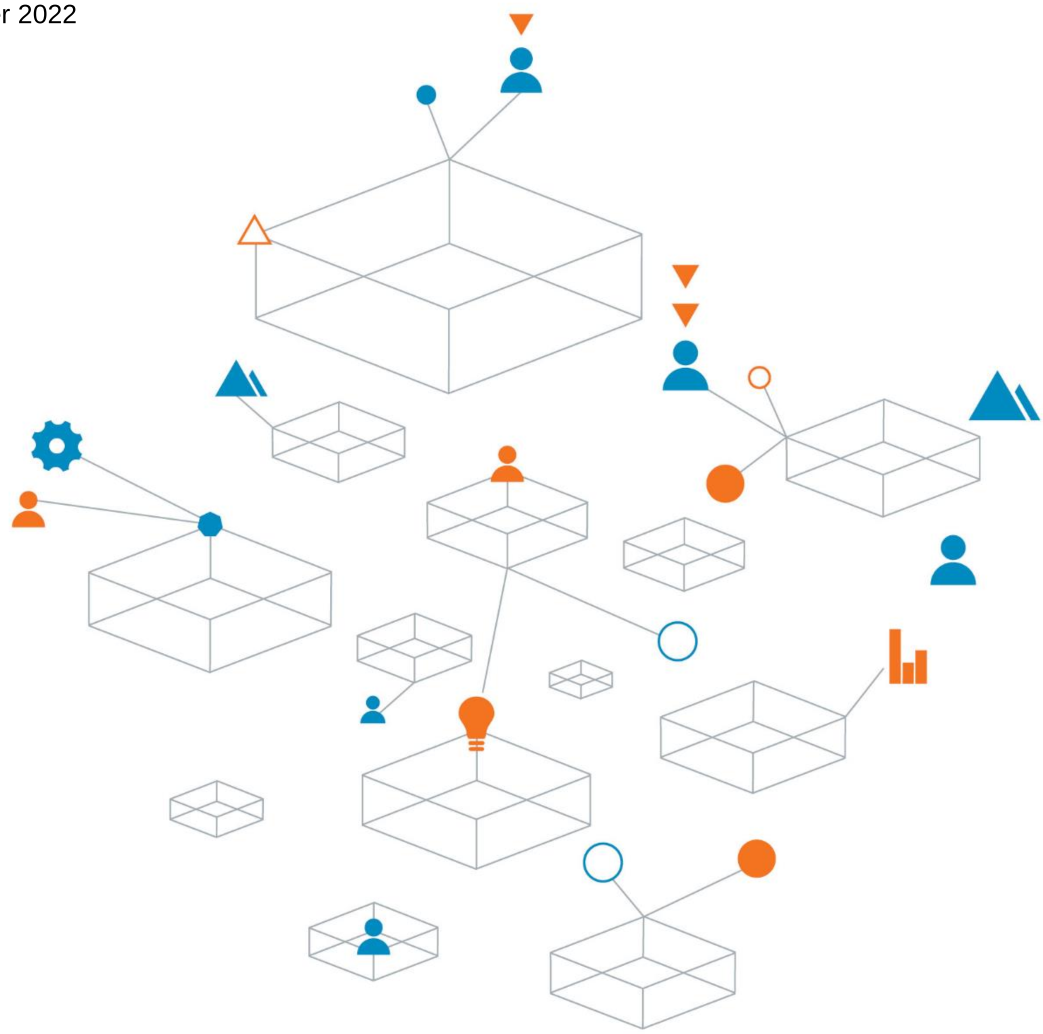
Ministry of Electricity and Energy Department of Power Transmission and System Control
230 kV Baluchaung (2) Loikaw – Taungoo (Sabakywe) Transmission Line Project

Initial Environmental Examination

September 2022



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230 kV Baluchaung (2) Loikaw – Taungoo (Sabakywe) Transmission Line Project – Initial Environmental Examination

Prepared for
Department of Power Transmission and System Control

Prepared by

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In partnership with

Coffey Myanmar Limited

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Quality information

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Glossary and abbreviations

Glossary

amenity *n.* the pleasantness or attractiveness of a place.

aquatic ecology *n.* the biological system comprising plants and animals living or found in or near water.

aquifer *n.* an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt).

biodiversity *n.* the variety among all living things including the different plants, animals and microorganisms, the genetic information they contain, and the ecosystems that they form.

consultation *n.* the action or process of formally discussing.

corona noise *n.* a crackling or humming sound that may emanate from transmission lines in association with corona discharge. Corona discharge is an electrical discharge caused by ionisation of the air surrounding a transmission line.

disturbance *n.* the disruption of existing features.

ecoregion *n.* a geographic region with distinctive environmental characteristics and ecosystems.

ecosystem *n.* an interacting system of animals, plants, other organisms and non-living parts of the environment.

endemic *adj.* native to a certain area.

hazardous material *n.* any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment.

montane rainforest *n.* also known as cloud forest, vegetation of tropical mountainous regions that often experiences heavy rainfall and where persistent condensation occurs due to the cooling of moisture-laden air currents as elevation increases.

PM_{10} particulates with a diameter less than 10 µm.

$PM_{2.5}$ particulates with a diameter less than 2.5 µm.

revegetation *v.* the process of preparing disturbed land to establish the right conditions to encourage a new vegetative cover by natural processes such as plant colonisation and succession, or manmade/active accelerated processes such as direct seeding or seed propagation and planting.

right-of-way *n.* a type of easement that gives someone the right to travel over land owned by someone else.

sedimentation *v.* the process in which sediment settles or is deposited.

substation *n.* part of an electrical generation, transmission and distribution system. A substation transforms the voltage of electricity before it is sent through power lines.

transmission line *n.* a specialised cable or other structure that is designed to conduct alternating current of radio frequency. A transmission line transmits electrical power from a generating substation to various distribution units across a power network.

village tract *n.* an administrative area within a township comprising several villages.

ward *n.* an administrative area within a larger village.

watercourse *n.* a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

Abbreviations

Abbreviation/Acronym	Meaning
BOD	biochemical oxygen demand
CFU	colony forming unit
COD	chemical oxygen demand
dB	A-weighted decibels
DMH	Department of Meteorology and Hydrology
DOP	Department of population
DPTSC	Department of Power Transmission and System Control
EAO	ethnic armed organisation
EC	electrical conductivity
ECC	environmental compliance certificate
ECD	Environmental Conservation Department
EHS	environmental health and safety
EIA	environmental impact assessment
EMMP	Environmental Management and Monitoring Plan
EMP	Environmental Management Plan
GAD	General Administration Department
HSSE	health, safety, security and environment
IAMAT	International Association for Medical Assistance to Travellers
ICOMOS	International Council on Monuments and Sites
IEE	initial environmental examination
IFC	International Finance Corporation
IOS	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IUSS	International Union of Soils Science
JICA	Japan International Cooperation Agency
kg	kilogram
km	kilometres
kV	kilovolts
KWCI	Karen Wildlife Conservation Initiative
L	litre
L_{Aeq}	A-weighted equivalent continuous sound level
m	metre
mg	milligram
MIMU	Myanmar Information Management Unit
MOECAF	Ministry of Environmental Conservation and Forestry
MOEP	Ministry of Electric Power

Abbreviation/Acronym	Meaning
MONREC	Ministry of Natural Resources and Environmental Conservation
NCA	nationwide ceasefire agreement
NEQ	National Environmental Quality
NGO	non-government organisation
NTU	nephelometric turbidity units
PIU	Project Implementation Unit
PMU	Project Management Unit
PM_{10}	particulate matter 10 μm diameter
$PM_{2.5}$	particulate matter 2.5 μm diameter
ROW	right-of-way
TCU	true colour unit
TDS	total dissolved solids
WHO	World Health Organization
WRB	World Reference Base
WWF	World Wildlife Fund

အစီရင်ခံစာ အကျဉ်းချုပ်

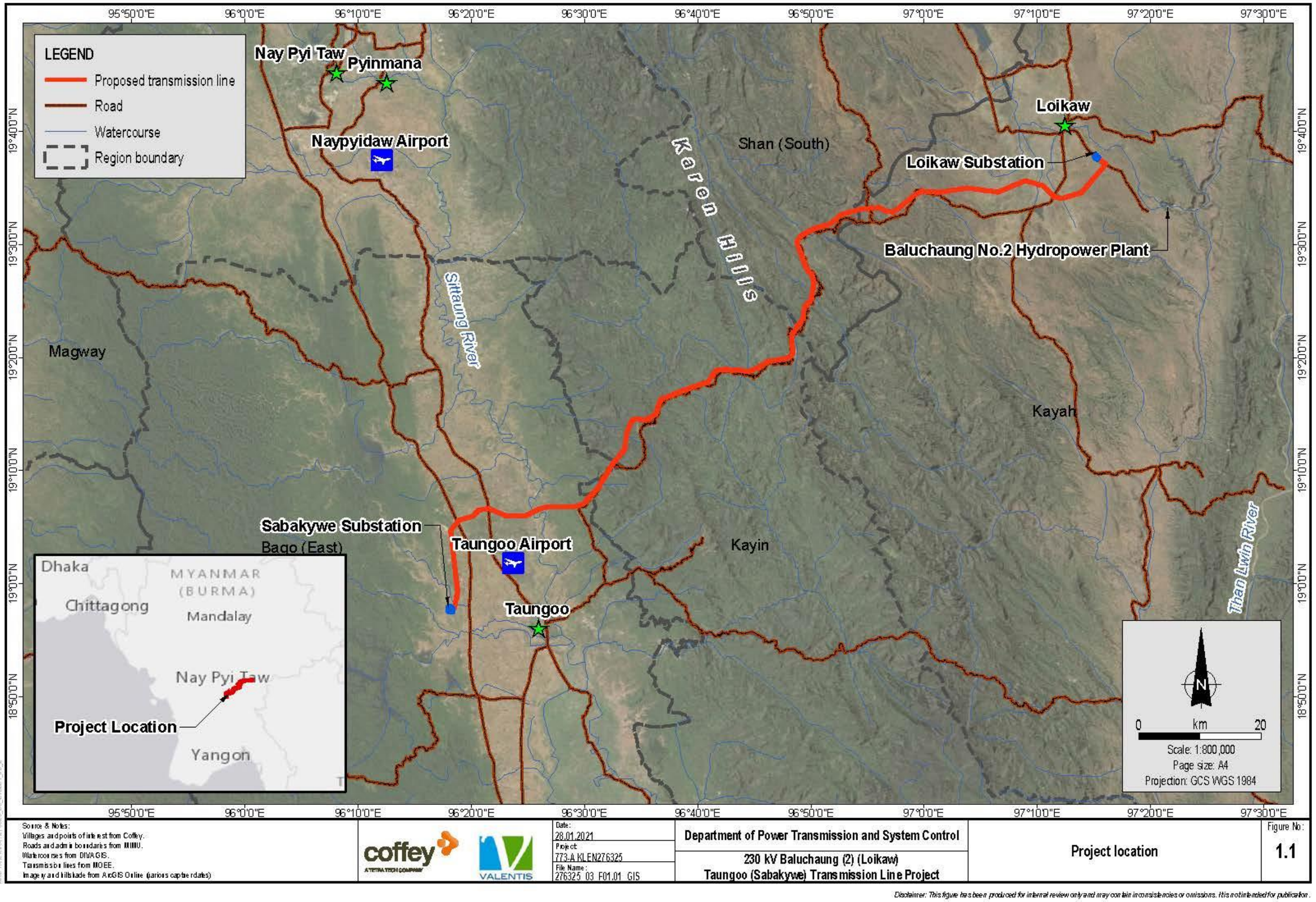
အစီရင်ခံစာအနှစ်ချုပ်

ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE) သည် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးအပေါ် အခြေခံ၍ တင်ပြထားပါသည်။ စီမံကိန်း၏ လက်ရှိပတ်ဝန်းကျင်နှင့် လူမှုရေးစီးပွားရေးဆိုင်ရာ အခြေခံသွင်ပြင် လက္ခဏာများ၊ စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများနှင့် စီစစ်အကဲဖြတ်ချက်များ၊ သက်ရောက်နိုင်သော ဆိုးကျိုးထိခိုက်မှုများကို ရှောင်ရှားခြင်း (သို့) လျော့ချခြင်းနည်းလမ်းများနှင့် စီမံခန့်ခွဲမှု အစီအမံများ စသည်တို့ကို အပြည့်အစုံ ထည့်သွင်းဖော်ပြထားပါသည်။ ထိုအပြင် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် စီမံကိန်းကြောင့် သက်ရောက်မှုရှိနိုင်သော နယ်မြေဒေသများမှ ရပ်ရွာလူထုများနှင့် တိုင်ပင်ဆွေးနွေးမှုများ၊ ရပ်ရွာလူထုနှင့် ဂန်ထမ်းများ တိုင်ကြားချက် ဆောင်ရွက်မှု အစီအစဉ် ပါဝင်ပြီး၊ စီမံကိန်းဆိုင်ရာ အကြံပေးချက်များကို တိကျမှန်ကန်စွာ မှတ်တမ်းတင်ခြင်း၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုနှင့် စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်များ (EMMP) တို့ပါဝင်ပါသည်။ အစီရင်ခံစာသည် စုစုပေါင်းအခန်း (၁၄) ခန်း၊ အပိုဒ်ခွဲပေါင်း (၆၆) ခန်း နှင့် အပိုဒ်ခွဲငယ်ပေါင်း (၈၀)ခန်း ဖြင့် ဖော်ပြထားပါသည်။

အခန်း (၁) နိဒါန်း

လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန (MOEP)၊ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) မှ ဘီလူးချောင်း (၂) လွိုင်ကော် - တောင်ငူ (စပါးကြွယ်) မဟာဓာတ်အားလိုင်း စီမံကိန်းဆောင်ရွက်ရန် အဆိုပြုခဲ့ပါသည်။ ထိုအဆိုပြုစီမံကိန်းသည် ပို့လွှတ်မှု ဝန်အားတိုးမြှင့်ပေးခြင်းနှင့် ဓာတ်အားစနစ် ပိုမိုခိုင်မာတောင့်တင်းစေခြင်းဖြင့် နိုင်ငံတော်ဓာတ်အားလိုင်းစနစ် အဆင့်မြင့်တင်ရာ၌ အထောက်အကူဖြစ်စေမည် ဖြစ်ပါသည်။

ယင်းအဆိုပြုစီမံကိန်းသည် ကယားပြည်နယ်၊ လွိုင်ကော်မြို့နယ်၊ ဘီလူးချောင်းအမှတ်(၂) ရေအားလျှပ်စစ်စက်ရုံမှ ပဲခူးတိုင်းဒေသကြီး၊ တောင်ငူမြို့နယ် စပါးကြွယ်ပင်မဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ မဟာဓာတ်အားလိုင်းကို သံမဏိ ရာဇမတ်တာဝါတိုင်များဖြင့် ဆက်သွယ်သွားမည်ဖြစ်သည်။ ထိုအဆိုပြု ဓာတ်အားလိုင်းသည် ပျမ်းမျှအရှည် ၁၆၀ ကီလိုမီတာခန့်ရှိပြီး ကယား၊ ရှမ်း၊ ကရင်ပြည်နယ်များ နှင့် ပဲခူးတိုင်းဒေသကြီးတို့ကို ဖြတ်သန်းသွားမည်ဖြစ်သည်။ (ပုံ ES - ၁)



ပုံ (၁): အဆိုပြု မဟာဓာတ်အားလိုင်း အူလမ်းကြောင်းပြမြေပုံ

စီမံကိန်းအဆိုပြုသူ/ပိုင်ရှင်

စီမံကိန်းအဆိုပြုသူသည် လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန (MOEP) အောက်ရှိ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) ဖြစ်သည်။ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) သည် သွယ်တန်းခြင်းဆိုင်ရာလုပ်ငန်းများစီမံခြင်း၊ ပြုပြင်ထိန်းသိမ်းမှုနှင့် ဆောက်လုပ်ရေးပရောဂျက်များကို ကြီးကြပ်ကွပ်ကဲခြင်းတို့ကို ပါဝင်လုပ်ဆောင်သည်။ ဆက်သွယ်ရန် အသေးစိတ်အချက်အလက်များကို အောက်ပါ ဇယား-၁ တွင် ဖော်ပြထားပါသည်။

ဇယား (၁) - ဆက်သွယ်ရန် အသေးစိတ်အချက်အလက်များ

အဓိကဆက်သွယ်ရန်	လိပ်စာ
ဦးသူရအောင်ဘို (ညွှန်ကြားရေးမှူးချုပ်) အီးမေးလ်:dgdptsc2021@gmail.com ဖုန်း: +၉၅ (၉)၄၂၈၆၀၁၆၁၉	လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန (MOEP) ရုံးအမှတ် (၂၇), နေပြည်တော် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်

အခန်း (၂) စီမံကိန်းကြောင်းအရာ

အဆိုပြုထားသောစီမံကိန်းသည် ကယားပြည်နယ်၊ လွိုင်ကော်မြို့နယ်၊ ဘီလူးချောင်းအမှတ်(၂) ရေအားလျှပ်စစ်စက်ရုံမှ ပဲခူးတိုင်းဒေသကြီး၊ တောင်ငူမြို့နယ် စပါးကြွယ်ပင်မဓာတ်အားခွဲရုံသို့ ၂၃၀ကေဗွီ မဟာဓာတ်အားလိုင်းမှာ ခန့်မှန်းခြေအားဖြင့် ၁၆၀ ကီလိုမီတာရှည်ပြီး၊ သံမဏိရာဇမတ် တာဝါတိုင် (၄၉၀) တိုင်များပေါ်တွင် ကေဗယ်ကြိုးများဖြင့် သွယ်တန်း ပါမည်။

တာဝါတိုင်တချို့သည် ကြိုးဝိုင်းတော နှင့် ကြိုးပြင်ကာကွယ်တောများကို ဖြတ်သန်းသွားပါမည်။ ကန်ခုနှစ်ဆင့် ကြိုးပြင်ကာကွယ်တော၌ တာဝါတိုင် (၄)တိုင်၊ နမ့်စံဖူး ကြိုးပြင်ကာကွယ်တော၌ တာဝါတိုင် (၂၀)တိုင်၊ ကရင်ချောင်း ကြိုးဝိုင်းတော၌ တာဝါတိုင် (၆)တိုင်နှင့် ပဲခွဲကြိုးဝိုင်းတော၌ တာဝါတိုင် (၉)တိုင်ဖြတ်သန်းသွားမည်ပါမည်။ ထို့ကြောင့် စီမံကိန်းအဆိုပြုသူနှင့် ဆောက်လုပ်ရေးကန်ထရိုက်များသည် သစ်တော ဦးစီးဌာနမှ ခွင့်ပြုမိန့်ကြိုတင်ရယူရမည်ဖြစ်ပါသည်။

လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းရာတွင် ပါဝင်သော အဓိက အစိတ်အပိုင်းများမှာ -

- လျှပ်စစ်ဓာတ်အားပို့ဆောင်ရန်အလူမီနီယမ်အလွိုင်းလျှပ်ကူးပစ္စည်းများ
- လျှပ်ကူးပစ္စည်းများအားထောက်ပံ့ရန် သံမဏိရာဇမတ်တာဝါတိုင်များ
- လျှပ်ကူးပစ္စည်းများအားမျှော်စင်များနှင့်ချိတ်ဆက်ရန် လျှပ်ကာကြိုးများ

