, the possibility of soil contamination and distribution of contaminated soil as a result of the demolition works in the Project area was evaluated in consideration of the possibility of soil contamination.
- In operation stage, the possibility of soil contamination in the Project area by the discharging of wastewater (domestic), spillage/leakage of oil and fuel from onsite storage, and onsite temporary storage of solid wastes (hazardous and non-hazardous) will be evaluated in consideration of the operation manner.

##### **(5) Forecast Results**

#### **Forecast Results in Construction/Closing Stage**

Oil leaks from machine, equipment and vehicles may lead to soil contamination. Oil spillage may arise from transferring oil to the machine, equipment or vehicle or from equipment, machinery and vehicle maintenance works. Nevertheless, the potential to cause soil contamination will be minimal.

The excavation activities for the construction of tower foundation and underground transmission lines are not anticipated to significantly impact on soil and geology of the project site other than disturbances to soil which could subsequently resulting in erosion and soil contamination by oil leaks from excavation and construction equipment.

The construction works include removal of topsoil and digging, as well as presence of machinery and

workers at site will have minor negative impact on soil quality. The identified impacts are the following:

- Mechanical impact on soil during excavation,
- Soil pollution by spilling or discharge of oil and oil derivatives, motor oil, and similar wastes originating from machinery and vehicles on site,
- Soil pollution due to uncontrolled deposition of solid waste (spoil material) on the land,
- Soil pollution due to uncontrolled discharge from on-site toilets for workers on the land.

The impact will likely to occur as the construction activities include a lot of excavation works and usage of machineries. However, it can be reduced and mitigated with both proper excavation procedure and proper handling of chemicals.

#### **Forecast Results in Operation Stage**

In operation stage, soil contamination in and around the Project area may probably occur due to the direct discharging of wastewater (domestic) into the water body, spillage/leakage of oil and fuel from onsite storage, and onsite temporary storage of solid wastes (hazardous and non-hazardous). Today PCBs usually reach the environment as a result of transformer oil leakage caused by transformer failures, poor handling of damaged electrical equipment, spilling during oil changes and improper waste disposal.

Oil pits are also used to collect oil leakage from the transformer. They are located below the transformers. Each power transformer or device that individually contains more than 1000 kg of oil must have an oil collecting pit for quick oil removal or collection. Transformer oils are found to contain some metals such as copper, iron, lead, aluminum, silver, tin and zinc. It is assumed that transformer oil contains the metals because of their presence in the materials of the transformer components.

Significant impact on soil will occur definitely so that necessary mitigation measures have to be taken to reduce the impact.

#### **7.1.6 Offensive Odor**

##### **(1) Forecast Item**

- Offensive odor generated from improper management of sewage (septic tank) and domestic waste storage from staff housing.

##### **(2) Forecast Area**

- The area considered to forecast the impact was set in and around the substation.

##### **(3) Forecast Period**

- The forecast period for the operation stage was set throughout the operation stage of the proposed project.

##### **(4) Forecast Method**

The impact forecast for offensive odor was conducted as follows:

- To examine the impact of offensive odor during the operation stage by considering the management of sewage (septic tank) and organic waste storage in the staff housing area.

##### **(5) Forecast Results**

#### **Forecast Results in Operation Stage**

Offensive odor can be generated from the sanitary areas (e.g. toilets, showers, basin, etc.) and domestic wastewater (from shower, basins, etc.) discharge pond and septic tanks. The sludges from septic tank can generate awful or unpleasant odor at the time of leakage, overflow or mishandling procedures while transferring to third parties for disposal.

Organic food wastes generated from the whole housing may release offensive odor if proper handling and waste management system are not provided and as the consequences, health problems within and surrounding areas of substation due to seepage of leachate to surrounding drains reached to public area, nuisance air quality, breeding of flies at filth, garbage or spoiled food.

The impact will be mostly temporary but it will be significant without proper mitigation measures. Proper waste management system for organic waste and proper design of sewage system could control the impact and reduce its significance level.

## **7.2 Natural Environment**

### **(1) Forecast Item**

- The impacts on natural environment such as protected area, flora and fauna, ecosystem, topography and geography etc., which might occur during the construction and closing phase of the substation and transmission lines.
- The impacts on natural environment such as protected area, flora and fauna, ecosystem, topography and geography etc., which might occur during the operation phase of the substation and transmission lines.

### **(2) Forecast Area**

- The area to be examined was set in and around the substation and transmission lines.

### **(3) Forecast Period**

- The forecast period was set throughout the construction and closing phase of the substation and transmission lines.

### **(4) Forecast Method**

The forecast method for natural environment was conducted as follows:

- To examine the impact on natural environment caused during the construction and closing phases considering the construction/renovation and demolition work plan for the substation and transmission lines.

### **(5) Forecast Result for Construction, Operation and Closing Stages**

#### Protected Area

There will be no significant impact on protected area due to the project implementation. The protected areas such as Intagaw reserved forest (16 km from TL), Moeyungyi wetland wildlife sanctuary (5.5 km from TL), Hlawga wildlife park (7 km from TL) are existed in this region. Therefore, the nearest distance between these areas and the transmission line route is about 5.5 km, and thus there will be no significant impact to those areas as they are far enough from the construction site.

#### Flora and Fauna, Ecosystem

There will be some impacts to flora and fauna existed on the transmission line route. Some of the trees along the transmission line route will have to be cut down for construction of tower foundation and access road. The contractor should identify and prepare the list of the trees including their specifications, location and ownership. The ownership of the trees should be identified with the help of TDC and Forest Department (FD). If the trees are owned by FD, the compensation and the cost for cutting trees should be given by the Contractor. The chopped stems shall be transferred to FD. If the trees are owned by TDC, the Contractor shall follow the rule and regulations of TDC for cutting down those trees.

#### Topography and Geography

There will have no impact on topography & geography because there is no large-scale excavation work for installation of transmission towers and distribution poles and construction of substation.

The impact will only occur to flora and fauna, and ecosystem of natural environment and it is expected to be significant. However, proper mitigation measures with the cooperation of the relevant Government authorities will help the impact to be minimized.

## **7.3 Social Environment**

### **7.3.1 Involuntary Resettlement and Land Acquisition**

#### **(1) Forecast Item**

- The impacts on Involuntary Resettlement and Land Acquisition which might occur during the construction and closing phase of the sub-station and transmission lines.
- The impacts on Involuntary Resettlement and Land Acquisition which might occur during the operation phase of the sub-station and transmission lines.

#### **(2) Forecast Area**

- The area considered to forecast the impact was set in and around the substation and ROW of transmission line.

#### **(3) Forecast Period**

- The forecast period was set throughout the construction and closing phase of the sub-station and transmission lines.
- The forecast period was set throughout the operation phase of the sub-station and transmission lines.

#### **(4) Forecast Method**

The forecast method for Involuntary Resettlement and Land Acquisition was conducted as follows:

- To examine the impact on the Involuntary Resettlement and Land Acquisition caused during the construction and closing phases considering the construction/renovation and demolition work plan for the sub-station and transmission lines.
- To examine the impact on the Involuntary Resettlement and Land Acquisition caused during the operation phase considering the operation work plan for the sub-station and transmission lines.

#### **(5) Forecast Result for Construction, Operation and Closing Stages**

During the feasibility study, Abbreviated Resettlement Action Plan (ARAP) report was prepared and the preliminary survey data for land acquisition, project affected persons (PAPs) and households (PAHs) and proposed compensation plan are addressed in that report.

In the Detail Design Stage, the additional socio-economic survey will be conducted to collect the detailed information of PAPs and PAHs and the ARAP report will be updated by using these data. And necessary mitigation measures and monitoring plan will be implemented by the Project Proponent and Contractor during the construction stage. The impact on the resettlement and land acquisition will be generally assessed in this IEE report.

#### **Substation**

Approximately 25~32 ha of permanent land in which most of the land area are agricultural land, has to be acquired for construction of substation. Therefore, there will be permanent loss of land and income

in those area. Those acquired land will be purchased directly from landowner with the unit price set by the Government for paddy field under the supervision of Yangon Regional Government (YRG). A small number of houses is found within the land area but those household will be avoided to be used in substation area so that no resettlement will be necessary for the project. Therefore, there will be socio-economy impact such as loss of income due to the construction of substation but it will be reduced by purchasing the land with proper amount of compensation as a mitigation measure.

### Transmission Lines

The total area of tower base along the transmission line has to be acquired for installation of transmission lines. The majority of total area will occupy mainly on plantation area and agriculture land. As most of the crop plantation can be resumed after the construction, there will not be any loss of permanent land and income due to the construction of transmission lines. The impact will be only temporary during the construction stage. Approximately total number of 139 structures have been affected according to the satellite survey within the ROW of transmission lines. This can be mitigated by conducting appropriate compensation measures by DPTSC.

## **7.3.2 Local Economy and Livelihood**

### **(1) Forecast Item**

- The impacts on local economy and livelihood which might occur during the construction and closing phase of the sub-station and transmission lines.
- The impacts on local economy and livelihood which might occur during the operation phase of the sub-station and transmission lines.

### **(2) Forecast Area**

- The area considered to forecast the impact was set in and around the substation and ROW of transmission line.

### **(3) Forecast Period**

- The forecast period was set throughout the construction and closing phase of the sub-station and transmission lines.
- The forecast period was set throughout the operation phase of the sub-station and transmission lines.

### **(4) Forecast Method**

The forecast method for local economy and livelihood was conducted as follows:

- To examine the impact on the local economy and livelihood caused during the construction and closing phases considering the construction/renovation and demolition work plan for the sub-station and transmission lines.
- To examine the impact on the local economy and livelihood caused during the operation phase considering the operation work plan for the sub-station and transmission lines.

### **(5) Forecast results**

#### **Forecast result in Construction/Closing Stages**

#### Local Economy

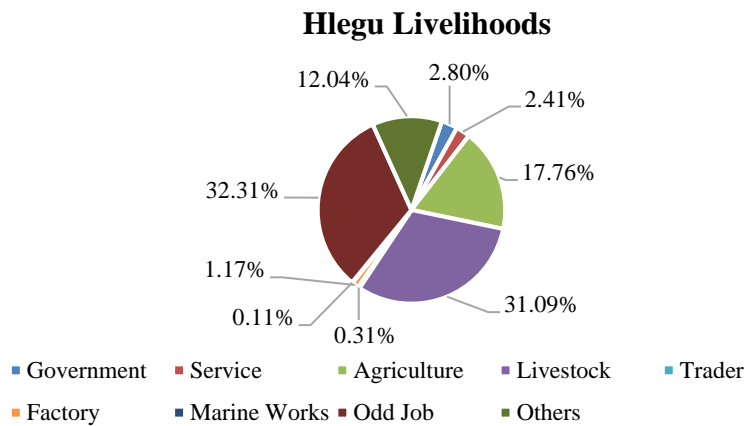
During the construction phase, some business such as plantation, cultivation, etc. will be temporarily disrupted by construction activities of towers and transmission lines. However, the Project will temporarily increase in sales of some local shops and vendors due to the increased demand of basic

construction materials.

The negative impact with low magnitude will be likely to occur due to the construction. However, it can be reduced to be insignificant with the proper mitigation measures to minimize the disturbance to local economy.

Livelihood

The substation is located in Sar Ta Lin Village in Hlegu Township. The main sources of livelihood in Hlegu townships are odd jobs, livestock and agriculture. According to the statistical data of Hlegu Township, most of the people are earning their livelihood in Odd Job (32.31%) and Livestock (31.09%).



**Figure 7.3-1 Livelihoods of Hlegu Township**

A lot of job opportunities will be created as most of general construction labor work force will derived from the local population from nearby Sar Ta Lin Village and surrounding villages for construction of new substation.

During the closure phase, the work will be almost the same as construction phase so that the impacts will be also the same. The positive impact will likely to occur in both stages and it will help to improve the livelihoods of local people by creating job opportunities.

**Forecast result in Operation Stage**

Local Economy

Yangon City is the strategic economic location which can be recognized as a commercial capital of Myanmar. Nevertheless, with major plans for the future, Myanmar’s energy demands are expected to grow concurrently with its development. The city used 1548MW in 2018, which is expected to increase based on growth rates, historical data and new projects. The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City.

The major positive impact will be resulted for the regional economy because of the infrastructure development due to the project.

Livelihood

As the substation compound is mostly occupied by agriculture land, it may create alternative livelihoods for laborer and landowner of affected agriculture land. Although the impact is likely to occur, it is low in nature and can be reduced to be insignificant by proper mitigation measures.



### **7.3.3 Existing Social Infrastructures and Social Services**

#### **(1) Forecast Item**

- The impacts on existing social infrastructures and social services which might occur during the construction and closing phase of the substation and transmission lines.
- The impacts on existing social infrastructures and social services which might occur during the operation phase of the substation and transmission lines.

#### **(2) Forecast Area**

- The area to be examined was set in and around the substation and transmission lines.

#### **(3) Forecast Period**

- The forecast period was set throughout the construction and closing phase of the substation and transmission lines.
- The forecast period was set throughout the operation phase of the substation and transmission lines.

#### **(4) Forecast Method**

The forecast method for local economy and livelihood was conducted as follows:

- To examine the impact on existing social infrastructures and social services caused during the construction and closing phases considering the construction/renovation and demolition work plan for the substation and transmission lines.
- To examine the impact on existing social infrastructures and social services caused during the operation phase considering the operation work plan for the substation and transmission lines.

#### **(5) Forecast Results in Construction/Closing Stages**

For local people living in and around the Project area, the accessibility of social infrastructure is expected to change more or less because of the construction work. During the construction phase, access road will be constructed for coming and going construction vehicles transportation of heavy machineries as per necessary. On the other hand, it is confirmed based on the existing regional information that social infrastructures such as schools and hospitals are located in the populated area around the Project site. Therefore, the traffic congestion might occur near the access road due to the temporal increasing on the construction vehicles. The traffic congestion is more expected in the underground transmission line construction rather than overhead transmission line construction as the TL will be constructed within the ROW of narrow street in the residential area. It will have a significant impact on surrounding community in road access. The TL alignment will also pass through the railway but the construction activities will not the disrupt the operation of railway system so that the impact is negligible. Moreover, the majority of TL alignment is the plantation and agriculture land so that no significant impact on public space is expected. Therefore, the impact will be only minor and can be reduced to insignificant with the proper mitigation measures.

### **7.3.4 Social Institutions**

#### **(1) Forecast Item**

- The impacts on social institutions which might occur during the construction and closing phase of the substation and transmission lines.
- The impacts on social institutions which might occur during the operation phase of the substation and transmission lines.

**(2) Forecast Area**

- The area to be examined was set in and around the substation and transmission lines.

**(3) Forecast Period**

- The forecast period was set throughout the construction and closing phase of the substation and transmission lines.
- The forecast period was set throughout the operation phase of the substation and transmission lines.

**(4) Forecast Method**

The forecast method for impact on social institutions was conducted as follows:

- To examine the impact on social institutions caused during the construction and closing phases considering the construction/renovation and demolition work plan for the substation and transmission lines.
- To examine the impact on social institutions caused during the operation phase considering the operation work plan for the substation and transmission lines.

**(5) Forecast Results in Construction/Closing Stages**

Due to the traffic congestion impact on social infrastructure and services as described in 7.3.3, the community near the Project area will be affected. On the other hand, the positive impact is expected on political institutions such as the Government. The Project will achieve the power sector development on important commercial area such as Yangon City.

Although it is evaluated that the project could disturb some social institutions, the impact will be only minor and can be reduced to insignificant with the proper mitigation measures.

## **7.4 Health and Safety**

### **7.4.1 Occupational Health and Safety**

**(1) Forecast Item**

- The impacts on occupational health and safety which might occur during the operation stage of the sub-station and transmission lines.
- The impacts on occupational health and safety which might occur during the construction and closing stage of the sub-station and transmission lines.

**(2) Forecast Area**

- The area examined to forecast the impact was set in and around the sub-station and transmission lines.

**(3) Forecast Period**

- The forecast period for the operation stage was set throughout the operation stage of the sub-station and transmission lines.
- The forecast period for the closing stage was set throughout the construction and closing stage of the sub-station and transmission lines.

**(4) Forecast Method**

The forecast method for occupational health and safety was conducted as follows:

- To examine the impact on the occupational health and safety caused during the operation stage by considering the operation work plan for the sub-station and transmission lines.
- To examine the impact on the occupational health and safety caused during the construction and closing stages by considering the construction and closing work plans of the sub-station and transmission lines.

The assessment could rely on the proposed design and facilities of the proposed project, construction plan, occupation safety and health guidelines and General Labor Laws Inspection Department, Ministry of Labor, Myanmar and General Environmental, Health and Safety (EHS) Guidelines of IFC.

## **(5) Forecast Results**

### **Forecast Results in the Construction and Closing Stages**

The possibility for accidents and incidents is expected to occur more or less during the implementation of the Project's construction (construction of site structures and facilities) and closing stages (demolition of the facilities). In order to prevent accidents and incidents, working conditions during the construction and closing stages shall be managed by the Contractor based on OHS training stipulated in international guidelines such as EHS Guidelines by the IFC. Especially during the hot season, countermeasures towards intense heat should be well prepared and announcements must be made for the prevention of heat stroke. In addition, accommodation for workers must be arranged to provide safe resting places for them. The impact is evaluated to be temporary with low intensity and it will occur occasionally.

As the work plan and impacts for construction stage are considered similar for the demolition works in the closing stage, it is evaluated that the Project Proponent will implement the same measures for the closing stage similarly as those taken during the construction stage.

It is evaluated that the impact will be only short term with low intensity. However, the Contractor shall prepare and implement appropriate HSE plan under the respective impact assessment to avoid the potential serious impacts on occupational health and safety. The Contractor shall also assign HSE manager and supervisor who is responsible for HSE related issues during the construction and demolition stage.

### **Forecast Results in the Operation Stage**

#### Workplace injuries

Workplace injuries are far too common on the job, and the majority of those random events can happen to anyone and at any time. Not only it is the employer's responsibility to ensure a safe work environment, but each employee also has a responsibility to themselves to exercise caution when on the job. Some of the most common injuries are listed below:

- On the job violent acts (e.g. fighting among workers)
- Ergonomics (e.g. repetitive motion, manual handling, lifting of heavy items, etc.)
- Vehicle accidents (e.g. employees driving for business purposes are often injured in traffic accidents, some of which can be fatal)
- Walking into injuries (e.g. walking into hard objects, ladders, etc. causing head, knee, neck and foot injuries)
- Falling object injuries (e.g. objects falling or dropped by another person can cause serious injuries e.g. head injuries commonly occur)
- Reaction injuries (e.g. injuries caused without falling which cause muscle, body and variety of other medical issues)



## 7.4.2 Community Health and Safety

### (1) Forecast Item

- The impacts on community health and safety which might occur during the construction and closing stages of the substation and transmission lines.
- The impacts on community health and safety which might occur during the operation stage of the substation and transmission lines.

### (2) Forecast Area

- The area examined to forecast the impact was set in and around substation and transmission lines.

### (3) Forecast Period

- The forecast period for the operation stage was set throughout the operation stage of substation and transmission lines.
- The forecast period for the construction and closing stage was set throughout the construction and closing stages of the substation and transmission lines.

### (4) Forecast Method

The forecast method for community health and safety was conducted as follows:

- To examine the impact on the community health and safety caused during the operation stage by considering the operation work plan for the substation and transmission lines.
- To examine the impact on the community health and safety caused during the construction and closing stages by considering the construction and closing work plans of the substation and transmission lines.

### (5) Forecast Result

#### Forecast results in the Construction/Closing Stages

There is a possibility of air pollutants emissions including dust by operation of construction machines and vehicles as well as construction work, which might cause some adverse effect of respiratory organ. Impact on public health and community, the dusty condition of construction site, the exhaust from the machineries & vehicles, the discharge of site generated waste water, the generation of construction waste, demolition debris, domestic wastes, hazardous wastes, the noise generation from construction machinery may affect the surrounding community.

No specific serious adverse impacts on community health and safety are expected as a result of construction of this Water Supply Project. There is potential hazard risk from open trenches in the vicinity of populated areas during the construction phase that should be mitigated by appropriate warnings and fencing.

The construction activities of this project are likely to have some impact on community health due to increased noise pollution and vibration, and local air pollution within and around the project site.

Noise pollution and vibration will be generated from additional traffic and operation of construction equipment. The school and the residential building located close to the project site will be affected by such noise pollution and vibration. Solid wastes generated by the construction activities and labors may create environmental pollution and thus affect public health, if not properly disposed. One possible impact on public health is that there would be no more offensive odor. Accident during construction phase is also an important issue. Proper measures are needed to reduce the risk of such accidents during

the construction phase.

**Forecast results in the Operation Stage**

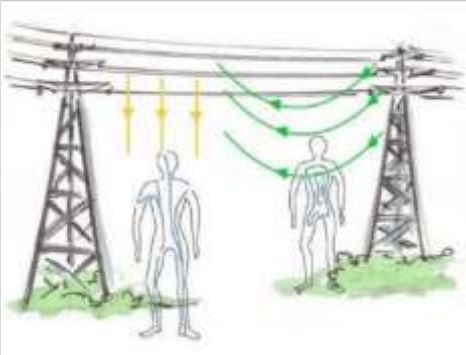

Impact on Public Health and Community

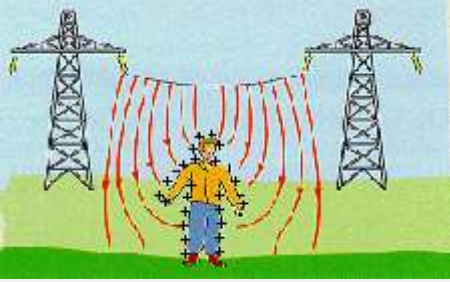
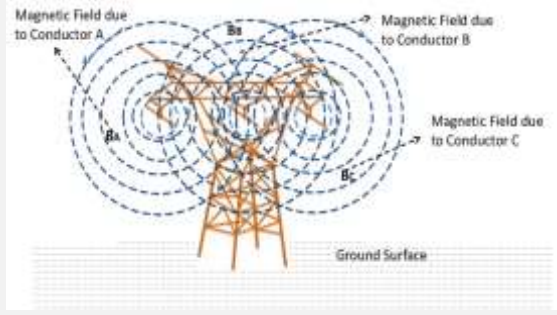


Electromagnetic field from operation and overhead high voltage AC transmission line can lead to incidence of health effects, including child leukemia, miscarriage, nausea, depression, loss of libido, infertility. Improvement power distribution may materialize stable and efficient electric power supply resulting in upgrading of social infrastructures and services as well as living condition of people. Thus, negative impact on public health is not anticipated.

Impact on Public Safety

Impact on public safety is traffic accidents and incidents due to the vehicle movement (supply of machines, raw materials, ferry services, etc.). At the operation phase, transmission lines present a risk of electrocution by direct contact with high-voltage equipment and lines and also be induced voltages, especially in the case of tools, vehicles and farm machinery that transit beneath transmission lines. Humans and farm animals can also risk electrocution or nuisance shock when inadequate grounding at substations energizes metal objects, such as stock tanks, outside substation grounds. The collapse of transmission towers during storms is also included in the electrocution causes.

The effects of power-line frequency electromagnetic fields (EMF) in humans are relatively high-level EMFs from overhead high-voltage AC transmission lines and equipment too can lead to an increased incidence of adverse health effects including childhood leukemia and miscarriage. Moreover, Corona and induced electromagnetic fields from the operation of high voltage transmission lines can also produce electromagnetic interference or electrical noise to community which affects the functioning of electronic and telecommunications equipment. “Jitter” in television screens and computer monitors can result because of electromagnetic interference. The network configuration of EMF and cause of electrocution and caution sign are described in Figure 7.4-3.

	
<p>Induced current on human body under transmission lines due to electric and magnetic field. (Source: Research Gate)</p>	<p>Possible Step and touch potentials to transmission line (Source: Electrical Engineering Blog)</p>

	
<p>Illustration of low frequency electromagnetic field (Source: World Health Organization)</p>	<p>EMF from transmission lines (Source: Research Gate)</p>
	
<p>Dangerous sign on fence around transmission tower (Source: alamy.com)</p>	<p>Dangerous sign on fence around transformer (Source: istockphoto.com)</p>

**Figure 7.4-3 Network of Electromagnetic Field, Possibilities of Electrocutation and Dangerous Sign for Tower and Transformer**

Impact on Public Security and Other Areas

High voltage transmission lines can produce electromagnetic interference that affects the functioning of electronic and telecommunication products such as “jitters” in television screens and phone lines are down. Occurrence of incidents and disputes among local residents and facilities workers may occur occasionally. The local residents may lose their comfort and privacy by the impact of migrated workers living in and around the area by causing discomfort and nuisance such as by indiscriminate throwing of rubbish and by transmission of communicable diseases.

The impacts could be long term with medium intensity and it will likely to occur occasionally. Therefore, necessary mitigation measures should be practiced avoiding adverse impact on general public.

**7.5 Emergency Response Plan**

**7.5.1 Fire**

**(1) Forecast Item**

- The risk of fire, which can be impacted by its construction, operations and demolition works

**(2) Forecast Area**

- The area examined to forecast the impact was set at the substation and ROW of transmission lines.

**(3) Forecast Period**

- The period examined to forecast the impact of fire hazard during the operation stage was set throughout the operation stage of the proposed project.
- The period examined to forecast the impact of fire hazard during the construction and closure stages were set throughout the construction and closing stage of the proposed project.

**(4) Forecast Method**

The assessment of the risk for potential fire accidents are conducted by the following method:

- To examine risk for potential fire accidents in operation stage by considering the operation work plan of the proposed project;
- To examine risk for potential fire accidents in construction and closure stages by considering the construction and closure work plans of the proposed project.

**(5) Forecast Results**

**Forecast Results during Construction/Closing Stages**

In the construction and closing stages, although the construction and closure works for the proposed project will contain large-scale works using fire-arms and explosives, the risk for fire accident could be considered a little. However, the risks are inevitable because some activities taken by the workers such as smoking and cooking could lead to fire accidents in the proposed project. To eliminate the risks for fire accidents, the behavior of the workers shall be managed by the construction contractor through provision of safety education and training for workers based on the OHS training stipulated in the international guidelines such as EHS Guidelines by IFC.

In the construction and closing stages, some of the risks of fire will be from the following:

- Behavior of workers (smoking, cooking near flammable sources, etc.)
- Storage of fuel (e.g. diesel and petrol for generators, heavy machinery equipment such as excavators)
- Electrical fires (e.g. usage of faulty equipment, un-safe electrical connections, broken electrical cords, etc.)
- Welding (from the welding of structures during construction)
- Cutting (sparks from the cutting of steel items by for example acetylene torches during demolition)

The impact could be long term with medium intensity but it is unlikely to occur during construction and closing stages.

Some of the mitigation measures for prevention of fire during construction and closing are as follows:

- Prohibit smoking and cooking especially near flammable sources such as near fuel storage areas, waste rubbish areas, etc., and provide a designated smoking
- Proper storage of fuel (e.g. designate storage and warn with danger signs, etc.)
- Inspect electrical equipment for faults, broken cords/wires, etc. and provide safe electrical equipment (usage of industrial approved sockets and wiring, etc.)
- Implement safe welding plan (check for un-safe condition, incompatible work nearby e.g. painting works, etc., provide cover around welding area to prevent sparks igniting other nearby items, check gas canisters and connections, provide portable fire extinguisher at every welding



work place, etc.)

- Check gas cylinders, valves and connections for usage of acetylene torches, incompatible work nearby, provide portable fire extinguisher, etc.

### Forecast Results during Operation Stages

In operation stage, there will be a risk for potential fire accidents from the substation and transmission lines. At the substation, transformer explosion and fire result from break down of insulation caused due to over-current, over-voltage or short circuit. Degradation of insulation like decay of the transformer oil due to moisture or ageing or decomposition is another case of fire in substation. Once the insulation drops below a threshold value an electric arc is generated. The temperature of the oil increases and oil decomposes leading to generation of ignitable gases and pressurization of the oil tank which may lead to explosion of transformer. Types and origins of fire which can cause from the transformer are described in Table 7.5-1. The most common causes of fire in transmission line are weather-related events such as thunderstorms and strong winds etc., that cause damage to lines and equipment attached to them. Once the equipment damaged or downed, wires may contact trees and other combustible materials resulting in sparks, smoke and fires. As the other cases, animal or human contact, equipment failures and conductor slaps can also create fire hazard in transmission lines. Therefore, the impacts could be long term with medium intensity and it will likely to occur sometimes.

**Table 7.5-1 Types And Origins of Substation Fires**

Types and origins of fires	Percentages
Oil-insulated circuit breakers	14.0
Current Transformers	14.0
Power transformers	9.3
Hot work procedures (welding, cutting and grinding)	9.3
Potential transformers	7.8
Engine-driven generators	7.0
Arson	6.3
Smoking	6.0
Lightning	4.7
Flammable liquid storage or handling	3.1
Terrorism	1.6
Miscellaneous fires	15.8

Source: <https://electrical-engineering-portal.com/substation-fire-protection>

## 7.5.2 Flood

### (1) Forecast Item

- Flood risk, triggered by heavy rain, cyclone, high tidal waves or tsunami, and which might increase flood vulnerability with the development and construction, operation, and closure stage of the proposed project.

### (2) Forecast Area

- The area examined to forecast the impact was set at the substation and ROW of transmission lines.

### (3) Forecast Period

- The period examined to forecast the impact of flooding during the operation stage was set throughout the operation stage of the proposed project.

- The period examined to forecast the impact of flooding during the construction and closure stage were set throughout the construction and closing stage of the proposed project.

**(4) Forecast Method**

- The assessment of flood risk is conducted on the potential flood risk triggered by heavy rain, cyclone, high tidal waves or tsunami in and around the proposed project site and confirm appropriate flood countermeasure as a precondition to the proposed project construction, operation and closing phases.

**(5) Forecast Result**

**Forecast Results during Construction/Closing Stages and Operation Stages**

Heavy rains, overflowing of canals, flooding, etc. during heavy storms, cyclones, rainfall, unexpected weather conditions, etc. may cause flooding in and around the Project sites. In the construction, operation and closing stages, the risk of flood occurrence is considered very little because the Project area is located at the low flood zone and constructed to satisfy the level requirement for flood prevention.

The Project site is to be located in Bago and Yangon regions, which is located in lower ground. Therefore, possible major risks of flood in the proposed project area may result from Bago River and Pasondaung creek. According to GAD result, there were no flooding until April 2018 for three years but according to the Department of Meteorology and Hydrology, Bago river have swelled in July, 2018 to their highest levels in more than five decades. The water level of the Bago River was estimated about 968 cm, which was over the water level of 950cm in both 1970 and 1994 and the highest level in 54 years.



Source: Myanmar Information Management Unit

**Figure 7.5-1 Map of Showing Flooded Area Around Bago And Ayeyarwaddy Region**

The impact could be long term with medium intensity and it will likely to occur sometimes due to the meteorological situation of Myanmar and location of the project.

### **7.5.3 Earthquake**

#### **(1) Forecast Item**

- The risk of earthquake, which can be impacted by high magnitude earthquake occurring in the Project area may increase the vulnerability of the Project site from earthquakes.

#### **(2) Forecast Area**

- The area examined to forecast the impact was set at the substation and ROW of transmission lines.

#### **(3) Forecast Period**

- The period examined to forecast the impact of earthquake during the operation stage was set throughout the operation stage of the proposed project.
- The period examined to forecast the impact of earthquake during the construction and closure stage were set throughout the construction and closing stages of the proposed project.

#### **(4) Forecast Method**

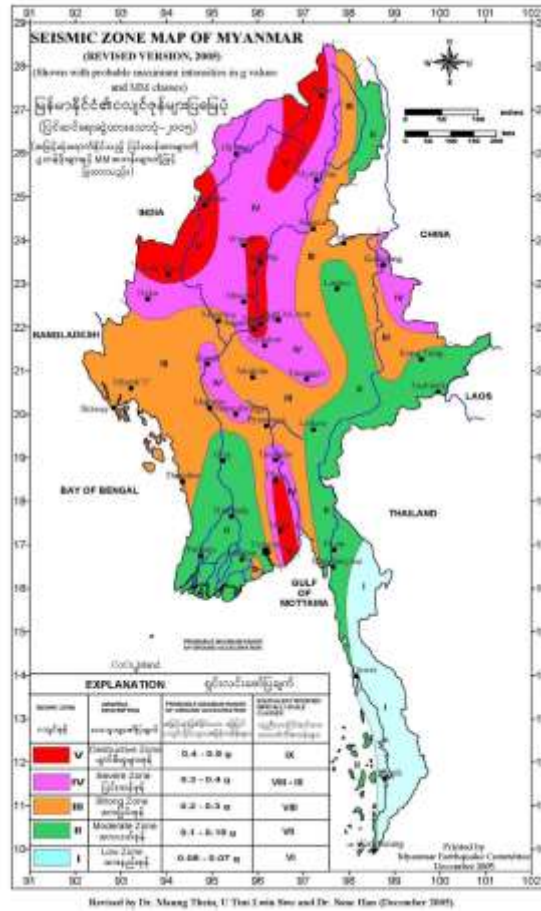
- The assessment of earthquake risk is generally conducted based on the preparedness, mitigation and prevention measures in pre-earthquake phase for earthquake risk reduction and mainly based on history of earthquake near Greater Yangon.