- လျှပ်စီးကာကွယ်မှုအတွက် မြေပြင်ဝါယာများ

ဆောက်လုပ်ရေးလုပ်ငန်း၌ လုပ်ငန်းခွင် မြေသားရှင်းလင်းခြင်းနှင့်လမ်းဖောက်လုပ်ခြင်း (လိုအပ်ပါက)၊ အုတ်မြစ် တည်ဆောက်ခြင်းအတွက် မြေညှိခြင်းနှင့် မြေကြီးတူးဖော်ခြင်း၊ တာဝါတိုင် နေရာတစ်ခုစီသို့ ပစ္စည်းများသယ်ယူပို့ဆောင်ခြင်း၊ တာဝါတိုင်များတပ်ဆင်ခြင်းနှင့် တပ်ဆင်ခြင်းမပြုမီ အခြေခံအဆောက်အအုံနှင့် ဆိုင်းကြိုးများ တည်ဆောက်ခြင်းတို့ပါဝင်သည်။ တပ်ဆင်ပြီးသည်နှင့် တစ်ပြိုင်နက် တာဝိုင်တိုင်များအကြား လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းမည်။

သယ်ယူပို့ဆောင်ရေးလမ်းကြောင်း

အဓိက ဆောက်လုပ်ရေးပစ္စည်းများ သယ်ယူပို့ဆောင်ရေးလမ်းကြောင်းမှာ တောင်ငူ-ယာဒိုလမ်းမကြီးဖြစ်ပြီး၊ လိုအပ်သည့်နေရာများတွင် လမ်းဖောက်လုပ်သွားမည်ဖြစ်ပါသည်။ တည်ရှိပြီးသာ ဆက်သွယ်ရေး ကားလမ်းကြောင်းကို တတ်နိုင်သမျှ အများဆုံး အသုံးပြုသွားမည်ဖြစ်ပါသည်။ သံမဏိမျှော်စင်အစိတ်အပိုင်းများကို သင့်လျော်သော ကုန်တင်ကားများဖြင့် ဆောက်လုပ်မည့်နေရာများသို့ ပို့ဆောင်သွားမည်ဖြစ်ပါသည်။ တာဝါတိုင်များဆောက်လုပ်ရန်အတွက် ကရိန်းကားများကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ကရိန်းကားသည် အပိုင်းအစတစ်စုစီကို နေရာချထားသောကြောင့် တာဝါတိုင် အပိုင်းများသည် ကြိုတင်စုစည်းထားသော မျှော်စင်အပိုင်းများကို ပေါင်းသည်းသွားမည်ဖြစ်ပါသည်။

လိုအပ်သော ကိရိယာများ

တည်ဆောက်ရေးလုပ်ငန်းများအတွက် လိုအပ်သော ကိရိယာများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

- Tensioner (90 kN) with 130 hp/2,500 rpm engine
- Puller (70 kN) with 280 hp/2,200 rpm engine
- 3 x engine compressors with 5-6 hp engine
- 2 x engine winches with 5 – 6 hp engine
- Tractor (90 kN) with 150 hp engine
- 3 x trucks (for transportation) (140 hp/3,400 rpm engine)
- Mobile crane (5 tonnes, 190 hp)

ဝန်ထမ်းအင်အားနှင့် အလုပ်ချိန်

တည်ဆောက်ရေးအဆင့်အတွက် စုစုပေါင်း ခန့်မှန်းလုပ်သား ၈၈၀ ဦးရှိပြီး အုတ်မြစ်ချခြင်း၊ တာဝါတိုင်ထောင်ခြင်းနှင့် ဓာတ်ကြိုးသွယ်တန်းခြင်းစသည့် လုပ်ငန်းများအတွက် အဖွဲ့များခွဲ၍ လုပ်ဆောင်သွားမည်။

- အုတ်မြစ်ချခြင်းလုပ်ငန်းအတွင် ဝန်ထမ်း (၃၀)ဦးပါ အဖွဲ့ ၄ ဖွဲ့မှ ၈ ဖွဲ့ထိ
- တာဝါတိုင်ထောင်ခြင်း လုပ်ငန်းအတွက် ဝန်ထမ်း (၃၅) ဦးပါ အဖွဲ့ ၄ ဖွဲ့မှ ၈ ဖွဲ့ထိ
- ဓာတ်ကြိုးသွယ်ခြင်းလုပ်ငန်းအတွက် ဝန်ထမ်း (၆၀) ဦးပါ အဖွဲ့ ၂ ဖွဲ့မှ ၆ ဖွဲ့ထိ

စီမံကိန်း၏ မည်သည့်အဆင့်တွင်မဆို နေ့စဉ်လုပ်ငန်းခွင်အတွင်းတွင် စုစုပေါင်းခန့်မှန်းလုပ်သား (၃၆၀) ဦးအထိ ရှိမည်ဖြစ်ပြီး၊ စီမံကိန်းလည်ပတ်နေစဉ်အတွင်း ပြုပြင်ထိန်းသိမ်းမှုအတွက် ကန်ထရိုက်ဝန်ထမ်း အရေအတွက်များ လိုအပ်ပါသည်။ အလုပ်အချိန်မှာ တစ်ရက်လျှင် (၈) နာရီ နှင့် တပတ်လျှင် (၆) ရက်လုပ်ကိုင်ရမည်ဖြစ်ပါသည်။ တာဝါတိုင်တစ်ခု တည်ဆောက်ခြင်းသည် ခန့်မှန်းခြေအားဖြင့် တစ်ရက်မှ သုံးရက်ခန့်ကြာမည်ဖြစ်ပါသည်။

လုပ်ငန်းခွင် ယာယီအဆောက်အဦများ

စပါးကြွယ်ခတ်အားခွဲရုံအနီး၊ လိပ်သိုမြို့နယ်၊ ယာဒိုကျေးရွာ၊ လွိုခထီကျေးရွာအနီးနှင့် သတ္တပလူကျေးရွာအနီးရှိ နေရာများကို တည်ဆောက်ရေးကာလအတွင်း နေရာထိုင်ခင်း နှင့် ကိရိယာတန်ဆာပလာများ သိုလှောင်ထားရှိရန်နေရာအဖြစ် ကနဦးရွေးချယ်ထားပါသည်။

လုပ်ငန်းခွင် ယာယီအဆောက်အဦရေိယာအတွက် ပေ ၂၀၀x ပေ ၈၀ နီးပါး မြေနေရာ ရှင်းလင်းခြင်း ပြုလုပ်ရပါမည်။ လုပ်ငန်းခွင်အတွင်း ယာယီအဆောက်အဦ (၁၆) လုံးခန့်ရှိမည်။ အစည်းအဝေးခန်းတစ်ခန်း၊ ကုန်ကြမ်းသိုလှောင်ရုံတစ်ခု၊ ဝန်ထမ်းနားနေဆောင် (၃) လုံး၊ ကားရပ်နားရာနေရာ၊ အလုပ်ရုံတစ်ခု၊ စားဖိုဆောင်တစ်ခု၊ လောင်စာဆီသိုလှောင်ရုံတစ်ခု၊ မီးစက်ဆောင်၊ ရေကန်၊ အိမ်သာ၊ ရေချိုးခန်း၊ အမှိုက်စွန့်ပစ်ရာနေရာ၊ ဝင်ပေါက်ဂိတ်နှင့် ဆေးပေးခန်းတစ်ခု ပါရှိပါမည်။ ဤယာယီအဆောက်အဦများကို သက်ကယ်မိုး (သို့) တာလပတ် (မိုးကာဖျင်၊ ဝါး ထရံ အကာနှင့် ဝါးကွပ် ကြမ်းခင်းများဖြင့် တည်ဆောက်သွားပါမည်။ လုပ်ငန်းခွင် ယာယီအဆောက်အဦတွင် စုစုပေါင်းဝန်ထမ်း(၁၂၀) ဦးခန့် နေထိုင်မည်ဖြစ်ပြီး၊ နေစားဝန်ထမ်းများကို အနီးရှိရွာများမှ ခန့်အပ်သွားမည်ဖြစ်ပါသည်။

ရေအသုံးပြုမှု

ရေအရင်းမြစ်အနေဖြင့် စီမံကိန်းအနီးနားရှိ ချောင်းများနှင့် ရေထွက်များမှ ရယူပါမည်။ ရေများကို သိုလှောင်ကန်၌ သိမ်းဆည်း၍ အသုံးပြုသွားပါမည်။ တည်ဆောက်ရေးလုပ်ငန်းများ၊ ဆေးကြော သန့်ရှင်းရေးလုပ်ငန်းများ၊ တကိုယ်ရည် သုံးစွဲခြင်း၊ ချက်ပြုတ်ရေးနှင့် သောက်သုံးရေအတွက် စုစုပေါင်းရေလိုအပ်ချက်မှာ တစ်ရက်လျှင် ၁၀,၄၆၀ လီတာ (တစ်လလျှင် ၃၁၀, ၈၀၀ လီတာ) ခန့်လိုအပ်နိုင်ပါသည်။

စီမံကိန်း၏ ရေရယူသုံးစွဲမှုသည် စီမံကိန်းဝန်းကျင်ရှိ သဘာဝရေစီးဆင်းမှုလမ်းကြောင်း (ရေစီးဆင်းရာလမ်းကြောင်း၊ ချောင်းများ၊ ရေလွှမ်းလွင်ပြင်များ) ကို အနှောက်အယှက်မဖြစ်စေရန် စနစ်တကျ စီစဉ်ဆောင်ရွက်ပါမည်။

စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲခြင်း

စွန့်ပစ်ပစ္စည်းအနေဖြင့် အခြေစိုက်စခန်းနှင့် လုပ်ငန်းဆောင်ရွက်ရာနေရာတို့မှ အစိုင်အခဲနှင့် စွန့်ပစ်အရည်တို့ အဓိကထွက်ရှိနိုင်ပြီး အစိုင်အခဲစွန့်ပစ်ပစ္စည်း တစ်ရက်လျှင် ပျှမ်းမျှ(၆၈)ကီလိုဂရမ် လည်းကောင်း၊ စွန့်ပစ်အရည်အနေဖြင့် တစ်ရက်လျှင်သာမန် ရေဆိုး(၂,၄၀၀)ဂါလံနှင့် မိလ္လာရေ(၄၈)ဂါလံ လည်းကောင်းထွက်ရှိနိုင်ပါသည်။ စီမံကိန်းအနေဖြင့် စွန့်ပစ်အစိုင်အခဲစီမံခန့်ခွဲရာတွင် လျှော့ချသုံးစွဲခြင်း၊

ဆက်လက်အသုံးပြုခြင်း၊ ပြန်လည်သုံးစွဲခြင်းနှင့် စွန့်ပစ်ခြင်းစသည့် အဆင့်လိုက် စနစ်တကျ ကိုင်တွယ်ဆောင်ရွက် သွားမည်ဖြစ်သည်။

စွန့်ပစ်အစိုင်အခဲများကို အခြေစိုက်စခန်းရှိ သတ်မှတ်ထားသော အမှိုက်စွန့်နေရာတွင်သာ စနစ်တကျစွန့်ပစ်စေမည်ဖြစ်သည်။ စွန့်ပစ်အရည်များကို အဓိကအားဖြင့် သာမန်ရေဆိုးနှင့် မိလ္လာရေဆိုးအနေဖြင့် ခွဲခြားနိုင်ပြီးလက်ဆေးစင်၊ ရေချိုးကန်စသည်မှ ထွက်ရှိသော သာမန်ရေဆိုးများကို သာမန်ရေဆိုးစုကန်သို့ ပို့ဆောင်စေပြီး ထိုမှတဆင့် အိမ်သာရေဆေးရန် ပြန်လည်သုံးစွဲသွားစေမည် ဖြစ်သည်။ ယင်းမှထွက်ရှိသော မိလ္လာရေများကို မိလ္လာကန်များသို့ ပို့ဆောင်ကာ သိုလှောင်စေမည်ဖြစ်သည်။

လောင်စာဆီ အသုံးပြုမှု

စီမံကိန်း၏ လုပ်ငန်းအဆင့်အားလုံးတွင် အသုံးပြုသော စက်ယန္တရားများ၊ ကားများ နှင့် ဂျန်နရေတာများတွင် ဒီဇယ်နှင့် ဓာတ်ဆီကို အသုံးပြုပါမည်။ တည်ဆောက်ခြင်းလုပ်ငန်းအဆင့်၏ စက်ယန္တရားများနှင့် သယ်ယူပို့ဆောင်ခြင်းလုပ်ငန်းများအတွက် စုစုပေါင်း လောင်စာဆီလိုအပ်ချက်မှာ တစ်ရက်လျှင် ၁၀-၁၅ ဂါလန်ခန့် (တစ်လလျှင် ၂၄၀-၃၆၀ ဂါလန်ခန့်)ဖြစ်ပြီး ဂျန်နရေတာ၊ လျှပ်စစ်မီးနှင့် ရေသုံးစွဲမှုအတွက် စုစုပေါင်း လောင်စာဆီလိုအပ်ချက်မှာ တစ်ရက်လျှင် ၅-၁၀ ဂါလန်ခန့် (တစ်လလျှင် ၁၅၀-၃၀၀ ဂါလန်ခန့်)ဖြစ်ပါသည်။

အချိန်ဇယားနှင့် ငွေကြေး

စီမံကိန်းအတွက် ဖြစ်နိုင်ခြေလေ့လာမှုကို ၂၀၂၁ ခုနှစ်တွင် ပြီးစီးရန် မျှော်လင့်ထားပြီး စီမံကိန်းကို ၂၀၂၂ ခုနှစ်တွင် ဆောင်လုပ်နိုင်ရန် မျှော်မှန်းထားသည်။ ကိုရီးယားသမ္မတနိုင်ငံမှ EDCF ချေးငွေဖြင့် အကောင်အထည်ဖော်ရန် ရည်ရွယ်ပါသည်။ စီမံကိန်း၏ ဖြစ်နိုင်ခြေလေ့လာမှုကို ကိုရီးယားနိုင်ငံဘက်မှ ဆောင်ရွက်ပေးမည်ဖြစ်ပြီး IEE လုပ်ငန်းစဉ်များကို မြန်မာနိုင်ငံဘက်မှ ဆောင်ရွက်မည်ဖြစ်သည်။ ယင်းလုပ်ငန်းစဉ်များ ပြီးစီးပါက စီမံကိန်းကုန်ကျစရိတ်ကို အကဲဖြတ်မည်ဖြစ်ပြီး ချေးငွေသဘောတူညီချက်ကို လက်မှတ်ရေးထိုးမည်ဖြစ်သည်။

အခြားနည်းလမ်းများ

စီမံကိန်းအတွက် အခြားရွေးချယ်စရာနည်းလမ်းများကို ထည့်သွင်းစဉ်းစားရာ၌ စီမံကိန်းကိုဆက်လက်မလုပ်ဆောင်ခြင်း၊ အခြားဓာတ်အားလိုင်းလမ်းကြောင်းများ၊ အခြားတည်ဆောက်ပုံနှင့် ဆောက်လုပ်ရေးနည်းလမ်းများ စသည်တို့ကို ထည့်သွင်း စဉ်းစားခဲ့ပါသည်။

အခြားရွေးချယ်စရာလမ်းကြောင်းများကို အကဲဖြတ်မှု၌ ထည့်သွင်းစဉ်းစားထားသောအဓိကအချက်များမှာ -

- ဆက်သွယ်မှုအတွက်လိုအပ်သောနေရာ၊ အခြေခံအဆောက်အဦးများ တည်ဆောက်နိုင်ခြင်းရှိ/မရှိခြင်း၊ ရာသီဥတုအခြေအနေ၊ မြေမျက်နှာသွင်ပြင်နှင့် ဘူမိနည်းပညာဆိုင်ရာကန့်သတ်ချက်များ စသည့် ရုပ်ဝတ္ထုဆိုင်ရာ ကန့်သတ်ချက်များ။
- စီမံကိန်းဧရိယာအတွင်း သဘာဝပတ်ဝန်းကျင်အခြေအနေနှင့် သဘာဝပတ်ဝန်းကျင်ထိခိုက်လွယ်မှုများ လွှမ်းမိုးခြင်း ရှိ/မရှိ။

- အလားအလာရှိသော ထိခိုက်နစ်နာနိုင်သော လူမှုအသိုင်းအဝိုင်းများ၊ ၎င်းတို့၏တန်ဖိုးများနှင့် စိုးရိမ်မှုများအပါအဝင် လူမှုရေးကန့်သတ်ချက်များ။
- စီးပွားရေးအခန်းကဏ္ဍ-စီမံကိန်းဖွံ့ဖြိုးတိုးတက်မှု အသုံးစရိတ်များ၊ စီမံကိန်းကြောင့် ရရှိလာမည့် အကျိုးအမြတ်များ။

အဆိုပြုထားသောလမ်းကြောင်းအား အနည်းအကျဥ်း ညှိနှိုင်းခြင်းများကို စီမံကိန်းဖြစ်နိုင်ခြေ လေ့လာမှုနှင့် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်သက်ရောက်မှုများ အကဲဖြတ်ခြင်းလုပ်ငန်းများကို တစ်စိတ်တစ်ပိုင်းအဖြစ်လည်း ထည့်သွင်း စဉ်းစားခဲ့ပါသည်။ တောင်တန်းများနှင့် သစ်တောမြေများကိုရှောင်ရှားသော အခြားလမ်းကြောင်းများသည် စီးပွားရေးအရ တွက်ခြေမကိုက်ပါ။

အခြားတာဝါတိုင်ဖွဲ့စည်းပုံ အမျိုးအစားများကို ထည့်သွင်းစဉ်းစားခဲ့သည်။ လက်ရှိအသုံးပြုနေသော ကွန်ယက်၏ အများစုနှင့်ကိုက်ညီစေရန် သံမဏိ ရာဇမတ်တာဝါတိုင်များကိုရွေးချယ်ခဲ့သည်။

စီမံကိန်းမှ စွမ်းအင်အရင်းအမြစ်များ ရရှိနိုင်မှု တိုးတက်လာမည်ဖြစ်ပါသည်။ ထို့ကြောင့် ကွန်ယက်၏ လျှပ်စစ်တည်ငြိမ်မှုကို တိုးတက်စေခြင်း၊ လူမှုရေး၊ စီးပွားရေးအကျိုးအမြတ်များနှင့်အတူ ရေရှည်တည်တံ့သော စက်မှုဖွံ့ဖြိုးတိုးတက်မှုကို အထောက်အကူ ပြုလိမ့်မည်။ ထို့ကြောင့် အခြေခံအားဖြင့် စီမံကိန်းအား ဆက်လက်မလုပ်ဆောင်ရန် ရွေးချယ်ခြင်းကို ပယ်ဖျက်ခဲ့သည်။

အခန်း (၃) မူဝါဒ၊ ဥပဒေနှင့် မူဘောင်များ

စီမံကိန်းသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂) အရ ပတ်ဂန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) လုပ်ထုံးလုပ်နည်း (၂၀၁၅) ဆန်းစစ်ခြင်း လိုအပ်ပါသည်။ EIA လုပ်ထုံးလုပ်နည်းသည် ဆိုးကျိုးသက်ရောက်နိုင်သည့် စီမံကိန်းများ၏ ဖွံ့ဖြိုးတိုးတက်မှုအတွက် ပတ်ဂန်းကျင်ဆိုင်ရာဆန်းစစ်မှုကို လမ်းညွှန်ချက်ပေးပြီး၊ ဖွံ့ဖြိုးမှု၏ သဘောသဘာဝနှင့် အရွယ်အစားပေါ်မူတည်၍ လိုအပ်သော ဆန်းစစ်ခြင်းအဆင့်ကို ဖော်ပြထားသည်။ စီမံကိန်းအဆိုပြုလွှာကို တင်ပြပြီးနောက် စီမံကိန်းကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE) အမျိုးအစားစီမံကိန်းအဖြစ် သတ်မှတ်လိုက်ပါသည်။