#### **(5) Forecast Results**

##### **Forecast Results during Construction/Closing Stages and Operation Stages**

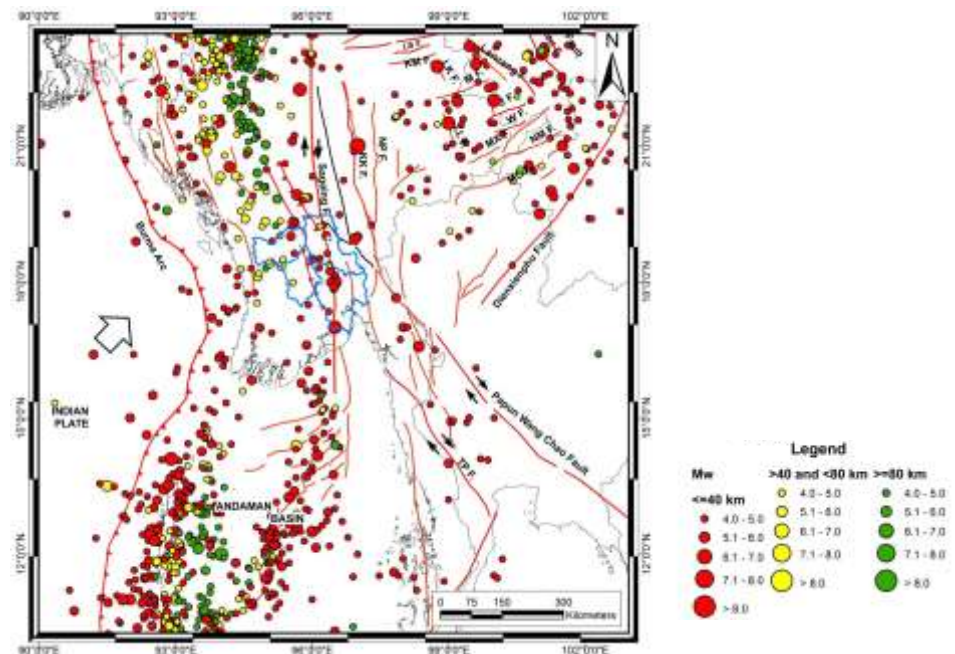
The major events happened on 8th Aug, 1929 (well-known Swa earthquake), 1930 May 5 (Bago earthquake) and Dec 4, 1930 (Phyu earthquake). Among these events, the most affected earthquake to Bago is the magnitude 7.3 Bago earthquake and this earthquake caused 500 casualties and great damage to properties in Bago and it also resulted many deaths (around 50 persons). Bago most portion of the town was considerably ruined and fire, and large ground cracks, exuded sand and water, probably the characteristics of liquefaction also occurred. All of these three events were originated from Sagaing right-lateral strike-slip fault.

The main fault source is the well-known right lateral strike-slip Sagaing Fault that is passing through the northern part of Bago City and near the center of Bago Region. As mentioned in the above, Bago Region can be regarded as very seismically active region since it is bounded by several active tectonic structures. Based on the historical record and the books of the history of Shwemawdaw Pagoda, the region had experienced 32 strong earthquakes since 197 BC (Min Htwe Naung, 1970). May 5, 1930 Bago Earthquake is 32nd event happened in the region. The largest event is 1912 Maymyo earthquake (Magnitude ~ 8.0) and the deadliest event is 1930 Bago earthquake.



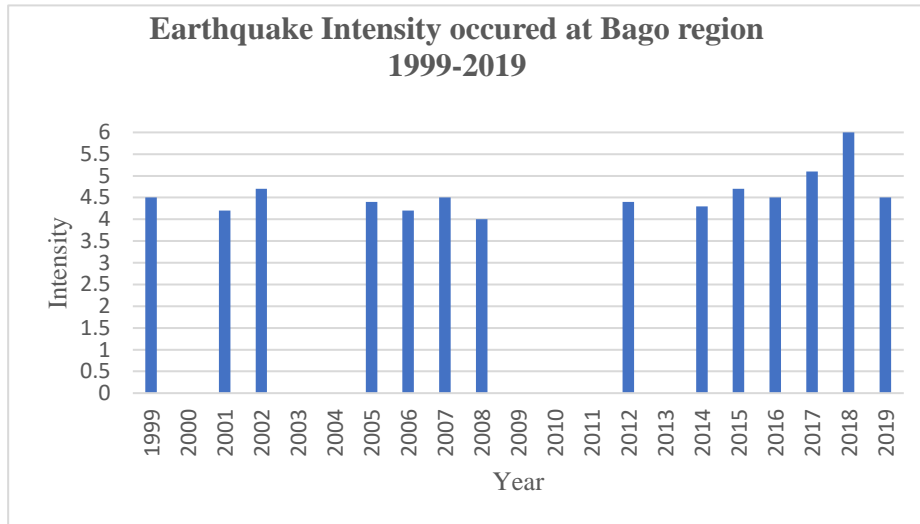
Source: www.earthquaketrack.com

Figure 7.5-2 Seismic Zone Map of Myanmar



Source: UN-HABITAT

Figure 7.5-3 Seismicity map of Bago Region (ISC earthquake catalog, 1906 – 2011)



Source: earthquaketrack.com

**Figure 7.5-4 Yearly Earthquake magnitude occurred at Bago region**

Figure 7.5-3 briefly illustrates the Seismicity map of Bago Region with the year 1906 to 2011. The chart in Figure 7.5-4 show the average yearly magnitude of the earthquake from 1999 to 2019. According to the data, the average magnitude of the earthquake is approximately around 4.5. Therefore, the impact should be considered as an emergency risk for this proposed project.

The following impact can be considered due to earthquake:

- Foundation of the equipment according to depth and dimension due to overturning moments shall be collapse because depth and foundation weight of these foundation are not enough for resistant moments.
- Bolts for connection the steel structure to foundation has not enough shear strength for transfer loads to foundation and shall be break after seismic loads.
- Connection parts which connect electrical parts to structural supports were not enough and shall be damage due to earthquake loads.
- Insulator and electrical parts which were made by Porcelain, after earthquake loads and due to internal material, casing thickness and joint connection system to other parts normally may be break.

The impacts could be long term with medium intensity and it might occur occasionally due to the geographical condition of the project location.

## 7.6 Summary of Impact Assessment

The impact assessment was conducted by examining the available data, hearing from stakeholders and carrying out field survey. The Project area is not included in the environmentally priority area as it is not existed in the conservation areas designated by Myanmar Government. The area has been in common with paddy fields, commercial plantations, secondary forests, scrub land and human habitation areas. For the safe side, Flora and Fauna secondary baseline data collection was conducted through the IEE study.

Consequently, it was concluded that the Project (new/expanded substation and 230kV/500kV transmission line) does not cause serious adverse impacts in operation stage and the majority of negative impacts are temporary and site-specific due to construction activities during the construction phase. The summary of anticipated potential adverse impacts is tabulated in the following Table 7.6-1.

**Table 7.6-1 Summary of Impact Assessment**

Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
Air Pollution	CS/CLS:	The principal source of potential air pollutant will be dust from construction/ demolition works. The exhaust gases (SO <sub>2</sub> , NO <sub>2</sub> & PM) will be emitted from the construction vehicles, generators and machinery.	Extent-On-site Duration-Short Term Intensity - Medium	The impact will occur.	Impact on air pollution due to dust and PM emission will occur <i>Definitely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
	OS:	The main source of air pollution will be the exhaust gas emission from vehicle movements.	Extent-On-site Duration-Long Term Intensity - Negligible	The impact is likely to occur sometimes.	Impact on air pollution due to vehicular movement will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Water Pollution	CS/CLS:	Wastewater may be generated from the site cleaning activities, temporary toilets, etc. Stormwater runoff passed through the construction site may contain muddy water, suspended sediments and construction materials.	Extent-Local Duration-Temporary Intensity - Low	The impact is likely to occur sometimes.	Impact on water pollution will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
	OS:	Wastewater may be generated from the staff housing, toilets, canteen etc.	Extent-Local Duration-Long Term Intensity - Low	The impact is likely to occur sometimes.	Impact on water pollution will occur <i>Occasionally</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Noise and Vibration	CS/CLS:	During Construction and Closing Stage, the major sources of noise and vibration will be construction equipment and vehicle movement.	Extent-On-site Duration-Short Term Intensity - Low	The impact will occur.	Impact on noise and vibration will occur <i>Definitely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)

Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
	OS:	Noise from the operation of transformers will be in the form of buzzing and humming which will be felt only up to 15 to 50 m from the substation area. Noise from overhead transmission lines will be from corona phenomenon which is the ionization of the air around the conductors as cracking or hissing noise.	Extent-On-site Duration-Long Term Intensity - Low	The impact is definitely to occur under the whole operation conditions.	Impact on noise and vibration will occur <i>Definitely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Waste	CS/CLS:	Less amount of hazardous wastes (such as used car batteries, broken glass, broken light fixtures, engine oil, etc.) and non-hazardous wastes (such as debris, concrete, metal, timber, etc. and pieces of iron, electric wire, empty package of material, etc.) may be generated from construction/ demolishing activities.	Extent-On-site Duration-Temporary Intensity - Low	The impact is likely to occur sometimes.	Impact on waste disposal will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
	OS:	If there have replacement in existing old equipment and devices and others, such as transformers, it would generate the used oil. Non-hazardous solid wastes such as paper, food waste, plastic bags, drink cans, etc. may be generated from staff housing.	Extent-On-site Duration-Long Term Intensity - Low	The impact is definitely to occur under the whole operation conditions.	Impact on waste disposal will occur <i>Definitely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Soil Contamination	CS/CLS:	Oil spillage may arise from transferring oil to the machine, equipment or vehicle or from equipment, machinery and vehicle during maintenance works.	Extent-On-site Duration-Short Term Intensity - Low	The impact is likely to occur under most conditions.	Impact on Soil Contamination will occur <i>Likely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
	OS:	In operation stage, soil contamination in and around the Project area may probably occur due to the direct discharging of wastewater (domestic) onto the soil, spillage/leakage of oil and fuel from on-site storage.	Extent-On-site Duration-Long Term Intensity - High	The impact will occur.	Impact on soil contamination will occur <i>Definitely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Major impact.	Major (A-)



Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
Offensive Odour	OS:	Offensive odour may be generated due to the improper management of sewage and domestic waste from staff housing etc.	Extent-On-site Duration-Long Term Intensity - Low	The impact is likely to occur sometimes.	Offensive odor impact will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Natural Environment (Flora and Fauna, Ecosystem)	CS/CLS/ OS:	There will be no forest and wildlife park passed through by the transmission line. There will be only vegetation clearing along the ROW. There will be no impact on topography & geography.	Extent-On-site Duration- Short term Intensity - Low	The impact is likely to occur sometimes.	Impact on natural environment will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Involuntary Resettlement and Land Acquisition	CS/CLS/ OS:	Permanent land of approximately 32.37ha (80 acre) has to be acquired for construction of substation. The total area of tower bases along the transmission line has to be acquired for installation of transmission lines.	Extent-On-site Duration-Permanent Intensity - Medium	The impact is likely to occur in most conditions.	Impact on involuntary resettlement and land acquisition will occur <i>Likely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Local Economy	CS/CLS:	The Project will temporarily in sales of local shops and vendors, etc. during the construction of towers transmission lines.	Extent-Local Duration-Short Term Intensity - Low	The impact is likely to occur sometimes.	Impact on local economy will occur <i>Likely</i> with <i>Low</i> magnitude. Therefore, the significance of positive impact can be assessed as Minor impact.	Minor (C-)
	OS:	The Project will implement the development of 500kV backbone system to solve insufficient power supply network system in Yangon City. Therefore, it will help in regional infrastructure and economic development in Yangon City.	Extent-Regional Duration-Permanent Intensity - Medium	The Impact will occur.	Impact on local economy will occur <i>Definitely</i> with <i>High</i> magnitude. Therefore, the significance of positive impact can be assessed as Major impact.	Major (A+)
Livelihood	CS/CLS:	During the construction phase, a lot of job opportunities will be created as most of general construction labour work force will derived from the local population.	Extent- Local Duration-Short Term Intensity - Medium	The impact is likely to occur in most conditions.	Impact on livelihoods will occur <i>Likely</i> with <i>Medium</i> magnitude. Therefore, the significance of	Moderate (B+)



Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
					negative impact can be assessed as Moderate impact.	
	OS:	The alternation in livelihoods will occur for the PAPs which lands are permanently acquired.	Extent- On-site Duration-Permanent Intensity - Low	The impact is likely to occur sometimes.	Impact on livelihoods will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Moderate impact.	Moderate (B-)
Existing social infrastructures and services	CS/CLS:	The project will not relocate houses based on the current plan. Accessibility of social infrastructure/services will be affected due to the increase of construction vehicles.	Extent-Local Duration-Short Term Intensity - Low	The impact is likely to occur sometimes.	Impact on existing social infrastructure and social services will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Minor impact.	Minor (C-)
Social Institutions	CS/CLS:	Due to the traffic congestion impact on social infrastructure and services, the community near the Project area will be affected.	Extent-Local Duration-Short Term Intensity - Low	The impact is likely to occur sometimes.	Impact on social institution will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Minor impact.	Minor (C-)
Occupational Health and Safety (OHS)	CS/CLS:	There is a possibility of air pollution, noise pollution, heat exposures, exposure to hazardous materials, etc. during the construction and closure stages. Moreover, the possibility of accidents and incidents is expected to occur more or less.	Intensity-Low Duration-Short Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on occupational health and safety will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
	OS:	Workplace injuries are far too common on the job.				Moderate (B-)

Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
		Engineers, electricians and overhead line workers are most exposed to electrical hazards.	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on work place injuries, exposure to radiation and other accidents will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	
		Unforeseen accidents such as road and traffic accidents with loss of human life and damage to structures.				
Community Health and Safety	CS/CLS:	The dusty conditions of the construction site, exhaust gases from the machinery & vehicles, the discharge of site-generated wastewater, the generation of construction waste, demolition debris, domestic wastes, hazardous wastes, and the noise generated by construction machinery may affect the surrounding community.	Intensity-Low Duration-Short Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on public health and safety will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
	OS:	Electromagnetic fields from operation and overhead high voltage AC transmission lines can lead to incidences of health effects.  Traffic accidents and incidents due to vehicle movement and direct contact with high-voltage equipment and lines.	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on public health and community, public safety and public security and others will occur <i>Occasionally</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Emergency Risks - Fire	CS/CLS:	Although the construction and closure work for the proposed project will contain large-scale work using firearms and explosives, the risk of fire accidents could be considered low. However, the risks are inevitable because some activities taken by the workers, such as smoking and cooking, could lead to fire accidents in the proposed project.	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is unlikely to occur sometimes.	Impact on fire will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)

Item	Stage	Source of Impact	Magnitude	Likelihood	Significance	Rating
	OS:	At the substation, transformer explosions and fires can result from a breakdown of insulation due to over-current, over-voltage or short circuit. The most common causes of fire in transmission lines are weather-related events such as thunderstorms and strong winds etc. that cause damage to lines and equipment attached to them. In other cases, animal or human contact, equipment failures and conductor slaps can also create fire hazards in transmission lines.	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on fire will occur <i>Occasionally</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Emergency Risks - Flood	CS/CLS/ OS:	Heavy rains, overflowing of canals, flooding, etc. during heavy storms, cyclones, rainfall, unexpected weather conditions, etc. may cause flooding in and around the project sites.	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on flood will occur <i>Occasionally</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)
Emergency Risks - Earthquake	CS/CLS/ OS:	<p>Bolts for connecting steel structures to foundations may not have enough shear strength to transfer loads to foundations and break after seismic loads.</p> <p>Parts which connect electrical parts to structural supports can be insufficient and become damaged due to earthquake loads.</p> <p>Insulator and electrical parts made of porcelain may break after earthquake loads.</p>	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on earthquake will occur <i>Occasionally</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Moderate impact.	Moderate (B-)

Source: IEE study team

## CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

### 8.1 Outline of Environmental Management Plan

Environmental Management Plan for the Project will consist of two components:

- 1) Environmental mitigation and consideration measures which shall be taken in the course of the Project implementation in operation and closure stages. The measures were examined based on the Project description and assessment results of environmental impacts, social impacts, health and safety impacts, and emergency risks.
- 2) Environmental monitoring plan to supervise/examine the implementation of proposed environmental mitigation and consideration measures and to measure the quality of surrounding environments under the influence of the Project activities during operation and closure stages.

### 8.2 Mitigation and Consideration Measures

#### 8.2.1 Mitigation and Consideration Measures for Construction and Closure Stage

Environmental mitigation and consideration measures in construction/closure stages for different aspects including pollution, natural environment, social environment, health and safety, and emergency risk are summarized in the Table 8.2-1. Most of environmental mitigations and consideration measures will be implemented by the contractor of construction/demolishing work under management of the Project proponent.

**Table 8.2-1 Environmental Mitigation Measures in the Construction/Closure Stage**

Category	Impact Item	Mitigation Measures	Implementer
Pollution	Air pollution	<ul style="list-style-type: none"> <li>▪ Water spraying of the entire construction site will be carried out during the demolition activities to suppress and control dust emissions.</li> <li>▪ Dust nets of adequate height shall be erected around the entire construction site perimeter.</li> <li>▪ The excavated earth material should be kept at the designated place and should be covered to prevent wind erosion.</li> <li>▪ In higher wind forces, construction work relating to dust generation will not be allowed.</li> <li>▪ Netting will be attached along fences to minimize the spread of dust to neighboring areas.</li> <li>▪ Construction materials which emit dust will be covered.</li> </ul>	Contractor
	Water pollution	<ul style="list-style-type: none"> <li>▪ Cover piles of building materials like cement, sand and other powders, regularly inspect for spillages, and locate them where they will not be washed into waterways or drainage areas.</li> <li>▪ Generators are sited on concrete foundations and with bund wall to prevent any spillage or leakage.</li> <li>▪ Sewage from septic tanks will be disposed of via request to Township Development Committee.</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>Site drainage system (temporary open soil gutter) will be in effect to prevent water ponding, overflowing and blocking.</li> </ul>	
	Noise and vibration	<ul style="list-style-type: none"> <li>Prior notification to the local community on the schedule of construction activities.</li> <li>Restriction of operation hours for heavy construction machines (such as excavators fitted with construction/demolition/breaking equipment) and avoid idling.</li> <li>Pay attention when dropping materials from a height.</li> <li>Construction work will not be conducted at night.</li> <li>Regular inspection, maintenance and servicing of machines and equipment will be conducted.</li> </ul>	Contractor
	Solid Waste	<ul style="list-style-type: none"> <li>Prepare a plan which includes the control of receipt, storage and final disposal of such substances.</li> <li>Waste should be collected daily.</li> <li>Non-hazardous waste should not be mixed with any category of hazardous waste at any time.</li> </ul>	Contractor
	Soil contamination	<ul style="list-style-type: none"> <li>Construction materials of hazardous or non-hazardous type are stored in adequate places to avoid contamination during occurrences of rain or floods.</li> <li>Maintenance of heavy equipment, machinery and vehicles will be conducted by authorized and experienced personnel.</li> <li>Fuel filling of certain machinery, equipment and vehicles will be carried out by an authorized vendor to prevent spill-over and leakage from fuel transfer and on-site storage.</li> <li>In any cases of occurrence, the contaminated soil will be collected, placed in appropriate containers and disposed through TDC.</li> </ul>	Contractor
Natural Environment	Flora, Fauna, Ecosystem	<ul style="list-style-type: none"> <li>Identify and prepare the lists of trees to be cut down</li> <li>Cooperate with relevant Government authorities (FD, TDC, etc.) for replantation</li> </ul>	Project Proponent/ Contractor
Social	Involuntary Resettlement and Land Acquisition	<p><u>Substation Land Acquisition</u></p> <ul style="list-style-type: none"> <li>The land required for substation area will be purchased in the help of YRG from the landowner. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul> <p><u>Transmission Line Land Acquisition</u></p> <ul style="list-style-type: none"> <li>Appropriate amount of compensation will be provided in accordance with The Farmland Law and Rules (2012), and Land and Crop Compensation Regulations by MOEE. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul>	Project Proponent

Category	Impact Item	Mitigation Measures	Implementer
	Local Economy	<ul style="list-style-type: none"> <li>▪ For persons affected by acquired agricultural land, the proper amount of compensation should be provided to not only the landowner but also the laborers working in those areas.</li> <li>▪ Moreover, temporary crop compensation in accordance with The Farmland Law and Rules (2012), and Land and Crop Compensation Regulations by MOEE should be provided to the affected business owner during the construction phase.</li> <li>▪ Mobilization and construction work for the project should be carried out carefully, so that standing crops are not damaged unnecessarily.</li> <li>▪ The project work may be delayed allowing the farmers to harvest their crops.</li> <li>▪ Work should not be continued through ripened crop fields.</li> </ul>	Contractor
	Livelihood	<ul style="list-style-type: none"> <li>▪ Investigating the possible procurement needs of the Project that can be sourced locally.</li> <li>▪ Identifying the range of skill required for the labor force and conduct a gap analysis against skills availability.</li> <li>▪ Providing information to local people of job openings through local advertising, information center, project notice boards.</li> <li>▪ Developing and implementing a local employment policy for the people of affected communities.</li> <li>▪ Practicing careful management about the expectation of local people in regard to the employment to avoid any disputes.</li> </ul>	
	Existing Social Infrastructures and Social Services	<ul style="list-style-type: none"> <li>▪ Arrange careful logistics management with an understanding of the bearing capacity of roads and bridges to be utilized.</li> <li>▪ Dispatch road maintenance crews to areas where access roads are damaged by construction activities, in consultation with relevant authorities.</li> <li>▪ Deliver prior notification to local authority and public for temporary road closures.</li> <li>▪ Provide road signs and safety barriers.</li> <li>▪ Avoid the rush hours when higher traffic volumes are expected, such as school start and end times, for transportation of construction materials and heavy machinery.</li> </ul>	Contractor
	Social Institutions	<ul style="list-style-type: none"> <li>▪ Arrange careful logistics management with understanding of the bearing capacity of roads and bridges to be utilized</li> <li>▪ Dispatch road maintenance crew to areas where access roads are damaged by construction activities in consultation with relevant authorities.</li> <li>▪ Deliver prior notification to local authorities and public for temporary road closures.</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Avoid the rush hours when higher traffic volume is expected, such as school start and end times, for transportation of construction materials and heavy machinery.</li> </ul>	
Health and Safety	Occupational Health and Safety	<ul style="list-style-type: none"> <li>▪ Visitors to the site are provided with PPE and escorted around the construction site.</li> <li>▪ PPE requirement signboards.</li> <li>▪ Nettings, and toe boards are provided at scaffolding workplaces to prevent falling material hazards.</li> <li>▪ Warning signages for various hazards are visibly posted to warn workers of at the workplace.</li> </ul>	Contractor
	Community Health and Safety	<ul style="list-style-type: none"> <li>▪ Implement regular water spraying on dust -emitting materials/surfaces.</li> <li>▪ Vehicles, machines and equipment must be routinely inspected, maintained and serviced to prevent exhaust emissions.</li> <li>▪ Ensure discharges of waste water from the project site do not affect/disturb the local community.</li> <li>▪ Ensure waste/rubbish disposal is conducted properly and regularly.</li> <li>▪ Avoid dangerous routes and consider rush-hour, school hours to reduce the risk of traffic accidents.</li> <li>▪ Understanding of traffic rules and regulations.</li> <li>▪ Educate employees on correct ways to integrate into the community and understanding local culture and traditions.</li> <li>▪ Restrict access to the site.</li> <li>▪ Establish site safety and security plan.</li> </ul>	Contractor
Emergency Risk	Flood	<ul style="list-style-type: none"> <li>▪ Proper communication systems such as alarm bells, visual alarms, etc. to provide emergency warning to workers and community.</li> <li>▪ Collection of updated emergency flood information related to project area through any media.</li> <li>▪ Preparation of flood response plan, including preparation for pumping out water in case of flooding, etc.</li> <li>▪ Arrangement of training by identifying roles and responsibilities, capabilities and requirements of personnel in an emergency and other training related to evacuation program in case of emergency.</li> </ul>	Contractor
	Fire	<ul style="list-style-type: none"> <li>▪ Behavior of workers (smoking, cooking near flammable sources, etc.)</li> <li>▪ Storage of fuel (e.g. diesel and petrol for generators, heavy machinery equipment such as excavators)</li> </ul>	Contractor

Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ Electrical fires (e.g. usage of faulty equipment, un-safe electrical connections, broken electrical cords, etc.)</li> <li>▪ Welding (from the welding of structures during construction)</li> <li>▪ Cutting (sparks from the cutting of steel items by for example acetylene torches during demolition)</li> <li>▪ Some of the mitigation measures for prevention of fire during construction and closing are as follows:</li> <li>▪ Prohibit smoking and cooking especially near flammable sources such as near fuel storage areas, waste rubbish areas, etc., provide a designated smoking</li> <li>▪ Proper storage of fuel (e.g. designate storage and warn with danger signs, etc.)</li> <li>▪ Inspect electrical equipment for faults, broken cords/wires, etc. and provide safe electrical equipment (usage of industrial approved sockets and wiring, etc.)</li> <li>▪ Implement safe welding plan (check for un-safe condition, incompatible work nearby e.g. painting works, etc., provide cover around welding area to prevent sparks igniting other nearby items, check gas canisters and connections, provide portable fire extinguisher at every welding work place, etc.)</li> <li>▪ Check gas cylinders, valves and connections for usage of acetylene torches, incompatible work nearby, provide portable fire extinguisher, etc.</li> </ul>	
	Earthquake	<ul style="list-style-type: none"> <li>▪ Prevention of transmission lines passing paths experiencing land sliding, turnovers, cuttings, and liquefaction hazard areas.</li> <li>▪ Prevention of transmission line and substation constructions where ground properties will resonate earthquake forces, such as high grounds with special geotechnical conditions.</li> <li>▪ Perform thoroughgoing Soil test considering proper development length and good connections to equipment for insulators during construction time regarding seismic conditions.</li> <li>▪ Prepare proper bedding for substation equipment and transmission line foundations from compacted soil.</li> <li>▪ Prepare a suitable design for equipment column foundations and control the settlement items.</li> <li>▪ Prepare a proper design for electrical power and control cabinet seating.</li> <li>▪ Construct a proper barrier around the substations.</li> <li>▪ Implement a proper connection for equipment on structures and foundations using bolts.</li> </ul>	Contractor



Category	Impact Item	Mitigation Measures	Implementer
		<ul style="list-style-type: none"> <li>Avoid the construction of elevated water tanks near buildings and equipment.</li> </ul>	

Source: IEE Study Team

**Table 8.2-2 Significance after Mitigation in the Construction/Closure Stage**

Item	Magnitude	Likelihood	Significance	Rating
Air Pollution	Extent-On-site Duration-Short Term Intensity - Negligible	The impact is likely to occur sometimes.	Impact on air pollution due to dust and PM emission will occur <i>Occasionally</i> with <i>Negligible</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Water Pollution	Extent-Local Duration-Temporary Intensity - Low	The impact is unlikely to occur.	Impact on water pollution will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Noise and Vibration	Extent-On-site Duration-Short Term Intensity - Low	The impact is likely to occur sometimes.	Impact on noise and vibration will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Waste	Extent-On-site Duration-Temporary Intensity - Low	The impact is unlikely to occur.	Impact on waste disposal will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Soil Contamination	Extent-On-site Duration-Short Term Intensity - Low	The impact is unlikely to occur.	Impact on soil contamination will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Flora, Fauna, Ecosystem	Extent-On-site Duration-Permanent Intensity - Low	The impact is unlikely to occur.	Impact on involuntary resettlement and land acquisition will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Involuntary Resettlement and Land Acquisition	Extent-On-site Duration-Permanent Intensity - Negligible	The impact is likely to occur sometimes.	Impact on involuntary resettlement and land acquisition will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Local Economy	Extent-On-site Duration-Short Term Intensity - Low	The impact is unlikely to occur.	Impact on local economy will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of positive impact can be assessed as Negligible impact.	Negligible (D)

Item	Magnitude	Likelihood	Significance	Rating
Livelihood	Extent- Local Duration-Short Term Intensity - Medium	The impact will definitely occur.	Impact on livelihoods will occur <i>Definitely</i> with <i>Medium</i> magnitude. Therefore, the significance of negative impact can be assessed as Major impact.	Major (A+)
Existing social infrastructures and services	Extent-Local Duration-Short Term Intensity - Low	The impact is unlikely to occur.	Impact on existing social infrastructure and social services will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Negligible impact.	Negligible (D)
Social Institutions	Extent-Local Duration-Short Term Intensity - Low	The impact is unlikely to occur.	Impact on social institutions will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Negligible impact.	Negligible (D)
Occupational Health and Safety (OHS)	Intensity-Low Duration-Temporary Legal Requirement - Low	The impact is unlikely to occur.	Impact on occupational health and safety will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Community Health and Safety	Intensity-Low Duration-Temporary Legal Requirement - Low	The impact is unlikely to occur.	Impact on public health and safety will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Emergency Risks - Fire	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is unlikely to occur.	Impact on fire will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Emergency Risks - Flood	Intensity-Low Duration-Short term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on flood will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Emergency Risks - Earthquake	Intensity-Low Duration-Short term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on earthquake will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)

Source: IEE Study Team

According to the evaluation, the expected impacts during construction and closure stage could be avoided or minimized by implementing the mitigation measures.

### 8.2.2 Mitigation and Consideration Measures for Operation Stage

Environmental mitigation and consideration measures in operation stage for different aspects including pollution, natural environment, social environment, health and safety, and emergency risk are summarized in the following Table 8.2-3. Most of environmental mitigations and consideration measures will be implemented by the Project proponent.

**Table 8.2-3 Environmental Mitigation Measures in Operation Stage**

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
Pollution	Air Pollution	<ul style="list-style-type: none"> <li>▪ Transportation vehicles, tools and machinery will be controlled, inspected and maintained regularly.</li> <li>▪ Following the rules and regulations of vehicle-s related laws which are prescribed now and in the future.</li> <li>▪ Avoiding idling vehicles; all the drivers must avoid unnecessary warm -up of engines or and uses of vehicles.</li> <li>▪ Use low Sulphur diesel oil in all vehicle and equipment engines.</li> </ul>	Project Proponent
	Water Pollution	<ul style="list-style-type: none"> <li>▪ Sewage generated from staff housings will be disposed of by requesting via request to Township Development Committee.</li> <li>▪ Ensure no leakage from oil pits to drain lines.</li> <li>▪ Ensure that drainage system of substation will be ensured has no water ponding, overflowing and or blocking.</li> </ul>	Project Proponent
	Noise and vibration	<ul style="list-style-type: none"> <li>▪ Avoid installations sound -reflecting surfaces in narrow places or and hallways.</li> <li>▪ Avoid mounting transformers on floors with low masses and uneven surfaces.</li> <li>▪ Use flexible conduit and bus connections.</li> <li>▪ Regular maintenance of transformers to avoid unnecessary noise production.</li> <li>▪ Use corona rings, smooth rounded -shapes high voltage electrodes and high-quality insulation.</li> </ul>	Project Proponent
	Solid Waste	<ul style="list-style-type: none"> <li>▪ Should be checked the Substations should be periodically checked to avoid generation of sometimes not to generate hazardous wastes.</li> <li>▪ All storage areas shall be cleaned thoroughly and regularly and especially during any spillage, contamination, leaks or the like.</li> <li>▪ Keep dustbins for wastes which may be occur due to damaged electrical equipment, or to be used by surrounding people.</li> </ul>	Project Proponent
	Soil contamination	<ul style="list-style-type: none"> <li>▪ Fuel filling of certain some machineries, equipment and vehicles will be carried out by the an authorized vendor to prevent spill over, and leakage from fuel transfer and on-site storage.</li> <li>▪ DPTSC should monitor oil leakage from aging or used electric transformers, oil-circuit breakers and batteries.</li> <li>▪ If considerable oil leakage is identified, DPTSC should reconsider proper prevention measures such as installing oil pits.</li> </ul>	Project Proponent
	Offensive Odor	<ul style="list-style-type: none"> <li>▪ Undertaking proper storage, handling and dispose methods of organic food wastes.</li> <li>▪ Disposing solid waste in a timely manner.</li> <li>▪ Discharging the sludge and effluent from the septic tanks regularly by Municipal services.</li> </ul>	Project Proponent

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
Natural Environment	Flora, Fauna, Ecosystem, Biodiversity, Protected area, Topography and Geography	<ul style="list-style-type: none"> <li>Replant the same number of the losses of lost plants in another area in this region.</li> </ul>	Project Proponent
Social Impacts	Involuntary Resettlement and Land Acquisition	<p><u>Substation Land Acquisition</u></p> <ul style="list-style-type: none"> <li>The land required for substation area will be purchased in the help of YRG from the landowner. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul> <p><u>Transmission Line Land Acquisition</u></p> <ul style="list-style-type: none"> <li>Appropriate amount of compensation will be provided in accordance with The Farmland Law and Rules (2012), and Land and Crop Compensation Regulations by MOEE. The Abbreviated Resettlement Action Plan (ARAP) was prepared for affected PAPs and PAHs.</li> </ul>	Project Proponent
	Local Economy and Livelihood	<ul style="list-style-type: none"> <li>The detailed survey on the information of each project affected persons (PAPs) should be conducted during detailed design stage.</li> <li>The ARAP will be updated with detailed information of PAPs and necessary mitigation measures will be considered base on that information.</li> </ul>	Project Proponent
Health and Safety	Occupational Health and Safety	<p><u>Workplace injuries</u></p> <ul style="list-style-type: none"> <li>Safe driving training, defensive driving training, understanding of traffic rules and regulations (obey speed limits, ban cell phone use and consumption of alcohol while driving, usage of seat belts, etc.), conducting safe loading and unloading, securing loads, ensuring vehicles are roadworthy and following of company policies, etc. are likely to reduce accidents and minimize casualties.</li> <li>It may be difficult to prevent reaction injuries; therefore, it is important for employees to pay attention to the surroundings around them.</li> <li>Certified and competent electrical workers should conduct all electrical works, and the checking and usage of safe and approved electrical equipment should be implemented, . Avoid usage of un-safe and faulty electrical devices.</li> <li>Provision of first aid kits</li> <li>A worker safety plan will be implemented to reduce risks that, to include testing of structural integrity prior to proceeding with the work and the use of fall protection measures.</li> </ul> <p><u>Exposure to Radiation</u></p>	Project Proponent

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ To identify the potential exposure levels in the workplace.</li> <li>▪ To train the workers in the identification of occupational EMF levels and hazards.</li> <li>▪ To develop an EMF safety program prior to operation.</li> <li>▪ To make sure that transmission lines are deactivated and grounded prior to being worked on.</li> <li>▪ To provide appropriate and adequate PPE for workers.</li> </ul> <p><u>Other accidents</u></p> <ul style="list-style-type: none"> <li>▪ FA first aid station with nurses on standby for all shifts and certified first aiders will be appointed set up, together with a first aid room with resting facilities. Training for in OHS, such as safety induction, safety orientation, toolbox meetings, safety committee meetings, visitor orientation, and proper management, as well as implementing the implementation of adequate plans for emergencies, such as training, drills, and response will be the main control for the accidents and emergencies.</li> </ul>	
	Community health and safety	<p><u>Public Health and Community</u></p> <ul style="list-style-type: none"> <li>▪ Implement health awareness training, encourage good hygiene behavior, conduct proper housekeeping, ensure there is no stagnant water to prevent mosquito breeding.</li> <li>▪ Initiate education for employees and area residents on the risks of, and prevention and available treatment of for, diseases.</li> <li>▪ Ensure waste/rubbish disposal is conducted properly and regularly.</li> <li>▪ Implement regular water spraying on dust -emitting materials/surfaces in at the project site.</li> </ul> <p><u>Public Safety</u></p> <ul style="list-style-type: none"> <li>▪ Signs and barriers such as locks on the doors, use of gates, and use of steel posts surrounding transmission towers (particularly in urban areas) would be installed will be implemented to prevent access to high voltage areas.</li> <li>▪ Grounding conducting objects (e.g. fences or other metallic structures) would will be installed near transmission lines to prevent shocks.</li> <li>▪ Development such as that for homes, shops etc., within ROW would will be prohibited.</li> <li>▪ Training or education to for public to prevent contact with potentially dangerous equipment.</li> <li>▪ Regular trimming of trees along the route to prevent accidents due to overgrowth onto the power lines.</li> <li>▪ Conduct regular inspections of the line to help identify missing of or corroded parts.</li> </ul>	Project Proponent

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
		<ul style="list-style-type: none"> <li>▪ To use phase cancellation, and shielding, and limit voltage and current flow levels.</li> <li>▪ To have the high clearance of transmission lines in design.</li> <li>▪ Public security and other areas</li> <li>▪ Train employees on correct ways to integrate into the community and understanding local culture and traditions.</li> <li>▪ Restrict access to the site.</li> </ul>	
Emergency Risk	Fire	<ul style="list-style-type: none"> <li>▪ Regular training and exercises for site staff regarding firefighting and other emergency responses.;</li> <li>▪ To have an early warning fire detection system, effective fire extinguishing system and provide portable fire extinguishers adjacent to normal entrance/exit doors.;</li> <li>▪ To install heat detectors or smoke detectors to sense a fire at the unattended substations;</li> <li>▪ To minimize the storage of paper products, cleaning fluids and other combustible materials in a control of buildings;</li> <li>▪ To provide egress from the buildings, such as exit lights and emergency lighting.</li> <li>▪ To provide emergency telephone numbers, in the order in which they should be called in a fire emergency;</li> <li>▪ Not to attack fires in cleared areas beneath lines and not to or spray water on or near wires or insulators from the ground or air;</li> <li>▪ To trim or cut the trees regularly near the area of ROW and monitor ROW vegetation according to fire risk;</li> <li>▪ To plant and manage fire resistant species (e.g. hardwoods) within the substation and adjacent to ROW.</li> </ul>	Project Proponent
	Flood	<ul style="list-style-type: none"> <li>▪ Proper communication systems such as alarm bells, visual alarms, etc. to provide emergency warning to workers and community;</li> <li>▪ Collection of updated emergency flood information related to project area through any media.;</li> <li>▪ Preparation of flood response plan, including preparation for pumping out water, in case of flooding, etc.; and</li> <li>▪ Arrangement of training by identifying roles and responsibilities, capabilities and requirements of personnel in an emergency and other training related to evacuation program in case of emergency.</li> </ul>	Project Proponent
	Earthquake	<ul style="list-style-type: none"> <li>▪ Prevention of transmission lines passing from the paths which are in experiencing land sliding, turnovers, cuttings, and liquefaction hazard areas;</li> <li>▪ Prevention of transmission lines and substations constructions where ground properties will resonance resonate earthquake</li> </ul>	Project Proponent

Category	Item	Environmental Mitigation and Consideration Measures	Implementer
		<p>forces, such as height high grounds with a special geotechnical condition.</p> <ul style="list-style-type: none"> <li>▪ Performing thoroughgoing Soil test considering proper development length and a good connection to equipment for insulators during construction time regarding seismic conditions.</li> <li>▪ Preparing proper bedding for substation equipment and transmission lines foundations from a compacted soil.</li> <li>▪ Performing a suitable designing for equipment column foundations and control the settlement items.</li> <li>▪ Performing a proper design for electrical power and control cabinet seating.</li> <li>▪ Construction a proper barrier around the substations.</li> <li>▪ Produce Implement a proper connection for equipment on structures and foundations with using bolts.</li> <li>▪ Avoiding the construction of elevated water tanks near the buildings and equipment.</li> </ul>	

Source: IEE Study Team

**Table 8.2-4 Significance after Mitigation in Operation Stage**

Item	Magnitude	Likelihood	Significance	Rating
Air Pollution	Extent-On-site Duration-Long Term Intensity - Negligible	The impact is unlikely to occur.	Impact on air pollution will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Water Pollution	Extent-Local Duration-Long Term Intensity - Negligible	The impact is unlikely to occur.	Impact on water pollution will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Negligible impact.	Negligible (D)
Noise and Vibration	Extent-On-site Duration-Long Term Intensity - Low	The impact is likely to occur sometimes.	Impact on noise and vibration will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Waste	Extent-On-site Duration-Long Term Intensity - Low	The impact is likely to occur sometimes.	Impact on waste disposal will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Soil Contamination	Extent-On-site Duration-Long Term Intensity - Medium	The impact is unlikely to occur.	Impact on soil contamination will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Offensive Odor	Extent-On-site Duration-Long Term Intensity - Low	The impact is unlikely to occur.	Offensive odor Impact will occur <i>Unlikely</i> with <i>Low</i> magnitude.	Negligible (D)

Item	Magnitude	Likelihood	Significance	Rating
			Therefore, the significance of impact can be assessed as Negligible impact.	
Involuntary Resettlement and Land Acquisition	Extent-On-site Duration-Permanent Intensity - Negligible	The impact is likely to occur sometimes.	Impact on involuntary resettlement and land acquisition will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Livelihood	Extent- On-site Duration-Permanent Intensity - Low	The impact is unlikely to occur.	Impact on livelihoods will occur <i>Unlikely</i> with <i>Low</i> magnitude. Therefore, the significance of negative impact can be assessed as Negligible impact.	Negligible (D)
Occupational Health and Safety	Intensity-Medium Duration-Short Term Legal Requirement - Low	The impact is unlikely to occur sometimes.	Impact on work place injuries, exposure to radiation and other accidents will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Community Health and Safety	Intensity-Medium Duration-Short Term Legal Requirement - Low	The impact is unlikely to occur sometimes.	Impact on public health and community, public safety and public security and others will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Emergency Risks - Fire	Intensity-Medium Duration-Long Term Legal Requirement - Low	The impact is unlikely to occur sometimes.	Impact on fire will occur <i>Unlikely</i> with <i>Medium</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Emergency Risks - Flood	Intensity-Low Duration-Short Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on flood will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)
Emergency Risks - Earthquake	Intensity-Low Duration-Short Term Legal Requirement - Low	The impact is likely to occur sometimes.	Impact on earthquake will occur <i>Occasionally</i> with <i>Low</i> magnitude. Therefore, the significance of impact can be assessed as Minor impact.	Minor (C-)

Source: IEE Study Team

According to the evaluation, the expected impacts during operation stage could be avoided or minimized by implementing the mitigation measures.

### 8.3 Environmental Monitoring Plan (EMoP)

Environmental monitoring plan including monitoring items, location, frequency and responsible organization in construction/closure stages and operation stage are shown in the following Table xx. Monitoring for construction/closing stage will be implemented by the contractors and monitoring for



operation stage will be implemented by project proponent.

**Table 8.3-1 Environmental Monitoring Plan**

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
<b>Construction/ Closure Stage</b>							
Air Quality	One point at the new 500 kV substation	CO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , SO <sub>2</sub> , Ozone, Wind Speed, Wind Direction	On-site measurement	Annually	Annually	MOEE/ DPTSC	Contractor
	In and around of substation area and along all transmission lines	water spraying, dust nets, covering construction materials and excavated earth	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor
Water Quality	One point near new 500kV substation	Temperature, pH, Electrical Conductivity,	On-site measurement	Once in dry season and once in rainy season	Annually	MOEE/ DPTSC	Contractor
		BOD, COD, Oil and grease, Total coliform bacteria, Total Nitrogen, Total phosphorus, Suspended Solids, Chromium, Cadmium, Arsenic, Zinc, Lead, Mercury, Copper, Iron, Manganese	Laboratory analysis				
	In and around of all substation and along all transmission lines	Septic tanks, temporary drainage system, bund wall or spill kit	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor
Noise and Vibration	One point at the new 500kV substation	Noise Level L <sub>Aeq</sub> (dB) Vibration Level L <sub>v10</sub> (dB)	On-site measurement	Annually	Annually	MOEE/ DPTSC	Contractor
	In and around of all substation and along all transmission lines	Records of notice letter, work schedule and night work, inspection and maintenance of machines	Visual inspection and keeping records	Monthly	Bi-annually	MOEE/ DPTSC	Contractor

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Solid Waste	All construction sites	Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Soil Contamination	All construction sites	Waste storage conditions, fuel filling method, spill kit (photos, drawing, etc.)	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Occupational Health and Safety	All construction sites	Records of PPE wearing, safety sign board, hazards warning post, tool box meeting, training, etc.	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
Community Health and Safety	All construction sites	Water spraying near residential area, wastewater discharge point, traffic control, training to drivers, restrict sign at the boundary of site	Visual inspection and keeping records	Monthly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Emergency Responses (Flood, Earthquake)	All construction sites	Records of drills for fire, flood and earthquake	Keeping records	quarterly	report to MOEE/ DPTSC (Monthly), Report to ECD in every 6 months by MOEE/DPT SC	MOEE/ DPTSC	Contractors
<b>Operation Stage</b>							
Water Quality	In and around of all substation	Septic tanks and drainage system	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Noise	In side substation	Records of inspection and maintenance of machines	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Solid Waste	In and around of all substation	Waste manage plan, record of waste collection and disposal (photos, vouchers, etc.)	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Soil Contamination	In and around of all substation	Waste storage conditions, oil filling method, oil pits (photos, drawing, etc.)	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Offensive Odor	Staff housings	Waste storage conditions, odor condition around septic tank	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Occupational Health and Safety	In and around of all substation	Incident and accident record, Records of provided PPE wearing,	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent
Community Health and Safety	In and around of all substation	Incident and accident record	Visual inspection and keeping records	Monthly	Bi-annually	MOEE	Project Proponent

Category	Location	Item	Monitoring Method	Frequency	Reporting	Responsibility (Supervision/ Implementation)	
						Supervision	Implementation
Emergency Responses (Fire)	In and around of all substation	Records of drills for fire, flood and earthquake	Keeping records	quarterly	Bi-annually	MOEE	Project Proponent

Source: IEE Study Team

## 8.4 Budget for Environmental Management and Monitoring Plan

This section describes the budget plans for the environmental management and environmental monitoring by the Project Proponent.

The Project proponent will take necessary environmental mitigation measures and its expenses for the environmental management not only at the construction and operation phases but also at the closing, termination and after termination phases in accordance with their IEE studies.

### 8.4.1 Budget Plan for the Environmental Management

The main costs for mitigation measures are shown in Table 8.4-1. The detailed costs for each mitigation measure are to be calculated at the detailed design stage.

**Table 8.4-1 Cost for Main Mitigation Measures**

No.	Item	Budget (Annual)
		Operation Phase
1.	- Maintenance costs for oil pits in transformer pads (new 500kV S/S)	- 500 USD/time x 4 times/yr = 2000 USD/yr
2	- Maintenance costs for drainage canals	- 300 USD/time x 2 times/yr = 600 USD/yr
3	- Cost for waste collected bins and other accessories	- 200 USD/yr
4	- Fee for disposal of hazardous and non-hazardous wastes	- 50 USD/2-ton (non-haz) x 12 ton/yr = 300 USD/yr - 1000 USD/ton (haz) x 1 ton/yr = 1000 USD/yr
5	- Maintenance costs for transmission lines such as trimming of trees	- 1200 USD/yr
6	- Implementation of EMP (including fee for salary, travel, documentation, etc.)	- 1200 USD/yr

Source: IEE Study Team

Note: Budget is estimated at April 2020

### 8.4.2 Budget Plan for Environmental Monitoring

In terms of the budget for environmental monitoring before/during construction, closing and operation phases, main monitoring cost is a cost for field measurements such as air quality, water quality and noise quality. Annual costs for field measurement in the construction stage by contractor and in the operation stage by the Project Proponent are estimated, respectively, as shown in Table 8.4-2.

**Table 8.4-2 Estimated Annual Costs for Monitoring in Construction/ Closing Stages and Operation Stage**

Stage	Monitoring Items	Implementing Organizations	Expected Cost	Remarks
Pre-construction	- conducting DMS survey (including crops)	Project Proponent	USD 45,000	To calculate the land compensation costs
<b>500 kV and 230 kV transmission lines</b>				
Construction	- implementation of mitigation measures	Project Proponent	USD 14,000/yr	Only the costs for field works
Operation	-Training and capacity development - EMF and safety clearance monitoring	Project Proponent	USD 6000/yr	
<b>Substations</b>				
Construction	- onsite monitoring of air, water and noise levels - implementation of mitigation measures	Project Proponent	USD 15,000/yr (AQ, WQ, NV)  USD 6,000/yr	
Operation	-Training and capacity development - EMF and safety clearance monitoring	Project Proponent	USD 6000/yr	

Source: IEE Study Team

Note: 1) Budget is estimate at January 2020

2) In case the cost for monitoring in operation and closing stage will exceed the budget, the extra expense will be secured by the Project Proponent

## 8.5 Grievance Resolution Process

The focal person in-charge of the environment and social safeguards under the Power Transmission Project Department (PTP) of DPTSC/MOEE as Project Implementation Unit (PIU) shall be responsible in receiving the complaint from an affected member of the community, validating community complaints, coordinating with the contractor towards the resolution of complaints, and in monitoring project performance to avoid recurrence of the problem. It is expected that complaints will be received and acted upon immediately.

The Project contact person of the PTP-DPTSC, Project Implementation Committee (PIC), and contractor shall coordinate all actions with the complainant and the village head. The department 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 PTP-DPTSC and contractor should explain the circumstances to the complainant and the village head.

The PTP-DPTSC and contractor will be given 15 days to resolve the grievance and provide feedback

to the complainant and the village head on the results of the investigation and the proposed course of action. If the complainant considers the issue to be satisfactorily resolved, the PTP-DPTSC and PIC documents the resolution of the complaint. PTP-DPTSC and PIC will continue monitoring the remedial measures undertaken by the contractor.

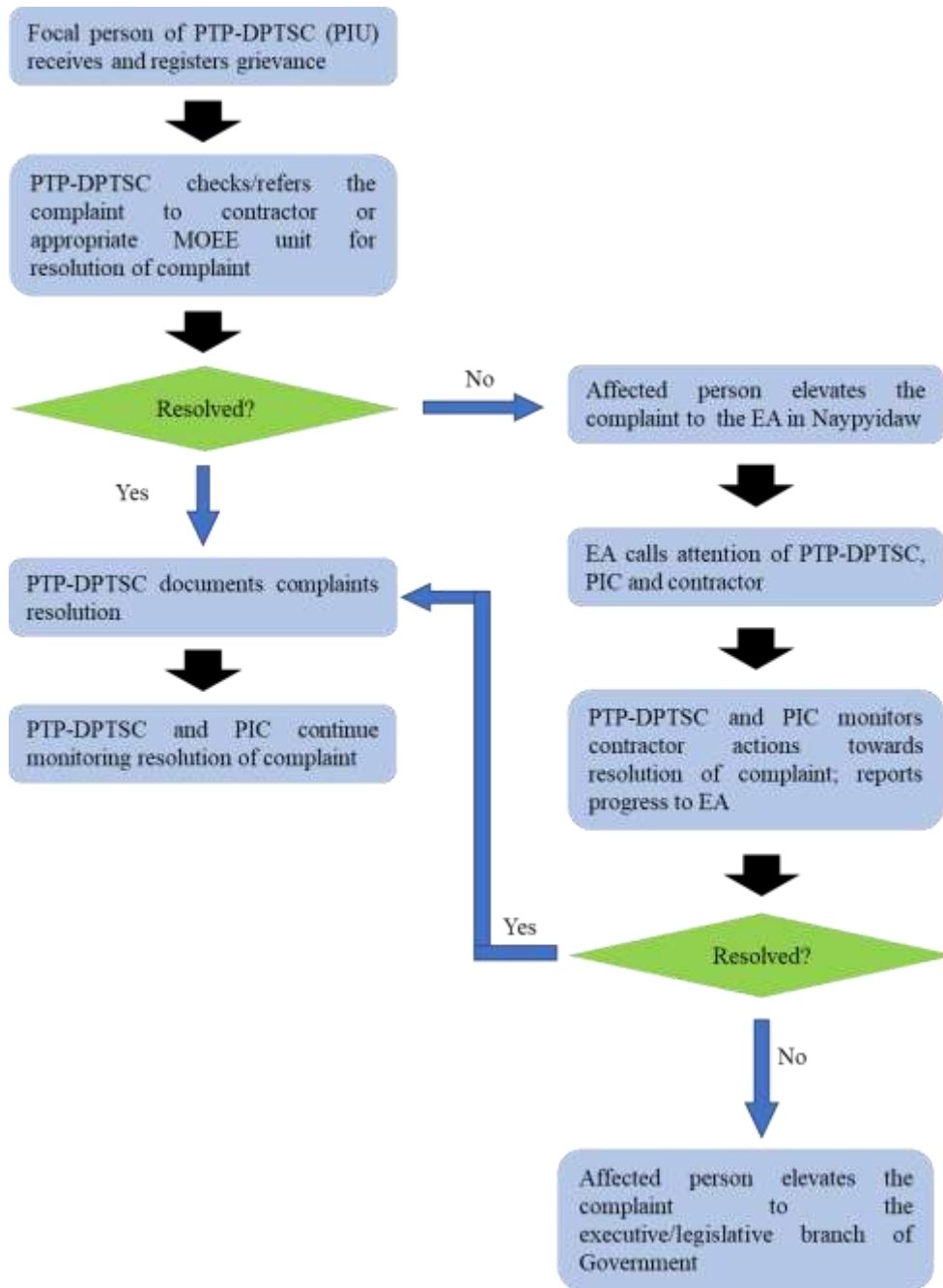
If the complainant is not satisfied with the actions to resolve the complaint, the complainant may raise the complaint to the EA in Naypyidaw. The EA may call a meeting among the complainant, PTP-DPTSC, PIC, and the contractor to discuss the resolution of the complaint. Remedial actions agreeable to all parties should be developed. The contractor under the supervision of the PTP-DPTSC should undertake the resolution of the complaint within one week.

If the complainant is still not satisfied with the actions undertaken to resolve the particular complaint, he/she may file the complaint with the Township – General Administrative Department (GAD). The Township – GAD will record the grievance, further investigate the grievance, and will also call on the complainant, PTP-DPTSC, and the contractor to discuss the resolution of the complaint. Commitments and schedule of action and resolution of the complaint that is agreeable to all parties should be developed during the meeting with the Township – GAD. If the complainant considers the issue to be satisfactorily resolved, the grievance resolution process will be documented by the Township - GAD.

If the grievance remains unresolved, the affected person has the option to elevate the grievance to the next higher levels of the Executive Branch of Government such as the GAD at the District Office and then the GAD at State/Regional Office.

### **8.5.1 Grievance Follow-Up**

The MOEE through the Power Transmission Project Department of DPTSC (PTP-Implementation) may contact the complainant at a later stage to check if activities continue to pose problems to the affected person or community. If there is a remaining problem, the issue will be treated as a new grievance and may re-enter the GRM process. The Grievance Redress Mechanism is as shown in Figure 8.5-1.



Source: IEE Study Team

**Figure 8.5-1 Structure and Process of the Grievance Redress Mechanism**

## **CHAPTER 9: PUBLIC CONSULTATION AND DISCLOSURE**

### **9.1 Approach and Objectives**

#### **9.1.1 Approach of PCM and PD for IEE**

Public consultation meeting (PCM) and public disclosure (PD) offer an opportunity for people to participate in the decision-making process for project design, development, and implementation of the Project. The primary objectives of stakeholder consultation are to provide information on the Project such as Purpose of the Project, Layout of the Project, Schedule, Environmental and Social Information on the Project area and method of construction and likely environmental and social impacts of the Project construction and operation as well as it provides a platform for project-affected persons and different stakeholders to express their views on possible impacts of the proposed intervention on environmental and social parameters.

The PCM and PD for IEE is conducted at the time of preparations of draft IEE report. Information about the findings of draft environmental and social impact assessment study and proposed mitigation measures are disseminated to the general public that are directly or indirectly affected by the Project. In addition, their feedback and opinions are obtained which are reflected in the IEE report together with their comments and request on the environmental and social mitigation measures, environmental management plan (EMP) and environmental monitoring plan.

#### **9.1.2 Objectives of PCM and PD for IEE**

The primary objective of the PCM and PD is to incorporate the opinion and suggestions of the public and all other stakeholders at the Project planning stage to ensure wider acceptability of the Project. The key objectives are as follows:

- 1) To provide information on the economic, environmental and social benefits as well as potential negatives impacts from the Project;
- 2) To ensure that the potential PAPs, stakeholders and local communities are engaged in a meaningful dialogue and are well informed prior to the decision of the Project proponent as to the nature and extent of social and environmental impacts attributable to the proposed project with respect to planning;
- 3) To ensure that the concerns of, and issues raised by the PAPs, stakeholder and local communities are incorporated and adequately addressed in the IEE study;
- 4) To engage in a participative exercise with PAPs, stakeholders and local communities and obtain expertise and local traditional wisdom and knowledge from them in order to plan the mitigation measures; and
- 5) To facilitate periodic opportunities to the principal stakeholders to offer their inputs on all key components of the Project.

### **9.2 Methodology for Public Consultation and Disclosure**

#### **9.2.1 Methodology for Public Consultation for IEE**

The methodology of the PCM is presented in the following Table 9.2-1.



**Table 9.2-1 Summary Public Consultation Meeting for the IEE**

Stage	Methodology and Special Considerations
Draft IEE stage: planned in March 2020	<p><b>【Method and the No. of the Meetings】</b> 1 meeting is planned for one day which will be organized in order to ensure the participation of the stakeholders in the public sector as well as the local residents.</p> <p><b>【Venue】</b> Related Township General Administration Department (Mingalardon, Hlegu, Dagon Myothit (East) and Bago, North Okkala, South Dagon, North Dagon, Thaketa).</p> <p><b>【Agenda】</b> Draft IEE on the Department of Power Transmission and System Control (DPTSC). Baseline survey result and impact assessment results Proposed environmental mitigation measures and environmental monitoring plan IEE study schedule</p> <p><b>【Expected Participants &amp; Invitation Method】</b> Local government body in and around the related townships. Local residents in project area. Project Proponent and related government organizations Any interested individuals and parties The invitation/notice on the meeting will be posted in each village 1 week in advance.</p> <p><b>【Language Used】</b> The presentation and handout will be in the Myanmar Language. The explanation will also be provided in the Myanmar Language.</p> <p><b>【Special Considerations to Socially Vulnerable Groups】</b> Feedback forms will be provided to the participants so that the people who hesitate to speak out in public can share their views and comments in written form Assistants will be available to fill out the form in case the participant requires assistance in writing/reading. Female assistants will be available for the female participants who need any assistance.</p>

Source: IEE Study Team

### 9.2.2 Methodology for Public Disclosure for IEE

The Executive Summary in Myanmar language of the draft IEE report will be disclosed for review and comments as shown in the following Table 9.2-2. The final IEE will be available for public viewing at the web-site of MOEE.

**Table 9.2-2 Public Disclosure for the IEE**

Stage	Methodology and Special Considerations
Draft IEE stage: planned in March 2020	<p><b>【Announcement Method】</b> Public disclosure will be announced 5 days before the public consultation meeting and 7 days after the public consultation meeting. (Total about 10 days). Disclosure period, comment submission method will be described in the disclosure places. The draft IEE report will be available on the official website.</p> <p><b>【Disclosure Place】</b> Related Township General Administration Department (Mingalardon, Hlegu, Dagon Myothit (East) and Bago, North Okkala, South Dagon, North Dagon, Thaketa). Village Tract Offices/Ward Offices in the Project area.</p> <p><b>【Disclosure Period】</b> About 10 working days (to exclude National Holidays, Saturdays and Sundays)</p> <p><b>【Comment Submission Method】</b></p>

Stage	Methodology and Special Considerations
	Comments can be submitted with the comment form provided at the disclosure places or by e-mail either in Myanmar Language or English language.

Source: IEE Study Team

### 9.3 Public Consultation Meeting for the Draft IEE Report

The public consultation meeting is held for five sessions to cover all of the project area of influence as described in Table 9.3-1.

**Table 9.3-1 Detailed Information of Public Consultation Meetings**

Time and Date	1 <sup>st</sup> session: Friday, 13 March 2020, 10:00 am to 12:00 pm 2 <sup>nd</sup> session: Monday, 16 March 2020, 10:00 am to 12:00 pm 3 <sup>rd</sup> session: Wednesday, 18 March 2020, 10:00 am to 12:00 pm 4 <sup>th</sup> session: Thursday, 19 March 2020, 4:00 pm to 5:00 pm 5 <sup>th</sup> session : Friday, 20 March 2020, 10 :00 am to 12 :00 pm
Venue	1 <sup>st</sup> session: Administration Office, Thingangyungyi Village, Mingalardon Township, Yangon 2 <sup>nd</sup> session: General Administration Department, Dagon Myothit (East) Township, Yangon 3 <sup>rd</sup> session: General Administration Department, Bago District, Bago 4 <sup>th</sup> session: General Administration Department, Eastern Yangon District, Yangon 5 <sup>th</sup> session : General Administration Department, Hlegu Township, Yangon
Attendees	1 <sup>st</sup> session: 33 peoples 2 <sup>nd</sup> session: 29 peoples 3 <sup>rd</sup> session: 54 peoples 4 <sup>th</sup> session: 17 peoples 5 <sup>th</sup> session : 34 peoples Total: 167 people
Agenda	Explanation on the Project Description Explanation on JICA's Policy Explanation on Result of IEE Study Question and Answer
Language used	In local language, Myanmar language
Feedback Sheet	In total 38 comments during five PCM sessions and disclosure were submitted.

Source: IEE Study Team

#### 9.3.1 Comments from Public Consultation Meeting

Questions/comments from participants and explanation/response from DPTSC/IEE Study Team during the stakeholder meetings are shown in Table 9.3-2.

**Table 9.3-2 Questions/Comments and Explanation/Response from Public Consultation Meeting**

No.	Question/Comment	Explanation and Response
Mingalardon Township		
1.	Mr. Zaw Lin (Township Administrator, Administration Department, Mingalardon Township) Comments – To show the exact list of PAPs, to present about the route of transmission line, how the overhead and underground transmission line will pass through and to check the 2019 Law for land acquisition.	Mr. Nyunt Wai (Executive Engineer, DPTSC) Answer - Presented about ROW and will be less or no impacts as this project is long-term and will apply the updated techniques to reduce high impacts as much as they can.
2.	Mr. Phone Thet Khaing(Sub- Assistant Engineer, YCDC),	Mr. Nyunt Wai (Executive Engineer, DPTSC),

No.	Question/Comment	Explanation and Response
	<p>Mr. Aunh Htut Linn (Assistant Engineer, YCDC)</p> <p>Question-1 Will the transmission line from Hlegu to Dagon Township (Dagon Myothit (East)) pass through No.7 Main Road?</p> <p>Question – 2 There is water supply system near the project, will it be affected?</p> <p>Question – 3 - Informed the location of water distribution pipeline. To check the Law for land acquisition (2019). Discussed about how many transmission lines will be. Can YCDC join the transmission lines from Hlegu?</p> <p>Question – 4 – Will be any damages due to transmission tower construction?</p>	<p>Answer 1– It will not pass through the No-7 main road but go along with the road.</p> <p>Answer 2– Underground transmission line will pass through Bo-Chan Street to substation. The team have been making surveys. Requested YCDC to approve DPTSC’s letter. Monopole transmission tower will be used at Thaketa substation</p> <p>Answer 3 – Presented about Law (2012) Land Acquisition. DPTSC will discuss about the losses and complaints. They will give compensation for crops losses. 30 ft square will be used for 230kV and 50 ft square will be used for 500kV. They will use 120 ft temporary for construction yard to keep the construction materials.</p> <p>Answer 4 - The compensation will be paid for any losses according to Department of Agriculture Land Management and Statistics. They will use updated techniques to reduce losses.</p>
3.	<p>Mr. Thet Khaing Oo (Hundred Household Head, Pyan Lei Nay Yar Cha Htar Ye Ward) –</p> <p>Question- Which area will be included in this project? Will the transmission line be underground or overhead?</p>	<p>Mr. Nyunt Wai (Executive Engineer, DPTSC)</p> <p>Answer--The monopole transmission towers, or super slim tower will be used to upgrade the 230 kV Hlawga-Thaketa transmission line, but underground transmission line will be used instead of monopole towers along the Bo-CHAN Road near the Hlawga Substation because of crowded residential area near the current transmission line.</p>
4.	<p>Mrs. Tin New Ni (YCDC)</p> <p>Question - Can the transmission lines and towers be combined?</p> <p>When will be the project implemented?</p> <p>Comments – Any suggestion for Pyin Ma Pin Line. If the current way of gas pipe will not be used, new routes would be. If new underground transmission lines would be constructed under the Bo-CHAN Road, there might be gas underground gas pipeline under the road. The transmission towers from Pyin-Ma Pin are now generating noise.</p>	<p>Mr. Nyunt Wai (Executive Engineer, DPTSC)</p> <p>Answer - YESC is trying to combine transmission lines as much as they can in Mandalay, there are combined transmission towers (4 in 1). The proposed transmission line will be from Dagon Township (East) to Zay Kabar (Bo-Chan).The noise is generated from Pyin Ma Bin as the transmission lines are suffering overload capacity. . The proposed project will include 2 circuits system for better current capacity for overload problem at Pyin Ma Bin It may take over 5 years to implement this project.</p>
<b>Dagom Myothit (East) Township</b>		
1.	<p>Mr. Zaw Min Htike (GAD)</p> <p>Comment-1 Although almost all the lands are owned by township development committee, there are still farmland working by farmers. So, it would be necessary to negotiate with both TDC and the local people. One issue in this township is that even though YCDC own the lands for implementing projects, some lands are still not utilized. Then, original farmers cultivate in their</p>	<p>Mr. Nyunt Wai (Assistant Director, DPTSC, MOEE)</p> <p>The suggestions are very useful for the project. There are many projects in MOEE which are facing many difficulties due to land issues. Therefore, we will carefully consider all your suggestions for the project.</p> <p>Yes, we will follow your suggestions.</p>