စီမံကိန်းသည် သက်ဆိုင်ရာ မြန်မာနိုင်ငံဥပဒေနှင့် လမ်းညွှန်ချက်များအပြင်၊ သက်ဆိုင်ရာ အမျိုးသားမူဝါဒများနှင့် စံချိန်စံညွှန်းများဖြစ်သော အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၊ အပြည်ပြည်ဆိုင်ရာ ငွေကြေးကော်ပိုရေးရှင်း (IFC) နှင့် အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းအဖွဲ့အစည်းများ၏ စံချိန်စံညွှန်းများနှင့် လမ်းညွှန်ချက်များ အတိုင်း ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

မြန်မာနိုင်ငံရှိ ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းဆိုင်ရာ စည်းမျဉ်းစည်းကမ်းမူဘောင်

- ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)
- အမျိုးသားပတ်ဝန်း ကျင်ဆိုင်ရာ ပေါ်လစီ (၁၉၉၄)
- Myanmar Agenda 21 (၁၉၉၇)
- စဉ်ဆက်မပြတ်ဖွံ့ဖြိုးတိုးတက်ရေးဆိုင်ရာမဟာဗျူဟာ (၂၀၀၉)

ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒ၊ ဥပဒေများနှင့် စည်းကမ်းများ

- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒ (၂၀၁၉)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၂)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်းဥပဒေ (၂၀၁၄)
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅)

သဘာဝပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအတွက် သက်ဆိုင်ရာဥပဒေများ၊ မူဝါဒများနှင့် စံနှုန်းများ

- လျှပ်စစ်ဥပဒေ (၂၀၁၄)
- အမျိုးသားစွမ်းအင်မူဝါဒ (၂၀၁၄)
- ရန်ကုန်တိုင်းဒေသကြီး စည်ပင်သာယာရေးဥပဒေ (၂၀၁၈)

အခြားသော တည်ဆဲဥပဒေများနှင့် နည်းဥပဒေများ

- သစ်တောဥပဒေ (၁၉၉၂)
- သစ်တောနည်းဥပဒေ (၂၀၁၈)
- တောရိုင်းတိရစ္ဆာန်နှင့် သဘာဝအပင်များ ကာကွယ်ရေးနှင့် သဘာဝနယ်မြေများ ထိန်းသိမ်းရေးဥပဒေ (၁၉၉၄)
- ဇီဝမျိုးစုံမျိုးကွဲနှင့် သဘာဝထိန်းသိမ်းရေးနယ်မြေများ ကာကွယ်ရေးဥပဒေ (၂၀၁၈)
- ရေအရင်းအမြစ်နှင့်မြစ်၊ချောင်းများထိန်းသိမ်းရေးဥပဒေ (၂၀၀၆)
- ရေချိုငါးလုပ်ငန်းဥပဒေ (၁၉၉၁)
- မြေသိမ်းအက်ဥပဒေ (၁၈၉၄)
- လယ်ယာမြေဥပဒေ (၂၀၁၂)
- သဘာဝဘေးအန္တရာယ်စီမံခန့်ခွဲမှုဥပဒေ (၂၀၁၃)
- ပြည်သူ့ကျန်းမာရေးဥပဒေ (၁၉၇၂)
- ကူးစက်ရောဂါများကာကွယ်နှိမ်နင်းရေးဥပဒေ (၁၉၉၅)
- မြန်မာနိုင်ငံမီးသတ်တပ်ဖွဲ့ဥပဒေ (၂၀၀၅)
- မော်တော်ယာဉ်ဥပဒေ (၂၀၁၅) နှင့် နည်းဥပဒေ (၁၉၈၇)
- ရှေးဟောင်းဝတ္ထုပစ္စည်းများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၅)
- ရှေးဟောင်းအဆောက်အအုံများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၅)
- ယဉ်ကျေးမှုအမွေအနှစ်ဒေသများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၁၉၉၈)
- အလုပ်သမား အဖွဲ့အစည်းဥပဒေ(၂၀၁၁)
- အလုပ်အကိုင်နှင့် ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ (၂၀၁၃)
- လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် ကျန်းမာရေးဥပဒေ (၂၀၁၉)
- လူမှုဖူလုံရေးဥပဒေ (၂၀၁၆)
- အလုပ်သမားလျော်ကြေးအက်ဥပဒေ (၁၉၂၃)
- အနည်းဆုံးအခကြေးငွေဥပဒေ (၂၀၁၃)

- အခကြေးငွေပေးချေရေးဥပဒေ (၂၀၁၆)

အမျိုးသားမူဝါဒနှင့် စံချိန်စံညွှန်းများ

- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅)
- စွန့်ထုတ်အရည်အဆင့်သတ်မှတ်ချက်များ (လျှပ်စစ်ဓာတ်အားထုတ်လွှတ်ခြင်းနှင့် ဖြန့်ဖြူးခြင်းလုပ်ငန်း)
- စွန့်ပစ်ရေ၊ စီးဆင်းရေ၊ ထုတ်လွှတ်အရည်နှင့် မိလ္လာရေစွန့်ထုတ်မှု
- သောက်သုံးရေအရည်အသွေး စံချိန်စံညွှန်း
- မြေအောက်ရေအရည်အသွေး စံချိန်စံညွှန်း
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) တန်ဖိုး (လေအရည်အသွေးနှင့် ဆူညံသံအဆင့်)
- လျှပ်စစ်၊သံလိုက်စက်ကွင်းများနှင့် ထိတွေ့မှုကန့်သတ်ချက်များ
- မြေအရည်အသွေး စံချိန်စံညွှန်း

နိုင်ငံတကာ စံချိန်စံညွှန်းများနှင့် လမ်းညွှန်ချက်များ နှင့် နိုင်ငံတကာ ကွန်ဗန်းရှင်းများနှင့် သဘောတူညီချက်များ

- The World Bank Environmental and Social Framework (The World Bank, 2017)
- The Equator Principles (EPFI, 2013)
- IFC Performance Standards on Environmental and Sustainability (IFC, 2012)
- Environmental, Health, and Safety General Guidelines (IFC, 2007a)
- IFC Handbook for preparing a resettlement action plan (IFC, 2002)
- International Labour Organization standards
- International Organization for Standardization (IOS)

စီမံကိန်းနှင့်သက်ဆိုင်သော နိုင်ငံတကာ ကွန်ဗန်းရှင်းများနှင့် သဘောတူညီချက်များ

- မြန်မာနိုင်ငံနှင့် နိုင်ငံတကာ ပတ်ဝန်းကျင်ဆိုင်ရာ ကွန်ဗင်းရှင်းများနှင့် သဘောတူညီချက်များ

အခန်း (၄) ကတိကဝတ်

ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE) တွင် ပါဝင်သော စီမံကိန်းအကြောင်းအရာ အချက်အလက်များသည် မှန်ကန်ပါသည်။ သဘာဝပတ်ဝန်းကျင် ထိခိုက်မှု လျော့ပါးစေရန် လုပ်ဆောင်မှုများ ဆောင်ရွက်သွားမည်။ စီမံကိန်းနှင့်သက်ဆိုင်သည့် ဥပဒေများ၊ စည်းမျဉ်းစည်းကမ်းများ၊ လမ်းညွှန်ချက်များ၊ လုပ်ထုံးလုပ်နည်းများနှင့် နိုင်ငံတကာ စည်းမျဉ်းများကို လိုက်နာသွားပါမည်။ ဤအစီရင်ခံစာတွင် စီမံကိန်းအဆိုပြုသူနှင့် အစီရင်ခံစာရေးသားသည့် တတိယအဖွဲ့အစည်းတို့၏ ကတိကဝတ်များ ထည့်သွင်းဖော်ပြထားပါသည်။

အခန်း (၅) လက်ရှိ ပတ်ဝန်းကျင်ဆိုင်ရာဖော်ပြချက်

ဤအခန်းတွင် စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လည်ပတ်ခြင်းပြုလုပ်မည့်ဧရိယာအနီးရှိ လက်ရှိပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားအခြေအနေများကို ဖော်ပြထားပါသည်။

- ရုပ်ပိုင်းဆိုင်ရာအင်္ဂါရပ် (မြေမျက်နှာသွင်ပြင်၊ မိုးလေဝသ၊ မြေထုပုံသဏ္ဍာန်၊ မြေအမျိုးအစားများ၊ မြေဖိုးလွှမ်းမှု၊ ဘူမိဗေဒ၊ ဇလဗေဒ၊ ဇီဝကမ္မဗေဒ၊ သဘာဝဘေးအန္တရာယ်များ၊ စသည်ဖြင့်)
- ရုပ်ပိုင်းဆိုင်ရာပတ်ဝန်းကျင် (ရေအရည်အသွေး၊ လေထုအရည်အသွေး၊ မြေဆီလွှာအရည်အသွေး၊ ဆူညံသံနှင့် မြေပုံစံများ စသည်ဖြင့်)
- ဂေဟဗေဒပတ်ဝန်းကျင် (ကာကွယ်ထားသောဧရိယာများ၊ ပန်းခြံနှင့် အပင်နှင့် တိရစ္ဆာန်များနှင့် ဂေဟစနစ်ဝန်ဆောင်မှုများစသဖြင့်)
- လူမှုစီးပွားပတ်ဝန်းကျင် (လူဦးရေ၊ စီးပွားရေးနှင့် အခြေခံအဆောက်အဦ အခြေအနေများ စသည်ဖြင့်)

ကွင်းဆင်းလေ့လာကြည့်ရှုခြင်း၊ စစ်တမ်းကောက်ယူခြင်းနှင့် ရပ်ရွာနှင့်စီမံကိန်း၏ဝန်ထမ်းများနှင့် ထိတွေ့ဆက်ဆံခြင်းတို့ဖြင့် အခြေခံအချက်အလက်များကို ကောက်ယူထားပါသည်။ အခြေခံအချက်အလက်များ ကောက်ယူခြင်းဆိုင်ရာလုပ်ငန်းအားလုံးကို စက်တင်ဘာ ၂၀၂၀ မှ ဖေဖော်ဝါရီ ၂၀၂၂ ခုနှစ်အတွင်း လုပ်ဆောင်ခဲ့ပါသည်။ အဓိကကျသော အခြေခံကျသည့် စောင့်ကြည့် အချက်အလက်များတွင် ရေအရည်အသွေး၊ လေထုအရည်အသွေး၊ လေတိုက်နှုန်းနှင့် လေတိုက်ရာလမ်းကြောင်း၊ ဆူညံသံအဆင့်၊ မြေဆီလွှာအရည်အသွေး၊ မြေပုံသဏ္ဍာန်စစ်တမ်း၊ အပင်နှင့် တိရစ္ဆာန်များ ၏ ဂေဟစနစ်ဆိုင်ရာ အင်္ဂါရပ်များ ပါဝင်ပါသည်။ရေနမူနာများကို ALARM ဓာတ်ခွဲခန်းနှင့် မြေအသုံးချမှုဦးစီးဌာန (စိုက်ပျိုးရေး၊ မွေးမြူရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန ဓာတ်ခွဲခန်း) တွင် ခွဲခြမ်းစိတ်ဖြာခဲ့သည်။ ရရှိသောရလဒ်များကို အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၏ စံနှုန်းများနှင့် နှိုင်းယှဉ်ခဲ့ပါသည်။ မြေမျက်နှာသွင်ပြင်၊ ဇလဗေဒ၊ မိုးလေဝသ၊ ပထဝီဝင်ဗေဒ၊ မြေဖိုးလွှမ်းမှု၊ သဘာဝဘေး အန္တရာယ်များနှင့် လူဦးရေစာရင်းဆိုင်ရာအချက်များသည် သက်ဆိုင်ရာ အစိုးရအဖွဲ့အစည်းများမှ စုဆောင်းရရှိသည့် ဒုတိယအချက်အလက်များအပေါ် အခြေခံပြီး ကိုးကား၍ ဖော်ပြထားပါသည်။

စီမံကိန်းတည်ရှိမှု အခြေအနေ

အဆိုပါစီမံကိန်းသည် ကယားပြည်နယ်၊ ရှမ်းပြည်နယ်၊ ကရင်ပြည်နယ်နှင့် ပဲခူးတိုင်းဒေသကြီး၏ အပိုင်းများကို ဖြတ်ကျော်သွားမည်ဖြစ်သည်။

ဇီဝရူပဗေဒ အခြေအနေ

လွိုင်ကော်နှင့် စပါးကြွယ် ဓာတ်အားခွဲရုံများသည် မြေနိမ့်ဒေသများ၌ တည်ရှိပြီး ကယား-ကရင်တောင်တန်း ခေါ် ကရင်တောင်တန်းများက ပိုင်းခြားထားသည်။ စီမံကိန်းဧရိယာ၏ အနောက်ဘက်အပိုင်း၌ စစ်တောင်းမြစ်ဝှမ်း တည်ရှိသည်။

ကယား - ကရင်တောင်တန်းများသည် မိုးသုန်သစ်တောဂေဟစနစ်တွင် တည်ရှိသည်။ ယင်းတောင်တန်းများသည် သဘာဝအရ မတ်စောက်ပြီးကျောက်ထူထပ်ပေါ်များ၍ အမြင့်အားဖြင့် မီတာ ၂၀၀၀ ကျော်မြင့်သည်။ သစ်တောပြုန်းတီးခြင်းနှင့် ခုတ်ထွင်မှု အလေ့အကျင့်များကြောင့် သဘာဝပတ်ဝန်းကျင်များ ယိုယွင်း ပျက်စီးလာခဲ့သည်။ ဓာတ်အားလိုင်း သွယ်တန်းရာလမ်းကြောင်းသည် ဘူမိဗေဒနှင့် မြေဆီလွှာအမျိုးမျိုးကို ဖြတ်ကျော်သွားပါမည်။

စီမံကိန်းဧရိယာအများစုသည် ကယား-ကရင်မိုးသစ်တောဂေဟစနစ်အတွင်း၌ တည်ရှိပြီး၊ ငှက်နှင့် နို့တိုက်သတ္တဝါမျိုးစိတ်များ ကြွယ်ဝသော ဒေသဖြစ်ပါသည်။ ကရင်တောင်တန်းတစ်ဖက်ခြမ်းရှိ မြေနိမ့်ပိုင်းဒေသများသည် စိုက်ပျိုးရေးနှင့် ကောက်ပဲသီးနှံစိုက်ပျိုးရေးအတွက် မြေညှိရှင်းလင်းထားပြီး ဖြစ်ပါသည်။ အဓိက စိုက်ပျိုးသီးနှံမှာ ဆန်စပါးဖြစ်ပါသည်။

အဆိုပြုထားသော ဓါတ်အားလိုင်းလမ်းကြောင်း၏ အနောက်ဘက်ခြမ်းသည် ထိခိုက်လွယ်သော ရွက်ကြွေမုတ်သုန်သစ်တောဂေဟာအတွင်းတွင် တည်ရှိပါသည်။ ဤဂေဟစနစ်တွင် ဧရိယာအများစုကို စိုက်ပျိုးရေးအတွက် အသုံးပြုရန် ရှင်းလင်းခုတ်ထွင်ထားပြီး ဖြစ်ပါသည်။ တောင်ငူအနီးအနားတဝိုက် ပတ်ဝန်းကျင်သည် လူတို့၏လုပ်ဆောင်မှုများကြောင့် ထင်ရှားစွာ နှောင့်ယှက်ခံရပြီး၊ ပတ်ဝန်းကျင်သွင်ပြင် အနေအထားမှာ မြက်ခင်း၊ လယ်ယာမြေနှင့် ချုံပုတ်များအဖြစ်တည်ရှိနေပါသည်။

အဆိုပြုထားသော ဓာတ်အားလိုင်းလမ်းကြောင်းသည် အောက်ပါ ကြိုးဝိုင်းတော နှင့် ကြိုးပြင်ကာကွယ်တော များကို ဖြတ်သန်းသွားပါမည်။

- စစ်တောင်းမြစ်အရှေ့ဘက်ရှိ ပဒဲ့ ကြိုးဝိုင်းတော
- ကရင်တောင်တန်းအနောက်ဘက်ခြမ်းရှိ ကရင်ချောင်း ကြိုးဝိုင်းတော အစွန်းဖျား
- ကရင်တောင်တန်းအရှေ့ဘက်ခြမ်း နှင့် လွိုင်ကော်အနောက်တောင်ဘက်ရှိ နမ့်စံဖူး ကြိုးပြင်ကာကွယ်တော
- လွိုင်ကော် တောင်ဘက်ရှိ ကန်ခုနှစ်ဆင့် ကြိုးပြင်ကာကွယ်တော မြောက်ဖက်အစွန်း

စီမံကိန်းဧရိယာအတွင်း ဇီဝမျိုးစိတ်များကို ကွင်းဆင်းပြုစုရာတွင် အပြည်ပြည်ဆိုင်ရာ သဘာဝ ထိန်းသိမ်းစောင့်ရှောက်ရေးသမဂ္ဂ (IUCN)မှ ပြဋ္ဌာန်းထားချက်များအရ အလွန်အမင်းမျိုးသုဥ်းရန် အန္တရာယ်ရှိနိုင်သောမျိုးစိတ် ၁၀ မျိုး (နို့တိုက်သတ္တဝါမျိုးစိတ် ၂ ခု၊ ငှက်မျိုးစိတ် ၆ ခုနှင့် ကုန်းနေရေနေ တွားသွား မျိုးစိတ် ၂ ခု)၊ မျိုးသုဥ်းရန်အန္တရာယ်ရှိသည့်မျိုးစိတ် ၁၅ မျိုး (နို့တိုက်သတ္တဝါမျိုးစိတ် ၈ ခု နှင့်ငှက်မျိုးစိတ် ၇ ခု)၊ ထိခိုက်လွယ်သည့်မျိုးစိတ် ၂၄ မျိုး (နို့တိုက်သတ္တဝါမျိုးစိတ် ၁၂ ခု၊ ငှက်မျိုးစိတ် ၁၀ ခု နှင့် ကုန်းနေရေနေ တွားသွား မျိုးစိတ် ၂ ခု) နှင့်မျိုးသုဉ်းရန်ခြိမ်းခြောက်မှုရှိသောမျိုးစိတ် ၃၈ မျိုး (နို့တိုက်သတ္တဝါမျိုးစိတ် ၇ ခု၊ ငှက်မျိုးစိတ် ၃၀ ခု နှင့် ကုန်းနေရေနေ တွားသွား မျိုးစိတ် ၁ ခု) စသည်တို့ကို ရှာဖွေတွေ့ရှိပါသည်။

စီမံကိန်းနယ်မြေ၏ အနောက်ပိုင်း တစ်စိတ်တစ်ဒေသမှာ အပူပိုင်းဒေသနှင့် အပူပိုင်းရေလွှမ်းမိုးသော လွင်ပြင်မြစ်များနှင့် စိုစွတ်သောမြေများပါဝင်သည့် စစ်တောင်း-ဧရာဝတီ ရေချိုဂေဟစနစ်အတွင်းတွင် တည်ရှိသည်။

စစ်တောင်းမြစ်သည် သဘာဝပတ်ဝန်းကျင်ထိခိုက်မှု နည်းပါးမည် ယူဆရသည်။ စီမံကိန်းဧရိယာ၏ အရှေ့ပိုင်းသည် အပူပိုင်းဒေသနှင့်အပူပိုင်းဒေသကုန်းမြင့်ရှိ မြစ်များသည် အလယ်သံလွင်ရေချိုဂေဟစနစ်တွင် တည်ရှိသည်။ သံလွင်မြစ်ဖြတ်သန်းရာ နေရာအများစုသည် အလယ်အလတ်ထိခိုက်နိုင်သော ဂေဟစနစ် ရှိနိုင်သည်ဟု ယူဆရသော်လည်း အင်းလေးကန်နှင့် ဘီးလူးချောင်းမြစ်အပါအဝင် မြစ်လက်တက်အချို့သည် ထိခိုက်မှု အများဆုံး ဖြစ်နိုင်ဖွယ်ရာ ရှိသည်ဟု ယူဆရသသည်။