No.	Question/Comment	Explanation and Response
	<p>lands again. The legal owner is YCDC and currently working on its original farmers. Therefore, discussions should be making with all of them. ROW of Transmission line (200 ft.) from Sar Ta Lin Village to Dagon Myothit (East) should be clear in design</p> <p>Comment-2 There are also other projects (especially industrial zone development plan) related to this township so that DPTSC need to consider a long-term plan for about 30 years. YCDC has those long-term plans and should discuss with them</p> <p>Comment-3 It is better to plan a design after field study because some data from google earth could not describe exact information.</p>	
2.	<p>Mr. Nay La (Water Distribution Department, Township Development Committee)</p> <p>Comment-1 There are also gas lines and water distribution lines. Therefore, it is necessary to negotiate with these respective authorities or departments. Most of the data can be obtained from Township Development Committee.</p>	<p>Mr. Nyunt Wai (DPTSC, MOEE)</p> <p>Answer-1 We also face many difficulties that the data are not relevant with ground condition. But we will always meet and discuss with related departments. For design, we proposed to use Slim Towers with double circuits which can high the cost, but it need small land area or size and reduce land acquisition issue. But Slim Towers are difficult to use in Mingalardon Township. Therefore, we will put 6 circuits in underground tunnel. After passing through tunnel, we will use Mono towers. Therefore, I also wish to suggest YCDC to invite and discuss with MOEE when implementing the new industrial zones. Then we will discuss to put enough space for transmission lines in the future. We also do not get data for gas pipelines. We also carried out detail survey designs along Bo Chan Road.</p> <p>Comment-1 Due to problems in land acquisition, the projects have to be delayed.</p> <p>Comment-2 Existing transmission lines of Hlawga-Thaketa needs to be upgrade. Slim towers are planned to be used with bored pile although it might be expensive.</p> <p>Comment-3 If government is planning to develop an industrial zone in this Dagon Myothit (East) Area, the electricity will be essential for everyone. So, please do corporate with us.</p>
3.	<p>Mr. Linn Htet Ko (District GAD)</p> <p>I wish to include land own list and related government list in the presentation. It should include project initial time and finishing time. How GAD and related departments like YCDC/ YESC should support for this project? There cannot have land issues in Yangon Area. Since the project is National level project, there should</p>	<p>Mr. NAKANO Hiroshi (Nippon Koei International LTD)</p> <p>Answer-1 As it is only feasibility stage, the project schedule has not been fixed the only information we can say for now is that target timing of loan agreement is in August. Design stage may take for</p>

No.	Question/Comment	Explanation and Response
	<p>be discussions in Central level. Sometimes following JICA guidelines exactly in our country may have difficulties. Therefore, international standards and guidelines should relevant with our country's condition.</p> <p>Question-1 Is there any project schedule which includes start and end date of the project?</p> <p>Question-2 How can GAD and other related departments involve in the project?</p> <p>Comment-1 It would be better to include departments and landowners related to project in power point presentation so that it is easier to know each responsibility.</p> <p>Comment-2 The project includes cutting trees and replantation. Then, the project owner should discuss with Forestry Department. There can be disagreement in usage of agricultural lands in Kawa and Thanatpin Townships. For slide 46, Ministry of Forestry has regulations of which kind of trees could be cut off and where to replant them. That is why, before starting the project, please make sure to negotiate with the Ministry of Forestry.</p>	<p>about 1 year. So, we still do not have project schedule.</p> <p>Answer-2 Our team could not decide what GAD can help to involve. DPTSC will discuss with related departments.</p>
4.	<p>Mr. Than Hlaing (No.1 Ward Administrator)</p> <p>Comment-1 There were two fatal incidents occurred with electric shock; one incident is at the dumping site and another one is occurred while repairing the electricity, in my ward. To avoid such situation, please provide us more information in advance so that we can give the precautions to the public.</p>	<p>Mr. Nyunt Wai (DPTSC, MOEE)</p> <p>Answer (DPTSC) Trees like bamboo which height cannot be controlled will need to be cut off. However, those which can be controlled will be remain the same. So, I believe if everyone follows respect laws and rules, number of accidents will be reduced.</p>
5.	<p>Mr. Aung Ko Ko (EE, YESC)</p> <p>If the transmission line will pass through No. 7 Road, I wish the line should be installed in the area located within the project operated by Zayyar Premier Company. If No.7 Road will be expended by future project, the transmission line needed to remove again.</p>	<p>Mr. Nyunt Wai (Assistant Director, DPTSC, MOEE)</p> <p>Currently, water pipelines are existed along No. 7 Road. We will discuss with YCDC for transmission line area. We will place the towers after negotiations with them</p>
<b>Bago District</b>		
1.	<p>Mr. Kyi Swe(Administrator, Oe Bo Village Tract)</p> <p>Question – When the transmission line pass through village track, will DPTSC give compensation?</p>	<p>Mr. Soe Naing Win (Assistant Director, DPTSC)</p> <p>Answer– When DPTSC make surveys, there are surveyor to be followed. During construction of the tower, there will be transportation, so, DPTSC will give the compensation for damaged crops until the construction ends. The compensation's value may be due to Department of Agriculture Land Management and Statistics rules by negotiating steps by steps.</p> <p>Dr.Phyo Thu Aung (MKI)</p>

No.	Question/Comment	Explanation and Response
		Answer– According to MOEE Law, there is no compensation for land acquisition in every village tract development project.
2.	<p>Mr. Kyaw San Aung (Deputy Township Administrator, Ka Wa Township)</p> <p>Question – Will DPTSC give compensation for Land Acquisition which is surrounding the tower? Communication operator gave compensation for land acquisition annually.</p> <p>Comments (Deputy Administrator, Ka Wa Township)- DPTSC should consider for making PCM for really affected people because this is unable to construct any buildings and unable to plant any crops.</p>	<p>Mr. Soe Naing Win (Assistant Director, DPTSC)</p> <p>Answer – There will not be compensation for land used for substation but DPTSC will give crops compensation by three times of current market price in every season because there are many towers in Myanmar. So, the government can't give for every land used.</p> <p>Dr.Phyo Thu Aung - (MKI)</p> <p>Answer – This is just the process of implementing IEE report. After loan is agreed, there will be detailed design and list of actual affected person will be out and Public Consultation Meeting will be held.</p>
3.	<p>Mr. Kyaw Thet (Department of Public Health)</p> <p>Comments - Noise and Vibration at Hlegu-Dar Pein should be measured every three months and should be inspected monthly. Water quality also should be tested 2 times in every rainy season.</p>	<p>Dr.Phyo Thu Aung (MKI)</p> <p>Answer – There is no standard rules and regulation of monitoring frequency but DPTSC will follow that comments.</p>
4.	<p>Mr. Tin Win Htut (Officer, Department of Fisheries) –</p> <p>Question – There are many fishponds under towers, so, will it be affected due to electricity?</p>	<p>Mr. Soe Naing Win (Assistant Director, DPTSC)</p> <p>Answer- (DPTSC, MOEE) – There are transmission lines above fishponds in Ayeyarwady Region and there are no issues happening until now. There may not be effect on these but after negotiation with the village tract, DPTSC will avoid these areas if possible.</p> <p>Mr. Hiroshi Nakano (NK)</p> <p>Answer – Enough insulator will be fixed at towers, so, there will be no electricity danger for fishponds. If someone who may be uneducated person touch the tower, it might be electrocution. DPTSC will follow the MOEE's Laws and JICA's international laws to be less or no impacts. According to MOEE's Rules, the tower must be built from the house in enough distance. Moreover, there are households under Hlawga-Thaketa 230kV transmission line. So, the technicians from both MOEE and JICA will improve that line by applying update techniques</p>
5.	<p>Mrs. Pa Pa Win (Assistant Director, Planning Department, Thanatpin Township)</p> <p>Question - Will be any danger if people will work under transmission line?</p>	<p>Mr. Soe Naing Win (Assistant Director, DPTSC)</p> <p>Answer – There will be no danger after the tower construction have done. 75 feet square is required for 230kV transmission for ROW. Lighting conductor will be fixed on the top of tower to be safe</p>
6.	<p>Mr. Nay Min (Deputy Staff Officer, Department of Forestry)</p>	<p>Dr.Phyo Thu Aung (MKI)</p> <p>Answer – This is just the stage to implement IEE report, after the loan is permitted that could take 1-</p>

No.	Question/Comment	Explanation and Response
	<p>Comments – To comprise sub-group including the members from relevant departments. According to his experiences, it was really complicated in compensation processes and hard to deal with Project-Affected Persons (PAPs).</p>	<p>year, detailed designs will be out. Then, DPTSC will cooperate with other departments to implement this project and affected people will be recorded and will be compensated. The cut-off date will be specified and will make surveys.</p>
<p>7.</p>	<p>Mr. Maung Soe (Kan Ni Village Tract Administrator, Kawa Township)  Comments - The transmission line in Kawa Township is broken. So Please implement the projects in safety way to be less damage. The relevant organizations should discuss with local people for Land Acquisition in details.</p>	<p>Mr. Soe Naing Win (Assistant Director, DPTSC)  Answer – If the transmission line is broken, there is no current in the transmission line so that no electric hazard is expected. Therefore, we don't need to be afraid of that condition.  Dr.Phyo Thu Aung (MKI)  Answer – MKI submitted IEE (Draft) and JICA commented including route of bird's migration. MKI have been considering about JICA's comments to put in IEE(Draft).</p>
<p>Eastern Yangon District</p>		
<p>1.</p>	<p>Mr. Soe Lin Htike (Thaketa Township Administrator)  Comment-1 There are transmission lines in No. (9) Ward of Thaketa. So, it would be better to get detail information of how the project involve in that area.  Comment-2 Even after the agreement between Myanmar Government and JICA, there might be difficulties when it comes to ground survey and negotiation with local people.  Question-1 Are transmission line tower new? Where would they be placed?  Question-2 How many third parties are involved in this project?</p>	<p>Dr. Phyto Thu Aung (Myanmar Koei LTD)  Answer-1 The old transmission line will be upgrade with new line. Therefore, location and length of the line is the same. It will upgrade current tower area. In other areas which are far from main road, the project will construct approach lane.  Mr Thura Aung (General Manager, Resource and Environment Myanmar Co., Ltd.)  The leading organization for IEE Study is Myanmar Koei International Co., Ltd. and we (REM) take the responsibility for social consideration and RAP framework. When we discussed with DPTSC, they did not want to share the project information with local people as it is feasibility stage because they worried that rumours would spread and the project would not work out as planned. However, they accepted to have stakeholder meeting at this feasibility stage.</p>
<p>2.</p>	<p>Mr Tint Zaw (North Okkalapa Township Administrator)  Question-1 Have DPTSC informed parliament members about the project?  Question-2 What are these feedback forms for?</p>	<p>Dr. Phyto Thu Aung (Myanmar Koei LTD)  Answer-1 DPTSC invited one parliament member in Hlegu Township.  Answer-2 These feedback forms are for Township Administrator, Ward Administrator and Local people who are interested in the project.</p>
<p>3.</p>	<p>Mr Ye Aung (Dagon Myo Thit (South) Township Administrator)  Comment-1 There will not be many issues in Eastern Yangon District since it is old transmission line area.</p>	<p>Dr. Phyto Thu Aung (Environmental Expert, Myanmar Koei International Co., Ltd.)  The project is just studying phase for loan agreement. The government has budget limitation.</p>

No.	Question/Comment	Explanation and Response
	<p>Mr Kyaw Moe (Dagon Myo Thit (North))</p> <p>Comment-1 If the project carried out after signing MOU, there will be many problems to be solved at ground level. The project should discuss with community first. Moreover, impact of transmission line is high on farmers especially during rainy season.</p>	<p>During meeting with MOEE in Naypyitaw, they do not wish to survey at villages/wards because some areas are sensitive area for survey. Moreover, the design is not confirmed yet.</p>
4.	<p>All Township Administrators</p> <p>We can give suggestions after giving information to the community. We wish the project will meet related government department and public as well. We will support the project 100 percent as electricity is very essential for the sake of our country and people.</p>	<p>Mr Thura Aung (General Manager, Resource and Environment Myanmar Co., Ltd.)</p> <p>The project is in initial stage and the design may be changed. If IEE study is not sufficient for this project, the developer will carry out EIA study according to ECD comments.</p>
<b>Hlegu Township</b>		
1.	<p>Mr. Win Aung (Deputy Township Administrator, General Administration Department (Hlegu))</p> <p>Question – Ask Land Acquisition about the area which will be passed through 230kV and 500kV. How many towers will be in Hlegu Township and how much area will be used?</p> <p>Comments-1 – Should consider about the area which will be used in Hlegu Township.</p> <p>Comments-2 – The project should consider for people who cannot live under ROW of 500 kV Transmission line. Compensation for substation area as well as for transmission line should be considered. Number of towers, distance between each tower and their location should be considered. We found that other transmission lines are sagging in some area.</p>	<p>Dr. Phyo Thu Aung (Environmental Expert, Myanmar Koei International Co., Ltd.)</p> <p>Answer – DPTSC need site survey to know about the numbers of towers in Hlegu Township. After get MOU, detailed designs will be out. JICA will support financially, this is draft stage. There are households under 230kV Hlawga-Thaketa but improvement of this line will be included in this project. Moreover, JICA will call tender for techniques as the adviser. So, many technicians will be included, JICA will also inspect the construction with the International Guidelines. It is sure that the proposed will be better the previous projects.</p>
2.	<p>Mr. Aung Aung (Village Administrator, Sar Ta Lin Village Tract)</p> <p>Comment - Since this is the loan acquisition phase, we cannot give suggestions for our village. When the project start, our village will corporate with the project by negotiating with landowners and community.</p> <p>Mr. Bo Bo Myint Aung, U Mya Aung (Township Development Committee)</p> <p>Comment- The vertical right of way can be changed when village are developed and ground level is changed due to the development.</p>	
3.	<p>Mr. Min Zaw (Township Engineer, Electricity Supply Cooperation)</p> <p>Comment-1- Since ground clearance is changing according to the time, the project should consider carefully for the height of the towers with some percentage adding on current ground level.</p>	<p>Dr. Phyo Thu Aung (Environmental Expert, Myanmar Koei International Co., Ltd.)</p> <p>Answer-1– Yes, the Ministry installs the towers at least 30 ft height. But in some places, the ground clearance of the tower is decreased due to the upgrading of the road.</p>



No.	Question/Comment	Explanation and Response
	<p>Comment-2 - Hlegu has limitation in electricity. The township will be developed in the near future with many development projects. The village administrators cannot discuss today is because they did not see detail design or transmission line route. But, when the project start, Hlegu Township will cooperate for the success of the project.</p>	<p>Answer-2– According to PCMs in other townships, there are suggestions for cooperation of related government departments, township administrators and ward/village heads and so on. Moreover, stakeholders also suggested meeting with current development project owners and proposed development project owners are also necessary. Mr. Hla Ko Oo (Assistant Engineer, DPTSC) Answer– According to MOEE Law, there is no compensation for land acquisition in every village tract development project.</p>
4.	<p>Mr. Bo Bo Myint Aung, Mr. Mya Aung (YCDC) Comment - There is 66kV transmission line from Hlawga but the villagers can't accept, so, the route might be changed. If DPTSC show the affected area in details, the leader from village tract can discuss with each other.</p>	<p>Dr. Phyo Thu Aung (Environmental Expert, Myanmar Koei International Co., Ltd.) Answer – Some proposed area is under private company and DPTSC expect to get MOU in current government. If the detailed designs out, site survey will be ok.</p>
5.	<p>Mr. Win Aung (Deputy Township Administrator, General Administration Department (Hlegu)) Comments - If DPTSC show the detailed design, the administrator from village tract can discuss more in details. In Htan-Ta-Bin, after the tower is constructed, the contractor cannot pay compensation and they can't negotiate till now. The value of the land will increase.</p>	<p>Dr. Phyo Thu Aung (Environmental Expert, Myanmar Koei International Co., Ltd.) Answer – DPTSC will negotiate with public construction enterprise and ROW is rarely allowed.</p>
6.	<p>Mr. Win Aung (Deputy Township administrator, General Administration Department) Comments - Plantation will be needed in exact areas.</p>	

Source- IEE Study Team



Mingalardon Township



Mingalardon Township



Mingalardon Township



Mingalardon Township



Dagon Myo Thit (East)



Dagon Myo Thit (East)



Dagon Myo Thit (East)



Dagon Myo Thit (East)



Bago District



Bago District





**Bago District**



**Bago District**



**Eastern Yangon District**



**Eastern Yangon District**



**Eastern Yangon District**



**Eastern Yangon District**



**Hlegu Township**



**Hlegu Township**



Source: IEE Study Team

**Figure 9.3-1 Photos of Public Consultation Meetings**

### 9.4 Public Disclosure for Draft IEE Report

Executive Summary of IEE report translated by Myanmar language, is prepared and disclosed together with feedback form to each invitee during PCM. The disclosure duration was 7 weekdays starting from the date of holding PCM. The disclosure duration for each township is shown in Table 9.4-1. The notice of disclosure duration and handout which describe project description briefly, were also posted on the notice board of the government offices for public access as shown in the following table. Also, Figure 9.4-1 shows the photos of public disclosure.

**Table 9.4-1 Disclosure Duration for the Summary of Draft IEE Report**

Public Consultation Meeting	Disclosure Duration
1 <sup>st</sup> Session	13-23 March 2020
2 <sup>nd</sup> Session	16-24 March 2020
3 <sup>rd</sup> Session	18-26 March 2020
4 <sup>th</sup> Session	19-30 March 2020
5 <sup>th</sup> Session	20-31 March 2020







Source: IEE Study Team



Public Disclosure at General Administration Department, Northern Yangon District (1<sup>st</sup> Session of PCM)

Public Disclosure at Electricity Supply Cooperation, Mingalardon Township (1<sup>st</sup> Session of PCM)



	
<p>Public Disclosure at Administration Office, Thingangyungyi Village Tract, Mingalardon Township (1st Session of PCM)</p>	<p>Public Disclosure at Administration Office, Pyan Lal Nay Yar Cha Hter Yay Villagg Tract, Mingalardon Township (1st Session of PCM)</p>
	
<p>Public Disclosure at General Administration Department, Dagon Myohtit (East) Township (2nd Session of PCM)</p>	<p>Public Disclosure at Administration Office, No (1) Ward, Dagon Myohtit (East) Township (2nd Session of PCM)</p>
	
<p>Public Disclosure at General Administration Department, Bago District (3rd Session of PCM)</p>	<p>Public Disclosure at General Administration Department, Bago Township (3rd Session of PCM)</p>

	
<p>Public Disclosure at Township Development Committee, Bago Township (3rd Session of PCM)</p>	<p>Public Disclosure at Forest Department, Bago District (3rd Session of PCM)</p>
	
<p>Public Disclosure at Department of Agricultural Land Management and Statistics, Bago Township (3rd Session of PCM)</p>	<p>Public Disclosure at Electricity Supply Corporation, Bago District (3rd Session of PCM)</p>
	
<p>Public Disclosure at General Administration Department, Thanatpin Township (3rd Session of PCM)</p>	<p>Public Disclosure at Department of Public Health, Thanatpin Township (3rd Session of PCM)</p>



Public Disclosure at Township Development Committee, Thanatpin Township (3rd Session of PCM)



Public Disclosure at General Administration Department, Kawa Township (3rd Session of PCM)



Public Disclosure at Township Development Committee, Kawa Township (3rd Session of PCM)



Public Disclosure at Department of Agricultural Land Management and Statistics, Kawa Township (3rd Session of PCM)

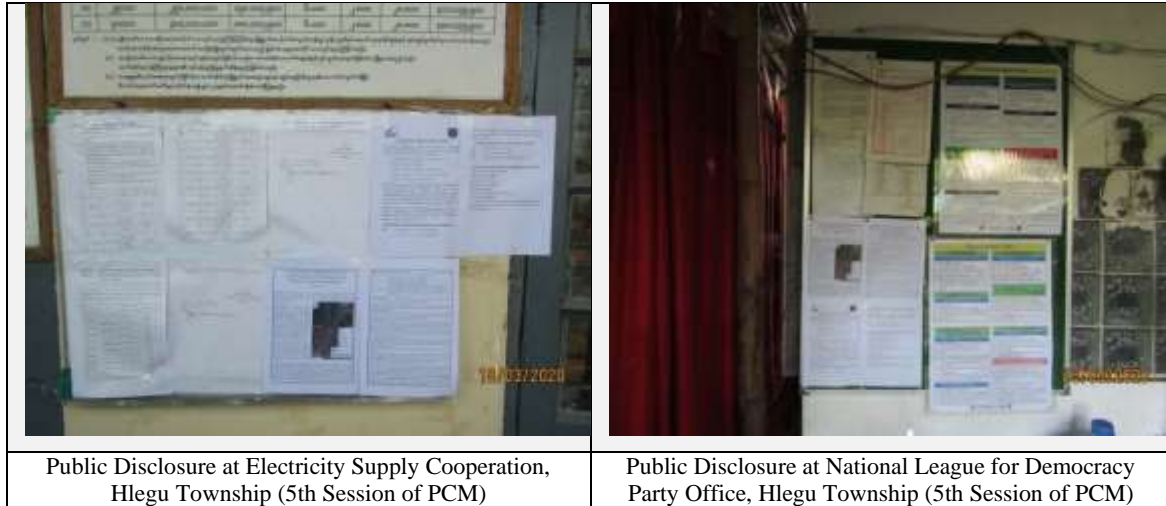


Public Disclosure at Electricity Supply Corporation, Kawa Township



Public Disclosure at General Administration Department, Hlegu Township (5th Session of PCM)





Source: IEE Study Team

**Figure 9.4-1 Photos of Public Disclosure**

**9.4.1 Comments from Public Disclosure**

Based on the public disclosed executive summary of IEE report translated by Myanmar language, several comments in the PCM sessions and 26 written comments in feedback forms during the PD were received. Comments are shown from Table 9.4-2 to Table 9.4-5. There were no special written comments from Yangon Eastern District.

**Table 9.4-2 Feedback from participants at Mingalardon PCM**

No.	Name	Township	Comment/Suggestion
1	U Aung Myat Lin	Thingangyungyi Village, Mingalardon	The consultations and meetings with the local people should be carried out four to five times rather than just one time.
2	U Thet Khine Oo	Pyanalnayyarchahatryay Ward, Mingalardon	There should be proper detailed explanations concerning the houses within the rehabilitation ward, located within the project area and concerning measures for the compensations.
3	U Hout Soh Khai	Mingalardon	There should be effective compensation schemes for lessening the potential impacts on the communities within and around the project area.
4	Daw Si Than	Shwe Nanthar Ywama Village, Mingalardon	If the project is good for the country, it is fully encouraged. It would be better if the project does not have negative impacts on the communities as well.
5	U Zaw Min Htwe	Thingangyungyi Village, Mingalardon	There should be no impact on the house during project implementation.
6	U Aung Htay	Thingangyungyi Village, Mingalardon	There should be no impact on the house and consider for public health.

Source: IEE Study Team

**Table 9.4-3 Feedback from Participants at Dagon Myothit (East) and Disclosure**

No.	Name	Township	Comment/Suggestion
1	U Kyaw Win Naing	125 Ward, Dagon Myothit (East)	The consultations and meetings with the local people should be carried out four to five times rather than just one time.

Source: IEE Study Team



**Table 9.4-4 Feedback from Participants at Bago PCM and Disclosure**

No.	Name	Township	Comment/Suggestion
1	U Nyi Nyi Htwe	General Administration Department, Bago	There should be more effective measures to make the respective farmers aware of and understand the compensations for their lands and gardens due to the project. There can be problems in signing MoUs on loans without taking these measures. Concerning the land compensation, it should be reconsidered by the concerned Ministry. According to 2012 Farmland Law, the farmers holding the Land Use Certificate (Form 7) are supposed to be the owners of their agricultural land.
2	U Kyaw Zin Nyunt	Township Development Committee, Bago	It is known that the cultivation can be carried out under the 500KV transmission tower. However, the cultivation should not be done alone this area since there can be dangers of electrical hazards. The area of the transmission line (41' x 31') is not a large one when it comes to the villages. After the project is implemented, there should be transparent negotiations and discussions.
3	U Nay Lin	Forest Department, Bago	There should be transparency in conducting field surveys for compensations with the local people before the actual implementation of the project so as to avoid unnecessary disputes.
4	U Aung Swe Lin	Bago	The current 230-KV transmission lines do not have clear-cut ground clearance in some places, and there are some cables are falling off just above the ground. In order to avoid such incidence, there should be strict distance of line span between the transmission towers.
5	Daw Htay Htay Win	Myanmar Maternal and Child Welfare Association, Bago	Sometimes especially in winters, there are cases that the transformers in the city have some errors and make some noise that can cause local people and the monks living around nervous and worried. In some cases, the electricity can even go off. Thus, it would be better not to be happen such cases after this project. It is very grateful for upgrading the transmission lines.
6	Daw Ei Ei Khin	Myanmar Women's Affair Federation, Bago	There can be problems concerning the lands. Since this project is intended for the development of the country, it would be better if the government also takes responsibility in solving this problem. There should be awareness raising activities and trainings by the concerned organizations so that the local people will be more engaged, interested and willing to support the project. In doing these, the non-governmental organizations should also contribute.
7	U Maung Maung Aye	Kanni Village, Bago	There should be effective measures concerning the environmental impacts of the project and the compensations for the affected communities. The system of the electrical transmission line should be safe enough to avoid the possible risks for the local people. Since this project can bring advantages to our country, there is no objection for the project.
8	U Khin Tun	Shwe Tan Village, Bago	The compensations should be provided not only for the affected crops in the lands near the transmission towers but also for the affected lands and crops along the transmission line.

No.	Name	Township	Comment/Suggestion
9	U Aung Thu Oo	Aut See Tee (East) Village, Bago	The project will be successful if there is strong collaboration among the government, the concerned ministries, the public and the JICA.
10	U Nyunt Aung	Department, of Agricultural Land Management and Statistics, Thanatpin	The project area should be away from the residence of the local communities as well as the extensive village areas. Concerning the compensations for crops, although the seasonal crops can be re-cultivated, the long-term crops could not be cultivated again. Thus, for those long-term crops, the compensations for the costs of cultivating them and for further two-or-three- year period should be provided.
11	Dr. Aye Aye Aung	Livestock Breeding and Veterinary Department, Thanatpin	Since there are measures to replant trees, there should also be measures for the pond providing the drinking water for animals located near the power station. In the awareness raising workshops, the information and knowledge on the routes of wild birds should be included.
12	U Hla Min Ko	Thanatpin	There should be consultations with the local communities living around the project area. It would be more feasible if there are measures on compensations or the annual rents for the lands for the transmission towers. There should be awareness raising activities for the communities around the project area on the measures taken for the potential risks of the electrical hazards.
13	Daw Kyu Kyu Myint	Department of Agriculture, Thanatpin	There should be open discussions about the project implementation with the farmers working on the ground.
14	U Wai Naing Hein	Department of Fisheries, Thanatpin	The Department of Fishers would like to suggest that the transmission lines should not be placed in the fishing ponds since it can cause electrical hazards. Thus, there should be considerations for this fact.
15	U Saw Myint	Forest Department, Thanatpin	The Initial Environmental Evaluation of the project (phase-3) should be carried out after conducting the field survey and awareness-raising activities with the concerned departments, village tracts, and providing training for the local communities.
16	U Kyaw Thet	Department of Public Health, Thanatpin	There should be regular monitoring on noise pollution once a month. The drains should be cleaned before and after the raining season. There should be measures for the safety and security of the local population.
17	U Kyaw San Aung	General Administration Department, Kawa	The 500-KV transmission line will pass through the Na Be Village Tract, Kawa Township. Thus, the construction of the transmission tower and the installation of the transmission line will be carried out across these areas. We are informed that the compensation will be provided only for the affected crops with 3 times that of the current price, but not for the lands. The Tele Com Operators pay the annual rents for the lands, where their transmission towers are placed. If the compensations or the annual rents for the lands for constructing the transmission towers are not provided,

No.	Name	Township	Comment/Suggestion
			there could be complaints since it is not in accordance with the Government's Land Acquisition Policy.
18	U Kyaw Lwin	Department, of Agricultural Land Management and Statistics, Kawa	It is said that it will be compensated three times the current price for the crops cultivated on the lands where the transmission line passes through. It would be better if there is specification of widths for both sides in installing the transmission line. For conducting the initial evaluation, prior information should be given to include all the concerned departments. Regarding the compensation for lands and crops, it should be reported to the Township Farm Land Management Committee to be more reliable and effective.
19	U Maung Soe	Nabebin Village, Kawa	During construction of the towers, there should be measures for the minimum impacts on the local farmers, and for the least impacts on the natural environment and the local people. There should also be proper compensation schemes. There should be transparent and open negotiations with the local farmers with more considerations on their interest.

Source: IEE Study Team

**Table 9.4-5 Feedback from Participants at Hlegu PCM and Disclosure**

No.	Name	Township	Comment/Suggestion
1.	U Aung Zaw	Sar Ta Lin Village Tract, Hlegu	This project should be implemented because it will support energy sector of the country. Safety on environmental and social sectors and mitigation of negative health impacts should be systematically and sufficiently carried out.
2.	U Si Thu Win	Sar Ta Lin Village Tract, Hlegu	It is fully agreed for construction of 500kV Transmission line in Hlegu Township. It is very crucial for development of the township. It can support energy sector of the country, too. The project should be carefully implemented by emphasizing on negative environmental impacts.
3.	U Zin Min Tun	Sar Ta Lin Village Tract, Hlegu	No disagreement on the project because it will not impact on biodiversity sensitive area and Yangon's Cultural Heritage Infrastructures. The project contractor should follow related mitigation measures within project area.
4.	U Myint Thein	Inn Taing Village Tract, Hlegu	It is fully encouraged for the project because it is very important in implementing country's projects and development of country's economy.
5.	U Paw San	Inn Taing Village Tract, Hlegu	It is fully welcoming the project since it can develop Villages/Wards, factories and living standards of Hlegu Township. But the project can have some negative impacts on environment and people. Therefore, technicians and professionals should work together to reduce negative impacts.
6.	U Aye Thaug	Inn Taing Village Tract, Hlegu	It is totally agreed for the project because it will support electricity needs of the county. The project should understand people's worry about danger and should explain protection systems for transmission line. Law Pi Ta Transmission Line becomes loosen down to the ground due to ground filling. Therefore, traffic and local people face the electricity danger during rainy season. Such kind of maintenance should be included in consideration of the project.
7.	U Myint Win	Alan Gapo Village Tract, Hlegu	The project will develop some villages in Hlegu Township. The compensation for affected farmers should be given by negotiating with

No.	Name	Township	Comment/Suggestion
			related persons. Technicians and professionals should work together to reduce negative impacts on environment. I am ready to support success of the project.
8.	U Nyan Tun	Alan Gapo Village Tract, Hlegu	The project will support economy and living standard people from Hlegu Township. Compensation for affected owners of farms and gardens should be given by negotiating with township representatives, village representatives and related government persons. It is very important because 75% of main livelihood of people in rural area is farmer. Technicians and professionals should work together to mitigate negative impacts on environment. I am ready to support success of the project.
9.	U Zaw Win Tun	Alan Gapo Village Tract, Hlegu	The project will support economy and living standard people from Hlegu Township. Impacted owners of farms and gardens should be given compensations negotiating with Township representatives, village representatives and related government persons. It is very important because 75% of main livelihood of people in rural area is farmer. Technicians and professionals should work together to mitigate negative impacts on environment. I am ready to support success of the project.
10	U Myint Ngwe	Shan Te Gyi Village Tract, Hlegu	Yangon has limitation in electricity and thus 500kV transmission line should be installed. The project can have few negative impacts on environment, but it can give much positive impacts.
11.	U Myint Naing	Shan Te Gyi Village Tract, Hlegu	By getting more power supply in the township, minimizing negative impact and using modern technologies, 500kV transmission line project should be implemented soonest.
12.	U Than Lin Aung	Shan Te Gyi Village Tract, Hlegu	Even though 500kV transmission line project may impact the environment more or less, it should be implemented because the people in ward, village and township can get sufficient electricity supply.

Source – IEE Study Team

## 9.5 Conclusion of the Comments for Draft IEE Report

As described above, 167 persons in total joined the 5 session PCMs ( Mingalardon, Dagon Myothit East, Bago, Eastern Yangon and Hlegu) at the Draft IEE Stage. There were local leaders and local NGO members in attendance.

Regarding public comments, several comments in the PCM sessions and 26 written comments in feedback forms during the PD were received. Among them were comments concerning environmental, social and health issues that may be impacted by the operation of the project. On the other hand, there were comments on the positive benefits on the local economy, employment of business opportunities and health activities. The received comments were reflected in this Final IEE report.

## **CHAPTER 10: CONCLUSIONS**

### **10.1 Key Findings**

The proposed project is the power sector improvement project within the Yangon Region. It aims for stabilization of the power supply through improvement of the backbone systems in Yangon, where power demand is expected to increase.

The Project consists of three components in total and they are 1) Installation of New 500 kV Transmission Lines, 2) Construction of New 500 kV Substation in Hlegu, 3) Installation of Facilities to existing 230kV Substations and Two 230 kV Transmission Lines. Therefore, preparation of the IEE is conducted for three (3) components altogether taking into consideration that similar negative impacts are anticipated for these three components, although extent of the impact is somewhat different.

According to preliminary environmental impact assessment described in Chapter 5, key environmental impacts are air pollution, water pollution, waste pollution, hazardous material, pollution, noise and vibration pollution, soil contamination, offensive odor, occupational health and safety, community health and safety and emergency hazards and risks. These environmental impacts to the sensitive receptors are assessed in detail in the draft IEE stage.

Regarding lifecycle of target substations and transmission lines, it is unlikely that facilities are closed and operation is stopped in the immediate future, although rehabilitation and/or renewal will be done as necessary. In addition, anticipated activities and negative impacts during Closing Stage are mostly same as those of Construction Stage. Therefore, results of identification and evaluation during Closing Stage is basically excluded.

The transmission lines and its connecting substations will be located in Bago and Yangon region. The Project sites are not located in ecologically sensitive areas. Moreover, the Project sites will be located far from the buildings and structures mentioned in Yangon City Heritage List.

In the construction stage, most of the impacts are temporary and site-specific and is considered insignificant as the Contractor entrusted by the Project Proponent carried out the necessary mitigation measures.

No significant negative impact is anticipated for procurement of goods such as utility vehicles and pole erection machine.

In the operation phase, most of the impacts are controlled and limited within the Project site.

Based on the results of identification and evaluation, examination of mitigation measures for pollution, natural environment and social, safety and health environment, an adequate Environmental Management Plan (EMP) and relating Environmental Monitoring Plan (EMoP) was established. In addition, an Emergency Risk Management Plan (ERMP) was examined.

### **10.2 Conclusions**

The proposed transmission line routes and location of the new substation are not included in the environmental priority area as it does not exist in the conservation areas designated by Myanmar Government. The area has been in common with paddy fields, commercial plantations, secondary forests, scrub land and human habitation areas. For the safe side, Flora and Fauna secondary baseline data collection was conducted through the IEE study.

Moreover, the Project Proponent is promoting the use of high technology machine and equipment and raw materials. The key environmental impacts such as air pollution, water pollution, solid waste, noise

pollution, hazardous materials, occupational health and safety, community health and safety and emergency risks were assessed in detail. IEE Report was prepared and the Project Proponent (DPTSC) will submit draft IEE Report to ECD for obtaining Environmental Compliance Certificate (ECC) as an evidence of environmental approval by Myanmar Government (MONREC). After issuance of ECC basically 30 working days after submission and at the implementation of the Project such as construction and operation, DPTSC will conduct environmental monitoring based on condition under the ECC and EMP/EMoP specified in the IEE Report and report to ECD every 6 months during the construction stage in general according to the EIA Procedure, 2015.

Consequently, it was concluded that the Project (new/expanded substation and 230kV/500kV transmission line) does not cause serious adverse impacts in operation stage and the majority of negative impacts are temporary and site-specific due to construction activities during the construction phase and the expected impacts could be avoided or minimized by implementing the mitigation measures.

**APPENDIX – I**  
**PUBLIC CONSULTATION MEETING**

**1.1 POWER POINT USED IN PUBLIC CONSULTATION  
MEETING**





လျှပ်စစ်စွမ်းအားစီမံရေးဦးစီးဌာန (DEPP)  
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန (DPTSC)  
လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန (MOEE)



မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်း စီမံကိန်း  
အပိုင်း (၃)

ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (မူကြမ်း)

သတင်းအချက်အလက်ဖြန့်ဝေခြင်း၊  
စီမံကိန်းနှင့်ပတ်သက်ဆက်နွယ်သူများနှင့်တွေ့ဆုံဆွေးနွေးခြင်း

မင်္ဂလာဒုံမြို့နယ်

၁၃-၃-၂၀၂၀

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### မာတိကာ

- ၁။ ရည်ရွယ်ချက်
- ၂။ စီမံကိန်းနောက်ခံအကြောင်းအရာနှင့် စီမံကိန်းအဆိုပြုသူ
- ၃။ စီမံကိန်းအကြောင်းအရာနှင့် သက်ဆိုင်သောဒေသများ
- ၄။ ၅၀၀ ကေဗီ ဓာတ်အားခွဲရုံတည်ဆောက်ရန် လျာထားသောနေရာ
- ၅။ လက်ရှိသဘာဝပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာအချက်အလက်များ အကျဉ်းချုပ်
- ၆။ ကွင်းဆင်းလေ့လာမှုများ
- ၇။ သက်ရောက်နိုင်ခြေဆန်းစစ်မှု ရလဒ်များ အကျဉ်းချုပ်
- ၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

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### ၁။ ရည်ရွယ်ချက်

- ❖ စီမံကိန်းအကြောင်း မိတ်ဆက်ရန်
- ❖ စီမံကိန်းနှင့်ပတ်သက်သော သတင်းအချက်အလက်ဖြန့်ဝေရန်
- ❖ သက်ရောက်နိုင်ခြေဆန်းစစ်မှု ရလဒ်များ အကျဉ်းချုပ်ကို ရှင်းလင်းတင်ပြရန်
- ❖ စီမံကိန်းအပေါ်သက်ဆိုင်သူများ၏ သဘောထားအမြင်များရယူရန်
- ❖ ၎င်းတို့ကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း လေ့လာမှုတွင် ထည့်သွင်းစဉ်းစား သွားနိုင်ရန်

### ၂။ စီမံကိန်းနောက်ခံအကြောင်းအရာနှင့် စီမံကိန်းအဆိုပြုသူ

#### ❖ စီမံကိန်းနောက်ခံအကြောင်းအရာ

မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း → ၂၀၁၅ မှစတင်၍ JICA ODA ချေးငွေဖြင့် မန္တလေးတိုင်းဒေသကြီး၊ ပဲခူးတိုင်းဒေသကြီး၊ ရန်ကုန်တိုင်းဒေသကြီး တို့တွင် ဆောင်ရွက်လျက်ရှိ

အပိုင်း (၁) → မန္တလေးတိုင်းဒေသကြီးရှိ မိတ္ထီလာဓာတ်အားခွဲရုံနှင့် ပဲခူးတိုင်းဒေသကြီးရှိ တောင်ငူဓာတ်အားခွဲရုံ

အပိုင်း (၂) → ပဲခူးတိုင်းဒေသကြီးရှိ ဘုရားကြီးဓာတ်အားခွဲရုံနှင့် ရန်ကုန်တိုင်းဒေသကြီးရှိ လှိုင်သာယာဓာတ်အားခွဲရုံ

#### ❖ အဆိုပြုစီမံကိန်း

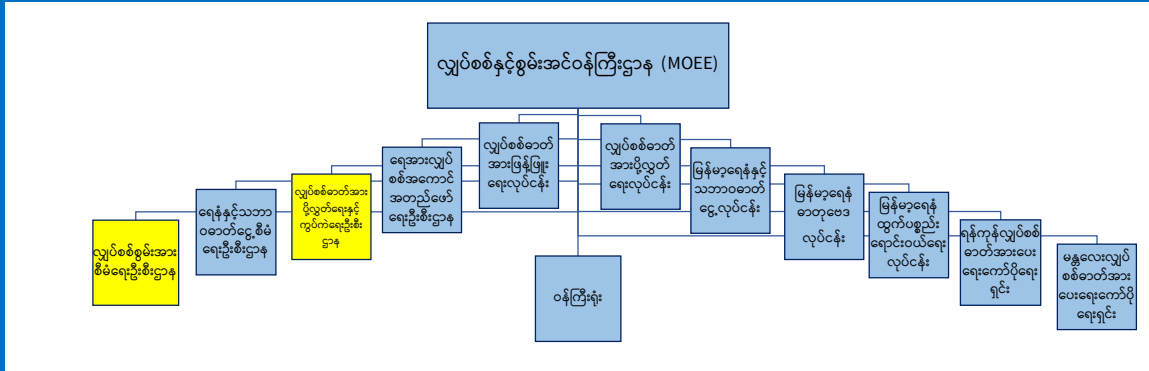
- အပိုင်း (၃) → ထိုဓာတ်အားခွဲရုံ ၂ ခုကြား ၅၀၀ kV ဓာတ်အားလိုင်း ချိတ်ဆက်ခြင်း
- ၁) ၅၀၀kV ဓာတ်အားခွဲရုံ အသစ်တည်ဆောက်ခြင်း
  - ၂) လက်ရှိ ၂၃၀kV ဓာတ်အားခွဲရုံ တိုးချဲ့ခြင်းနှင့် အဆင့်မြှင့်တင်ခြင်း
  - ၃) ၅၀၀kV ဓာတ်အားလိုင်း အသစ်တည်ဆောက်ခြင်း
  - ၄) ၂၃၀kV ဓာတ်အားလိုင်း (၂) လိုင်း အသစ်တည်ဆောက်ခြင်း
  - ၅) လက်ရှိ ၂၃၀kV ဓာတ်အားလိုင်းအဆင့်မြှင့်တင်ခြင်း

### ၂။ စီမံကိန်းနောက်ခံအကြောင်းအရာနှင့် စီမံကိန်းအဆိုပြုသူ

#### ❖ စီမံကိန်းအဆိုပြုသူ

စီမံကိန်းအကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း      ➔      လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန (DPTSC)

စီမံကိန်းစတင်ရန်အကဲဖြတ်စစ်ဆေးခြင်း      ➔      လျှပ်စစ်စွမ်းအားစီမံရေးဦးစီးဌာန (DEPP)



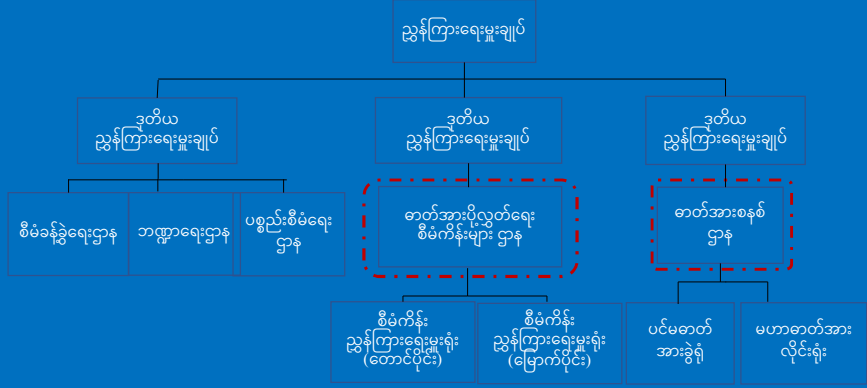
မူရင်း- လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန (MOEE) ၏ဖွဲ့စည်းပုံ

### ၂။ စီမံကိန်းနောက်ခံအကြောင်းအရာနှင့် စီမံကိန်းအဆိုပြုသူ

#### ❖ စီမံကိန်းအဆိုပြုသူ

လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၏ ဖွဲ့စည်းပုံ



မူရင်း- လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန

## ၃။ စီမံကိန်းအကြောင်းအရာနှင့် သက်ဆိုင်သောဒေသများ

အဆောက်အဦများ	အမျိုးအစား	တည်နေရာ	ပမာဏအရွယ်အစား	တိုင်းဒေသကြီး
ဓာတ်အားခွဲရုံ	ဓာတ်အားခွဲရုံသစ်	လှည်းကူး	၂၅ - ၃၂ ဟတ်တာ	ရန်ကုန်
	မူလတည်ရှိသော ဓာတ်အားခွဲရုံအားတိုးချဲ့ခြင်း	အရှေ့ဒဂုံ	မူလမြေကွက်	ရန်ကုန်
	မူလတည်ရှိသော ဓာတ်အားခွဲရုံအားအဆင့်မြှင့်တင်ခြင်း	လှော်ကား	မူလမြေကွက်	ရန်ကုန်
ဓာတ်အား ပို့လွှတ်ရေးလိုင်း	၅၀၀ kV ဓာတ်အားလိုင်းသစ်	ဘုရားကြီး - လှည်းကူး (ကောင်းကင်ဓာတ်အားပို့လွှတ်ရေးလိုင်းသစ်)	၆၈.၉ ကီလိုမီတာခန့်	ပဲခူး- ရန်ကုန်
	၂၃၀ kV ဓာတ်အားလိုင်းသစ်	လှည်းကူး - အရှေ့ဒဂုံသို့ (ကောင်းကင်ဓာတ်အားပို့လွှတ်ရေးလိုင်းသစ်)	၁၉.၅ ကီလိုမီတာခန့်	ရန်ကုန်
	၂၃၀ kV ဓာတ်အားလိုင်းသစ်	လှည်းကူး - လှော်ကားသို့	၁၇.၄ ကီလိုမီတာခန့်	ရန်ကုန်
		၂။မြေအောက်ဓာတ်အားပို့လွှတ်ရေးလိုင်းသစ်	၄.၆ ကီလိုမီတာခန့်	
၂၃၀ kV ဓာတ်အားလိုင်း အဆင့်မြှင့်တင်ခြင်း	လှော်ကား - သာကေတ (မူလနယ်နမိတ်၊ ကောင်းကင်လိုင်းကိုအဆင့်မြှင့်တင်ခြင်းဖြင့်)	၂၂.၃ ကီလိုမီတာခန့်	ရန်ကုန်	

မူရင်း- JICA လေ့လာရေးအဖွဲ့

## စီမံကိန်းအကြောင်းအရာ

### ❖ ၅၀၀ kV ဓာတ်အားလိုင်း၏ ဒီဇိုင်းအယူအဆ (လျာထား)

ဓာတ်အားလိုင်း	ဘုရားကြီး - လှည်းကူး ၅၀၀kV ဓာတ်အားလိုင်း
ဓာတ်အားလိုင်းအရှည်	၆၈.၉ ကီလိုမီတာ (၄၂.၈၁ မိုင်)
အမျိုးအစား	Galvanized steel towers with concrete foundations
တာဝါတိုင်အရေအတွက်	၁၄၀-၁၅၀ ခန့်
တာဝါများကြား ယေဘုယျ အကွာအဝေး	၄၅၀ မီတာခန့် (၀.၂၇ မိုင်)
တာဝါတိုင်အမြင့်	၆၅ မီတာ မှ ၁၁၀ မီတာထိ (ယေဘုယျအားဖြင့် မီတာ ၇၀ ခန့်)
တာဝါတိုင် အောက်ခြေဧရိယာ	တွက်ချက်ဆဲ
Right of Way (ROW)	၆၀ မီတာ (တစ်ဖက်တွင် မီတာ ၃၀ စီ )

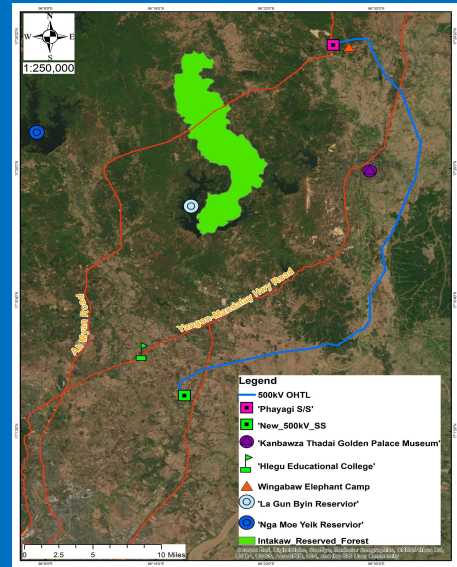
မူရင်း- JICA လေ့လာရေးအဖွဲ့

### စီမံကိန်းအကြောင်းအရာ

❖ ၅၀၀ kV ဓာတ်အားလိုင်းအကြောင်း (လျာထား)

- ❖ ဖြတ်သန်းသွားမည့် မြို့နယ်များ →
  - ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့နယ်၊ သနပ်ပင်မြို့နယ် နှင့် ကဝမြို့နယ်
  - ရန်ကုန်တိုင်းဒေသကြီး၊ လှည်းကူးမြို့နယ်
- ❖ ဖြတ်သန်းသွားမည့်လမ်းများ →
  - ပဲခူးမြို့အနီးရှိ ရန်ကုန်-မန္တလေး အမြန်လမ်းမကြီး
  - လှည်းကူးမြို့နယ်ရှိ အမှတ် (၂) လမ်းမကြီး
- ❖ ထိန်းသိမ်းဧရိယာ

ဘုရားကြီး ဓာတ်အားခွဲရုံရှိ ဓာတ်အားလိုင်းစတင်ရာနေရာမှ ၁.၅ ကီလိုမီတာ အကွာတွင် ဝက်ဘော်ဆင်စခန်းရှိသည်။



ဘုရားကြီး-လှည်းကူး ၅၀၀kV ဓာတ်အားလိုင်းအကြောင်းပြပုံ 9

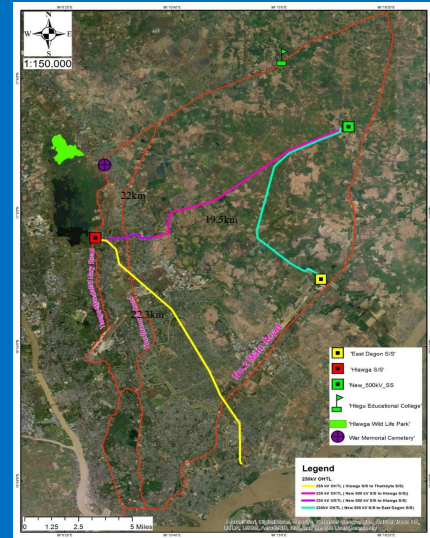
### စီမံကိန်းအကြောင်းအရာ

❖ ၂၃၀kV ဓာတ်အားလိုင်းသစ် (၂) လိုင်းတည်ဆောက်ခြင်း

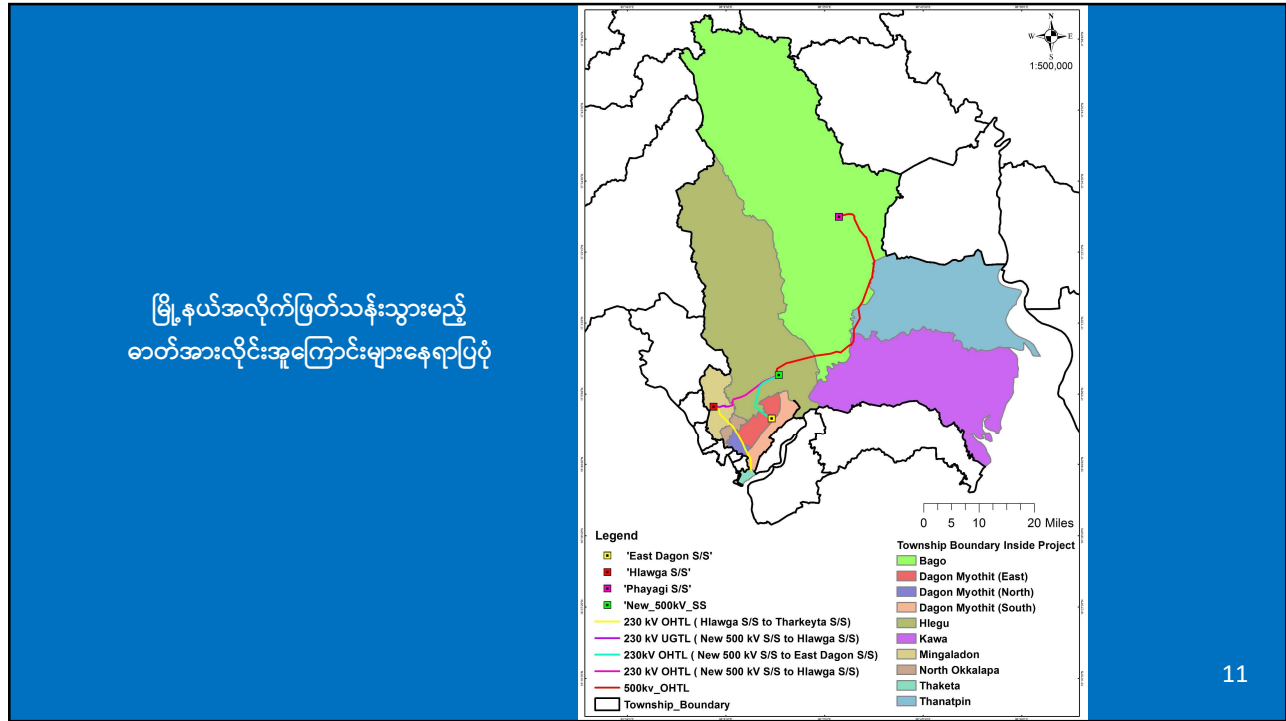
- (၁) လှည်းကူးဓာတ်အားခွဲရုံသစ်မှ လက်ရှိအရှေ့ဒဂုံ ဓာတ်အားခွဲရုံသို့ ဖြတ်သန်းသွားမည့်မြို့နယ်များ → လှည်းကူးမြို့နယ် နှင့်ဒဂုံမြို့သစ်(အရှေ့ပိုင်း)
- (၂) လှည်းကူးဓာတ်အားခွဲရုံသစ်မှ လက်ရှိလှော်ကားဓာတ်အားခွဲရုံသို့ ဖြတ်သန်းသွားမည့်မြို့နယ်များ → လှည်းကူးမြို့နယ် နှင့် မင်္ဂလာဒုံမြို့နယ်
- ဖြတ်သန်းသွားမည့် လမ်းမများ → အမှတ် (၇) လမ်းမကြီး၊ ပုလဲမြို့သစ်လမ်း၊ ပေါက်ငှုလမ်း၊ အမှတ် (၃) လမ်းမကြီးနှင့် ရန်ကုန်-မန္တလေးအမြန်လမ်း

❖ လက်ရှိ ၂၃၀kV ဓာတ်အားလိုင်း အဆင့်မြှင့်တင်ခြင်း

- (၃) လှော်ကားဓာတ်အားခွဲရုံမှ လက်ရှိ သာကေတ ဓာတ်အားခွဲရုံသို့ (လက်ရှိဓာတ်အားလိုင်းလမ်းကြောင်းအတိုင်းတည်ဆောက်ခြင်း) ဖြတ်သန်းသွားမည့်မြို့နယ်များ → မင်္ဂလာဒုံ၊ မြောက်ဥက္ကလာ၊ ဒဂုံမြို့သစ် (အရှေ့၊ မြောက်၊ တောင်)၊ သာကေတ



၂၃၀kV ဓာတ်အားလိုင်းအကြောင်းများပြပုံ 10



11

### စီမံကိန်းအကြောင်းအရာ

❖ ၅၀၀kV လှည်းကူး ဓာတ်အားခွဲရုံသစ်၏ဒီဇိုင်းလျာထားချက်

တပ်ဆင်မည့်ကိရိယာများ

- 500kV switchgear (H-GIS) → 6 bays for power lines, 3 bays for transformer, spare 1 bay
- Transformers → 500/230/33 kV 2 units (single-phase transformer x 7 units (including spares))
- Complete 230 kV switchgear → 8 bays for transmission lines (including spares), 3bays for transformer
- Control and Protection Device → Transmission line protection device 1 set, Transformer protection device 1 set, Busbar protection device 1 set, SCADA 1 set
- On site power supply → AC panel 1 set, DC panel 1 set, DC battery charger 1 set, Battery 1 set, Emergency power generation 1 set, Communication 1 set

12

12

### စီမံကိန်းအကြောင်းအရာ

#### ❖ လက်ရှိ အရှေ့ဒဂုံ 230kV ဓာတ်အားခွဲရုံ၏ တိုးချဲ့ဒီဇိုင်းလျာထားချက်

- ❖ တည်နေရာ - အရှေ့ဒဂုံမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီး
- ❖ ဘေးပတ်ဝန်းကျင် မြေအသုံးချမှု - လယ်ယာစိုက်ပျိုးမြေများ၊ ငါးဖမ်းလုပ်ငန်း နှင့် အခြားသောဖွံ့ဖြိုးရေးအစီအစဉ်များ
- ❖ လက်ရှိတပ်ဆင်ထားသော ပစ္စည်းများ (၂၀၁၆) - 230kV gas insulated switchgear (Hyundai), 230/66/11 kV main transformer (Hyundai) x 2, 11 kV switchgear, On site Power Supply



အရှေ့ဒဂုံ 230kV ဓာတ်အားခွဲရုံ

### စီမံကိန်းအကြောင်းအရာ

#### ❖ လက်ရှိ အရှေ့ဒဂုံ 230kV ဓာတ်အားခွဲရုံတွင် တိုးချဲ့ဒီဇိုင်းလျာထားချက်

လက်ရှိ GIS bay အား

တိုးချဲ့တပ်ဆင်သွားမည့်ပစ္စည်းများ

- Complete 230 kV switchgear (GIS) → 2 bays for power lines
- Control and protection device → 230kV transmission line protection device 2 panel , SCADA (expansion)1 set



အရှေ့ဒဂုံ 230kV ဓာတ်အားခွဲရုံတွင် တိုးချဲ့တပ်ဆင်သွားမည့်နေရာပြပုံ



### စီမံကိန်းအကြောင်းအရာ

❖ လက်ရှိ ၂၃၀kV လှော်ကားဓာတ်အားခွဲရုံ၏ အဆင့်မြှင့်တင်မှု ဒီဇိုင်းလျာထားချက်

- ❖ တည်နေရာ - မြောက်လတ္တီကျုဒ် ၁၆° ၅၈: ၅၄ နှင့် အရှေ့လောင်တီကျုဒ် ၉၆° ၇: ၃၅၊ မင်္ဂလာဒုံမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီး
- ❖ လက်ရှိတပ်ဆင်ထားသော ပစ္စည်းများ - 230 kV air-insulated switchgear, 230/66/11 kV main transformer, 230/33/11 kV main transformer x 3, 66 kV switchgear, 33 kV switchgear, 11 kV switchgear, On-site power supply,

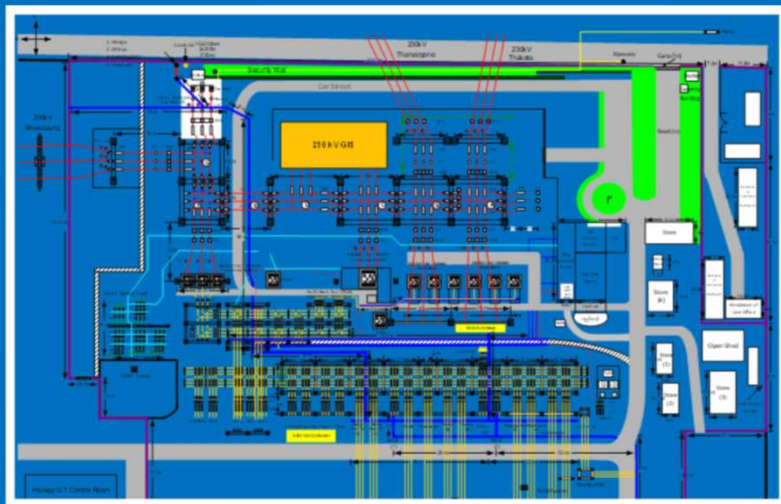


လှော်ကားဓာတ်အားခွဲရုံ

### စီမံကိန်းအကြောင်းအရာ

❖ လက်ရှိ လှော်ကား 230kV ဓာတ်အားခွဲရုံတွင် အဆင့်မြှင့်တင်မှု ဒီဇိုင်းလျာထားချက် တိုးချဲ့တပ်ဆင်သွားမည့်ပစ္စည်းများ:

- ❖ Complete 230 kV switchgear (GIS)
  - 3 bays for power transmission lines (including spares)
  - 2 bays for bus connection
- ❖ Control and protection device
  - Transmission line protection device 2 panel
  - Busbar protection device 1 set
  - SCADA (expansion) 1 set



လှော်ကား 230kV ဓာတ်အားခွဲရုံတွင် အဆင့်မြှင့်တင်သွားမည့်နေရာပြပုံ





17

**စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ**

❖ ပဲခူးမြို့နယ်တွင်ဓာတ်အားလိုင်းဖြတ်သန်းမည့် ကျေးရွာများ (လျာထား)

- ၁) အောက်စီဒီး(အရှေ့)
- ၂) ဘုရားငုတ်တို
- ၃) ကမာနတ်
- ၄) ကော့ချဲ
- ၅) ခုန်တိုင်း
- ၆) ကင်းပိုင်ခြံ
- ၇) ကျောက်တန်း
- ၈) မယင်း
- ၉) အိုးဘို
- ၁၀) ရှမ်းရွာကြီး
- ၁၁) ရွှေတန်
- ၁၂) တတ်ခလေး
- ၁၃) ဝင်္ဂဘော်၊
- ၁၄) ဈေးညောင်ပင်

ပဲခူးမြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

**Legend**

- Village Tract Boundary
- Auk Si Dee (East)
- Hpa Yar Ngoke To
- Ka Mar Nat
- Kawt Che
- Khon Taing
- Kin Paing Chon
- Kyauk Tan
- Ma Yin
- Oe Bo
- Shan Ywar Gyi
- Shwe Tan
- Tat Ka Lay
- Win Ga Baw
- Zay Nyaung Pin
- Bago\_Township\_Boundary
- Bago\_Township\_Village\_Tract\_Boundaries
- 500kv\_OHTL
- 'Phayagi S/S'

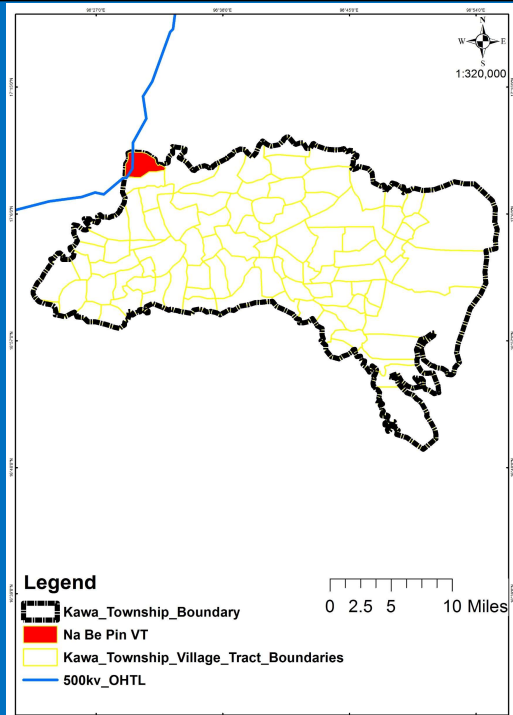
18

### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

❖ ကဝမြို့နယ်တွင်ဓာတ်အားလိုင်းဖြတ်သန်းမည့် ကျေးရွာများ (လျာထား)

၁) နဘဲပင်ကျေးရွာအုပ်စု

ကဝမြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

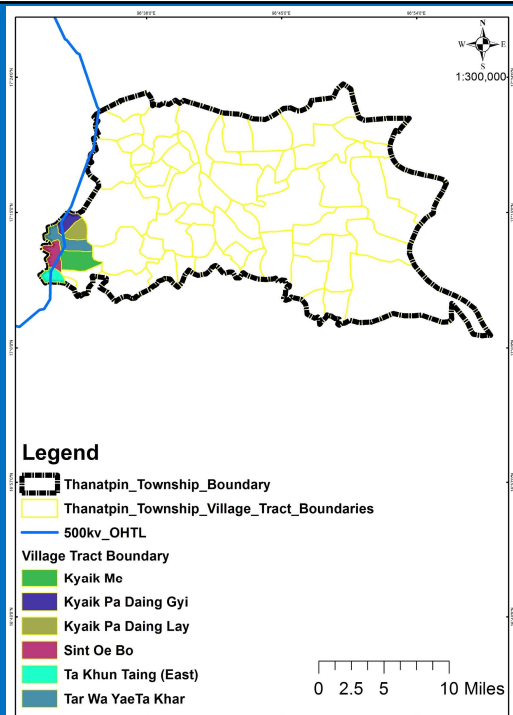


### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

❖ သနပ်ပင်မြို့နယ်တွင် ၅၀၀kV ဓာတ်အားလိုင်းဖြတ်သန်းမည့် ကျေးရွာများ (လျာထား)

- ၁) ကျိုက်မဲ
- ၂) ကျိုက်ပဒိုင်ကြီး
- ၃) ကျိုက်ပဒိုင်လေး
- ၄) စဉ့်အိုးဘို
- ၅) တံခွန်တိုင် (ရှေ့)
- ၆) တာဝရေတံခါး

သနပ်ပင်မြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ





21

**စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ**

❖ လှည်းကူးမြို့နယ်တွင် ၅၀၀kV နှင့် ၂၃၀kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့် ကျေးရွာများ (လျာထား)

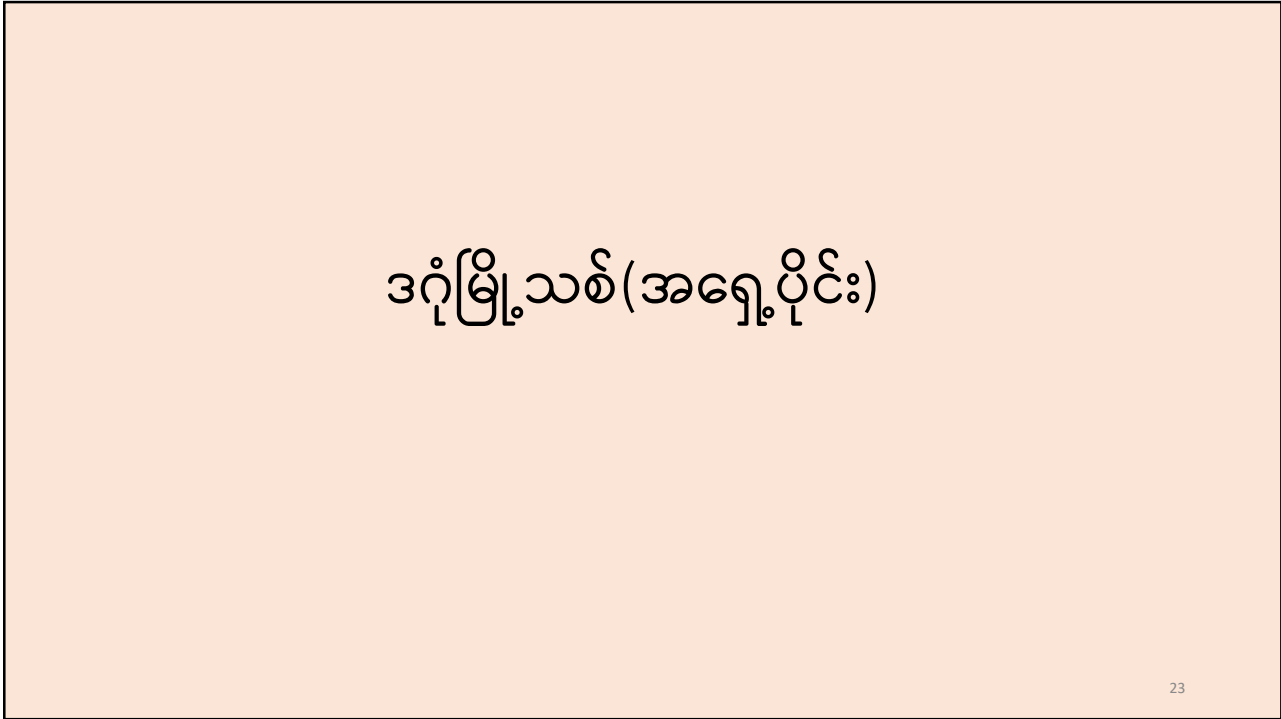
- ၁) အလံဂပို
- ၂) အဝိုင်း (အနောက်)
- ၃) ဘားလားတံတားကြီး
- ၄) ဘိုးရင်ကလေး
- ၅) အင်းတိုင်
- ၆) ကျွန်းကုန်း
- ၇) မလစ် (အနောက်)
- ၈) နိုင်ဒီကုန်း
- ၉) ဆားတလင်း
- ၁၀) ရှမ်းတဲကြီး (အထက်)
- ၁၁) စစ်ပင် (မြောက်)
- ၁၂) စွယ်လပ်
- ၁၃) သနပ်ပြင်