စီမံကိန်းဧရိယာအတွင်းတွင်ဖြစ်ပေါ်နိုင်သော IUCN Red List ရေနေသတ္တဝါများတွင် အလွန်အမင်းမျိုးသုဥ်းရန် အန္တရာယ်ရှိသည့် mollusc မျိုးစိတ် ၁ မျိုး၊ မျိုးသုဥ်းရန်အန္တရာယ်ရှိသည့်မျိုးစိတ် ၂ မျိုး၊ ထိခိုက်လွယ်မျိုးစိတ် ၃ မျိုး၊ မျိုးသုဥ်းလုနီးပါးရှိခြိမ်းခြောက်နေသောငါးမျိုးစိတ် ၅ မျိုးနှင့်အင်းဆက်ပိုးမွှားမျိုးစိတ် ၁ မျိုး များပါဝင်သည်။

ဇီဝမျိုးစုံမျိုးကွဲများဆိုင်ရာ စစ်တမ်းကောက်ယူရာ၌ IUCN Red List တွင် အပင်မျိုးစိတ် ၃၉ မျိုး၊ နို့တိုက်သတ္တဝါမျိုးစိတ် ၁၁ မျိုး၊ ကုန်းနေရေနေတွားသွားမျိုးစိတ် ၁ မျိုးနှင့် ငါးမျိုးစိတ် ၂ မျိုး (ထိခိုက်လွယ်သော၊ မျိုးသုဥ်းရန်အန္တရာယ်ရှိနိုင်သော၊ အလွန်အမင်း မျိုးသုဉ်းရန်အန္တရာယ်ရှိသော) စသည်တို့ကို တွေ့ရှိရပါသည်။

လူမှုရေးဆိုင်ရာ အခြေအနေ

အဆိုပြုဓာတ်အားလိုင်းကြောင်းသည် သဘာဝသယံဇာတနှင့် ယဉ်ကျေးမှုအမွေအနှစ်များ ပေါကြွယ်ဝသော မတူညီသည့် ပြည်နယ်နှင့်တိုင်းဒေသကြီးအမျိုးမျိုးကို ဖြတ်သန်းသွားသည်။

- စီမံကိန်းဧရိယာ၏ အရှေ့ပိုင်းအပိုင်းသည် ကယားပြည်နယ်ဖြစ်သည်။ ဤပြည်နယ်သည် သဘာဝသယံဇာတများနှင့် ယဉ်ကျေးမှုအမွေအနှစ်များ ပေါကြွယ်ဝသည်။ အဓိကစိုက်ပျိုးသီးနှံမှာ ဆန်စပါးဖြစ်သည်။ ဤပြည်နယ်သည် သစ်ကုန်သွယ်မှု သမိုင်းကြောင်းရှိပြီး တရားမဝင် သစ်ထုတ်လုပ်ခြင်းကြောင့် သစ်တောများ အကြီးအကျယ်ခုတ်ထွင် ရှင်းလင်းခဲ့သည်။
- စီမံကိန်းဧရိယာ၏ ဗဟို(အလယ်)အပိုင်းသည် ကရင်တောင်တန်းများ၏ ကျောက်ထူထပ်သော တောင်တန်းဒေသဖြစ်သည်။ သစ်တောပြုန်းတီးခြင်းနှင့် သစ်ခုတ်ယူခြင်းအလေ့အကျင့်များသည် သဘာဝပတ်ဝန်းကျင်အားယိုယွင်းပျက်စီးစေသည်။ ကျွန်းနှင့်အခြားသစ်မာများကို သစ်ထုတ်လုပ်ပြီး ဒေသခံပြည်သူများသည် ဆန်၊ ပြောင်းနှင့်ပြောင်းဆန်တို့ကို စိုက်ပျိုးကြသည်။
- စီမံကိန်းဧရိယာ၏ အနောက်ဘက်အပိုင်းသည် ပဲခူးတိုင်းစစ်တောင်းမြစ်ဝှမ်းတွင် တည်ရှိသည်။ ပဲခူးတိုင်းဒေသကြီးသည် သစ်ကုန်သွယ်မှုအပေါ် အဓိက မှီခိုနေရသည်။ တောင်ငူသည် ကျွန်းနှင့် အခြားသစ်မာများဖြင့် ဖုံးလွှမ်းထားသော တောင်တန်းများဖြင့် နယ်နိမိတ်ချင်း ထိစပ်နေသည်။ ချိုင့်ဝှမ်းအလယ်၌ မြေအသုံးပြုမှုသည် အဓိကအားဖြင့် ဆန်စိုက်ပျိုးခြင်းနှင့် ရန်ကုန်မှမန္တလေးကားလမ်း၊ ရထားလမ်း စသည်တို့ ဖြစ်သည်။

အဆိုပြုထားသော လျှပ်စစ်ဓါတ်အားလိုင်းလမ်းကြောင်းသည် မြို့နယ် (၆) ခုကို ဖြတ်ကျော်သွားပြီး၊ ဓာတ်အားလိုင်းနှင့် (၂) ကီလိုမီတာ အတွင်းတွင် ကျေးရွာအုပ်စု (၅၃) ခုရှိသည်။ ထိုအဆိုပြုထားသော လျှပ်စစ်ဓါတ်အားလိုင်းလမ်းကြောင်းသည် များသောအားဖြင့် အချိန်ကြာမြင့်စွာ လူမှုရေး ပဋိပက္ခ ရှိသောနေရာများနှင့် စစ်တပ်ရှိနေသော ကရင်နှင့်ကယားပြည်နယ်များကို ဖြတ်သန်းသွားသည်။

ရေရှည်လူမှုရေး ပဋိပက္ခများသည် ဒေသအတွင်း နေထိုင်သူများ၏ ဘဝနှင့်အသက်မွေးဝမ်းကျောင်းမှုများကို များစွာထိခိုက်စေခဲ့ပြီး လူအများ နေရပ်ကိုစွန့်ခွာသွားကြရသည်။

တိုင်းရင်းသားလက်နက်ကိုင်အဖွဲ့အစည်းများ (EAOs)သည် အဆိုပြုထားသော ဓာတ်အားလိုင်း ဖြတ်သန်းသွားရာ လမ်းကြောင်းဖြစ်သော မြို့နယ် (၆)ခု အနက် လွိုင်ကော်၊ ဒီမောဆို၊ သံတောင်ကြီး၊ တောင်ငူ စသည့်မြို့နယ် (၄)ခုတွင် တည်ရှိသည်။ ထိုမြို့နယ် (၄)ခု၌ မြေမြှုပ်မိုင်းများလည်းရှိသည်။ အစိုးရပိုင်စက်ရုံများ၊ တံတားများနှင့် စွမ်းအင်တာဝါတိုင်များကို ကာကွယ်ရန်အတွက် စစ်တပ်သည် မြေမြှုပ်မိုင်းများကို အသုံးပြု၍ သတိပေး ဆိုင်းဘုတ်များ စိုက်ထူခဲ့သည်။ ပတ်ဝန်းကျင်ရှိ သစ်တောဧရိယာများ၌ မြေမြှုပ်မိုင်းများထားရှိသည်ဟု သတင်းများရရှိပြီး၊ မြေမြှုပ်မိုင်းကြောင့်ဖြစ်ပွားသော လူနှင့်တိရစ္ဆာန်များ သေဆုံးခြင်းများကိုလည်း လေ့လာ တွေ့ရှိရသည်။

စီမံကိန်းဧရိယာအတွင်းတွင် စိတ်ဝင်စားဖွယ်ကောင်းသော ယဉ်ကျေးမှုအမွေအနှစ်နေရာများလည်းရှိသည်။ အဆိုပြုထားသော ဓါတ်အားလိုင်းလမ်းကြောင်းတလျှောက်တွင် မသိသောယဉ်ကျေးမှုအမွေအနှစ် (သို့) ရှေးဟောင်းသုတေသနနေရာများလည်း ရှိနိုင်သည်။ လွိုင်ကော်မြို့တွင် ဘုရား (၉၃) ခုနှင့် ဘုန်းတော်ကြီးကျောင်း (၉၉) ခု၊ ပြတိုက် (၂)ခု၊ လူမျိုးစုပြတိုက်နှင့် ကချင်ပြည်နယ်ယဉ်ကျေးမှုပြတိုက်တို့ တည်ရှိသည်။

အခန်း (၆) ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ခြင်းနှင့်လျော့ပါးစေရေး ဆောင်ရွက်မှုများ

သက်ရောက်မှုဆန်းစစ်ရန် ချဉ်းကပ်ခြင်း

ဤအပိုင်းသည် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးကဏ္ဍများပေါ်တွင် စီမံကိန်းလုပ်ဆောင်မှုများမှ ဖြစ်နိုင်ခြေရှိသော အကျိုးသက်ရောက်မှုများကို ခွဲခြားသတ်မှတ်ထားပြီး ဤအစီရင်ခံစာ (အခန်း ၅) တွင် ဖော်ပြထားသည့် အခြေခံစစ်တမ်းကို ထည့်သွင်းစဉ်းစားမှုများအပေါ် အခြေခံ၍ သက်ရောက်မှုလျော့ပါးစေရေး အစီအစဉ်များကို အကြံပြုထားသည်။ ဤအခန်းတွင်ဖော်ပြထားသော သက်ရောက်မှုနှင့် အကဲဖြတ်မှုနည်းလမ်းများနှင့်အညီ အကြိုတည်ဆောက်ခြင်းနှင့် တည်ဆောက်ခြင်းကာလ၊ လုပ်ငန်းလည်ပတ်သည့်ကာလ၊ လုပ်ငန်းဖျက်သိမ်းသည့်ကာလ များအတွက် ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများကို ဆန်းစစ်ထားပါသည်။ ထို့အပြင် မတူညီသော စီမံကိန်းများလုပ်ဆောင်မှုများမှ ဖြစ်ပေါ်လာမည့် သက်ရောက်မှုအမျိုးအစားနှင့် အတိုင်းအတာများကိုလည်း ဆွေးနွေးထားပြီး ၎င်း၏အတိုင်းအတာနှင့် ပြင်းထန်မှုနှင့် သက်ရောက်မှုလျော့ပါးစေရေးအစီအစဉ်များကိုလည်း ဖော်ပြထားသည်။

သက်ရောက်မှုတစ်ခုစီကို ဆန်းစစ်ရာတွင် လုပ်ငန်းခွင်၏ လက္ခဏာရပ်များနှင့် စီမံကိန်း၏လုပ်ငန်းအဆင့် (၃) ဆင့်တွင် လုပ်ဆောင်မည့် လုပ်ငန်းများ၏ လုပ်ငန်းများ၏ ပြင်းအား၊ ကြာချိန်၊ အတိုင်းအတာနှင့် ဖြစ်နိုင်ခြေတို့ကို ထည့်သွင်းစဉ်းစားခြင်းအပေါ် အခြေခံထားသည်။ ဤဆန်းစစ်ခြင်းနည်းလမ်းသည်

အရည်အသွေးကောင်းမွန်ပြီး သက်ရောက်မှုတစ်ခုစီ၏ သိသာထင်ရှားမှုကို အမျိုးအစား (၅)မျိုးဖြင့် ခွဲခြားထားပါသည်။ ယင်းတို့မှာ အလွန်နိမ့်၊ အနိမ့်၊ အလယ်အလတ်၊ မြင့်၊ အလွန်မြင့်မားတို့ဖြစ်ပါသည်။

စီမံကိန်းလုပ်ဆောင်မှုအဆင့်

အကြိုတည်ဆောက်ခြင်းနှင့် တည်ဆောက်ခြင်းကာလ- ဤအဆင့်၏ လုပ်ငန်းဆောင်တာများတွင် မြေနေရာရှင်းလင်းခြင်းနှင့် လမ်းဖောက်လုပ်ခြင်း၊ အုတ်မြစ်ချခြင်းအတွက် မြေတူးဖော်ခြင်း၊ တာဝါတိုင်တစ်ခုချင်းစီသို့ ပစ္စည်းများပို့ဆောင်ခြင်း၊ တာဝါတိုင်များတပ်ဆင်ခြင်းနှင့် တပ်ဆင်ခြင်းမပြုမီ အဆောက်အဦအတွက် အုတ်မြစ်ချတည်ဆောက်ခြင်းများ ပါဝင်ပါသည်။ တာဝါတိုင်များထောင်ပြီးသည်နှင့် တာဝါတိုင်များကြားတွင် ဓာတ်အားလိုင်းသွယ်တန်းသည့်ကြိုးများ တပ်ဆင်သည်။ သွယ်တန်းခြင်း တည်ဆောက်ရာတွင် ရေရှည်နှင့် ယာယီသက်ရောက်မှုများ ဖြစ်ပေါ်နိုင်ပါသည်။ ရေရှည်အကျိုးသက်ရောက်မှုများအနေဖြင့် မြေယာအသုံးပြုမှု ကန့်သတ်ချက်များ၊ သစ်တောမြေများ ဆုံးရှုံးခြင်းနှင့် ရှုခင်းပဒါသဆိုင်ရာ သက်ရောက်မှုများ စသည့်တို့ ဖြစ်ပေါ်နိုင်ပါသည်။ ဓာတ်အားလိုင်း ပြုပြင်နေစဉ် သို့မဟုတ် ROW ပြုပြင်ထိန်းသိမ်းနေစဉ်ကာလများ သို့မဟုတ် တည်ဆောက်ရေးကာလများတွင် ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားအပေါ်တွင် ယာယီအကျိုးသက်ရောက်မှုများရှိနိုင်ပါသည်။ ၎င်းတို့တွင် ဆောက်လုပ်ရေးလုပ်ငန်းများ လုပ်ဆောင်နေချိန်အတွင်း ဆူညံသံများထွက်ပေါ်ခြင်း သို့မဟုတ် သီးနှံများ ပျက်စီးခြင်းတို့ ဖြစ်ပေါ်နိုင်ပါသည်။ ရေတိုအကျိုးသက်ရောက်မှုများကို စနစ်တကျ စီမံခန့်ခွဲခြင်း သို့မဟုတ် လျော့ပါးစေရေးနည်းလမ်းများ ကို အသုံးမပြုပါက ရေရှည်အကျိုးသက်ရောက်မှုများအဖြစ်ပြောင်းလဲ သက်ရောက်နိုင်ပါသည်။ တည်ဆောက်ရေးလုပ်ငန်းများလုပ်ဆောင်နေချိန်တွင် ဝန်းကျင်ရှိ လေထုအရည်အသွေး ယိုယွင်းလာပြီး မော်တော်ကားများနှင့် စက်ယန္တရားများ အသုံးပြုခြင်းနှင့် ပစ္စည်းများ အတင်အချပြုလုပ်ခြင်းတို့ကြောင့် ဆူညံသံအဆင့်များ တိုးမြင့်လာခြင်းတို့ ဖြစ်ပေါ်လေ့ရှိသည်။ ဤသက်ရောက်မှုများသည် ဆောက်လုပ်ရေးလုပ်ငန်းခွင်များတွင်သာ ဖြစ်ပေါ်နိုင်ခြင်းမဟုတ်ဘဲ သယ်ယူပို့ဆောင်ရေးလမ်းကြောင်းများ အနီးတွင်လည်း ဖြစ်ပွားနိုင်သည်။ မြို့ပြဆိုင်ရာ ဆောက်လုပ်ရေးလုပ်ငန်း များကြောင့် ရေထု ညစ်ညမ်းသွားစေနိုင်သည်။ မည်သို့ပင်ဆိုစေကာမူ ဤအဆင့်မှ ဖြစ်ပေါ်လာသော သက်ရောက်မှုများသည် ယာယီဖြစ်ပြီး စီမံခန့်ခွဲနိုင်သည်ဟု ယူဆပါသည်။ ဤအဆင့်တွင် ပတ်ဝန်းကျင်ရေအရည်အသွေး အပေါ် သိသာထင်ရှားသော သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများကို ရှိနိုင်မည်မဟုတ်ပါ။

လုပ်ငန်းလည်ပတ်သည့်ကာလ- ဤစီမံကိန်းသည်လုပ်ဆောင်ခြင်းသည် ဘီလူးချောင်းနှင့် နမ့်ပေါင်ချောင်းများရှိ ရေအားလျှပ်စစ်စီမံကိန်းများ ပါဝင်သည့် ကယားပြည်နယ်၏ လက်ရှိနှင့် အနာဂတ် ရေအားလျှပ်စစ်စီမံကိန်းများမှ လျှပ်စစ်ဓာတ်အားထိရောက်စွာ ဖြန့်ဝေနိုင်ရန် အထောက်အပံ့ဖြစ်စေပါသည်။ မြန်မာနိုင်ငံ မြောက်ပိုင်းနှင့် ရန်ကုန်ဧရိယာသို့ အကြီးစားဓာတ်အားဖြန့်ဝေခြင်း အတွက် လက်ရှိ ၅၀၀KV စပါးကြွယ် ဓာတ်အားခွဲရုံသည် အဓိကကျမည် ဖြစ်သည်။ ဓာတ်အားလိုင်း စတင်မည့် လွိုင်ကော်ဓာတ်အားခွဲရုံသည် ကယားပြည်နယ်အတွင်း လျှပ်စစ်ဓာတ်အားရရှိရေးနှင့် ဒေသတွင်း အနာဂတ်လျှပ်စစ်လိုအပ်ချက်ကို ဖြည့်ဆည်းပေးနိုင်မည်။ ဤအဆင့်တွင် ရုပ်ပိုင်းဆိုင်ရာ ပတ်ဂန်းကျင်အပေါ် သိသာထင်ရှားသော သက်ရောက်မှုများ မရှိနိုင်ပါ။ လုပ်ငန်းလည်ပတ်သည့်ကာလအတွင်း သွယ်တန်းထားသော ဓာတ်အားလိုင်းများနှင့် တိုက်မိပါက ဓာတ်လိုက်ခြင်းနှင့် တိရစ္ဆာန်များ သေဆုံးခြင်းများ

ဖြစ်ပေါ်နိုင်သည်။ IUCN စာရင်းဝင် ခြိမ်းခြောက်ခံနေရသောမျိုးစိတ်များအပေါ်သက်ရောက်မှုအတိုင်းအတာသည် အကန့်အသတ်ဖြင့်ရှိနိုင်ပြီး ထိခိုက်ခံရနိုင်သော တိရစ္ဆာန်မျိုးစိတ်များအပေါ်တွင် အလယ်အလတသက်ရောက်မှု ရှိမည်ဟု ခန့်မှန်းရသည်။