**Legend**

- Village Tract Boundary
- Ah Lan Ga Po
- Ah Waing (West)
- Bar Lar Ta Dar Gyi
- Boe Yin Ka Lay
- Inn Taing
- Kyun Kone
- Ma Lit (West)
- Saing Di Kone
- Sar Ta Lin
- Shan Te Gyi (Upper)
- Sit Pin (North)
- Swei Lat
- Tha Nat Pyin
- Hlegu\_Township\_Boundary
- Hlegu\_Township\_Village\_Tract\_Boundaries
- 500kv\_OHTL
- 230 kV OHTL ( New 500 kV S/S to Hlawga S/S)
- 230kV OHTL ( New 500 kV S/S to East Dagon S/S)
- \*New\_500kV\_SS

0 4 8 16 Miles

22



23

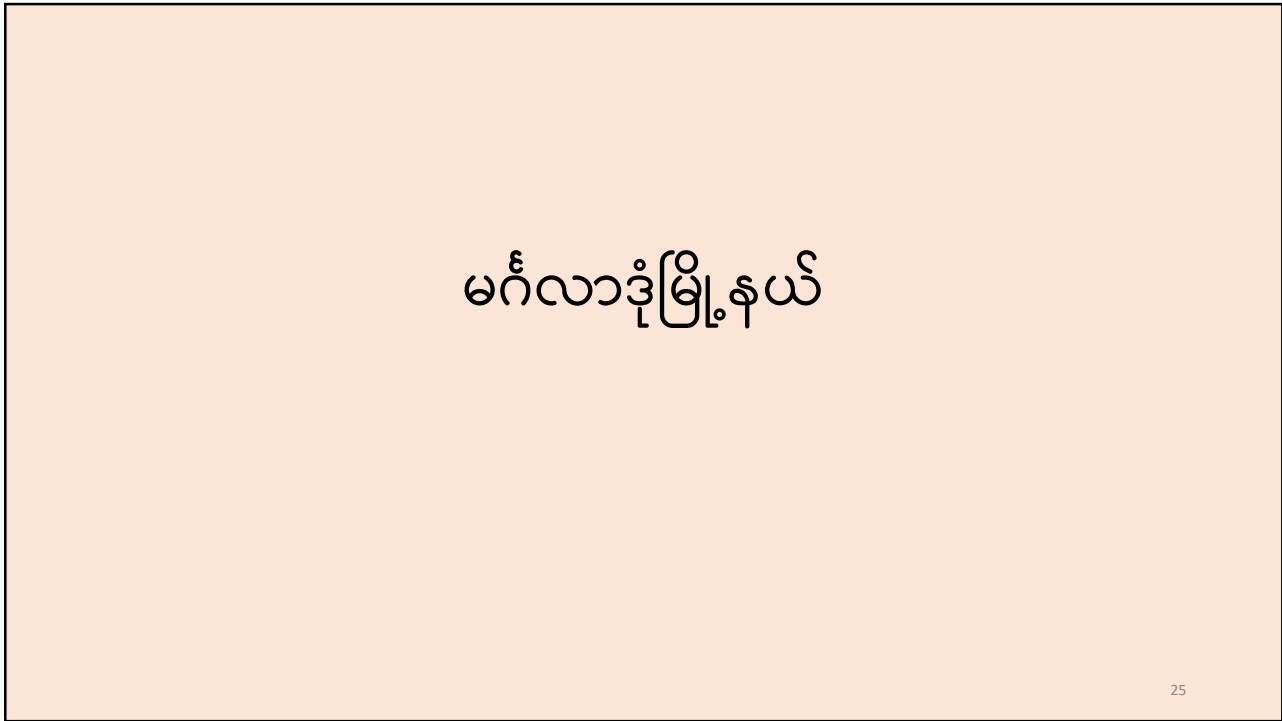
**စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ**

- ❖ ဒဂုံမြို့သစ်(အရှေ့ပိုင်း)တွင် ၂၃၀kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့်ရပ်ကွက်များ (လျာထား)

- ၁) အမှတ်-၁ ရပ်ကွက်၊
- ၂) အမှတ်-၄ ရပ်ကွက်၊
- ၃) အမှတ်-၅ ရပ်ကွက်၊
- ၄) အမှတ်-၉ ရပ်ကွက်၊
- ၅) အမှတ် -၁၀ ရပ်ကွက်၊
- ၆) အမှတ် -၅၂ ရပ်ကွက်၊
- ၇) တောင်တလုပ်ရပ်ကွက်
- ၈) သုံးခွ (အရှေ့ပိုင်း) ရပ်ကွက်၊

ဒဂုံမြို့သစ်(အရှေ့ပိုင်း)မြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

24



25

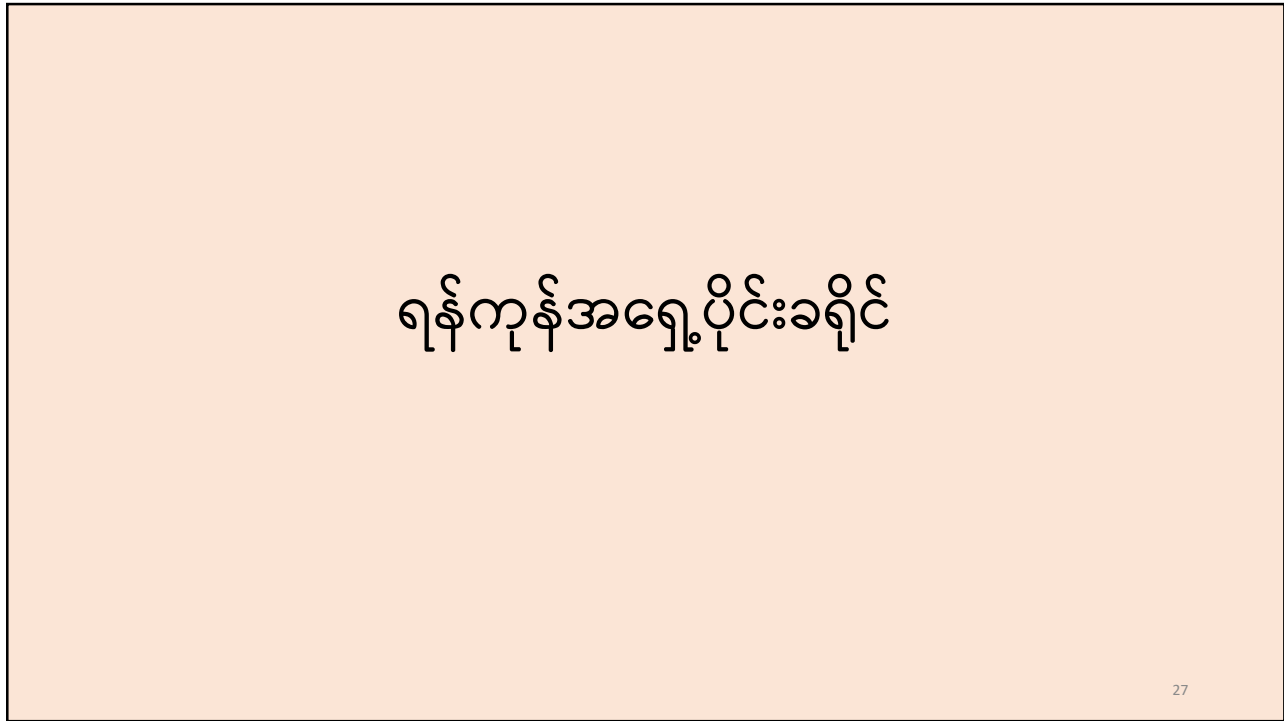
### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

- ❖ မင်္ဂလာဒုံမြို့နယ်တွင် ၂၃၀kV ဓာတ်အားလိုင်းဖြတ်သန်းမည့်ရပ်ကွက်များ (လျာထား)

- ၁) ချစ်တီးကုန်းရပ်ကွက်
- ၂) ပြန်လည်နေရာချထားရေးရပ်ကွက်
- ၃) ရွှေနံသာကျေးရွာအုပ်စု
- ၄) ပျဉ်းမပင်ကျေးရွာအုပ်စု
- ၅) သင်္ဃန်းကျွန်းကြီး ကျေးရွာအုပ်စု

မင်္ဂလာဒုံမြို့နယ်တွင် ဖြတ်သန်းမည့်  
ဓာတ်အားလိုင်းအကြောင်းပြပုံ

26



27

**စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ**

- ❖ ဒဂုံမြို့သစ်(တောင်ပိုင်း)မြို့နယ်တွင် ၂၃၀ kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့် ရပ်ကွက်များ (လျာထား)

၁) အမှတ် - ၂၂ ရပ်ကွက်  
 ၂) အမှတ် - ၂၃ ရပ်ကွက်  
 ၃) အမှတ် - ၂၆ရပ်ကွက်

ဒဂုံမြို့သစ်(တောင်ပိုင်း)မြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

1:100,000

**Legend**

- Dagon Myothit (South)\_Township\_Boundary
- Dagon\_Myothit\_South\_ward\_boundary
- 230 kV OHTL ( Hlawga S/S to Tharkeyta S/S)

**Ward**

- No (22) Ward
- No (23) Ward
- No (26) Ward

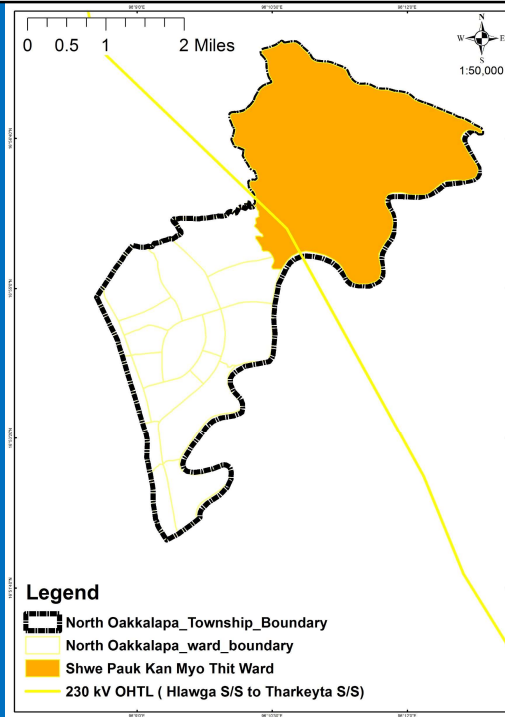
28

### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

❖ မြောက်ဥက္ကလာပမြို့နယ်တွင် ၂၃၀kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့်ရပ်ကွက်များ (လျာထား)

၁) ရွှေပေါက်ကံမြို့သစ်ရပ်ကွက်

မြောက်ဥက္ကလာပမြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

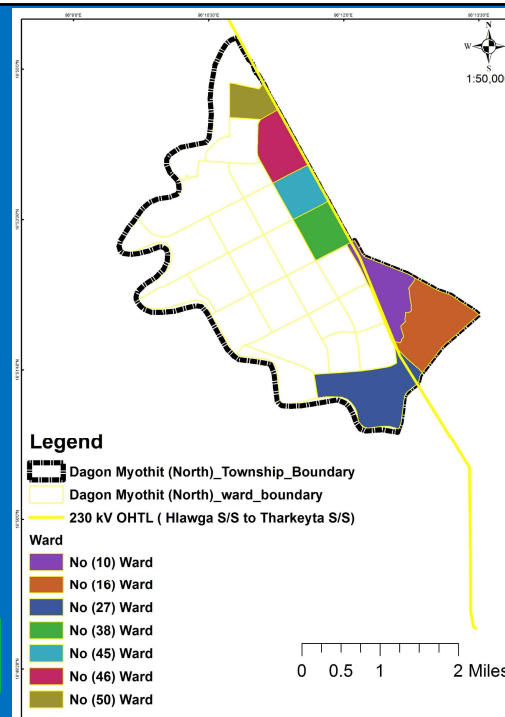


### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

❖ ဒဂုံမြို့သစ်(မြောက်ပိုင်း)မြို့နယ်တွင် ၂၃၀kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့်ရပ်ကွက်များ (လျာထား)

- ၁) အမှတ်-၁၆ ရပ်ကွက်
- ၂) အမှတ်-၁၀ ရပ်ကွက်
- ၃) အမှတ်-၂၇ ရပ်ကွက်
- ၄) အမှတ်-၃၈ ရပ်ကွက်
- ၅) အမှတ်-၄၅ ရပ်ကွက်
- ၆) အမှတ်-၄၆ ရပ်ကွက်
- ၇) အမှတ်-၅၀ ရပ်ကွက်

ဒဂုံမြို့သစ်(မြောက်ပိုင်း)မြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ

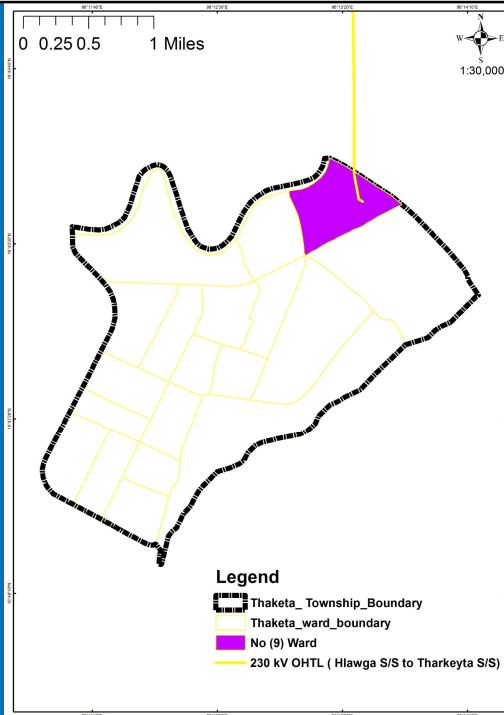


### စီမံကိန်းနှင့်သက်ဆိုင်သောဒေသများ

❖ သာကောတမြို့နယ်တွင် ၂၃၀kV ဓာတ်အားလိုင်း ဖြတ်သန်းမည့်ရပ်ကွက် (လျာထား)

၁) အမှတ်-၉ ရပ်ကွက်၊

သာကောတမြို့နယ်တွင် ဖြတ်သန်းမည့် ဓာတ်အားလိုင်းအကြောင်းပြပုံ



31

31

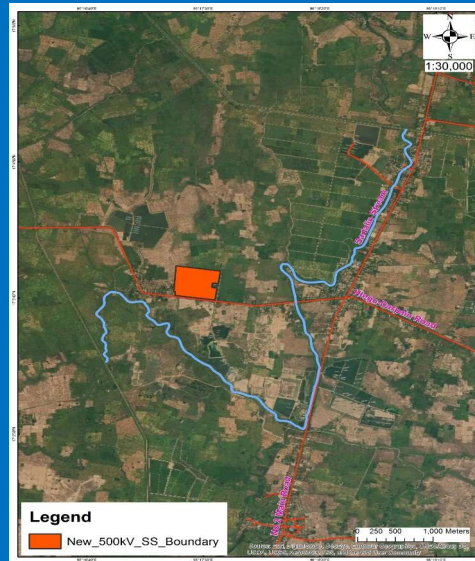
### ၄။ ၅၀၀ ကေဗီ ဓာတ်အားခွဲရုံတည်ဆောက်ရန် လျာထားသောနေရာ

တည်နေရာ - ဆားတလင်းရွာ၊ လှည်းကူးမြို့နယ်  
 အကျယ်အဝန်း - ၂၅ - ၃၂ ဟတ်တာခန့်

ဘေးပတ်ဝန်းကျင်အကြောင်းအရာ

အနီးဆုံးလမ်း - လှည်းကူး-ဒါးပိန်လမ်း၊ အမှတ်(၂)လမ်းမကြီး  
 အနီးဆုံးချောင်း - ဆားတလင်းချောင်း  
 လက်ရှိမြေအသုံးချမှု - လယ်ယာမြေ

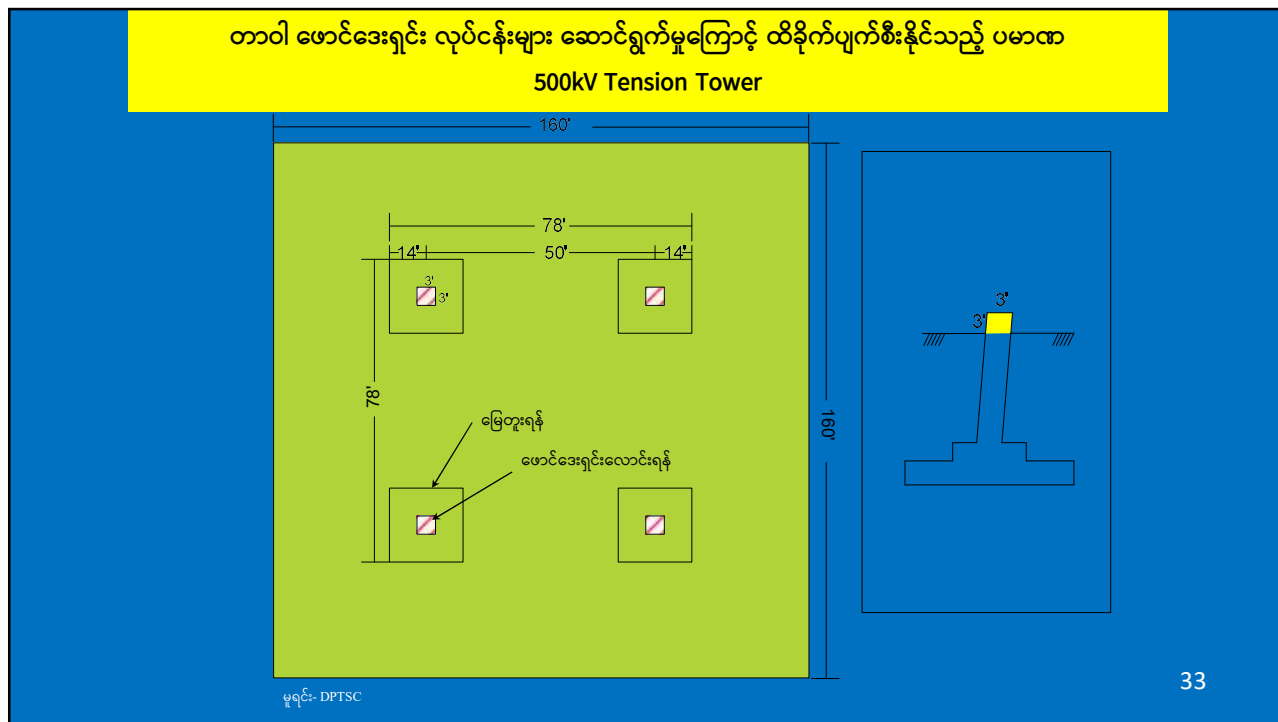
❖ လျာထားသောမြေနေရာ ဝယ်ယူရန်အတွက် ရန်ကုန်တိုင်းဒေသကြီး အစိုးရအဖွဲ့ နှင့် လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေး ဦးစီးဌာနတို့ ပူးပေါင်းညှိနှိုင်းဆောင်ရွက်သွားမည် ဖြစ်သည်။



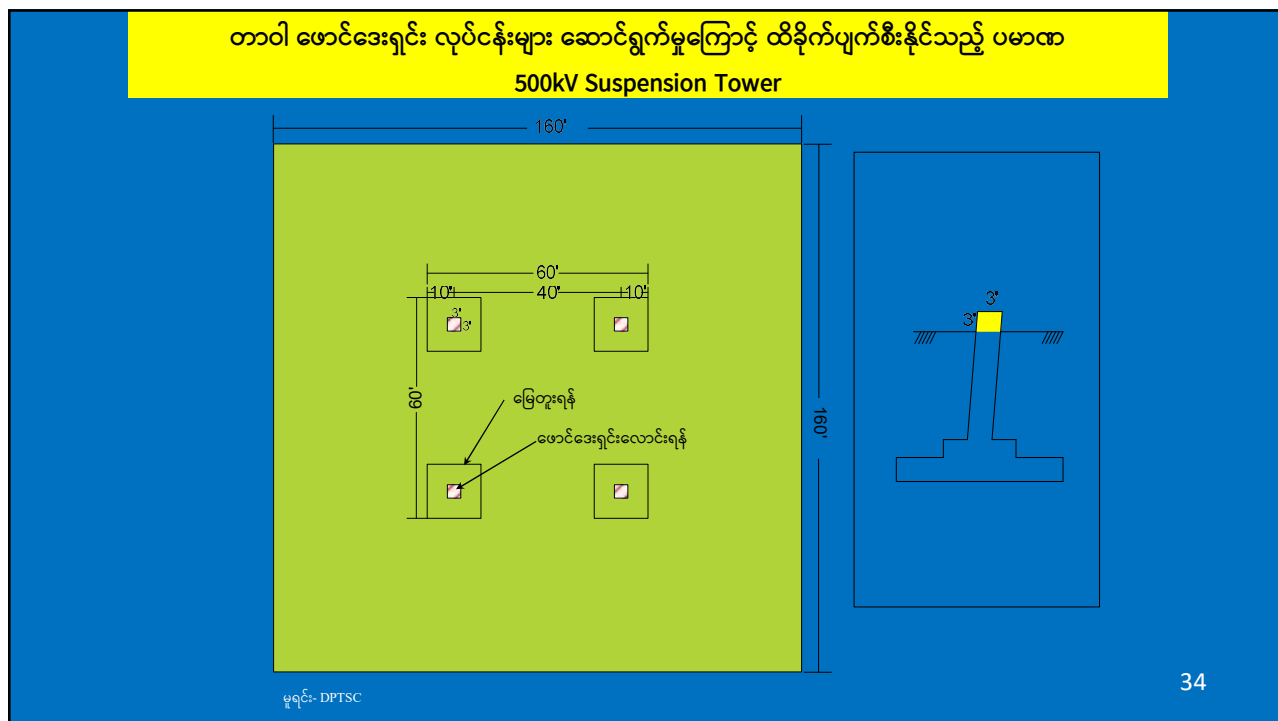
လှည်းကူးမြို့နယ်ရှိ ဓာတ်အားခွဲရုံသစ် လျာထားတည်နေရာပြပုံ 32  
မူရင်း- JICA လေ့လာရေးအဖွဲ့

32

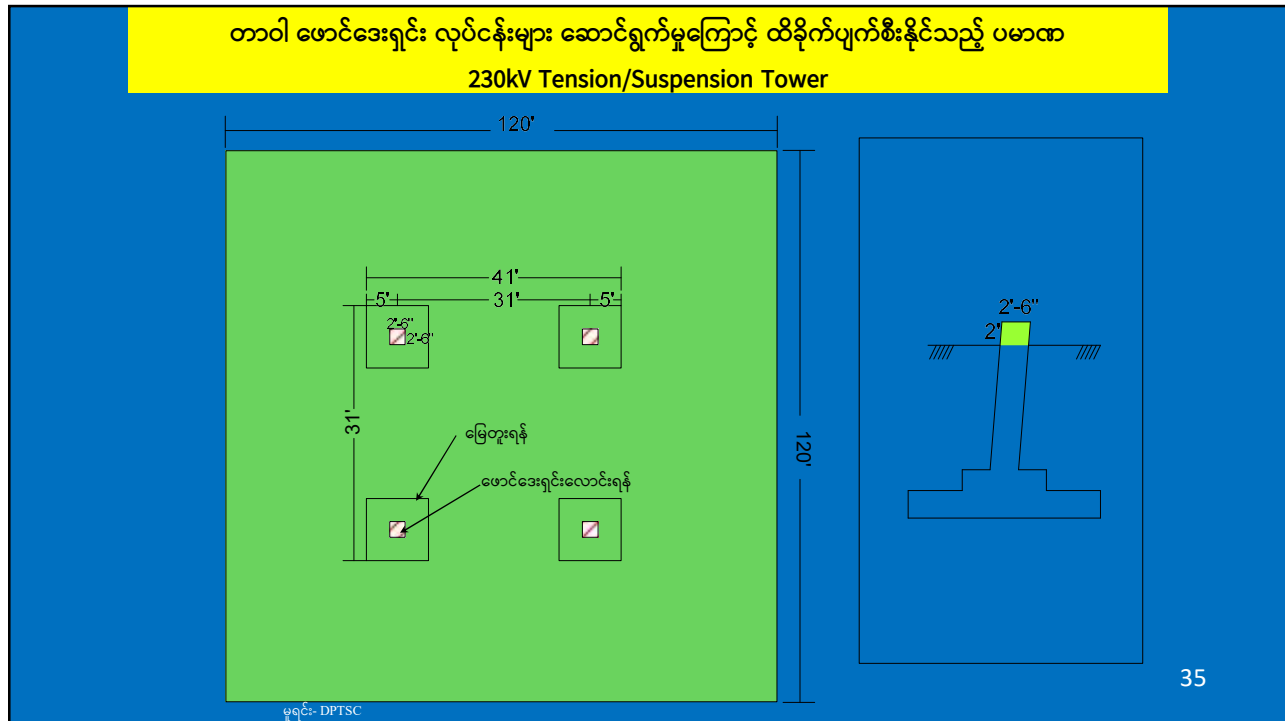




33



34



35



36

**နမူနာ ဓာတ်ပုံများ (မြေပြန်ဖို့ခြင်း)**

မူရင်း- DPTSC

37

37

**ဓာတ်အားလှိုင်းအောက်တွင်ကောက်ပဲသီးနှံများအပြည့်အဝပြန်လည်စိုက်ပျိုးနိုင်ပါသည်**

မူရင်း- DPTSC

38

38

ဓာတ်အားလိုင်းအောက်တွင်ကောက်ပဲသီးနှံများအပြည့်အဝပြန်လည်စိုက်ပျိုးနိုင်ပါသည်



မူရင်း- DPTSC

၅။ လက်ရှိသဘာဝပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာအချက်အလက်များ အကျဉ်းချုပ်

အပူချိန် နှင့် မိုးရေချိန်

ဧပြီလ အမြင့်ဆုံးအပူချိန်မှာ ၃၀.၇ ဒီဂရီ စင်တီဂရိတ် နှင့် အနိမ့်ဆုံးအပူချိန်မှာ ၂၄.၄ ဒီဂရီ စင်တီဂရိတ်ဖြစ်သည်။ နှစ်စဉ်မိုးရေချိန်မှာ ၂၄၁ - ၂၇၈ မီလီမီတာဖြစ်သည်။

ဇလဗေဒအခြေအနေများ

စီမံကိန်းဧရိယာအနီးတစ်ဝိုက်တွင် ပဲခူးမြစ် နှင့် ပုဇွန်တောင်ချောင်း (ငမိုးရိပ်ချောင်းအထက်ပိုင်း) ပါသည်။

အပင်များ နှင့်တိရစ္ဆာန်များ

စီမံကိန်းဧရိယာအနီးတစ်ဝိုက်တွင် လှော်ကား ဥယျာဉ်၊ မိုးယွန်းကြီး အပန်းဖြေစခန်း၊ အင်းတကော် ထိန်းသိမ်းသစ်တော တို့ရှိသည်။

အရေးပေါ်ဘေးအန္တရာယ်များ

ရေကြီးခြင်း၊ ဆိုင်ကလုန်းမုန်တိုင်းနှင့် ငလျင်တို့ ဖြစ်ပေါ်ခဲ့သော မှတ်တမ်းများ ရှိပါသည်။

လူဦးရေ

၂၀၁၈ခုနှစ် အောက်တိုဘာလ၊ မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးရုံး၏ မှတ်တမ်းအရ -

ဒဂုံမြို့သစ် အရှေ့ပိုင်းရှိ လူဦးရေမှာ ၁၅၇,၇၈၅ ၊ ဒဂုံမြို့သစ်တောင်ပိုင်းရှိ လူဦးရေမှာ ၁၅၅,၆၁၁

ဒဂုံမြို့သစ် မြောက်ပိုင်းရှိ လူဦးရေမှာ ၉၂,၇၇၄ ၊ လှည်းကူးမြို့နယ်ရှိ လူဦးရေမှာ ၂၃၄,၂၂၉

မင်္ဂလာဒုံ မြို့နယ်ရှိ လူဦးရေမှာ ၂၅၇,၂၅၀၊ ပဲခူးမြို့နယ်ရှိ လူဦးရေမှာ ၄၃၆,၀၂၂

မြောက်ဥက္ကလာမြို့နယ်ရှိ လူဦးရေမှာ ၁၃၅,၉၁၃ နှင့် သာကေတမြို့နယ်ရှိ လူဦးရေမှာ ၁၁၄,၂၀၂ တို့ဖြစ်သည်။

### ၆။ ကွင်းဆင်းလေ့လာမှုများ

#### ပတ်ဝန်းကျင်ဆိုင်ရာလက်ရှိအခြေအနေ

##### လေထုအရည်အသွေး

- လေအရည်အသွေးတိုင်းတာမှု - (၂၄) နာရီဆက်တိုက် (ခြောက်သွေ့ရာသီ)
- တိုင်းတာမှု အမျိုးအစား - SO<sub>2</sub>, NO<sub>2</sub>, Ozone, PM<sub>2.5</sub> နှင့် PM<sub>10</sub>
- တွေ့ရှိချက် - NEQG လမ်းညွှန်ချက်နှင့်နှိုင်းယှဉ်ရာတွင် SO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> နှင့် ozone ရလဒ်တန်ဖိုးသည် NEQG တန်ဖိုးထက်များ၊ NO<sub>2</sub> ပါဝင်မှုရလဒ်သည် NEQG လမ်းညွှန်ချက် အောက်လျော့နည်း

ဖြစ်နိုင်ချေရှိသောထုတ်လွှတ်မှုအရင်းအမြစ်များ - လှည်းကူး-ဒါးပိန်လမ်းပေါ်ရှိ ယာဉ်များသွားလာခြင်း နှင့် အနီးနားရှိအုတ်ဖုတ်လုပ်ငန်း

##### ရေထုအရည်အသွေး

- ရေနမူနာကောက်ယူသောနေရာ - ဆားတလင်းချောင်း
- တိုင်းတာမှု အမျိုးအစား - NEQG လမ်းညွှန်ချက် (လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းနှင့် ဖြန့်ချိရေး)
- တွေ့ရှိချက် - total coliform များခြင်း၊ သံဓာတ်မြင့်တက်ခြင်း
- ဖြစ်နိုင်ချေရှိသောအရင်းအမြစ်များ - သဘာဝအလျောက်တည်ရှိနေသော ဘတ်တီးရီးယားများ နှင့် သံဓာတ်ကြွယ်ဝသော မြေဆီလွှာ

### ၆။ ကွင်းဆင်းလေ့လာမှုများ

#### မြေဆီလွှာအရည်အသွေး

- မြေနမူနာကောက်ယူသောနေရာ - ဆားတလင်းကျေးရွာအနီး
- တိုင်းတာမှု အမျိုးအစား - မြေဆီလွှာကို ညစ်ညမ်းစေသော သတ္တုများ
- တွေ့ရှိချက် - ဗီယက်နမ် နှင့် ထိုင်းနိုင်ငံရှိ သတ်မှတ်ထားသော စံနှုန်းများအရ စီမံကိန်းပတ်ဝန်းကျင်ရှိ မြေဆီလွှာအရည်အသွေးမှာ ကောင်းမွန် ပါသည်

#### ဆူညံသံနှင့် တုန်ခါမှုအဆင့်များ

- တိုင်းတာသောနေရာ - ဆားတလင်းကျေးရွာအနီး
- တိုင်းတာမှု အမျိုးအစား - ဆူညံသံနှင့်တုန်ခါမှု
- တိုင်းတာချိန် - (၂၄) နာရီဆက်တိုက် (ခြောက်သွေ့ရာသီ)
- တွေ့ရှိချက် - နေ့ချိန်တိုင်းတာမှု ရလဒ်များသည် NEQG လမ်းညွှန် တန်ဖိုးအောက် လျော့နည်း
- ဖြစ်နိုင်ချေရှိသောအရင်းအမြစ်များ - ညချိန်တိုင်းတာမှု ရလဒ်များသည် လမ်းညွှန်ချက်ရှိ တန်ဖိုးထက် မြင့်မား
- ညအချိန် ယာဉ်များ သွားလာမှု



### ၆။ ကွင်းဆင်းလေ့လာမှုမှတ်တမ်းများ



လေထုအရည်အသွေးတိုင်းတာခြင်း



ဆားတလင်းချောင်းတွင် ရေနမူနာကောက်ယူခြင်း



မြေဆီလွှာအရည်အသွေးတိုင်းတာခြင်း



အသံနှင့်တုန်ခါမှုအရည်အသွေးတိုင်းတာခြင်း

သက်ရောက်နိုင်ခြေဆန်းစစ်မှုနှင့် အဆိုပြုလျော့ပါးစေရေးနည်းလမ်းများ၊  
ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များ