လုပ်ငန်းဖျက်သိမ်းသည့်ကာလ- လုပ်ငန်းဖျက်သိမ်းခြင်းအဆင့်သည် ရင်းနှီးမြှုပ်နှံမှု စာချုပ်တွင် ဖော်ပြထားသည့် အခြေအနေများနှင့် ဆက်စပ်နေပါသည်။ ဤအဆင့်တွင် ဖျက်သိမ်းခြင်းလုပ်ငန်းများမှ ထွက်ရှိသော ကတ္တရာနှင့် ကွန်ကရစ်များကို ဖယ်ရှားရန် Backhoes နှင့် pile drivers များအသုံးပြုခြင်း၊ ထွက်ရှိလာသော အမှိုက်များကို သယ်ယူရန် ကရိန်းများ၊ ဘူဒိုဇာများနှင့် တူးဖော်ခြင်းဆိုင်ရာ အကြီးစားစက်ကိရိယာများ အသုံးပြုခြင်းတို့ ပါဝင်ပါသည်။ လိုအပ်ပါက ထွက်ရှိလာသော အန္တရာယ်ရှိသော ပစ္စည်းများကို အုပ်ချုပ်ရေး အာဏာပိုင်များ၏ လမ်းညွှန်ချက်များနှင့်အညီ စွန့်ပစ်ရမည်။ ပိတ်သိမ်းသည့်အခါတွင် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ ထိခိုက်မှုများကို လျော့ပါးသက်သာစေရန် လုပ်ငန်းရှင်သည် လုပ်ငန်းလည်ပတ်မှု ချက်ချင်းရပ်ခြင်းမပြုလုပ်ပဲ ပိတ်သိမ်းရန်အတွက် ကြိုတင်ပြင်ဆင်ထားသော အစီအစဉ်တစ်ရပ်လိုအပ်ပါသည်။

အကြိုတည်ဆောက်ခြင်းနှင့် တည်ဆောက်ခြင်းကာလတွင် လေအရည်အသွေး၊ ဆူညံသံနှင့်တုန်ခါမှု၊ ဇလဗေဒ၊ ဇီဝကမ္မဗေဒနှင့် ရေအရည်အသွေး၊ မြေမျက်နှာသွင်ပြင်နှင့် မြေအရည်အသွေး၊ စွန့်ပစ်အစိုင်အခဲထွက်ရှိမှု၊ စွန့်ပစ်အရည်ထွက်ရှိမှု၊ အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု၊ မြင်ကွင်းပသာဒ၊ လုပ်ငန်းခွင်နှင့်ဒေသတွင်း ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ ကုန်းနေနှင့် ရေနေ ဇီဝမျိုးစုံမျိုးကွဲများ၊ နှင့် လူမှုစီးပွားအခြေအနေကြောင့် သက်ရောက်မှုများသည် အလယ်အလတ်အဆင့် သက်ရောက်မှုများအဖြစ် ဆန်းစစ်လေ့လာတွေ့ရှိရသည်။ အခြားသက်ရောက်မှုများဖြစ်သည့် ယဉ်ကျေးမှုအမွေအနှစ်၊ ယာဉ်နှင့်သယ်ယူပို့ဆောင်ရေးသည် နည်းသည့်အဆင့်သက်ရောက်မှုများ အဖြစ် ဆန်းစစ်တွေ့ရှိရသည်။

လုပ်ငန်းလည်ပတ်သည့်ကာလတွင် သွယ်တန်းထားသော ဓာတ်အားလိုင်းများ၏ လုပ်ဆောင်ချက်သည် အများအားဖြင့် သိသာထင်ရှားသော လေထုတ်လွှတ်မှု (IFC 2007a) ကို မဖြစ်ပေါ်စေဘဲ၊ လေထုအရည်အသွေးအပေါ် သက်ရောက်မှုများမှာ မပြောပလောက်အောင်နည်းပါးနိုင်သည်။ အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု၊ မြင်ကွင်းပသာဒ၊ လုပ်ငန်းခွင်နှင့်ဒေသတွင်း ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ ကုန်းနေနှင့် ရေနေ ဇီဝမျိုးစုံမျိုးကွဲများ၊ လူမှုစီးပွားအခြေအနေတို့အပေါ်သက်ရောက်မှုများသည် အလယ်အလတ်အဆင့် သက်ရောက်မှုများအဖြစ် ဆန်းစစ်တွေ့ရှိရသည်။ အခြားသက်ရောက်မှုများ ဖြစ်သည့် လေအရည်အသွေး၊ ဆူညံသံနှင့်တုန်ခါမှု၊ ဇလဗေဒ၊ ဇီဝကမ္မဗေဒနှင့် ရေအရည်အသွေး၊ မြေမျက်နှာသွင်ပြင်နှင့် မြေအရည်အသွေး၊ စွန့်ပစ်အစိုင်အခဲထွက်ရှိမှု၊ စွန့်ပစ်အရည်ထွက်ရှိမှုနှင့် ယာဉ်နှင့်သယ်ယူပို့ဆောင်ရေး စသည့်တို့တွင် နည်းသည့်အဆင့် သက်ရောက်မှုများအဖြစ် ဆန်းစစ်လေ့လာခြင်းရလဒ်များအရ ဆန်းစစ်တွေ့ရှိရသည်။

လုပ်ငန်းဖျက်သိမ်းသည့်ကာလတွင် ယဉ်ကျေးမှုအမွေအနှစ်နှင့် ယာဉ်နှင့်သယ်ယူပို့ဆောင်ရေးသည် နည်းသည့်အဆင့်သက်ရောက်မှုများ အဖြစ် ဆန်းစစ်တွေ့ရှိရပြီး အခြားသောခေါင်းစဉ်ကွဲများ အပေါ်သက်ရောက်မှုမှာ အလယ်အလတ်အဆင့် သက်ရောက်မှုများ အဖြစ်ဆန်းစစ်တွေ့ရှိရပါသည်။

အကြွင်းအကျန် သက်ရောက်မှု အကျဉ်းချုပ်

သက်ရောက်မှုအများစုသည် အလွန်နည်း (သို့) အနည်းငယ်နှင့် အလယ်အလတ် သက်ရောက်နိုင်ချေရှိသည်ကို တွေ့ရှိရသည်။

- စီမံကိန်းအကြိုတည်ဆောက်ခြင်းနှင့် တည်ဆောက်ခြင်းအဆင့်တွင် မြင်ကွင်းပသာဒအပေါ် သက်ရောက်မှု အလယ်အလတ်အဆင့်ရှိပါသည်။
- စီမံကိန်းလုပ်ငန်းလည်ပတ်ခြင်အဆင့်တွင် မြင်ကွင်းပသာဒနှင့် ကုန်းနေနှင့် ရေနေ ဇီဝမျိုးစုံမျိုးကွဲများ အပေါ်သက်ရောက်မှု အလယ်အလတ်အဆင့်ရှိပါသည်။
- စီမံကိန်းဖျက်သိမ်းခြင်းလုပ်ငန်းအဆင့် မြင်ကွင်းပသာဒအပေါ်သက်ရောက်မှု အလယ်အလတ်အဆင့် ရှိပါသည်။

လျော့ပါးရေးဆိုင်ရာ စီမံခန့်ခွဲမှုလုပ်ငန်းများ

သိသာထင်ရှားသည့် မကောင်းသောသက်ရောက်မှုများအား သက်ရောက်မှုလျှော့ချရန်အတွက် လျော့ပါးစေရန် နည်းလမ်းများသည် အရေးကြီးသည်။ လေအရည်အသွေး၊ ဆူညံသံနှင့်တုန်ခါမှု၊ ဇလဗေဒ၊ ဇီဝကမ္မဗေဒနှင့် ရေအရည်အသွေး၊ မြေမျက်နှာသွင်ပြင်နှင့် မြေအရည်အသွေး၊ စွန့်ပစ်အစိုင်အခဲထွက်ရှိမှု၊ စွန့်ပစ်အရည်ထွက်ရှိမှု၊ အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု၊ မြင်ကွင်းပသာဒ၊ လုပ်ငန်းခွင်နှင့်ဒေသတွင်း ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ ကုန်းနေနှင့် ရေနေ ဇီဝမျိုးစုံမျိုးကွဲများ၊ နှင့် လူမှုစီးပွားအခြေအနေ စသည့်တို့အပေါ် သက်ရောက်နိုင်မှုများကို ထည့်သွင်းစဉ်းစားထားပြီး၊ ၎င်းတို့နှင့် သက်ဆိုင်သော လျော့ချရေးအစီအစဉ်များကို လုပ်ငန်းအဆင့်အလိုက် ဇယား (၆.၅၊ ၆.၆ နှင့် ၆.၇) တွင်ဖော်ပြထားပါသည်။ အဆိုပြုစီမံကိန်းသည် အလုပ်အကိုင်အခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ စီးပွားရေးအခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ အခွန်ငွေရရှိနိုင်ခြင်း၊ လူမှုစီးပွားတာဝန်ယူမှု အစီအစဉ်များကြောင့် ဒေသတွင်းဖွံ့ဖြိုးတိုးတက်ခြင်း၊ ကာဗွန်ထုတ်လုပ်မှု လျှော့ချခြင်း၊ သယံဇာတများထိန်းသိမ်းခြင်းနှင့် ပတ်ဝန်းကျင်နှင့်လိုက်လျော ညီထွေသော စီးပွားရေးများ အစပြုနိုင်ခြင်း စသည့် ကောင်းသောသက်ရောက်မှုများကိုလည်း ဖြစ်ပေါ်စေနိုင်သည်။

အခန်း (၇) စုပေါင်းသက်ရောက်မှု ဆန်းစစ်ခြင်း

စုပေါင်းသက်ရောက်မှုဆန်းစစ်ခြင်းကို လုပ်ဆောင်ရာတွင် သက်ဆိုင်ရာ သဘာဝပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ယဉ်ကျေးမှုဆိုင်ရာ ကဏ္ဍများအတွက် အကျိုးသက်ရောက်မှုဆန်းစစ်ခြင်း၏ တွေ့ရှိချက်များအပေါ်တွင် အရင်းတည်၍ လုပ်ဆောင်ပါသည်။ ယင်းဒေသရှိ အခြားသောစီမံကိန်းများနှင့် သက်ဆိုင်သော အများသူငှာရရှိနိုင်သည့် အချက်အလက်များကိုလည်း စဉ်းစားသုံးသပ်ထားပါသည်။ ဤစီမံကိန်း၏ လွှမ်းခြုံဧရိယာအတွင်း ဓာတ်အားလိုင်းနှင့် ဓာတ်အားခွဲရုံများနှင့် အလှမ်းဝေးသော စီမံကိန်းများ၏ စုပေါင်းသက်ရောက်မှုများ မဖြစ်နိုင်သောကြောင့် ၎င်းစီမံကိန်းများကို ထည့်သွင်း စဉ်းစားခြင်းမပြုခဲ့ပါ။ စုပေါင်းသက်ရောက်မှု ဆန်းစစ်ခြင်းအတိုင်းအတာ၊ စုပေါင်းသက်ရောက်မှု တန်ဖိုးအကျဉ်းချုပ် နှင့် စုပေါင်းသက်ရောက်မှု စီမံခန့်ခွဲမှုတို့ကို ဤအခန်းတွင် ဖော်ပြထားပါသည်။

အခန်း (၈) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုနှင့် စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များ

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်

လျော့ချရန်နည်းလမ်းများနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များအား အကောင်အထည်ဖော်ဆောင်ရွက်ရာတွင် လိုအပ်သော အခြေခံလိုအပ်ချက်များနှင့် တာဝန်ရှိသူများအား ဤအစီရင်ခံစာတွင် ဖော်ပြထားသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အား သက်ရောက်မှုများ လေ့လာ ဆန်းစစ်ချက်များနှင့် သက်ရောက်မှုအဆင့်များကို အခြေခံ၍ စီမံကိန်း၏ အကြိုတည်ဆောက်ခြင်း နှင့်တည်ဆောက်ခြင်းကာလ၊ လုပ်ငန်းလည်ပတ်သည့်ကာလနှင့် လုပ်ငန်းဖျက်သိမ်းသည့်ကာလ တို့အတွက် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး မူဘောင်များ နှင့် ရေးဆွဲထားခြင်းဖြစ်သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် အဆိုပြုစီမံကိန်းအား အောက်ဖော်ပြပါအစီအစဉ်များ ပါဝင်သော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့်အညီ အကောင်အထည်ဖော် ဆောင်ရွက်ရမည်။

- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်
- ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်
- လေအရည်အသွေးစီမံခန့်ခွဲမှုအစီအစဉ်
- ဆူညံသံအဆင့်စီမံခန့်ခွဲမှုအစီအစဉ်
- ရေအရည်အသွေးစီမံခန့်ခွဲမှုအစီအစဉ်
- မြေအရည်အသွေးစီမံခန့်ခွဲမှုအစီအစဉ်
- စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်
- ဘေးအန္တရာယ်ရှိပစ္စည်းများစီမံခန့်ခွဲမှုအစီအစဉ်
- Avian and Bats Collision and Electrocution Management Plan

- Electromagnetic wave, Electrocution and Electromagnetic Field (EMF) Prevention Management Plan
- လုပ်ငန်းခွင်နှင့်ဒေသတွင်း ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- မီးဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- အရေးပေါ်ကိစ္စများအတွက်တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင်ရေးအစီအစဉ် (မီးဘေး၊ ပေါက်ကွဲခြင်း၊ နှင့် လျှပ်စစ်ဘေးအန္တရာယ်)
- လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်
- သစ်ပင်များပြန်လည်စိုက်ပျိုးမှု အစီအစဉ်

ထို့အပြင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်မှုအစီအစဉ်များ လုပ်ဆောင်ရန်အတွက် လျာထားခန့်မှန်းကုန်ကျစရိတ်မှာ ဤအစီရင်ခံစာထဲတွင် ဖော်ပြပြီးဖြစ်ပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အတွက် လျာထားကုန်ကျစရိတ်မှာ **အမေရိကန်ဒေါ်လာ ၅၀၀,၀၀၀** ဖြစ်ပြီး ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်မှု အစီအစဉ်အတွက် အကြိုတည်ဆောက်ရေးကာလနှင့် တည်ဆောက်ရေးကာလ၊ လုပ်ငန်းလည်ပတ်သည့်ကာလနှင့် လုပ်ငန်းဖျက်သိမ်းသည့်ကာလများအတွက် ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်မှု အစီအစဉ်၏ ခန့်မှန်းလျာထားကုန်ကျစရိတ်မှာ **အမေရိကန်ဒေါ်လာ ၁၆၀,၀၀၀** ဖြစ်ပါသည်။ ယင်းအသုံးစရိတ်များမှာ နှစ်စဉ်ကုန်ကျမည်ဖြစ်ပါသည်။ လူမှုစီးပွားတာဝန်ယူမှုအတွက် ရန်ပုံငွေ **အမေရိကန်ဒေါ်လာ ၂၀,၀၀၀** သတ်မှတ်ထားပါသည်။ ထိုရန်ပုံငွေများသည် လျှပ်စစ်ဓါတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC)၏ နှစ်စဉ် ရန်ပုံငွေစာရင်း၌ ထည့်သွင်းတင်သွင်းသွားပါမည်။ ပတ်ဝန်းကျင်နှင့်အခြားသော သက်ဆိုင်ရာ ဝန်ဆောင်မှုပေးသောအဖွဲ့များ၏ ဝန်ဆောင်ခများမှာ အချိန်နှင့်တပြေးညီ ပြောင်းလဲမှုများရှိပါက စီမံကိန်းအဆိုပြုသူသည် ဖော်ပြပါ ပတ်ဝန်းကျင်ဆိုင်ရာအသုံးစရိတ်ကို ထပ်တိုး၍ ယင်းအစီအစဉ်များကို လုပ်ဆောင်သွားပါမည်။

ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်သည် စီမံကိန်း၏မကောင်းသောသက်ရောက်မှုများ၊ သက်ရောက်မှုရင်းမြစ်များ၊ လျော့ချရန်နည်းလမ်းများ၊ ကျန်ရှိသောသက်ရောက်မှုများနှင့် တာဝန်ယူဆောင်ရွက်မည့်ပုဂ္ဂိုလ်တို့ အား အကြိုတည်ဆောက်ခြင်းနှင့်တည်ဆောက်ခြင်းကာလ၊ လုပ်ငန်းလည်ပတ်သည့်ကာလနှင့် လုပ်ငန်း ဖျက်သိမ်းသည့်ကာလ တို့အတွက် ဖော်ပြထားပါသည်။ ပတ်ဝန်းကျင်စောင့်ကြပ် ကြည့်ရှုမှု အစီအစဉ်သည် လေနှင့်ရေအရည်အသွေး၊ ဆူညံသံပမာဏနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစစ်ဆေးခြင်းများအား စောင့်ကြပ်ကြည့်ရှုရန် အမျိုးအစား၊ အကြိမ်အရေအတွက်နှင့် တာဝန်ယူဆောင်ရွက်မည့်ပုဂ္ဂိုလ် တို့အား ဖော်ပြထားခြင်းဖြစ်သည်။ လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်သည် ဒေသခံပြည်သူများတွက် ဖွံ့ဖြိုးမှုလုပ်ငန်းများ ဆောင်ရွက်ပေးရန်နှင့် အဆိုပြုစီမံကိန်းသည် စီမံကိန်းအကောင်အထည်ဖော်သူ ကိုသာမက ဒေသခံပြည်သူများအတွက်လည်း အကျိုးရှိကြောင်း ဖော်ပြရန်ဖြစ်သည်။ **မီးဘေးအန္တရာယ် ကင်းရှင်းရေးအစီအစဉ်သည်** အဆိုပြုစီမံကိန်း၏ မီးဘေးအန္တရာယ်များ လျော့ချရန်အတွက် ဖော်ပြထားပါသည်။ **အရေးပေါ်ကိစ္စများအတွက်တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင်ရေးအစီအစဉ်** သည် အရေးပေါ်ကိစ္စရပ်များဖြစ်ပေါ်ပါက မည်သို့ဆောင်ရွက်ရမည်ကို ဖော်ပြထားပါသည်။

အခန်း (၉) ဆက်စပ်ပတ်သက်သူများနှင့် ဆွေးနွေးတိုင်ပင်ခြင်း

ဆက်စပ်ပတ်သက်သူများဆိုသည်မှာ ပြည်သူ့အစိုးရ၊ ပြည်ထောင်စုအစိုးရ၊ ဝန်ကြီးဌာနများ၊ ဦးစီးဌာနများ၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD)၊ ကယား၊ ရှမ်းနှင့် ကရင်ပြည်နယ်အစိုးရများ၊ ပဲခူးတိုင်းဒေသကြီးအစိုးရ၊ ဒေသန္တရအုပ်ချုပ်ရေး၊ ကရင်ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာလုပ်ရှားမှု ကွန်ရက်၊ ဒေသခံ မြို့၊ ရွာ အဖွဲ့အစည်းများ၊ အစိုးရမဟုတ်သောနှင့် အရပ်ဘက်လူမှုအဖွဲ့အစည်းများ၊ တစ်ဦးချင်းနှင့် အခြားဒေသခံအုပ်စုများ စသည်တို့ ပါဝင်ပါသည်။

အများပြည်သူနှင့် ဆွေးနွေးညှိနှိုင်းတိုင်ပင်ခြင်း အစီအစဉ်ကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE) စီမံကိန်းအတွက် ပြဌာန်းထားသော လူထုပါဝင်မှုလမ်းညွှန်ချက်များနှင့် IFC စွမ်းဆောင်ရည် စံနှုန်းများအပေါ် အခြေခံသည်။

ဆွေးနွေးညှိနှိုင်းတိုင်ပင်ခြင်း၏ အဓိကရည်ရွယ်ချက်သည် စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်များကို မျှဝေ တင်ပြရန်နှင့် အများပြည်သူများ၏ စိုးရိမ်မှုများ၊ မျှော်လင့်ချက်များ (သို့) ထင်မြင်ယူဆချက်များနှင့် စီမံကိန်းကြောင့်ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများကို မှတ်တမ်း တင်ခြင်းတို့ဖြစ်ပါသည်။

စီမံကိန်း၏ဆောက်လုပ်ရေးနှင့် လည်ပတ်မှုတစ်လျှောက်လုံးတွင် ရပ်ရွာလူထုတိုင်ကြားချက်များ၊ စိုးရိမ်မှုများကို လိုအပ်သည့်အတိုင်းမှတ်တမ်းတင်ခြင်း၊ ပြန်လည်သုံးသပ်ခြင်းနှင့် မကျေနပ်မှု တိုင်ကြားခြင်း လုပ်ငန်းစဉ်ကို လိုအပ်သလို အကောင်အထည်ဖော်မည်ဖြစ်သည်။

အများပြည်သူ ထုတ်ဖော်ပြောကြားခြင်းနှင့် ဆွေးနွေးတိုင်ပင်ခြင်းနှင့် တက်ရောက်သူများ

ဆက်စပ်ပတ်သက်သူများကို ၂၀၂၁ ခုနှစ် ဇန်နဝါရီလ ၂၃ ရက်နေ့ထုတ်မြန်မာ့အလင်းနေ့စဉ်သတင်းစာမှ တဆင့် ဖိတ်ကြားခဲ့ပါသည်။ (ပုံ ၉.၁၊ နောက်ဆက်တွဲ ၁၄.၈)။ ဒေသန္တရအစိုးရ ဗျူရိုကရေစီနှင့် ကျေးရွာအုပ်ချုပ်ရေးအဖွဲ့များမှ ပုဂ္ဂိုလ်များကို ဖိတ်ကြားခဲ့သည်။ ဒေသခံလူထု (သောက်ရေခပ်၊ ကျေးမင်း၊ မစ၊ ကော်ပတ်ခြံ၊ ယာဒို ကျေးရွာ၊ ကရင်ပြည်နယ်) တို့ကိုလည်း ၂၀၂၁ ခုနှစ် ဇန်နဝါရီလ ၂၁ ရက်နေ့တွင် သက်ဆိုင်ရာ ကျေးရွာကိုယ်စားလှယ်များမှတဆင့် ဒေသခံကျေးရွာများမှ တာဝန်ရှိသူများထံ အကြောင်းကြားပြီး ဒေသခံလူထု (လောပိတ စံပြ နှင့် ဆောင်းဒူးရွာ ၊ ကယားပြည်နယ်) တို့ကိုလည်း ၂၀၂၁ ခုနှစ် ဖေဖော်ဝါရီ ၁၀ ရက်၌ အကြောင်းကြား၍ ဖိတ်ကြားခဲ့ပါသည်။ အများပြည်သူဆွေးနွေးတိုင်ပင်ခြင်း အစည်းအဝေးစာရင်း အသေးစိတ်ကို ဇယား ၉.၁ တွင် ဖော်ပြထားသည်။

ဤအစည်းအဝေးတွင် အပိုင်း (၅) ပိုင်းပါဝင်ပါသည်။

- စီမံကိန်းအကြောင်းအရာမိတ်ဆက်၊
- ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE) မိတ်ဆက်နှင့် ရည်ရွယ်ချက်နှင့် လုပ်ဆောင်နေမှုများဖော်ပြချက်၊
- လက်ရှိအချိန်ထိဆောင်ရွက်ခဲ့သော အခြေခံလေ့လာမှုများနှင့် တည်ဆောက်ခြင်းဆိုင်ရာ အဓိက လိုအပ်ချက်များကို ရှင်းလင်းခြင်း၊

- စီမံကိန်းဆိုင်ရာ ဖြစ်နိုင်ချေရှိသည့် ကောင်း/ဆိုးသော သက်ရောက်မှု၊ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာစီမံခန့်ခွဲမှုနှင့် စီမံခန့်ခွဲမှုမဟာဗျူဟာအတွက် ဦးစားပေးများကို ရှင်းလင်းခြင်း၊
- ဒေသခံကျေးရွာများနှင့် မြန်မာနိုင်ငံအတွက် ရရှိမည့် စီမံကိန်းဆိုင်ရာအကျိုးကျေးဇူးများကို အကျဉ်းချုံးဖော်ပြခြင်း။

အသေးစိတ်တင်ပြချက် (Powerpoint Slides) များကို နောက်ဆက်တွဲ (၁၄.၁၀) တွင် ဖော်ပြထားသည်။ အစည်းအဝေးတက်ရောက်သူများ စာရင်းကို နောက်ဆက်တွဲ (၁၄.၉)တွင် ဖော်ပြထားပါသည်။ အစည်းအဝေးများတွင် တင်ပြချက်တစ်ခုစီ၏ ပြီးဆုံးချိန်တွင် အမေးအဖြေကဏ္ဍကို ပြုလုပ်ခဲ့သည်။ ဤအစည်းအဝေးများ၏ အကျဉ်းချုပ်ကို ဇယား (၉.၃၊ ၉.၅၊ ၉.၆၊ ၉.၈၊ ၉.၉ နှင့် ၉.၁၁) တွင် ဖော်ပြထားသည်။

အမေးအဖြေကဏ္ဍများတွင် အောက်ပါ အဓိကပြဿနာများနှင့် မေးခွန်းများ ပါဝင်သည်။

- စီမံကိန်းအကောင်ထည်ဖော်ဆောင်ရွက်ခြင်းကြောင့် လယ်ယာမြေများအပေါ် သက်ရောက်မှုနှင့် မြေယာဆုံးရှုံးနိုင်မှုကိစ္စများနှင့်ယင်း နှင့်သက်ဆိုင်သော လျော်ကြေးငွေကိစ္စရပ်များ
- လျှပ်စစ်ရရှိနိုင်မှုနှင့် တည်ဆောက်ရေးကာလအတွင်း ဝင်ငွေနှင့်/သို့မဟုတ် အလုပ်အကိုင် အခွင့်အလမ်းများကဲ့သို့သော ကောင်းသောအကျိုးသက်ရောက်မှုကိစ္စရပ်များ
- တာဝါတိုင်ကြား အကွာအဝေး
- ယခင် ဓာတ်အားသွယ်တန်းခြင်းစီမံကိန်းများကဲ့သို့ နယ်မြေခံကျေးရွာများမှ လုံခြုံရေးပေးရန် လိုအပ်နိုင်မှုကိစ္စရပ် များ ပါဝင်ပါသည်။

အခန်း (၁၀) မကျေလည်မှုများကို ပြန်လည်ဖြေရှင်းပေးမည့် လုပ်ငန်းစဉ်

မကျေလည်မှုများကိုဖြေရှင်းပေးမည့် အစီအစဉ်သည် အဆိုပြုစီမံကိန်းနှင့်ပတ်သက်သော မကျေလည်မှုများကို မည်သို့ဖြေရှင်းပေးမည်ဖြစ်ကြောင်း ဖော်ပြထားခြင်းဖြစ်သည်။ မကျေလည်မှုများကို ပြန်လည်ဖြေရှင်းပေးမည့် လုပ်ငန်းစဉ် (GRM) သည် ထိခိုက်ခံစားရသူများ၏ စီမံကိန်းနှင့်သက်ဆိုင်သည့် တိုင်ကြားချက်များကို လက်ခံခြင်း၊ အတည်ပြုခြင်းနှင့် ကိုင်တွယ်ဖြေရှင်းခြင်းအတွက် စနစ်တကျ လုပ်ငန်းစဉ်တစ်ခုဖြစ်သည်။ စီမံကိန်းအဆိုပြုသူ လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန (MOEP) အောက်ရှိ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC)သည် ထိခိုက်မှုလျော့ပါးစေရေး အစီအစဉ်များနှင့် ရပ်ရွာဆက်ဆံရေး လုပ်ငန်းများကို အကောင်အထည်ဖော်ခြင်းဖြင့် နစ်နာမှုများကို တားဆီးကာကွယ်ရန် တက်ကြွစွာ ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ စီမံကိန်း၏ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ စွမ်းဆောင်ရည်နှင့် ပတ်သက်သည့် ထိခိုက်ခံစားရသူ၏ စိုးရိမ်ပူပန်မှုများ၊ တိုင်ကြားမှုများနှင့် မကျေလည်မှုများကို DPTSC၊ MOEE သည် GRM မှတဆင့် ဆောလျင်စွာ ဖြေရှင်းပေးမည် ဖြစ်ပါသည်။ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကိစ္စရပ်များအတွက် ပူးတွဲမကျေနပ်ချက်များကို ဖြေရှင်းရန်အတွက် လုပ်ငန်းစဉ်တစ်ရပ်ကို ဖွဲ့စည်းရန် အဆိုပြုထားသည်။ ပြန်လည်နေရာချထားရေးနှင့် လျော်ကြေးငွေနှင့် ဆက်စပ်နေသော မကျေလည်မှုများကို ပြန်လည်နေရာချထားရေး အစီအစဉ်တွင် ဖော်ပြထားသည့် သီးခြားလုပ်ငန်းစဉ်တစ်ခုဖြင့် ဖြေရှင်း ဆောင်ရွက်ပေးပါမည်။

အခန်း (၁၁) စီမံကိန်းဖျက်သိမ်းခြင်းနှင့် ပြန်လည်ထူထောင်ခြင်း အစီအစဥ်

စီမံကိန်းဖျက်သိမ်းခြင်း၊ ပြန်လည်နေရာချထားခြင်းနှင့် ပြန်လည်ထူထောင်ခြင်းဆိုင်ရာ လုပ်ငန်းများသည် သင့်လျော်သော အုပ်ချုပ်ရေး အာဏာပိုင်များ၏ လိုအပ်ချက်များကို လိုက်နာရမည်ဖြစ်ပါသည်။ မဟာဓာတ်အားလိုင်း၏ ဒီဇိုင်းသက်တမ်းသည် ယေဘုယျအားဖြင့် သက်တမ်း နှစ် (၅၀) မှ နှစ်(၆၀) ထိ ဖြစ်ပါသည်။ သို့ဖြစ်ပါ၍ ဖျက်သိမ်းခြင်းသည် နှစ်အတော်ဝေးကွာနေသောကြောင့် သဘာဝ ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် စီးပွားရေးဆိုင်ရာ သက်ရောက်မှုများစွာကို ခန့်မှန်းရန်ခက်ခဲလှပါသည်။ ထို့ကြောင့် ဖျက်သိမ်းချိန်တွင် အသေးစိတ် ဖျက်သိမ်းခြင်းနှင့် ပြန်လည်ထူထောင်ရေး အစီအစဥ်ကို ရေးဆွဲပြီး အကောင်အထည်ဖော်ရန် အကြံပြုထားပါသည်။

အခန်း (၁၂) နိဂုံးချုပ်နှင့် အကြံပြုတင်ပြချက်များ

ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံတွင် ဖော်ပြခဲ့သည့်အတိုင်း စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုအဆင့်သည် အလယ်အလတ်နှင့် အနည်းငယ်သာကျန်ရှိလိမ့်မည်ဟု ယေဘုယျအားဖြင့် တွက်ချက်တင်ပြထားပါသည်။ ထိုဖြစ်ပါ၍ အစီရင်ခံစာ၌ ရေးဆွဲဖော်ပြထားသော လျော့ပါးသက်သာစေရေးနည်းလမ်းများ၊ ပတ်ဝန်းကျင်နှင့် တခြား စီမံခန့်ခွဲမှုကို တိကျစွာ လိုက်နာအကောင်အထည်ခြင်း၊ စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များကို သေချာစွာ ဖော်ဆောင်ရွက်ပါက အဆိုပြုတင်ပြထားသော မဟာဓာတ်အားလိုင်းစီမံကိန်းသည် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဆိုးဝါးစွာ ထိခိုက်မှုများ ကင်းရှင်း၍ ပြည်သူလူထုနှင့် နိုင်ငံတော်ကို အကျိုးပြုနိုင်သော စီမံကိန်းတစ်ခုဖြစ်ပါသည်။

Executive Summary

This initial environmental examination (IEE) report establishes an environmental and socio-economic baseline, which describes the existing environmental and social setting of the Project, identifies potential environmental and socio-economic impacts related to the Project, and outlines mitigation and management measures to avoid or reduce the significance of negative impacts. The IEE will also involve consultation with project-affected communities to accurately document project concerns and incorporates an environmental management and monitoring plan (EMMP) for the Project.

Chapter 1: Introduction

The Ministry of Electric Power (MOEP) Department of Power Transmission and System Control (DPTSC) propose to construct a transmission line from Baluchaung (2) Loikaw to Taungoo (Sabakywe) (the Project). The Project will contribute to upgrading the national electricity system by enabling increased transmission loads and strengthening the network.

The Project will involve construction of a new 230 kV transmission line consisting of steel lattice towers between the Loikaw substation in Kayah State and the Sabakywe substation near Taungoo, in Bago region. The new transmission line will be approximately 160 km long and will traverse sections of the Kayah, Shan and Kayin states and the Bago region (Figure ES 1).

Project Proponent/Owner

The project proponent is the DPTSC, an electricity-related department under MOEP. The DPTSC is involved in network planning, and oversight of maintenance and construction projects. Contact details for the DPTSC are provided in Table ES 1.

Table ES 1: Contact Details

Primary Contact	Address
U Thura Aung Bo (Director General) Email: dgdptsc2021@gmail.com Phone: +95 (0)9 428 601 619	Department of Power Transmission and System Control Ministry of Electric Power The Republic of the Union of Myanmar Office No. 27, Nay Pyi Taw

Chapter 2: Project Description

The Project will involve the construction of a new 230 kV transmission line which will be strung on steel lattice towers to be constructed between the Loikaw substation, and the Sabakywe substation near Taungoo, covering a distance of approximately 160 km and comprised of 490 towers. There will be approximately five towers per 1.6 km of transmission line.

Some towers will be passed through the reserved forests and public protected forests. There will be four towers in Kan Kunesin PPF, twenty towers in Nam San Phoo PPF, six towers in Karen Chaung RF and nine towers in Pade RF. Therefore, the project proponent and construction contractor must get the permission from the Forest Department to build towers in the reserve forest and public protected forest.

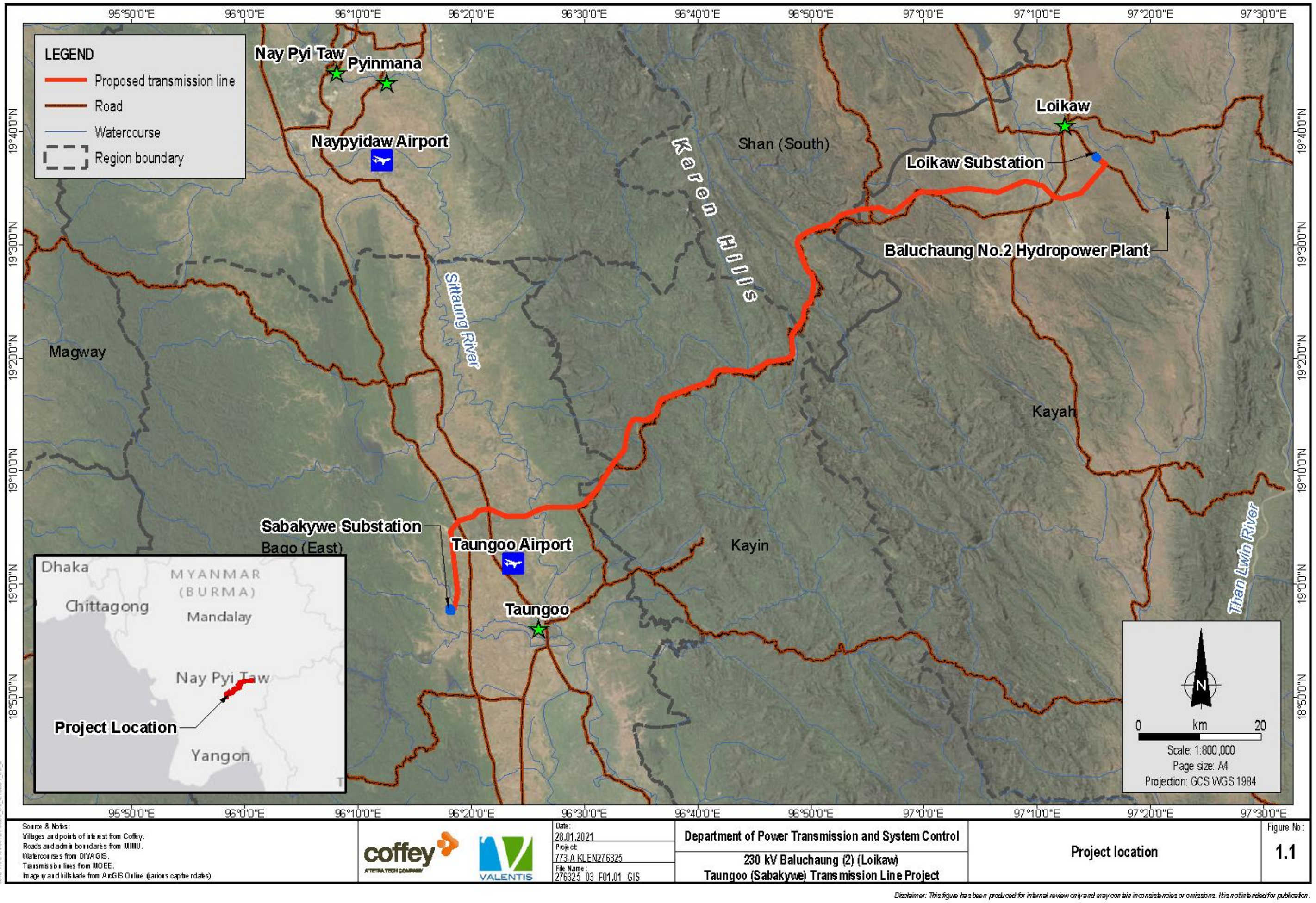


Figure ES 1: Project Location

The proposed transmission line is a 230 kV three-phase, double-circuit line. On the steel lattice towers, this would be arranged vertically with two sets of three phases on each side of each tower.

The key components that make up the transmission line are:

- Aluminium alloy conductors to carry electricity.
- Steel lattice towers to support the conductors.
- String insulators to connect the conductors to the towers.
- Ground wires for lightning protection.

Construction will involve site clearance and access road construction (where required), grading and excavation of soils for foundation installation, transportation of materials to each tower site, and building of foundations and anchors prior to assembly and installation of towers. Once assembled and installed, the transmission line is strung between the towers.

Access Road

The main transport route will be the Taungoo-Leiktho-Yardo Road with access tracks constructed where required. The public existing access has to be used as much as possible. The steel tower parts will be transported to the sites via suitable trucks. A crane will be used to construct the towers. Tower riggers will bolt the pre-assembled tower sections together as the crane puts each piece in place.

Required Equipment

The required equipment for construction are as follows:

- Tensioner (90 kN) with 130 hp/2,500 rpm engine.
- Puller (70 kN) with 280 hp/2,200 rpm engine.
- 3 x engine compressors with 5-6 hp engine.
- 2 x engine winches with 5 – 6 hp engine.
- Tractor (90 kN) with 150 hp engine.
- 3 x trucks (for transportation) (140 hp/3,400 rpm engine).
- Mobile crane (5 tonnes, 190 hp).

Workforce and Working Hours

The construction workforce is expected to include up to 880 people, with different teams associated with different stages of the project (foundation construction, tower erection and stringing).

The workforce required for each aspect of project construction varies, and is summarised below:

- Foundation construction will require four to eight teams consisting of 30 people per team.
- Tower erection will require four to eight teams consisting of 35 people per team.
- Stringing will require two to six teams consisting of 60 people per team.

Up to 360 people will be present on site at any stage of the project. Limited personnel will then be required for ongoing maintenance during operation of the Project. The working hours is 8 hours a day. Working days is 6 days per week. The erection of each tower is expected to take approximately one to three days.

Camp Sites

The tentative plan of five camps site’s locations are near Sabakawe Station, Leik Tho Township, Yar Do Village, near Lwee Ka Hti Village and near That Ta Pa Lu Village which may be chosen as the potential place for accommodation, equipment staging and storage during construction period.