(Impact Assessment)  
သက်ရောက်နိုင်ခြေဆန်းစစ်မှု

- ◆ ညစ်ညမ်းမှု
  - ◆ သဘာဝပတ်ဝန်းကျင်
  - ◆ လူမှုပတ်ဝန်းကျင်
  - ◆ ကျန်းမာရေးနှင့်လုံခြုံရေး
  - ◆ အရေးပေါ်ဘေးအန္တရာယ်
  - ◆ အခြား
- ↓
- ☐ မတည်ဆောက်မီကာလ (PC)
  - ☐ ဆောက်လုပ်ရေးကာလ (CO)
  - ☐ လုပ်ငန်းလည်ပတ်ကာလ (OP)
  - ☐ ပိတ်သိမ်းကာလ (CLP)

ပတ်ဝန်းကျင်လျော့ပါးစေရေးနှင့် စီမံခန့်ခွဲမှုအစီအစဉ်များ  
(Mitigation Measures and EM Plan)

- ဖြစ်နိုင်ချေရှိသောဆိုးကျိုးသက်ရောက်မှုများကိုလျော့ပါးစေရန်

၆။ သဘာဝပတ်ဝန်းကျင်၊ လူမှုရေးနှင့်ကျန်းမာရေးနှင့် အရေးပေါ်အန္တရာယ် သက်ရောက်မှုများ အကဲဖြတ်ခြင်းအကျဉ်းချုပ်

အမျိုးအစား	သက်ရောက်မှုများ	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	အဆင့်သတ်မှတ်ချက်	
			CS/CLS	OS
၁။	ညစ်ညမ်းမှု	လေထု ညစ်ညမ်းမှု	B- => D	C- => D
		ရေထု ညစ်ညမ်းမှု	C- => D	B- => D
		အသံနှင့်တုန်ခါမှု	B- => C-	B- => C-
		အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း	C- => D	B- => C-
		မြေဆီလွှာ ညစ်ညမ်းမှု	B- => D	A- => C-
၂။	သဘာဝပတ်ဝန်းကျင်	တိရစ္ဆာန်၊ ဂေဟဗေဒစနစ်၊ ဇီဝမျိုးစုံမျိုးကွဲ၊ ထိန်းသိမ်းစောင့်ရှောက်ရေးနယ်မြေ	C-	D
၃။	လူမှုပတ်ဝန်းကျင်	ပြန်လည်နေရာချထားရေးနှင့် မြေယာရယူခြင်း	A- => B-	A- => B-
		ဒေသခံစီးပွားရေးနှင့် အသက်မွေးဝမ်းကြောင်း	A+/A-	A+/A-
		တည်ရှိပြီးဖြစ်သော လူမှုရေးဆိုင်ရာအဆောက်အအုံများနှင့် ဆောင်ရွက်မှုများ	A+/A-	A+/A-
၄။	ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	လူမှုရေး အဖွဲ့အစည်းများ	A- => B-	D
		လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး	C- => D	B- => C-
၅။	အရေးပေါ်ဘေးအန္တရာယ်	ရေဘေးအန္တရာယ်	C-	B- => C-
		ငလျင်လှုပ်ခြင်း	B- => C-	B- => C-

ဆိုးကျိုးအဆင့်	ကောင်းကျိုးအဆင့်
အများအားဖြင့် လက်ခံနိုင်သည့်သက်ရောက်မှု	အများအားဖြင့် လက်ခံနိုင်သည့်သက်ရောက်မှု
D	D
အသင့်အတင့်	အသင့်အတင့်
C-	C+
သိသာသော	သိသာသော
B-	B+
အလွန်သိသာသော	အလွန်သိသာသော
A-	A+

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့် အဖွဲ့အစည်း
ညစ်ညမ်းမှု	လေထု ညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>တည်ဆောက်ရေးလုပ်ငန်းစဉ်အတွင်း ဖုန်မှုန့်ထုတ်လွှတ်မှု များကို လျော့ပါးစေခြင်း နှင့် ထိန်းချုပ်ခြင်းများ ဆောင်ရွက်ရာတွင် ဆောက်လုပ်ရေးလုပ်ငန်း တစ်ခု လုံးကို ရေဖြန်းပေးခြင်း။</li> <li>ဆောက်လုပ်ရေးလုပ်ငန်း ပတ်ဝန်းကျင်တစ်ခုလုံး တွင် လုံလောက်သောအမြင့်ရှိ ဖုန်ပိုက်ကွန်များ ကန်ထရိုက်တာ တပ်ဆင်ခြင်း။</li> <li>ဖုန်ထွက်စေသော ဆောက်လုပ်ရေးပစ္စည်းများကို ဖုံးအုပ် ထားခြင်း။</li> </ul>	ကန်ထရိုက်တာ
	ရေထုညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>ယာယီမိလ္လာကန်များမှ မိလ္လာများအားလုံးကို မြို့နယ်စည်ပင်သာယာရေးကော်မတီအား အကြောင်းကြား၍ စွန့်ပစ်စေခြင်း။</li> <li>ရေအိုင်ခြင်း၊ လျှံထွက်ခြင်းနှင့် ပိတ်ဆို့ခြင်းတို့ မရှိစေရန် အတွက် လုပ်ငန်းခွင်အတွင်း ရေနုတ်မြောင်းစနစ် (ယာယီဖွင့်လှစ်ထားသောမြေဆီလွှာကျင်း) များထားရှိခြင်း။</li> </ul>	
	အသံနှင့်တုန်ခါမှု	<ul style="list-style-type: none"> <li>ဆောက်လုပ်ရေးလုပ်ငန်းဇယားနှင့် ပတ်သက်၍ ဒေသခံ ပြည်သူ များကို ကြိုတင်အသိပေးခြင်း။</li> <li>ဆောက်လုပ်ရေး၊ ပစ္စည်းကိရိယာများ ဥပမာ- မြေတူးစက်များ ကဲ့သို့ စက်ယန္တရားများ၏ လည်ပတ်မှုအချိန်ကို ကန့်သတ်ထားပြီး မလုံအပ်ဘဲ လည်ပတ်ခြင်းများ ရှောင်ကျဉ်ခြင်း။</li> <li>ပစ္စည်းများကိုအမြင့်မှ လွှတ်ချသောအခါ ဂရုစိုက်ခြင်း။</li> <li>ညအချိန်တွင် ဆောက်လုပ်ရေးလုပ်ငန်းကို ရပ်နားခြင်း။</li> </ul>	ကန်ထရိုက်တာ

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
ညစ်ညမ်းမှု	အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း	<ul style="list-style-type: none"> <li>စွန့်ပစ်ပစ္စည်းများကို လက်ခံရရှိခြင်း၊ သိုလှောင်ခြင်းနှင့် နောက်ဆုံးစွန့်ပစ်ခြင်းတို့ ပါဝင်သော လုပ်ငန်းစဉ်ကိုပြင်ဆင်ခြင်း။</li> <li>စွန့်ပစ်ပစ္စည်းများကို နေ့စဉ်ကောက်ယူခြင်း။</li> </ul>	ကန်ထရိုက်တာ
	မြေဆီလွှာ ညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>မိုးရေကြီးခြင်းနှင့် ရေလွှမ်းမိုးမှုများ ဖြစ်ပွားချိန်တွင် ညစ်ညမ်းမှုကိုရှောင်ရှားရန် ဆောက်လုပ်ရေးပစ္စည်းများ၊ အန္တရာယ်ရှိသော (သို့) အန္တရာယ်မရှိသော အမျိုးအစားများကို သင့်လျော် သောနေရာတွင် သိုလှောင်ထားခြင်း။</li> <li>ညစ်ညမ်းသောမြေဆီလွှာများ ဖြစ်ပေါ်သည့် မည်သည့် အခြေအနေမျိုးတွင်မဆို ၎င်းတို့ကို သင့်လျော်သောပုံးများ တွင် စုဆောင်းပြီး မြို့နယ် စည်ပင်သာယာရေးကော်မတီ (TDC) မှ တစ်ဆင့် စွန့်ပစ်ခြင်း။</li> </ul>	ကန်ထရိုက်တာ
သဘာဝပတ်ဝန်းကျင်	တိရစ္ဆာန်၊ ဂေဟဗေဒစနစ်၊ ဇီဝမျိုးစုံမျိုးကွဲ၊ ထိန်းသိမ်းစောင့်ရှောက်ရေးနယ်မြေ	<ul style="list-style-type: none"> <li>ဤဒေသရှိ ပင်များ၏ဆုံးရှုံးမှုကို အခြားနေရာတွင် ထပ်မံစိုက်ပျိုးခြင်း။</li> </ul>	ကန်ထရိုက်တာ

47

47

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
လူမှုပတ်ဝန်းကျင်	ပြန်လည်နေရာချထားရေးနှင့် မြေယာရယူခြင်း	<ul style="list-style-type: none"> <li>လယ်ယာမြေဥပဒေနှင့် နည်းဥပဒေများ (၂၀၁၂)၊ MOEE မှ မြေနှင့် ကောက်ပဲသီးနှံ နှစ်နှာကြေးစည်းများအရ သင့်လျော်သော လျော်ကြေးငွေများ ပေးခြင်း။</li> <li>ထိခိုက်ခံစားရသောပြည်သူလူထု နှင့် ထိခိုက်ခံစား ရသော အိမ်ထောင်စုများအတွက် (ARAP) ကို ပြင်ဆင်ပါ။</li> </ul>	DPTSC
	ဒေသခံ စီးပွားရေးနှင့် အသက်မွေးဝမ်းကြောင်း	<ul style="list-style-type: none"> <li>ဓာတ်အားခွဲရုံးအတွက် လယ်ယာမြေများ၏ နှစ်နှာသူများ အတွက် သင့်လျော်သော လျော်ကြေးပမာဏကို ပေးလျော်ခြင်း။</li> <li>စီမံကိန်း၏ ဆောက်လုပ်ရေး လုပ်ငန်းဆောင်တာများကို ဂရုတစိုက်လုပ်ဆောင်ခြင်းဖြင့် သီးနှံများကို မလှိအပ်ဘဲ မပျက်စီး စေခြင်း။</li> <li>ရင့်မှည့်သော ကောက်ပဲသီးနှံ ရိတ်သိမ်းချိန်တွင် စိုက်ခင်းများတွင် လုပ်ငန်းများကို ခေတ္တရပ်ဆိုင်းထားခြင်း။</li> </ul>	DPTSC ကန်ထရိုက်တာ
	တည်ငြိမ်ပြီး ဖြစ်သော လူမှုရေးဆိုင်ရာအဆောက်အအုံများနှင့် ဆောင်ရွက်မှုများ	<ul style="list-style-type: none"> <li>လမ်းနှင့်တံတားများ၏ သယ်ဆောင်နိုင်စွမ်းကို နားလည်သိရှိပြီး ထောက်ပံ့ပို့ဆောင်ရေး စီမံခန့်ခွဲမှု များကို ဂရုတစိုက် စီစဉ်ပေးခြင်း။</li> <li>သက်ဆိုင်ရာအာဏာပိုင်များနှင့် တိုင်ပင်ဆွေးနွေးပြီး ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် ပျက်စီးသွားသည့် လမ်းများနေရာသို့ လမ်းပြုပြင် ထိန်းသိမ်းရေးအဖွဲ့ကို စေလွှတ်ခြင်း။</li> <li>လမ်းဆိုင်ဘုတ်များ၊ လုံခြုံရေးအတားအဆီး များ ထားရှိခြင်း။</li> </ul>	ကန်ထရိုက်တာ

48

48



၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
လူမှုပတ်ဝန်းကျင်	လူမှုရေးအဖွဲ့အစည်းများ	<ul style="list-style-type: none"> <li>ယာယီလမ်းပိတ်ခြင်းကို ဒေသခံအာဏာပိုင်များနှင့် ပြည်သူလူထုထံ ကြိုတင်အကြောင်းကြားခြင်း။</li> <li>ကျောင်းတက်ကျောင်းဆင်းချိန်၊ ဆောက်လုပ်ရေးပစ္စည်းများနှင့် အကြီးစားစက်ယန္တရားများ သယ်ယူ ပို့ဆောင်ချိန် ကဲ့သို့ ယာဉ်အသွားအလာများသည့်ချိန်များကို ရှောင်ခြင်း။</li> </ul>	ကန်ထရိုက်တာ
ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	<ul style="list-style-type: none"> <li>လုပ်ငန်းခွင်နေရာတွင် လာရောက်လေ့လာသူများကို တစ်ကိုယ်ရည်ကာကွယ်ရေးပစ္စည်းများ ပေးထားပြီး ဆောက်လုပ်ရေးလုပ်ငန်းပတ်ဝန်းကျင်ကို စောင့်ကြပ်ခြင်း။</li> <li>တစ်ကိုယ်ရည်ကာကွယ်ရေးပစ္စည်း လိုအပ်ချက်ပြ ဆိုင်းဘုတ်များ ထားရှိခြင်း။</li> <li>အလုပ်ခွင်ရှိအလုပ်သမားများအား သတိပေးရန် ဘေးအန္တရာယ်အမျိုးမျိုးအတွက် သတိပေးဆိုင်းဘုတ် များ ထားရှိခြင်း။</li> </ul>	ကန်ထရိုက်တာ
	လူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	<ul style="list-style-type: none"> <li>ယာဉ်စည်းကမ်း လမ်းစည်းကမ်းများကို လိုက်နာဆောင်ရွက်ခြင်း။</li> <li>လုပ်ငန်းခွင်နေရာအတွင်း ဝင်ရောက်ခွင့်ကိုကန့်သတ်ခြင်း။</li> <li>လုပ်ငန်းခွင်လုံခြုံမှုနှင့် လုံခြုံရေးအစီအစဉ်များကို ချမှတ်ခြင်း။</li> </ul>	

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

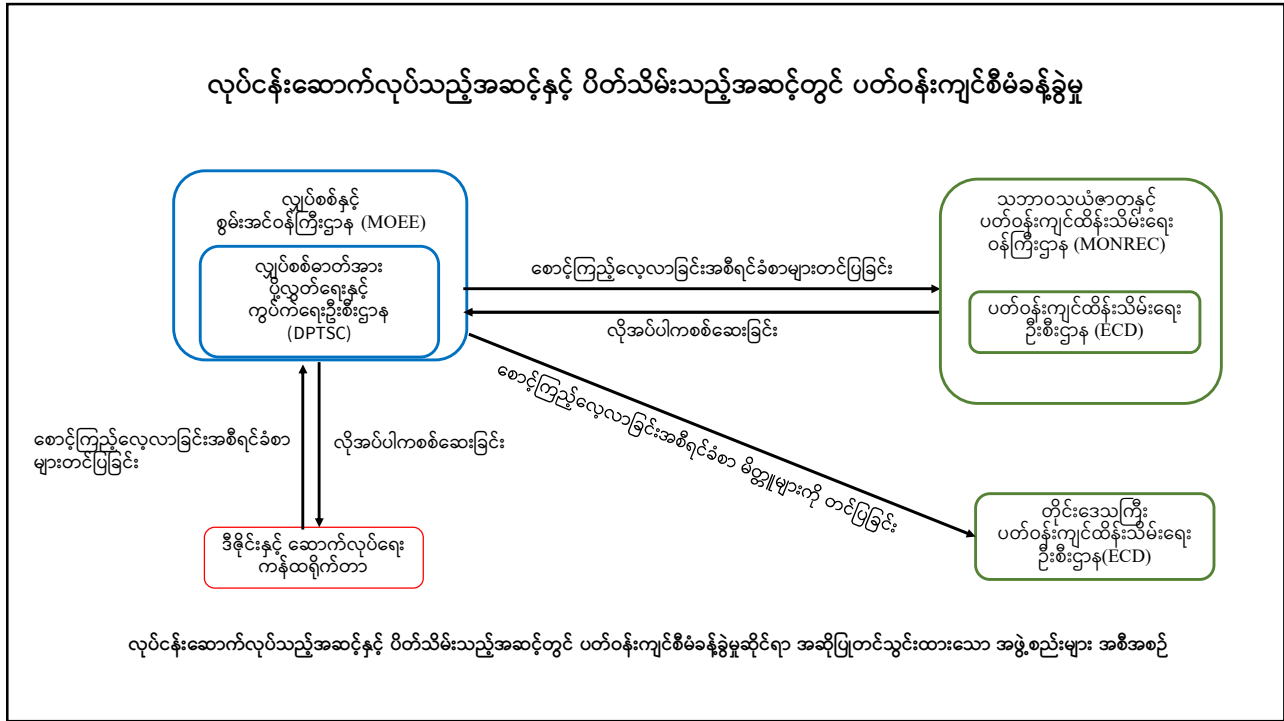
အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
အရေးပေါ်ဘေးအန္တရာယ်	ရေဘေးအန္တရာယ်	<ul style="list-style-type: none"> <li>စီမံကိန်း၊ ဧရိယာနှင့် သက်ဆိုင်သော အရေးပေါ်ရေးကြီးမှုသတင်း အချက်အလက်များကို မည်သည့်မီဒီယာမှမဆို စုဆောင်းခြင်း။</li> <li>အရေးပေါ် အခြေအနေအတွက် တစ်ဦးချင်းစီ၏ အခန်းကဏ္ဍများ၊ တာဝန်များ၊ စွမ်းရည်နှင့် လိုအပ်ချက်များကို လေ့ကျင့်ပေးခြင်းနှင့် ကယ်ဆယ်ရေးနှင့် ဆက်စပ်သောအခြားသင်တန်းများ ပို့ချခြင်း။</li> </ul>	ကန်ထရိုက်တာ
	ငလျင်လှုပ်ခြင်း	<ul style="list-style-type: none"> <li>ငလျင်ခံစားနိုင်သော မြေနေရာများတွင် ဓာတ်အားခွဲရုံ နှင့် ဓာတ်အားလိုင်း ဆောက်လုပ်ခြင်းကို ရှောင်ရှားခြင်း။</li> <li>ဓာတ်အားခွဲရုံ နှင့် ဓာတ်အားလိုင်း သင့်လျော်သော အခြေခံ အုတ်မြစ်များကို ကျစ်လစ်သိပ်သည်းသော မြေဆီလွှာတွင် တည်ဆောက်ခြင်း။</li> <li>လျှပ်စစ်ဓာတ်အားခွဲရုံနှင့် ထိန်းချုပ်အဆောက်အဦနေရာများအား ကောင်းမွန်စွာဒီဇိုင်းဆွဲ ထားခြင်း။</li> </ul>	ကန်ထရိုက်တာ

### ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ်

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	နေရာ	စောင့်ကြပ်ကြည့်ရှုခြင်း နည်းလမ်းများ	တိုင်းတာ စစ်ဆေးမှု အကြိမ်ရေ	အစီရင်ခံစာတင်ခြင်း	တာဝန်ရှိသူ (ကြီးကြပ်ခြင်း ၊ အကောင်အထည်ဖော်ခြင်း)	
					ကြီးကြပ်ခြင်း	အကောင်အထည်ဖော်ခြင်း
<b>လုပ်ငန်းဆောက်လုပ်သည့်အဆင့်</b>						
လေထုအရည် အသွေး	လှည်းကူး-ဒါးပိန်လမ်း၊ ဆားတလင်းရွာ၊ လှည်းကူးမြို့နယ်ရှိ ၅၀၀ kV ဓာတ်အား ခွဲရုံသစ်တည်နေရာ	လက်တွေ့ကွင်းဆင်းလေ့လာခြင်း၊ အမြင်ဖြင့်စစ်ဆေးခြင်း၊ ဖုန်လုံဇကာတပ်ဆင်ထားမှု စစ်ဆေးခြင်း	လစဉ်	ခြောက်လ တစ်ကြိမ်	DPTSC	ကန်ထရိုက်တာ
ဆူညံသံနှင့် တုန်ခါမှုအဆင့် (dBA)	လှည်းကူး-ဒါးပိန်လမ်း၊ ဆားတလင်းရွာ၊ လှည်းကူးမြို့နယ်ရှိ ၅၀၀ kV ဓာတ်အား ခွဲရုံသစ်တည်နေရာ	ဆူညံသံတိုင်းတာခြင်း၊ သော ဆူညံသံမြင့် စက်များကိုစစ်ဆေးခြင်း၊ ဆူညံသံလျော့ချရေးကိရိယာ များကိုစစ်ဆေးခြင်း	သုံးလ တစ်ကြိမ်	ခြောက်လ တစ်ကြိမ်	DPTSC	ကန်ထရိုက်တာ
ရေထုအရည်အသွေး	500 kV ဓာတ်အား ခွဲရုံသစ်အနီးရှိ ဆားတလင်း ချောင်း	ရေမြောင်းစနစ်နှင့်ရေအရည် အသွေး ထိန်းချုပ်သည့်စနစ်ကိုစစ် ဆေးခြင်း	တစ်နှစ် တစ်ကြိမ်	တစ်နှစ် တစ်ကြိမ်	DPTSC	ကန်ထရိုက်တာ

### ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ်

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	နေရာ	စောင့်ကြပ်ကြည့်ရှုခြင်း နည်းလမ်းများ	တိုင်းတာ စစ်ဆေးမှု အကြိမ်ရေ	အစီရင်ခံစာတင်ခြင်း	တာဝန်ရှိသူ (ကြီးကြပ်ခြင်း ၊ အကောင်အထည်ဖော်ခြင်း)	
					ကြီးကြပ်ခြင်း	အကောင်အထည်ဖော်ခြင်း
စွန့်ပစ်အစိုင်အခဲ၊ သန့်ရှင်းမှု၊ ကျန်းမာရေးနှင့်ဘေးကင်းရေး၊ ပြည်သူ့လူထု တိုင်ကြားချက်များ၊ အလုပ်သမားများ ခိုက်ရန်ဖြစ်ပွားမှု၊ ပြည်သူ့လူထု မတော်တဆဖြစ်ပွားမှု	ဆောက်လုပ်ရေးဧရိယာ အားလုံး	အမြင်ဖြင့်စစ်ဆေးခြင်း၊ DPTSC နှင့် ကန်ထရိုက်တာ မှပုံမှန်မှတ်တမ်းတင်ခြင်း၊ အင်တာဗျူးခြင်း	လစဉ်	၆လ တစ်ကြိမ်	DPTSC	ကန်ထရိုက်တာ



53

### ၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
ညစ်ညမ်းမှု	လေထုညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>သယ်ယူပို့ဆောင်ရေးယာဉ်များ၊ ကိရိယာများနှင့် စက်ယန္တရားများကို ပုံမှန်ထိန်းချုပ်ခြင်း၊ စစ်ဆေးခြင်းနှင့် ထိန်းသိမ်းခြင်း။</li> <li>ယာဉ်မောင်းများအားလုံးသည် မလိုအပ်ဘဲ စက်နွီးထားခြင်းကဲ့သို့ အင်ဂျင်လည်ပတ်စေခြင်းများကို ရှောင်ရှားခြင်း။</li> <li>မော်တော်ယာဉ်နှင့် စက်ပစ္စည်းအင်ဂျင် အားလုံး အတွက် ဆာလ်ဖာပါဝင်မှုနည်းသော ဒီဇယ်ဆီ အသုံးပြုခြင်း။</li> </ul>	DPTSC
	ရေထုညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>ဝန်ထမ်းအိမ်ယာများမှထွက်ရှိသော မိလ္လာများကို မြို့နယ်စည်ပင် သာယာရေးကော်မတီအား အကြောင်းကြား၍ စွန့်ပစ် စေခြင်း။</li> <li>ဓာတ်အားခွဲရုံဆီစုကျင်းမှ ရေမြောင်းအတွင်းသို့ ယိုစိမ့်မှု မဖြစ်စေရန်စစ်ဆေးခြင်း။</li> <li>ရေအိုင်ခြင်း၊ လျှို့ဝှက်ခြင်းနှင့် ပိတ်ဆို့ခြင်းတို့မရှိစေရန် ဓာတ်အား ခွဲရုံ ၏ ရေနုတ်မြောင်းစနစ်ကို စစ်ဆေးခြင်း။</li> </ul>	DPTSC
	အသံနှင့်တုန်ခါမှု	<ul style="list-style-type: none"> <li>မလိုအပ်သော ဆူညံမှုကိုရှောင်ရှားရန် ထရန် စဖော်မာကို ပုံမှန် ပြုပြင်ထိန်းသိမ်းခြင်း။</li> </ul>	DPTSC

54

54

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
ညစ်ညမ်းမှု	အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း	<ul style="list-style-type: none"> <li>အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျသိမ်းဆည်း စွန့်ပစ်ခြင်း။</li> <li>အထူးသဖြင့် ယိုဖိတ်မှု၊ ညစ်ညမ်းမှုဖြစ်ချိန်တွင် သိုလှောင်ရာနေရာ အားလုံးကို သေသေချာချာ နှင့် အချိန်မှန်သန့်ရှင်းပေးခြင်း။</li> <li>လျှပ်စစ်ပစ္စည်းကိရိယာ အပျက်အစီးများ သို့မဟုတ် အနီးအနားရှိ လူများအတွက် အန္တရာယ်များထားရှိခြင်း။</li> </ul>	DPTSC
	မြေဆီလွှာ ညစ်ညမ်းမှု	<ul style="list-style-type: none"> <li>စက်ပစ္စည်းများ၊ ကိရိယာများနှင့် မော်တော်ယာဉ် အချို့ကို လောင်စာဆီဖြည့်တင်းခြင်းတွင် ယိုဖိတ်ခြင်း နှင့် ယိုစိမ့်ခြင်း မဖြစ်စေရန် ဆောင်ရွက်ခြင်း။</li> <li>အကယ်၍ ဆီယိုစိမ့်မှုဖြစ်ပေါ်ပါက သင့်လျော်သောကြိုတင် ကာကွယ်ရေး အစီအစဉ်များ ဆောင်ရွက်ခြင်း။</li> </ul>	DPTSC

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အမျိုးအစား	ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့်အဖွဲ့အစည်း
ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး	လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး	<p>လုပ်ငန်းခွင်ထိခိုက်မှု</p> <ul style="list-style-type: none"> <li>လျှပ်စစ်နှင့် ပတ်သတ်သော အလုပ်အားလုံးကို လက်မှတ်ရထားပြီး အရည်အချင်း ပြည့်ဝသော လျှပ်စစ်လုပ်သားများဖြင့် ဆောင်ရွက်ခြင်း။</li> <li>ရှေ့ဦး သူနာပြု ပစ္စည်းများထောက်ပံ့ပေးခြင်း။</li> <li>အလုပ်သမားများ၏ လုံခြုံရေးအတွက် အမြင့်မှပြုတ်ကျပါက ကာကွယ်စောင့်ရှောက်ရေး အစီအစဉ်များရေးဆွဲထားခြင်း နှင့် လုပ်ငန်းအဖွဲ့စည်း တည်ဆောက်ပုံ စနစ်ဆိုင်ရာ မရှိကြိုတင် စမ်းသပ်ခြင်းကဲ့သို့သော အန္တရာယ်လျော့ချ ရေး လုပ်ငန်းစဉ်များ ဖြင့်အစီအစဉ်များကိုဖော်ဆောင်နိုင်သည်။</li> </ul> <p>လျှပ်စစ်ဓာတ်အားအရှိန် သက်ရောက်မှု</p> <ul style="list-style-type: none"> <li>လုပ်ငန်းခွင်တွင်း လျှပ်စစ်ဓာတ်အားအရှိန် သက်ရောက်မှု အဆင့်များကိုဖော်ထုတ် ခြင်း။</li> <li>ဓာတ်အားလိုင်းများ ပြင်ဆင်ခြင်းမပြုလုပ်မီ လျှပ်စစ်စီးမနေစေရန် သေချာစစ်ဆေးခြင်း။</li> </ul> <p>အခြားမတော်တဆမှုများ</p> <ul style="list-style-type: none"> <li>ဘေးကင်း လုံခြုံရေးဆိုင်ရာ သင်တန်း များ၊ ဟောပြောပွဲများ၊ မနက်ခင်းအစည်းအဝေးများ၊ ကော်မတီ အစည်းအဝေးများ၊ လာရောက်လေ့လာသူများအား လှည့်လည် ပြသခြင်းများ သင့်လျော်သော စီမံခန့်ခွဲရေး များ ကဲ့သို့သော လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေးဆိုင်ရာ သင်တန်း များနှင့် အရေးပေါ် အခြေအနေအတွက် လေ့ကျင့်ရေး များ ဆောင်ရွက်ခြင်းဖြင့် မတော်တဆဖြစ်မှုများကို လျော့ချ ခြင်း။</li> </ul>	DPTSC

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင် ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့် အဖွဲ့အစည်း
ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး	လူထု ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	လူထုကျန်းမာရေးနှင့် အဖွဲ့အစည်း အန္တရာယ်ရှိနိုင်သော ပစ္စည်းကိရိယာများနှင့် ထိတွေ့ခြင်းမှ ကာကွယ်ရန် အများပြည်သူအား သင်တန်း ပေးခြင်း သို့မဟုတ် ပညာပေးခြင်း။ ဓာတ်အားလိုင်းများရှိ သံချေးတတ်နေသော အပိုင်းများ ကို သတ်မှတ်စစ်ဆေးခြင်း။  ပြည်သူ့လုံခြုံရေးနှင့် အခြားအရာများ ဒေသခံလူထုနှင့် ညှိနှိုင်းပြီးလုပ်ငန်းခွင်နေရာအတွင်း ဝင်ရောက်ခွင့်ကိုကန့်သတ်ခြင်း။	DPTSC
အရေးပေါ်ဘေးအန္တရာယ်	လျင်လျင်ခြင်း	❖ အရေးပေါ်အခြေအနေအတွက် တစ်ဦးချင်းစီ၏ အခန်း ကဏ္ဍများ၊ တာဝန်များ၊ စွမ်းရည်နှင့် လိုအပ်ချက် များကို လေ့ကျင့်ပေးခြင်းနှင့် ကယ်ဆယ်ရေးနှင့် ဆက်စပ်သော အခြားသင်တန်းများ ပို့ချခြင်း။	DPTSC

၈။ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်များ

အမျိုးအစား	ပတ်ဝန်းကျင် ဆိုင်ရာ အချက်များ	လျော့ပါးသက်သာစေမည့်နည်းလမ်းများ	အကောင်အထည်ဖော်မည့် အဖွဲ့အစည်း
အရေးပေါ်ဘေးအန္တရာယ်	မီးဘေး အန္တရာယ်	❖ မီးသတ်ရန်နှင့် အခြားအရေးပေါ်အခြေအနေများနှင့် ပတ်သက်၍ ဝန်ထမ်းများအား လေ့ကျင့်ပေးခြင်း။ ❖ ကြိုတင်မီးသတ်ပေးရေးစနစ်၊ ထိရောက်သောမီးသတ်စနစ်နှင့် ခရီးဆောင်မီးသတ်ဆေးဘူးများကို ပုံမှန်ဝင်ပေါက်၊ ထွက်ပေါက် တံခါးများနှင့် ကပ်လျက်ထားရှိခြင်း။ ❖ အရေးပေါ်တယ်လီဖုန်းနံပါတ်များကို မီးအရေးပေါ်အခြေအနေ တွင်ခေါ်ဆိုရန် ပေးထားခြင်း။	DPTSC
	ရေဘေး အန္တရာယ်	❖ စီမံကိန်း ဧရိယာနှင့်သက်ဆိုင်သော အရေးပေါ်ရေကြီးမှုသတင်း အချက်အလက် များကို မည်သည့်မီဒီယာမှမဆို စုဆောင်းခြင်း။ ❖ အရေးပေါ် အခြေအနေအတွက် တစ်ဦးချင်းစီ၏ အခန်းကဏ္ဍများ၊ တာဝန်များ၊ စွမ်းရည်နှင့် လိုအပ်ချက်များကို လေ့ကျင့်ပေးခြင်းနှင့် ကယ်ဆယ်ရေးနှင့် ဆက်စပ်သော အခြားသင်တန်းများ ပို့ချခြင်း။	DPTSC

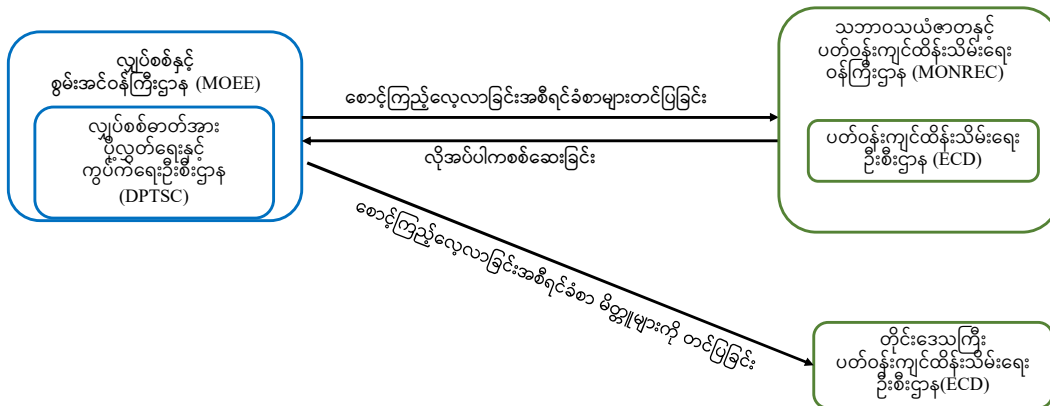
ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ်