Approximately 200 ft and 80ft of vegetation clearance will be required for camp site areas. The camp site will be temporary. There are 16 buildings will be at camp site. The camp will be built by wood, bamboo and nipa palm roof, weather proof tarpaulin. Approximately 120 works will stay at camp site and the casual labour will be from near villages. Camp site will be featured with one meeting room, one raw material storage area, three staffs living quarter, one car parking area and one workshop area, one storage room and one kitchen, one oil storage area and one drinking water storage area, one bathroom and one toilet, one rubbish tank area and one clinic for health, one security gate at entrance and three emergency exits for emergency cases.

Water Usage

Water supply for the project area is obtained from the springs & creeks near the project site by means of pumps. And water from the springs will be collected in water storage tank in order to domestic camp water uses and construction activities water uses.

Water usage during the construction stages will predominantly be for two main purposes: (A) Domestic (camp) water, and (B) construction water. Water supply for the project area is obtained from the springs & creeks near the project site by means of pumps. And water from the springs will be collected in water storage tank in order to domestic camp water uses and construction activities water uses.

It is estimated that up to 80 L per person per day will be used for personal cleaning and estimate 3 L per person per day bottled potable water will be used for drinking and cooking. The water usage for construction water will be 200 L per day and general equipment cleaning will be 300L per day. Total a camp site and construction water usage will be 10,460 L per day (310,800 L per month).

The proposed program will not interfere with any natural drainage (e.g. drainage lines, creeks, floodplains) in the project area.

Waste Management

Domestic solid wastes are the main source of solid waste that will be generated from the campsite area. It is estimated that approximately 0.56kg of solid wastes will be generated per person per day and total 23kg of solid wastes will be produced per day. It is estimated that approximately 20 gallons of graywater and 0.4 gallons blackwater will be generated per person per day. Total 2,400 gallons of graywater and 48 gallons of black water will be generated per day.

3R principles will be implemented in its solid waste management system. Dry waste will undergo secondary segregation process in order to pick out any useful waste products such as paper and cardboard, that still have some end value after its product life, for sale. Other remaining waste will be disposed of at the designated waste disposal site. Waste disposal site will be collected periodically by waste trucks.

Black water from toilets or urinals will be directly sent to the septic tank for storage. Septic tank will be periodically cleaned by sewage truck. Systematic drainage system will be employed throughout the campsite area to control stormwater runoff across the campsite area. All waste water will be channeled into the natural jungle vegetation areas using carefully constructed site water drainage, and allowed to evaporate.

Fuel Consumption

Diesel and Petrol fuel and oil will be used for all stages of the construction programs, in the following scopes: (1) Staffs vehicles (2) Construction and associated equipment (3) Generators and water pumps (camp and drilling) (4) Earthwork’s machinery (excavator, etc.)

It is estimated that the construction, associated machinery and transportation will use approximately 10 to 15 gallons of fuel per day (240 to 360 gallons per month). It is estimated that the camp (generator, electricity, water pumping etc.) will use approximately 5 to 10 gallons of fuel per day (150 to 300 gallons per month).

Time Frame and Budget

The feasibility study for the Project is due for completion in 2021, with construction of the Project anticipated in 2022.

The Republic of Korean EDCF Loan is intended to be implemented. The Feasibility Study of the project will be conducted by the Korean side and the IEE work will be conducted by Myanmar Side. After these processes are completed, the project cost will be evaluated and the loan agreement will be signed.

Alternatives

Alternatives to the project were considered, including not proceeding with the project, alternative routes, and alternative structures and methods of construction.

Key constraints identified and considered in the assessment of alternative routes included:

- Physical constraints including the location where connectivity is required, a lack of enabling infrastructure and the climatic, topographic and geotechnical constraints imposed by the landscape.
- Prevailing environmental conditions and environmental sensitivities within the project area.
- Social constraints including potentially affected communities and their values and concerns.
- Economic constraints driven by factors including project development expenditure, number of towers and the need for the Project to be in a position to supply power in a profitable manner.

The Project will improve access to energy resources, improve electric stability of the network and assist in sustainable industrial development with associated social and economic benefits. On this basis, the option of not proceeding with the Project was discarded.

Minor adjustments to the proposed route were considered as part of the project feasibility study and environmental and social impact assessment process. Alternative routes avoiding the mountainous and forested terrain were not economically feasible.

Alternative types of tower structure were considered. Lattice steel towers were selected as the preferred choice to align with the majority of the existing network.

Chapter 3: Legislative Context

The Project requires an assessment under the Environmental Impact Assessment (EIA) procedure (2015) in accordance with the Environmental Conservation Law (2012). The EIA procedure provides guidance for environmental assessment for the development of projects that may have an adverse impact and outlines the required level of assessment depending on the nature and scale of the development.

Myanmar and International policy, laws, legal, regulations, resource and environmental conservation regulations, electrical laws and regulations, project policy, law, rules and regulations, National Environmental Quality (Emission) Guidelines, International standards, guidelines, and agreements should be compiled during construction and operation period are presented in this report.

Regulatory Framework for Environmental Assessment in Myanmar

- Constitution of the Republic of the Union of Myanmar (2008)
- National Environmental Policy (1994)
- Myanmar Agenda 21 (1997)
- National Sustainable Development Strategy (2009)

Environmental Policy, Laws and Rules

- National Environmental Policy of Myanmar (2019)
- The Environment Conservation Law (2012)
- Environmental Conservation Rules (2014)
- Environmental Impact Assessment Procedure (2015)

Pertinent Laws, Policy, and Standards for Environmental Management

- Electricity Law (2014)
- National Energy Policy (2014)
- Yangon Development Law (1990)

Other Applicable Laws and Rules

- Forest Law (1992)
- Forest Rule (2018)
- Protection of Wildlife and Conservation of Natural Areas Law (1994)
- Protection of Biodiversity and Natural Protected Areas Law (2018)
- Protection of Wildlife and Wild Plant and Conservation of Natural Area Rule (2002)
- Conservation of Water Resources and Rivers Law (2006)
- Freshwater Fisheries Law (1991)
- Land Acquisition Act (1984)
- Farmland Law (2012)
- Natural Disaster Management Law (2013)
- The Union of Myanmar Public Health Law (1972)
- The Prevention and Control of Communicable Diseases Law (2015)
- The Myanmar Fire Force Law (2015)
- The Myanmar Fire Brigade Law (2016)
- Motor Vehicle Law (2015) and Rules (1987)
- The Protection and Preservation of Antique Objects Law (2015)
- The Protection and Preservation of Ancient Monuments Law (2015)
- The Protection and Preservation of Cultural Heritage Regions Law (1998)
- Labour Organization Law (2011)
- Employment and Skill Development Law (2013)
- Occupational Health and Safety Law (2019)
- Social Security Law (2012)
- Workmen's Compensation Act (1923)
- Minimum Wages Law (2013)
- Payment of Wages Law (2016)

National Policies and Standards

- National Environmental Quality (Emission) Guidelines (2015)
- Effluent Limits for Electric Power Transmission and Distribution
- Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges
- National Drinking Water Quality Standards
- Groundwater Quality Standards
- National Environmental Quality Emission Guidelines Values (Air Emission & Noise Level)
- Exposure Limits to Electric and Magnetic Fields
- Soil Quality Standards

International Standards and Guidelines and International Agreements and Conventions

- The World Bank Environmental and Social Framework (The World Bank, 2017)
- The Equator Principles (EPFI, 2013)

- IFC Performance Standards on Environmental and Sustainability (IFC, 2012)
- Environmental, Health, and Safety General Guidelines (IFC, 2007a)
- IFC Handbook for preparing a resettlement action plan (IFC, 2002)
- International Labour Organization standards
- International Organization for Standardization (IOS)

International Conventions and Agreements related to the Project

- International Environmental Agreement with Myanmar, Conventions, and agreements

Chapter 4: Commitment

The basic project information contained in the Initial Environmental Examination (IEE) is correct. Activities to mitigate environmental Impacts will be carried out. laws, rules, regulations pertinent and guidelines relevant to the Project; that procedures and international rules will be followed. Commitments from the project proponent and the third party are included.

Chapter 5: Existing Environment

This chapter describes the existing baseline environment and socioeconomic in/around which the project area would be constructed and operated.

- **Physical Feature** (covering Topography, Meteorology, Landform, Soil Types, Land Cover, Geology, Hydrology, Hydrogeology, Natural Hazards etc.)
- **Physical Environment** (covering Water Quality, Air Quality, Soil Quality, Noise and Land forms etc.)
- **Ecological Environment** (including protected areas, Park and Flora, Fauna and ecosystem services)
- **Socio-economic Environment** (Demography, Economy and Infrastructure Conditions etc.

The baseline data generation was supplemented with field observation, surveys, and interaction with the community and project personnel. All the baseline survey activities were conducted during September 2020 to February 2021. The primary baseline monitoring data includes water quality, ambient air quality, wind speed and wind direction, noise levels, soil quality, landform survey, ecological features of flora, fauna. Water samples were analysed at the ALARM laboratory and at the Land Use Department (Laboratory of Ministry of Agriculture, Livestock and Irrigation). The results obtained were compared with the standards of National Environmental Quality (Emission) Guidelines. The Topography, Hydrology, Meteorology, Geomorphology, Land Cover, Natural Hazards, and Demography factors are based and referred on the secondary data collected from various Government and Semi-Government organizations.

Project Setting

The Project traverses sections of the Kayah, Shan and Kayin states and the Bago region.

Biophysical Setting

The Loikaw and Sabakywe substations are situated in lowland areas, separated by the Kayah-Karen Mountains, also known as the Karen Hills. The western section of the project area lies in the Sittaung River valley. The Kayah-Karen Mountains are rugged mountain terrain, with the Kayah-Karen montane rainforest ecosystem typically steep and reaching elevations of over 2000 m. Deforestation and human extraction practices have degraded the natural environment over time. The transmission line route traverses variable geology and soils.

Most of the project area is within the Kayah-Karen montane rainforest ecoregion which has a high diversity of bird and mammal species. The lowland areas either side of the Karen Hills have mostly been cleared for agriculture and cultivation, with rice as the dominant crop.

The western side of the proposed transmission line route is in the vulnerable Irrawaddy moist deciduous forest ecoregion. Large areas of this ecoregion have been cleared and utilised for agriculture. The area around Taungoo has been significantly disturbed by human activity and is characterised by grass, farmland and bush.

The proposed transmission line route passes through the following reserved and protected public forests:

- Pade Reserved Forest just east of the Sittaung River.
- The edge of the Karenchaung Reserved Forest on the western side of the Karen Hills.
- Nam San Phoo Public Protected Forest on the eastern side of the Karen Hills, southwest of Loikaw.
- The northern edge of Kan Kunesin Public Protected Forest, south of Loikaw.

An International Union for Conservation of Nature (IUCN) search of the project area identified 10 Critically Endangered species (two mammal species, six bird species and two herpetofauna species), 15 Endangered species (eight mammal species and seven bird species), 24 Vulnerable species (12 mammal species, 10 bird species and two herpetofauna species), and 38 New Threatened species (seven mammal species, 30 bird species and one herpetofauna species).

Part of the western section of the project area lies within the Sittaung-Irrawaddy freshwater ecoregion, comprised of tropical and subtropical floodplain rivers and wetland complexes. The Sittaung River is considered to have low ecological sensitivity. Part of eastern section of the project area is located in the Middle Salween freshwater ecoregion, comprised of tropical and subtropical upland rivers. Most of the Thanlwin River is considered to be of medium ecological sensitivity, though Lake Inle and some tributaries, including the Baluchaung River are considered highly sensitive. IUCN Red List aquatic species that may occur within the project area include one Critically endangered mollusc species, two Endangered, three Vulnerable and five Near Threatened fish species, and one Near Threatened insect species.

The biodiversity survey identified 39 plant species, 11 mammal species, one herpetofauna species and two fish species considered threatened (Vulnerable, Endangered or Critically Endangered) on the IUCN Red List.

Social setting

The transmission line route passes through various different states and regions, rich in both natural resources and cultural heritage:

- The eastern section of the project area is in Kayah State. This state is rich in both natural resources and cultural heritage. The main crop is rice, which is mostly irrigated. The state has a history of timber trade and the forests have been largely cleared by illegal logging.
- The central section of the project area covers rugged mountain terrain of the Karen Hills. Deforestation and human extraction practices have degraded the natural environment over time. Teak and other hardwoods are logged and local communities use cultivation to grow upland rice, corn and millet.
- The western section of the project area lies in the Sittaung River valley in Bago region. The Bago region is strongly dependent on the timber trade. Taungoo is bordered by mountain ranges covered by teak and other hardwoods. Land use in the middle of the valley is largely rice cultivation with the Yangon to Mandalay road and railway also present.

The proposed transmission line route traverses six townships and there are 53 village tracts within 2 km of the proposed line.

Most of the proposed transmission line route passes through Kayin and Kayah states, which have a history of conflict and Tatmadaw (military) presence. Long-term social conflict has impacted the lives and livelihoods of residents in the area with many people having moved away.

Ethnic armed organisations (EAOs) are present in four of the six townships the proposed transmission line route passes through: Loikaw, Demoso, Thandaunggyi and Taungoo. These four townships are known to have land mines present. Land mines have been used by the Myanmar Tatmadaw to protect state-owned factories, bridges and power towers, with warning signs erected. Landmines are reported to have been placed in the surrounding forested areas, and there are reported to be several incidents of death or injury of people and livestock caused by landmines.

A number of cultural heritage sites of interest exist within the project area. Unknown cultural heritage or archaeological sites may also exist along the proposed transmission line route. There are 93 pagodas and 99 monasteries in Loikaw Township, as well as two museums, the Ethnic group Museum and Kachin State Cultural Museum.

Chapter 6: Environmental and Social Impact Assessment and Mitigation Measures

Approach to the impact assessment

This section identifies the potential impacts from project activities on the environmental and social aspects and recommended mitigation measures based on the considerations of baseline survey reported earlier in this report (Chapter 5). Potential impacts for preconstruction, construction, operation, and decommission phases have been assessed in accordance with the impact and assessment methods mentioned in this section. While identifying the key features, the section also discusses the type and range of impacts likely to result from the different project activities, measuring its extent and severity and proposed mitigation measures.

Potential impacts of the project are generally identified for three phases; construction phase, operation phase and decommissioning phase.

Phase of the Project

Pre-Construction and Construction Phase: In this phase, the activities will involve site clearance and access road construction (where required), grading and excavation of soils for foundation installation, transportation of materials to each tower site, and building of foundations and anchors prior to assembly and installation of towers. Once assembled and installed, the transmission line is strung between the towers. The construction of a transmission line involves both long-term and temporary impacts. Long-term impacts can exist as long as the line is in place and include land use restrictions, loss of woodland, and aesthetic impacts. Temporary impacts occur during construction or at infrequent intervals such as during line repair or ROW maintenance. They can include noise or crop damage during construction. Short-term impacts can become long-term impacts if not properly managed or mitigated.

During the stage of the construction works deterioration of air quality and increase of noise levels often occur as a result of, among others, mobilization of vehicles and machinery and loading and unloading and transporting of materials. These impacts do not necessarily occur only at the construction sites, but can take place near the transport routes. Water may also be contaminated as a result of civil works. Nevertheless, the impacts are generated by this stage are temporary and thus considered to be manageable. No significant environmental impacts on the surrounding water bodies are expected at this stage.

Operation Phase: During the operation period, the Project will contribute to efficient transfer of power from existing and future hydropower projects in Kayah State including hydropower schemes on the

Baluchaung River and Nam Pawn River. The existing 500 kV Sabakywe substation will be key in transferring future large-scale generation in the north of Myanmar to the southern and Yangon area.

The Loikaw substation, where the proposed transmission line starts will support access to electricity in Kayah State and meet future demand in the region. No significant impacts on physical environment are expected at this stage. During operations, collisions with operating transmission lines may result in electrocution and fauna mortality. Impacts to IUCN listed threatened species are expected to be limited to individuals and are predicted to be of moderate magnitude to the overall population of affected fauna species.

Decommissioning Phase: This is the final phase of the project, and it will be end in relation to the conditions as stated in the investment contract. Decommissioning would require the use of equipment such as backhoes and pile drivers to break up and remove existing asphalt and concrete, heavy equipment such as cranes, bulldozers, and excavators, and heavy trucks to haul away large amounts of debris. Where needed, any existing hazardous materials used in construction of these buildings would be properly handled and disposed of in accordance with governing authority requirements. In case of closing, the company has to have a close out plan before ending operation immediately so that the environmental and socio-economic impacts could be mitigated.

Methodology

The assessment of each impact is based on consideration of the magnitude, duration, extent and probability of activities, which are going to be carried out during four phases and characteristics of the project site. The assessment is qualitative and the significance of each impact is classified into five categories: very low, low, moderate, high, very high.

During the ***pre-construction and construction phase***, impacts on air quality, noise and vibration, hydrology, hydrogeology & water quality, landform and soil, solid waste generation, liquid waste generation, hazardous waste generation, visual, occupational and community health and safety, terrestrial and aquatic biodiversity, and socio-economic are assessed as **Moderate Impacts** and impacts on cultural heritage and traffic and transport are categorized as **Low Impacts**.

During the ***operation phase***, the operation of transmission lines does not usually result in significant air emissions (IFC 2007a), and air quality impacts are expected to be negligible during operation of the transmission line. Impacts on hazardous waste generation, visual, occupational and community health and safety, terrestrial and aquatic biodiversity, and socio-economic are assessed as **Moderate Impacts** and other impacts like impacts are categorized as **Low Impacts** according to the results of assessments.

During the ***decommissioning phase***, impacts on cultural heritage and traffic and transport are categorized as **Low Impacts** while the rest of impacts on other categories are assessed as **Moderate Impacts.**

Residual Impact Summary

Most impacts have been identified as low or very low, with some moderate impacts. Those moderate impacts are summarised as follows:

During ***pre-construction and construction phase***, impact on visual is assessed as **Moderate Impact**.

During ***operation phase***, impacts on visual and terrestrial and aquatic biodiversity are assessed as **Moderated Impact**.

During ***decommissioning phase***, impact on visual is assessed as **Moderate Impact.**

Mitigation and Management Measures

Mitigation and management measures are important to minimize and reduce potential significant negative impacts. Impacts on Air quality, Noise and vibration, Hydrology, hydrogeology & water quality, Landform and soil, Solid waste generation, Liquid waste generation, Hazardous waste generation, Visual, Occupational and community health and safety, Terrestrial and aquatic biodiversity, Cultural heritage, Socio-economic and Traffic and transport are considered for Pre-construction and construction, Operation, and Decommissioning Phases of this project. In addition, respective detailed mitigation and management measures are described in Table 6.5, 6.6 and 6.7 that aim to reduce the significance of these impacts on the identified values. The proposed project can ensure some positive impacts such as providing job opportunities, business opportunities, revenue to government, CSR development, resources conservation and green economy.

Chapter 7: Cumulative Impact Assessment

The assessment of potential cumulative impacts of the Project draws on the findings of the impact assessments for relevant environmental, social and cultural aspects. Publicly available information on other projects in the area was also reviewed. Projects distant from the transmission line and substation sites were excluded as they are unlikely to have impacts that will overlap with the area of influence of this Project. Scope of the assessment, summary of cumulative impacts on values, and cumulative impact management are included.