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	နေရာ	စောင့်ကြပ်ကြည့်ရှုခြင်းနည်းလမ်းများ	တိုင်းတာစစ်ဆေးမှုအကြိမ်ရေ	အစီရင်ခံစာတင်ခြင်း	တာဝန်ရှိသူ (ကြီးကြပ်ခြင်း၊ အကောင်အထည်ဖော်ခြင်း)	
					ကြီးကြပ်ခြင်း	အကောင်အထည်ဖော်ခြင်း
လုပ်ငန်းလည်ပတ်သည့်အဆင့်						
စွန့်ပစ်အပိုင်အခဲ၊ သန့်ရှင်းမှု၊ ကျန်းမာရေးနှင့် ဘေးကင်းရေး၊ ပြည်သူ့လူထု တိုင်ကြားချက်များ၊ အလုပ်သမားများ ခိုက်ရန်ဖြစ်ပွားမှု၊ ပြည်သူ့လူထု မတော်တဆဖြစ်ပွားမှု၊	ဓာတ်အားကြိုး လိုင်းတစ်လျှောက်ဧရိယာများ၊ ခွဲရုံနေရာများ	အမြင်ဖြင့်စစ်ဆေးခြင်း၊ DPTSC နှင့် ကန်ထရိုက်တာမှပုံမှန်မှတ်တမ်းတင်ခြင်း၊ အင်တာဗျူးခြင်း	လစဉ်	ဖိလ တစ်ကြိမ်	MOEE	DPTSC

59

59

လုပ်ငန်းလည်ပတ်သည့်အဆင့်တွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု



လုပ်ငန်းလည်ပတ်သည့်အဆင့်တွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုဆိုင်ရာ အဆိုပြုတင်သွင်းထားသော အဖွဲ့စည်းများ အစီအစဉ်

60

ကျေးဇူးတင်ပါသည်

61

61

## **1.2 INVITATION LETTERS USED IN PUBLIC CONSULTATION MEETING**





**မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း နှင့် ပတ်သက်သော  
သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း ဖိတ်ကြားလွှာ  
မင်္ဂလာဒုံမြို့နယ်**

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် အောက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း (၃) ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် နိုင်ငံတကာ အကြံပေး ကုမ္ပဏီ ဖြစ်သော Nippon Koei Co., Ltd. & Myanmar Koei International Ltd. နှင့်ပူးတွဲ၍ အစီစဉ် ရေးဆွဲလျှက်ရှိပါသည်။ ထိုသို့ရေးဆွဲရာတွင် လိုအပ်ချက် တစ်ခုဖြစ်သည့် စီမံကိန်းနှင့် ပတ်သက်သော ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (IEE) အစီရင်ခံစာအား ရေးသားပြုစု လျှက်ရှိပါသည်။ ၎င်း IEE အစီရင်ခံစာနှင့် ပတ်သက်၍ မင်္ဂလာဒုံ မြို့နယ် သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါ ဝင်စားသူများအား ရှင်းလင်းတင်ပြပြီး အကြံဉာဏ်များရယူရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲအား အောက်ပါ အတိုင်း စီစဉ်ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

စီမံကိန်းတွင် ပါဝင်မည့် လုပ်ငန်းများ

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

အစည်းအဝေး (၁)

- ရက်စွဲ ။ ။ (၁၃) ရက် ၊ မတ်လ ၂၀၂၀ ( သောကြာနေ့ )
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လယ် (၁၂) နာရီအထိ
- နေရာ။ ။ မင်္ဂလာဒုံမြို့နယ်၊ ၊ မြို့နယ်အထွေထွေ အုပ်ချုပ်ရေးမှူးရုံးခန်းမ။



**မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း နှင့် ပတ်သက်သော  
သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း ဖိတ်ကြားလွှာ  
ဒဂုံမြို့သစ် (အရှေ့ပိုင်း)မြို့နယ်**

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် အောက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း (၃) ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် နိုင်ငံတကာ အကြံပေး ကုမ္ပဏီ ဖြစ်သော Nippon Koei Co., Ltd. & Myanmar Koei International Ltd. နှင့်ပူးတွဲ၍ အစီစဉ် ရေးဆွဲလျက်ရှိပါသည်။ ထိုသို့ရေးဆွဲရာတွင် လိုအပ်ချက် တစ်ခုဖြစ်သည့် စီမံကိန်းနှင့် ပတ်သက်သော ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (IEE) အစီရင်ခံစာအား ရေးသားပြုစု လျှက်ရှိပါသည်။ ၎င်း IEE အစီရင်ခံစာနှင့် ပတ်သက်၍ ဒဂုံမြို့သစ် (အရှေ့ပိုင်း) မြို့နယ် **သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါ ဝင်စားသူများအား** ရှင်းလင်းတင်ပြပြီး အကြံဉာဏ်များရယူရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲအား အောက်ပါ အတိုင်း စီစဉ်ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

စီမံကိန်းတွင် ပါဝင်မည့် လုပ်ငန်းများ

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

အစည်းအဝေး (၂)

- ရက်စွဲ ။ ။ (၁၆) ရက် ၊ မတ်လ ၂၀၂၀ ( တနင်္လာနေ့ )
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လည် (၁၂) နာရီအထိ
- နေရာ။ ။ ဒဂုံမြို့သစ် (အရှေ့ပိုင်း)မြို့နယ်၊ မြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးခန်းမ။



**မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း နှင့် ပတ်သက်သော သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း ဖိတ်ကြားလွှာ ပဲခူးခရိုင်**

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် အောက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း (၃) ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် နိုင်ငံတကာ အကြံပေး ကုမ္ပဏီ ဖြစ်သော Nippon Koei Co., Ltd. & Myanmar Koei International Ltd. နှင့်ပူးတွဲ၍ အစီစဉ် ရေးဆွဲလျှက်ရှိပါသည်။ ထိုသို့ရေးဆွဲရာတွင် လိုအပ်ချက် တစ်ခုဖြစ်သည့် စီမံကိန်းနှင့် ပတ်သက်သော ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (IEE) အစီရင်ခံစာအား ရေးသားပြုစု လျှက်ရှိပါသည်။ ၎င်း IEE အစီရင်ခံစာနှင့် ပတ်သက်၍ ပဲခူးခရိုင် သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများအား ရှင်းလင်းတင်ပြပြီး အကြံဉာဏ်များရယူရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲအား အောက်ပါ အတိုင်း စီစဉ်ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

**စီမံကိန်းတွင် ပါဝင်မည့် လုပ်ငန်းများ**

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

**အစည်းအဝေး (၃)**

- ရက်စွဲ ။ ။ (၁၈) ရက် ၊ မတ်လ ၂၀၂၀ ( ဗုဒ္ဓဟူးနေ့ )
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လည် (၁၂) နာရီအထိ )
- နေရာ။ ။ ပဲခူးခရိုင်၊ ခရိုင် အထွေထွေ အုပ်ချုပ်ရေးမှူးရုံးခန်းမ



**မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း နှင့် ပတ်သက်သော သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း ဖိတ်ကြားလွှာ ရန်ကုန်အရှေ့ပိုင်းခရိုင်**

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် အောက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း (၃) ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် နိုင်ငံတကာ အကြံပေး ကုမ္ပဏီ ဖြစ်သော Nippon Koei Co., Ltd. & Myanmar Koei International Ltd. နှင့်ပူးတွဲ၍ အစီစဉ် ရေးဆွဲလျက်ရှိပါသည်။ ထိုသို့ရေးဆွဲရာတွင် လိုအပ်ချက် တစ်ခုဖြစ်သည့် စီမံကိန်းနှင့် ပတ်သက်သော ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (IEE) အစီရင်ခံစာအား ရေးသားပြုစု လျှက်ရှိပါသည်။ ၎င်း IEE အစီရင်ခံစာနှင့် ပတ်သက်၍ ရန်ကုန်အရှေ့ပိုင်းခရိုင် **သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါ ဝင်စားသူများအား** ရှင်းလင်းတင်ပြပြီး အကြံဉာဏ်များရယူရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲအား အောက်ပါ အတိုင်း စီစဉ်ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

စီမံကိန်းတွင် ပါဝင်မည့် လုပ်ငန်းများ

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

အစည်းအဝေး (၄)

- ရက်စွဲ ။ ။ (၁၉) ရက် ၊ မတ်လ ၂၀၂၀ ( ကြာသာပတေးနေ့ ) (လျာထား)
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လည် (၁၂) နာရီအထိ ) (လျာထား)
- နေရာ။ ။ ရန်ကုန်အရှေ့ပိုင်းခရိုင်၊ ခရိုင် အထွေထွေ အုပ်ချုပ်ရေးမှူးရုံးခန်းမ (လျာထား)



**မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း နှင့် ပတ်သက်သော သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါဝင်စားသူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း ဖိတ်ကြားလွှာ လှည်းကူးမြို့နယ်**

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် အောက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း (၃) ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် နိုင်ငံတကာ အကြံပေး ကုမ္ပဏီ ဖြစ်သော Nippon Koei Co., Ltd. & Myanmar Koei International Ltd. နှင့်ပူးတွဲ၍ အစီစဉ် ရေးဆွဲလျက်ရှိပါသည်။ ထိုသို့ရေးဆွဲရာတွင် လိုအပ်ချက် တစ်ခုဖြစ်သည့် စီမံကိန်းနှင့် ပတ်သက်သော ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (IEE) အစီရင်ခံစာအား ရေးသားပြုစု လျှက်ရှိပါသည်။ ၎င်း IEE အစီရင်ခံစာနှင့် ပတ်သက်၍ လှည်းကူးမြို့နယ် သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ စိတ်ပါ ဝင်စားသူများအား ရှင်းလင်းတင်ပြပြီး အကြံဉာဏ်များရယူရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲအား အောက်ပါ အတိုင်း စီစဉ်ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

စီမံကိန်းတွင် ပါဝင်မည့် လုပ်ငန်းများ

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

အစည်းအဝေး (၅)

- ရက်စွဲ ။ ။ (၂၀) ရက် ၊ မတ်လ ၊ ၂၀၂၀ ( သောကြာနေ့ ) (လျာထား)
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လည် (၁၂) နာရီအထိ (လျာထား)
- နေရာ။ ။ လှည်းကူးမြို့နယ်၊ မြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးခန်းမ။ (လျာထား)

### **1.3 NOTICE LETTERS USED IN PUBLIC CONSULTATION MEETING**



## အများပြည်သူများ သိရှိစေရန် ထုတ်ဖော်တင်ပြခြင်း

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနသည် ဂျပန်နိုင်ငံ JICA ချေးငွေဖြင့် မဟာဓာတ်အားလိုင်း ကွန်ရက် အဆင့်မြှင့်တင်ခြင်းစီမံကိန်း အပိုင်း - ၃ (Phase III) ဖြင့်အောက်ဖော်ပြပါ စီမံကိန်း များကို အကောင်အထည်ဖော် တည်ဆောက် သွားမည်ဖြစ်ပါသည်-

- (က) ဘုရားကြီး- အရှေ့ဒဂုံ (လှည်းကူး) ၅၀၀ ကေဗီ ဓာတ်အားလိုင်း၊
- (ခ) အရှေ့ဒဂုံ (လှည်းကူး) ဓာတ်အားခွဲရုံ၊
- (ဂ) အရှေ့ဒဂုံ (လှည်းကူး) - အရှေ့ဒဂုံ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း
- (ဃ) အရှေ့ဒဂုံ (လှည်းကူး) - လှော်ကား ၂၃၀ ကေဗီ ဓာတ်အားလိုင်းနှင့်
- (င) လှော်ကား-သာကေတ ၂၃၀ ကေဗီ ဓာတ်အားလိုင်း။

အထက်ဖော်ပြပါ မဟာဓာတ်အားလိုင်း ကွန်ရက်အဆင့်မြှင့်တင်ခြင်း စီမံကိန်းအပိုင်း(၃)တွင် ပါဝင်သော ဓာတ်အားလိုင်းနှင့် ဓာတ်အားခွဲရုံစီမံကိန်း လုပ်ငန်းများ အတွက် ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (မူကြမ်း) ကိုရေးသားပြုစုပြီး ယခုအခါ ၎င်းအစီရင်ခံစာ၏အကျဉ်းချုပ်များကို အများပြည်သူများ သိရှိစေရန်အတွက် သက်ဆိုင်ရာ ရုံးများ အသီးသီးသို့ ပေးပို့ထားပြီးဖြစ်ပါသဖြင့် (၂၀၂၀) ခုနှစ် မတ်လ ( ) ရက်နေ့ နံနက်ပိုင်းမှ (၂၀၂၀) ခုနှစ် မတ်လ ( ) ရက်နေ့ ညနေပိုင်းအတွင်း သွားရောက်ဖတ်ရှု လေ့လာနိုင်ပါသည်။

အစီရင်ခံစာအကျဉ်းချုပ်နှင့် ပတ်သက်၍ အကြံပြုနိုင်ပါရန် အကြံပြုချက် တောင်းခံလွှာများ ကိုလည်း သက်ဆိုင်ရာရုံးများသို့ ပေးဝေထားပြီး ဖြစ်ပါသည်။ ထင်မြင်ယူဆချက်များနှင့် အကြံပေးချက်များကို ယခုကြေညာစာကပ်ထားသည့် နေရာများ၌ အောက်ဖော်ပြပါ အချိန်ကာလ အတွင်းတွင် ပေးပို့ထားနိုင်ပါသည်။

### အများပြည်သူများ၏ ထင်မြင်ချက်များနှင့်အကြံပေးချက်များအားလက်ခံမည့်အချိန်ကာလ

- အချိန် - (၂၀၂၀) ခုနှစ် မတ်လ ( ) ရက်နေ့ နံနက်ပိုင်းမှ
- (၂၀၂၀) ခုနှစ် မတ်လ ( ) ရက်နေ့ ညနေပိုင်းအထိ

ထို့အပြင် အထက်ပါစီမံကိန်းနှင့် ပတ်သက်၍ သက်ဆိုင်ရာ အဖွဲ့အစည်းများနှင့် စိတ်ပါဝင်စားသူများ တွေ့ဆုံဆွေးနွေးပွဲကိုလည်း အောက်ပါအစီအစဉ်အတိုင်း ကျင်းပမည်ဖြစ်ကြောင်း အသိပေးအပ်ပါသည်။

**စီမံကိန်းနှင့် သက်ဆိုင်သူများပါဝင်သော အစည်းအဝေး၊ ပဲခူး မြို့နယ်၊ ကဝမြို့နယ်၊ သနပ်ပင်မြို့နယ် (စုပေါင်း)**

- ရက်စွဲ ။ ။ (၁၈) ရက် ၊ မတ်လ ၊ ၂၀၂၀ ( ဗုဒ္ဓဟူးနေ့ )
- အချိန် ။ ။ နံနက် (၁၀) နာရီမှ နေ့လည် (၁၂) နာရီအထိ
- နေရာ။ ။ ပဲခူးခရိုင်၊ ခရိုင် အထွေထွေ အုပ်ချုပ်ရေးမှူးရုံးခန်းမ

**ကနဦး ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း အစီရင်ခံစာ အကျဉ်းချုပ် ဖြန့်ဝေထားသော နေရာများ**

- ၁။ ခရိုင်အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (ပဲခူးခရိုင်)
- ၂။ မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၃။ မြို့နယ်စည်ပင်သာယာရေးဦးစီးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၄။ မြို့နယ်လျှပ်စစ်ဓာတ်အားပေးရေးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၅။ ပြည်သူ့ကျန်းမာရေး ဦးစီးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၆။ မြို့နယ်လယ်ယာမြေ စီမံခန့်ခွဲရေးနှင့် စာရင်းအင်း ဦးစီးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၇။ သစ်တောဦးစီးဌာန (ပဲခူး၊ ကဝ၊ သနပ်ပင်)
- ၈။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
- ၉။ ပဲခူးမြို့နယ်ရှိ အောက်စီဒီး (အရှေ့)၊ ဘုရားငုတ်တို၊ ကမာနတ်၊ ကော့ချ၊ ခုန်တိုင်း၊ ကင်းပိုင်မြို့၊ ကျောက်တန်း၊ မယင်း၊ အိုးဘို၊ ရှမ်းရွာကြီး၊ ရွှေတန်၊ တတ်ခလေး၊ ဝင်္ဂဘော်၊ ဈေးညောင်ပင် ကျေးရွာ အုပ်စု အုပ်ချုပ်ရေးမှူးရုံးများ
- ၁၀။ ကဝမြို့နယ်ရှိ နဘဲပင်ကျေးရွာအုပ်စုနှင့် သနပ်ပင်မြို့နယ်ရှိ ကျိုက်မဲ၊ ကျိုက်ပဒိုင်ကြီး၊ ကျိုက်ပဒိုင်လေး၊ စဉ့်အိုးဘို၊ တံခွန်တိုင် (ရှေ့)၊ တာဝရေတံခါး ကျေးရွာ အုပ်စု အုပ်ချုပ်ရေးမှူးရုံးများ



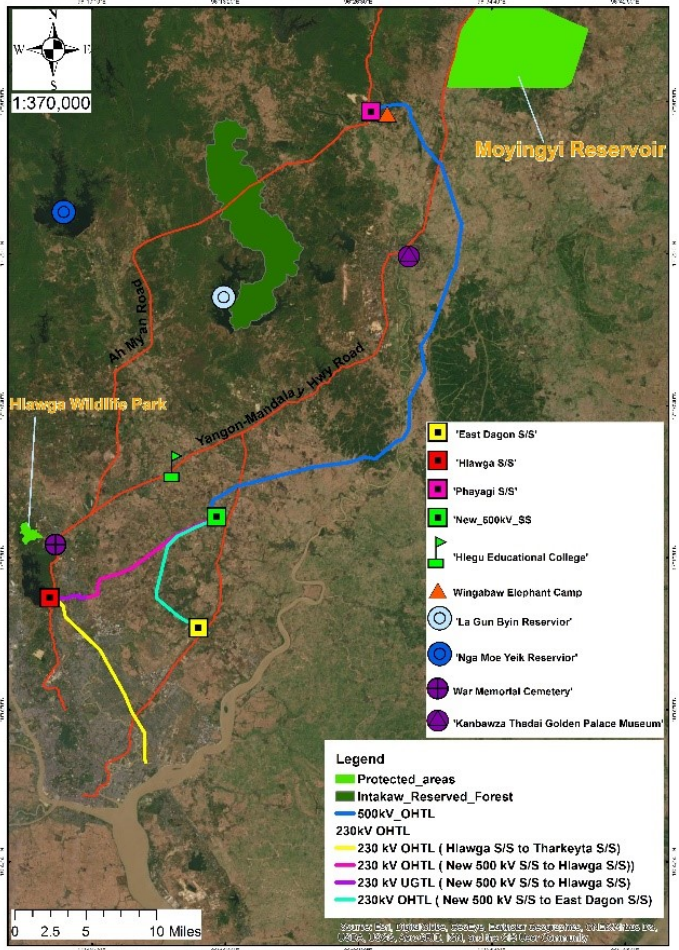
## **1.4 HANDOUTS USED IN PUBLIC CONSULTATION MEETING**

**မဟာဓာတ်အားလိုင်းကွန်ရက်အဆင့်မြှင့်တင်ခြင်း စီမံကိန်း (အပိုင်း-၃) ၏  
ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (မူကြမ်း) နှင့်ပတ်သက်၍  
စီမံကိန်းနှင့်ပတ်သက်ဆက်နွယ်သူများနှင့်တွေ့ဆုံဆွေးနွေးပွဲ  
၂၀၂၀ ခုနှစ်၊ မတ်လ**

**ရည်ရွယ်ချက်။** ။ စီမံကိန်း ရေးဆွဲနေစဉ် ကာလအတွင်း (ဖြစ်နိုင်ချေလေ့လာခြင်း) စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုဝန်းကျင် ဆိုင်ရာ သက်ရောက်မှုများအပေါ် စီမံကိန်းနှင့် ပတ်သက်ဆက် နွယ်သူများ၏ သဘောထား အမြင်များကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း လေ့လာမှုတွင် ထည့်သွင်း စဉ်းစားသွားနိုင်ရန်အတွက် တွေ့ဆုံဆွေးနွေးပွဲကို ဆောင်ရွက်ရခြင်းဖြစ်ပါသည်။

**စီမံကိန်းနောက်ခံ။** ။ မြန်မာနိုင်ငံ၏ လျှပ်စစ်လို အပ်ချက် အများဆုံးဖြစ်သော ရန်ကုန်ဧရိယာတွင် လျှပ်စစ် ဓာတ်အားလိုင်းများ နည်းပါးမှုနှင့် လျှပ်စစ်ဖြန့်ဖြူးရာတွင် လိုအပ်ချက်များ ဖြစ်ပေါ်နေပါသည်။ ဓာတ်အားဖြန့်ဖြူးရေး လိုင်းပိုင်းအချို့တွင် ဖြန့်ဖြူးပေးလိုက်သော ဓာတ်အား ပမာဏသည် ဓာတ်အားဖြန့်ဖြူးပေးနိုင်သည့် ကန့်သတ် ပမာဏထက် ကျော်လွန်နေခြင်းနှင့် သက်တမ်းကြာနေ သော ဓာတ်အားလိုင်းနှင့် ဓာတ်အားခွဲရုံများ အသုံးပြုနေ ရခြင်း တို့သည် လျှပ်စစ်ဓာတ်အား ပြတ်တောက်မှု ဖြစ်ပေါ် နိုင်ခြေ အများဆုံး ရှိပါသည်။ ဤအခြေအနေကို ပိုမိုကောင်း မွန်စေရန် “မဟာဓာတ်အားလိုင်းကွန်ရက် အဆင့်မြှင့်တင် ခြင်းစီမံကိန်း” ၏ အဓိကကျောရိုးမဖြစ်သော ၅၀၀ kV ဓာတ်အားဖြန့်ဖြူးရေးလိုင်း စနစ်ဖွံ့ဖြိုးတိုးတက်ရေး အ တွက် JICA မှ တဖြည်းဖြည်းထောက်ပံ့လာခဲ့ပါသည်။

ရန်ကုန်သည် မြန်မာ့စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှုအတွက် အဓိကနေရာဖြစ်ပြီး လျှပ်စစ်ဓာတ်အား လိုအပ်ချက်မှာ မြင့်တက်လာမည် ဟု ခန့်မှန်းထားပါသည်။ ထို့ကြောင့် ရန်ကုန်တွင် လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးပေးသော အဓိက ကျောရိုးမ ဓာတ်အားလိုင်းစနစ်ကို တိုးတက်အောင် ပြုလုပ် ခြင်းဖြင့် လျှပ်စစ် ဓာတ်အားထောက်ပံ့မှုကို တည်ငြိမ်စေ ခြင်းသည် စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှုအတွက် မရှိမဖြစ် လိုအပ်ပါသည်။



**အကောင်အထည်ဖော် ဆောင်ရွက်မည့် အဖွဲ့အစည်း။** ။စီမံကိန်းကို အကောင်အထည်ဖော်မည့် အဖွဲ့အစည်းမှာ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန (MOEE) လက်အောက်ရှိ လျှပ်စစ်ဓာတ်အား ပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) ဖြစ်ပြီး စီမံကိန်း အကောင်အထည်ဖော်ခြင်း၊ ဓာတ်အားဖြန့်ဖြူးရေးလိုင်းနှင့် ဓာတ်အားခွဲရုံ လည်ပတ်ခြင်းနှင့် ထိန်းသိမ်းစောင့်ရှောက်ခြင်း လုပ်ငန်းများကို ဆောင်ရွက်ပါမည်။ လျှပ်စစ်နှင့်စွမ်းအင် ဝန်ကြီးဌာန လက်အောက်ရှိ လျှပ်စစ်စွမ်းအားစီမံရေးဦးစီးဌာန (DEPP) သည် စီမံကိန်းဆိုင်ရာ ကနဦးသုံးသပ်ခြင်းနှင့် စီမံကိန်း စုံစမ်းစစ်ဆေးခြင်း လျှပ်စစ်စွမ်းအင် ထုတ်လုပ်ခြင်း၊ ပို့လွှတ်ခြင်း၊ ဖြန့်ဖြူးပေးခြင်းစသော လုပ်ငန်းစဉ်များ တိုးချဲ့ရန်အတွက် အလုံးစုံပါဝင် ရေးဆွဲထားသော စီမံချက်များကိုဖော်ထုတ်ခြင်း၊ နိုင်ငံတ ကာ အဖွဲ့အစည်းများနှင့် နှစ်ဦးနှစ်ဖက် ပူးပေါင်းစီစဉ် ရေးဆွဲခြင်းများအတွက် ဦးဆောင်မှု အခန်းကဏ္ဍမှ လုပ်ဆောင်ပါသည်။

**အကောင်အထည်ဖော်ဆောင်ရွက်မည့် လုပ်ငန်းများ။ ။** မဟာဓာတ်အားလိုင်းကွန်ရက်အဆင့်မြှင့်တင်ခြင်း စီမံကိန်း (အပိုင်း-၃) တွင် အောက်ပါလုပ်ငန်းများ အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ဓာတ်အားခွဲရုံ	လှည်းကူး မြို့နယ်တွင် ၅၀၀ kV ဓာတ်အားခွဲရုံသစ် တည်ဆောက်ခြင်း
	အရှေ့ဒဂုံတွင် မူလတည်ရှိသော ဓာတ်အားခွဲရုံအား အဆင့်မြှင့်တင်ခြင်း
	လှည်းကူးတွင် မူလတည်ရှိသော ဓာတ်အားခွဲရုံအား အဆင့်မြှင့်တင်ခြင်း
ဓာတ်အားပို့လွှတ်ရေးလိုင်းများ	ဘုရားကြီး ဓာတ်အားခွဲရုံမှ လှည်းကူး ဓာတ်အားခွဲရုံသို့ ၅၀၀ kV ဓာတ်အား လိုင်းသစ် တည်ဆောက်ခြင်း
	လှည်းကူး ဓာတ်အားခွဲရုံမှ အရှေ့ဒဂုံ ဓာတ်အားခွဲရုံသို့ ၂၃၀ kV ဓာတ်အား လိုင်းသစ် တည်ဆောက်ခြင်း
	လှည်းကူး ဓာတ်အားခွဲရုံမှ လှည်းကူး ဓာတ်အားခွဲရုံသို့ ၂၃၀ kV ဓာတ်အား လိုင်းသစ် တည်ဆောက်ခြင်း
	လှည်းကူး ဓာတ်အားခွဲရုံမှ သာကေတ ဓာတ်အားခွဲရုံသို့ မူလတည်ရှိသော ၂၃၀ kV ဓာတ်အား လိုင်း အား အဆင့်မြှင့်တင်ခြင်း

**အဓိက တွေ့ရှိချက်များ။ ။** စီမံကိန်းစတင်ရန် ဖြစ်နိုင်ချေလေ့လာသည့်အဆင့်တွင် ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း လေ့လာမှု၏ ရလဒ်အရ အောက်ဖော်ပြပါအချက်အလက်များကို အချုပ်အားဖြင့် တွေ့ရှိရသည်။

(၁) အဆိုပြုထားသောစီမံကိန်းသည် ပဲခူးနှင့် ရန်ကုန်တိုင်းဒေသကြီးအတွင်း စွမ်းအင်ကဏ္ဍတိုးတက်ရေးစီမံကိန်း ဖြစ်သည်။ ဤစီမံကိန်းသည် ရန်ကုန်မြို့တွင် စွမ်းအားလိုအပ်ချက်မြင့်မားနိုင်သဖြင့် အဓိကပင်မကျောရိုးအဖြစ် စွမ်းအင် ထောက်ပံ့မှုပေးရာတွင် တည်ငြိမ်မှုရှိစေရန်ရည်ရွယ်ပါသည်။

(၂) ဓာတ်အားလိုင်းများနှင့် သက်ဆိုင်ရာဓာတ်အားခွဲရုံများသည် ပဲခူးနှင့် ရန်ကုန်တိုင်းဒေသကြီးတွင် တည်ရှိပါသည်။ စီမံကိန်း ဧရိယာသည် ဂေဟဗေဒအထိခိုက်မခံသော ဧရိယာများတွင် တည်ရှိမည်မဟုတ်ပါ။ ထို့အပြင် စီမံကိန်းဧရိယာသည် ရန်ကုန်မြို့နယ် ယဉ်ကျေးမှုအမွေအနှစ်စာရင်းတွင် ဖော်ပြထားသော အဆောက်အဦ များအနီးတွင်မတည်ရှိပါ။

(၃) ကနဦး ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှု အကဲဖြတ်ချက်များအရ တည်ဆောက်ရေး ကာလအတွင်း ခန့်မှန်းထားသည့် အဓိက ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများမှာ လေထုညစ်ညမ်းမှု၊ ရေထုညစ်ညမ်းမှု၊ စွန့်ပစ်ပစ္စည်းညစ်ညမ်းမှု၊ အန္တရာယ်ဖြစ်စေသော ပစ္စည်းများ၊ ဆူညံသံနှင့် တုန်ခါမှု၊ မြေသားညစ်ညမ်းမှု၊ အနံ့ဆိုးများ၊ လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လူမှုပတ်ဝန်းကျင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး နှင့် အရေးပေါ်ဘေး အန္တရာယ် တို့ဖြစ်ပါသည်။ သို့ရာတွင် သက်ရောက်မှုအများစုမှာ ယာယီသက်ရောက်မှုဖြစ်ပြီး လုပ်ငန်းခွင် အတွင်းတွင်သာ သက်ရောက်နိုင်ခြင်း၊ စီမံကိန်း အဆိုပြုသူမှ အပ်နှံထားသော ကန့်ထိခိုက်တာမှ လိုအပ်သော သက်ရောက်မှု လျှော့ပါးရေး နည်းလမ်းများကို ဆောင်ရွက် မည်ဖြစ်သောကြောင့် “သိသာထင်ရှားမှု မရှိနိုင်” ဟုယူဆနိုင်ပါသည်။

(၄) ဓာတ်အားခွဲရုံ နှင့် ဓာတ်အားပို့လွှတ် ရေးလိုင်းများ၏ အသုံးပြုမှု သက်တမ်းအနေဖြင့် မဝေးသောအနာဂတ်တွင် လိုအပ်သလို ပြန်လည်ပြုပြင်ခြင်း/ တည်ဆောက်ခြင်းများ ရှိနိုင်သော်လည်း ပိတ်သိမ်းခြင်း နှင့် လုပ်ငန်းရပ်ဆိုင်းခြင်းများ မဖြစ်ပေါ်နိုင်ပါ။ ထို့အပြင် ပိတ်သိမ်းခြင်းအဆင့်၌ မျှော်မှန်းထားသော လုပ်ငန်းစဉ်များနှင့် ဆိုးကျိုးများမှာ တည်ဆောက်သည့်အဆင့်နှင့် အများစုမှာ တူညီမည်ဟု ခန့်မှန်းရသည်။

(၅) လုပ်ငန်းလည်ပတ်သည့်အဆင့်တွင် သက်ရောက်မှုအများစုမှာ စီမံကိန်း ဧရိယာအတွင်းတွင် ထိန်းချုပ်ကန့်သတ် ထားနိုင်မည် ဖြစ်သည်။

(၆) ခွဲခြမ်းစိတ်ဖြာခြင်းနှင့် အကဲဖြတ်ခြင်းများအရ သဘာဝပတ်ဝန်းကျင် နှင့် လူမှုပတ်ဝန်းကျင်၊ ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် ကျန်းမာရေး အတွက် ထိခိုက်မှုလျော့ချရေး လုပ်ဆောင်ရမည့် အရာများကို ဖော်ထုတ်သတ်မှတ်ခြင်း၊ လုံလောက်မှုရှိသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် နှင့် စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ်များကို ဖော်ထုတ်သတ်မှတ်ခြင်း တို့ကို ဆောင်ရွက်ထား ပါသည်။ ထို့အပြင် အရေးပေါ်အခြေအနေ စီမံခန့်ခွဲမှုအစီအစဉ် (ERMP) ကိုလည်း ဆန်းစစ် ဖော်ထုတ်ခဲ့ပါသည်။

**နိဂုံး။ ။** စီမံကိန်း၏ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အတည်ပြုချက်အဖြစ် မြန်မာနိုင်ငံအစိုးရ၏ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဆိုင်ရာလက်မှတ် (ECC) ကို ရရှိရန်အတွက် ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာကို ပြုစုခဲ့ပြီး စီမံကိန်းအဆိုပြုသူ (DPTSC) မှ ပြင်ဆင်ထားသော အစီရင်ခံစာကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) သို့တင်ပြသွားမည်ဖြစ်ပါသည်။ ECC အား အခြေခံအားဖြင့် IEE အစီရင်ခံစာ တင်ပြပြီး အလုပ်လုပ်ရက်ပေါင်း (၆၀) ရက် နောက်ပိုင်းမှသာလျှင် ECD မှ ထုတ်ပေးပြီး လက်မှတ်ရရှိပါက စီမံကိန်း၏ တည်ဆောက်ခြင်းနှင့် လည်ပတ်ခြင်း အဆင့်များတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုခြင်း လုပ်ငန်းများအား ECC နှင့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ဖော်ပြချက်များအတိုင်း DPTSC မှ လုပ်ဆောင်ရမည်ဖြစ်ပြီး ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) နှင့်အညီ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန ထံသို့ လုပ်ငန်းတည်ဆောက်သည့် ကာလအတွင်း (၆) လတစ်ကြိမ် အစီရင်ခံစာ တင်ပြရမည်ဖြစ်သည်။