Chapter 8: Environmental Management and Monitoring Plans

Environmental Management Plan

Institutional requirements and responsible persons for implementing mitigation measures and EMP are also described in this report. The Environmental Management Plan (EMP) was prepared based on findings of impacts and its significance and designed with the framework of health and safety for all three phases; pre-construction & construction phase, operation phase and decommissioning phase of the proposed project. The project proponent must manage the development of the proposed project by implementing the EMP, which is composed of five parts as follows:

- Contractor Environmental Management Plan
- Environmental Monitoring Plan
- Air Quality Management Plan
- Noise Level Management Plan
- Water Quality Management Plan
- Soil Quality Management Plan
- Waste Management Plan
- Hazardous Material Management Plan
- Avian and Bats Collision and Electrocution Management Plan
- Electromagnetic wave, Electrocution and Electromagnetic Field (EMF) Prevention Management Plan
- Occupational and Community Health and Safety Plan
- Emergency Response and Preparedness Plan (Fire hazards, Blasting, and Electrical Hazards)
- Aircraft Safety Plan
- Revegetation Plan
- Corporate Social Responsibility (CSR) Plan

Moreover, cost estimation for EMP and EMoP were also described in this report. The cost of detail budget allocation for EMP is **USD 500,000** and the cost of environmental monitoring plan during pre-construction and construction stage, operation stage and decommissioning is **USD 160,000** and these will cost annually. The estimate Corporate Social Responsibility (CSR) budget is **USD 20,000**. The project proponent (DPTSC) will allocate the estimation cost of Environmental Monitoring Plan under the yearly budget of the department. The project proponent will add the budgets for coming years if prices would be varied according to the time and services providers.

The **Responsible Organization of Mitigation Measures and Cost Estimation** for pre-construction & construction phase, operation phase and decommissioning phase (Detailed in Table 6.8, 6.9 and 6.10). The **Environmental Monitoring Plan (EMoP)** identifies parameters, frequency and responsible persons to monitor for air quality, water quality, noise level and environmental auditing (Detailed in Table 8.2, 8.3 and 8.4). The **Corporate Social Responsibility (CSR) Plan** aims to create social welfare for local community and to prove that the implementation of the proposed project is beneficial for not only the project proponent but also for the local community. The **Firefighting Plan** aims to protect fire hazards of the proposed project. The **Emergency Preparedness and Response Plan** identify how to overcome emergency cases effectively.

Chapter 9: Stakeholder consultation

Stakeholders identified included Myanmar Government, ministries and departments, Union Government, Environmental Conservation Department (ECD), Kayah, Shan and Kayin State governments, Bago Region Government, local administration, Karen Environmental and Social Action Network, local townships, villages and their communities. Non-government and civil society organizations and individuals, and other local groups.

A public consultation plan has been prepared to guide public consultation and disclosure for the Project IEE and has been based on the Public Participation Guidelines and IFC Performance Standards. Consultation focused on project awareness information and recording stakeholder concerns, expectations or opinions on the Project and its potential impacts.

A community grievance process will be implemented throughout construction and operation of the Project to allow community complaints/concerns to be recorded, reviewed and acted upon, as required.

Public Disclosure and Consultation and Attendees

The stakeholders and public were invited through the Myanma Alinn daily newspaper on 23rd January 2021. (Figure 9.1 & Appendix 14.8). Local government bureaucracy and village administrations were invited by personnel. The local community (Thauk Yay Khat, Kyay Min, Ma Sa, Kaw Pat Chan, Yado Villages at Kayin State) were also informed via the local village chief/officers and announcement through villages representatives on 21st January, 2021 and the local community (Law Pi Ta San Pya and Saung Du Villages at Kayah State) were also informed on 10th February, 2021. The detail of Public consultation meeting list is presented in Table 9.1.

These meetings involved a presentation which included five parts:

- Introducing the project.
- Introducing the IEE, its purpose and the process of undertaking an IEE.
- Outlining the baseline studies undertaken so far and required prior to construction.
- Explaining potential positive and negative impacts, environmental and social management and priorities for management strategies.
- Outlining the benefits of the Project to local villages and Myanmar.

The detail presentation slides are attached in Appendix 14.10. Attendee lists are attached in Appendix 14.9. A question-and-answer session was held at the completion of each presentation. A summary of these sessions is provided in Table 9.3, 9.5, 9.6, 9.8, 9.9 and 9.11. Key issues and queries raised during the question-and-answer sessions included:

Whether the Project will have positive impacts for local villages, such as access to electricity and opportunities for income and/or employment during construction. Impacts to agricultural land, loss of land and associated compensation. The span between transmission towers. Whether local villages will need to provide security as for previous transmission line projects.

Chapter 10: Grievance Redress Mechanism

A Grievance Redress Mechanism (GRM) is a systematic process for receiving, validating and addressing affected people's project-related complaints. In general, MOEP will work proactively towards preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before these issues become grievances. Through the GRM, MOEP shall promptly address affected people's concerns, complaints, and grievances about the project's environmental performance without retribution. It is proposed that a joint grievance redress mechanism be instituted for both environmental and social related issues. Grievances associated with resettlement and compensation are addressed through a separate process described in the resettlement Plan.

Chapter 11: Decommissioning and Resettlement Plan

Decommissioning, reclamation, and restoration activities will adhere to the requirements of appropriate governing authorities.

The design life of transmission lines is generally from 50 to 60 years. Because the decommissioning would occur relatively far in the future it is difficult to forecast many environmental, social, or economic impacts since the baseline at that time will be unknown. It is recommended that at the time.

Chapter 12: Conclusion and Recommendation

As indicated in this Initial Environmental Examination Report, it is generally calculated that the level of potential adverse impacts caused by the project will remain moderated to minor. Assuming the mitigation measures and monitoring requirements in the Environmental Management Plan are effectively implemented, the project is not expected to have a significant adverse environmental impact. The proposed project will benefit the public and the nation free from adverse environmental and social impacts.

Chapter 1

1. Introduction

The Ministry of Electric Power (MOEP) Department of Power Transmission and System Control (DPTSC) propose to construct a transmission line from Baluchaung (2) Loikaw to Taungoo (Sabakywe) (the Project). The Project will contribute to upgrading the national electricity system by enabling increased transmission loads and strengthening the network.

The Project will involve construction of a new 230 kV transmission line consisting of steel lattice towers between the Loikaw substation in Kayah State and the Sabakywe substation near Taungoo, in Bago region. The new transmission line will be approximately 160 km long and will traverse sections of the Kayah, Shan and Kayin states and the Bago region (Figure 1.1).

This initial environmental examination (IEE) report establishes an environmental and socio-economic baseline which describes the existing environmental and social setting of the Project, identifies potential environmental and socio-economic impacts related to the Project, and outlines mitigation and management measures to avoid or reduce the significance of negative impacts. In addition, the IEE involved consultation with project-affected communities to document project concerns (described in further detail in Chapter 5) and incorporates an environmental management and monitoring plan (EMMP) for the Project (Chapter 8).

1.1. Project Proponent/Owner

The project proponent is the DPTSC, an electricity-related department under MOEP.

The DPTSC is responsible for the oversight of power transmission and system control in Myanmar (Figures 1.2 and 1.3). The DPTSC is involved in network planning, and oversight of maintenance and construction projects. Contact details for the DPTSC are provided in Table 1.1.

Table 1.1: Contact Details

Primary Contact	Address
U Thura Aung Bo (Director General) Email: dgdptsc2021@gmail.com Phone: +95 (9) 428 601 619	Department of Power Transmission and System Control Ministry of Electrical Power The Republic of the Union of Myanmar Office No. 27, Nay Pyi Taw Myanmar

1.2. Lead Environmental Consultant

The lead environmental consultant for the Project is Valentis Environmental and Geotechnical Services Limited (Valentis) supported by Coffey Myanmar Ltd (Coffey) (Appendix 14.1).

Valentis and Coffey are both registered with the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) to conduct environmental and social impact assessment in Myanmar. (Appendix 14.2). Both Valentis and Coffey have strong in-country experience in environmental and social impact assessment. Coffey has over 40-years environmental and social impact assessment experience for resource projects internationally. Contact details for Valentis and Coffey are provided in Table 1.2. The core IEE project team and their responsibilities are outlined in Table 1.3.

Table 1.2: Lead Environmental Consultant Contact Details

Valentis (Primary Contact)	Coffey (Secondary Contact)
La Min Win, Group MD lmwin@valentisasia.com Mobile: +95 (0)9 515 4777 Office: +95 (0)1 966 9883 No. 234, Pyay Road, Level 7, Central 9 Office Tower Mayangone (9 Mile), Yangon, Myanmar	Erica Colley Senior Associate erica.colley@coffey.com

Table 1.3: IEE Key Team Members and Responsibilities

No.	Name (Sur name, Given name)	Roles	Roles & Responsibility in the Project	Education Background
1.	Emma Waterhouse (Coffey)	Key Consultant	**Environmental Expert (EIA) / Project Manager** • Waste Management • Legal Analysis Oversight project direction & all technical aspect	• MSc (Hons) Resource Management • BSc (Botany and Zoology)
2.	Erica Colley (Coffey)	Key Consultant	**Environmental Expert (EIA)** • Responsible for setting up project system and procedures • Overall project coordination • Cost and schedule control and successful Project delivery • Distribution of tasks, management of reporting	• MSc (Environmental Science) • BSc (Biology) Certified Practising Project Manager
3.	Than Khin (Valentis)	Team Leader	**Team Leader/Environmental Expert (Pollution)** • In-country coordination • Management of field teams including oversight of HSSE and OHS • Training and capacity building internally and external staff accompanying field teams • Impact Assessment and Mitigation Measure • Management of reporting	• D.Eng (Environmental) • M.E (Environmental) • B.E(Chemical) • Dip. in Environmental Engineering • Certificate of Occupational Health & Safety Specialist, OSHA Academy, USA
4.	Patrick Vilder (Coffey)	Associate Consultant	**Social Impact Assessment Lead** • Guidance and oversight for social baseline studies • Advice and technical review for the socio-economic impact assessment • Scoping and oversight of consultation activities	• MA(Rural Development), • M.EngSc BEng(Hon)
5.	Thant Zin (Valentis)	Field Survey Team Leader	**Field Survey Lead** • In-country management of stakeholder engagement and consultation • Air, Water & Soil • Socio-economic survey • Public consultation	• B.Sc (Forestry) • Dip.RS& GIS • Dip.ES • MS. (EAM) • Certificate of Social Risk Management
6.	Michael Sale (Coffey)	Associate Consultant	**Environmental Expert (Ecology)** • Advice, guidance and technical review for terrestrial ecological aspect	• Ph.D (Ecology) BSc (Hon)

7.	Kyaw Naing Oo (Subconsultant to Valentis)	Associate Consultant	**Fauna and biodiversity specialist/Field Lead** • Field survey and reporting on Fauna terrestrial and aquatic ecology aspects	• Ph.D (Zoology) • PG.Dip in Biotechnology • MSc (Zoology) BSc.(Hon) Zoology
8.	Tun Tun Myint (subconsultant to Valentis)	Associate Consultant	**Flora Specialist/Field Lead** • Field survey and reporting on Flora ecology aspects	• M.Sc (Zoology) • M.Res(Botany) • B.Sc.(Hon) Zoology
9.	John Sweeney (Coffey)	Associate Consultant	**Environmental Expert (Water and Hydrology)**	• BSc. (Hon) (Earth Science / Hydrogeology)
10.	Minn Chit Thu (Valentis)	Geologist	**Lead Geologist** • Manage of soil baseline sampling and observations	• M.Res. (Credit) Economic Geology • M.Sc. (Credit) Economic Geology • B.Sc. (Hons) Geology • Dip in GIS
11.	Yin Min Thann (Valentis)	Geotechnical Engineer	**Lead Geotechnical Engineer** • Management of field assessment of land stability and geotechnical aspect	• M.Sc. Geotechnical and Geoenvironmental Engineering • M.Sc. Geology • B.Sc. (Hons) Geology
12.	Powar Yadanar Khant (Valentis)	GIS	**GIS expert** • Preparation of drawings with GIS tasks • Manage and report data collected during the project	• B.Sc. Geology • Diploma of GIS & RS
13.	Myo Zaw (RJE-Valentis)	Project Assistant	**Electrical Engineer** • Advice on engineering aspects • Power system & transmission	• BE (Electrical Power)

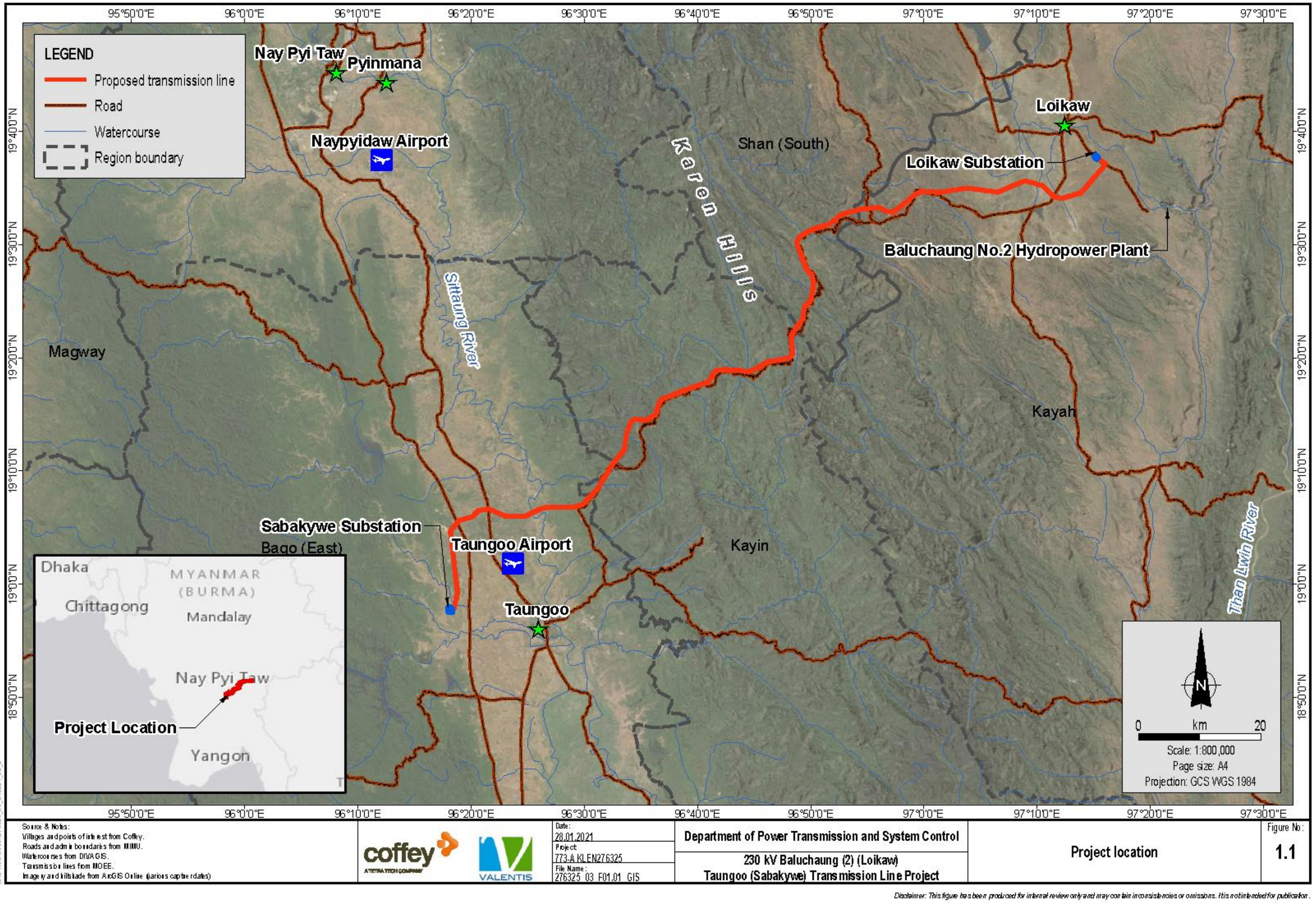


Figure 1.1: Project Location

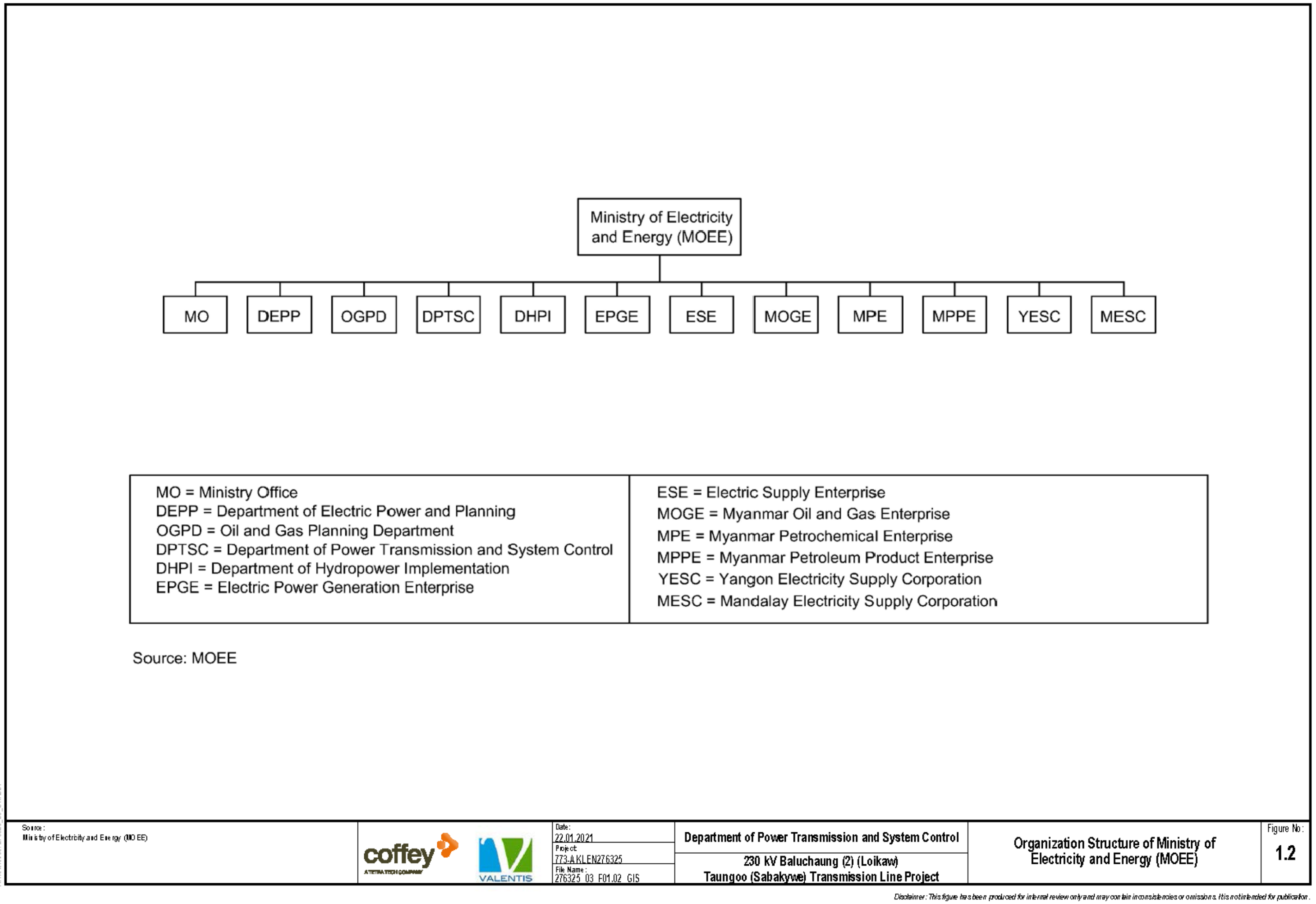


Figure 1.2: Organisation structure of Ministry of Electricity and Energy

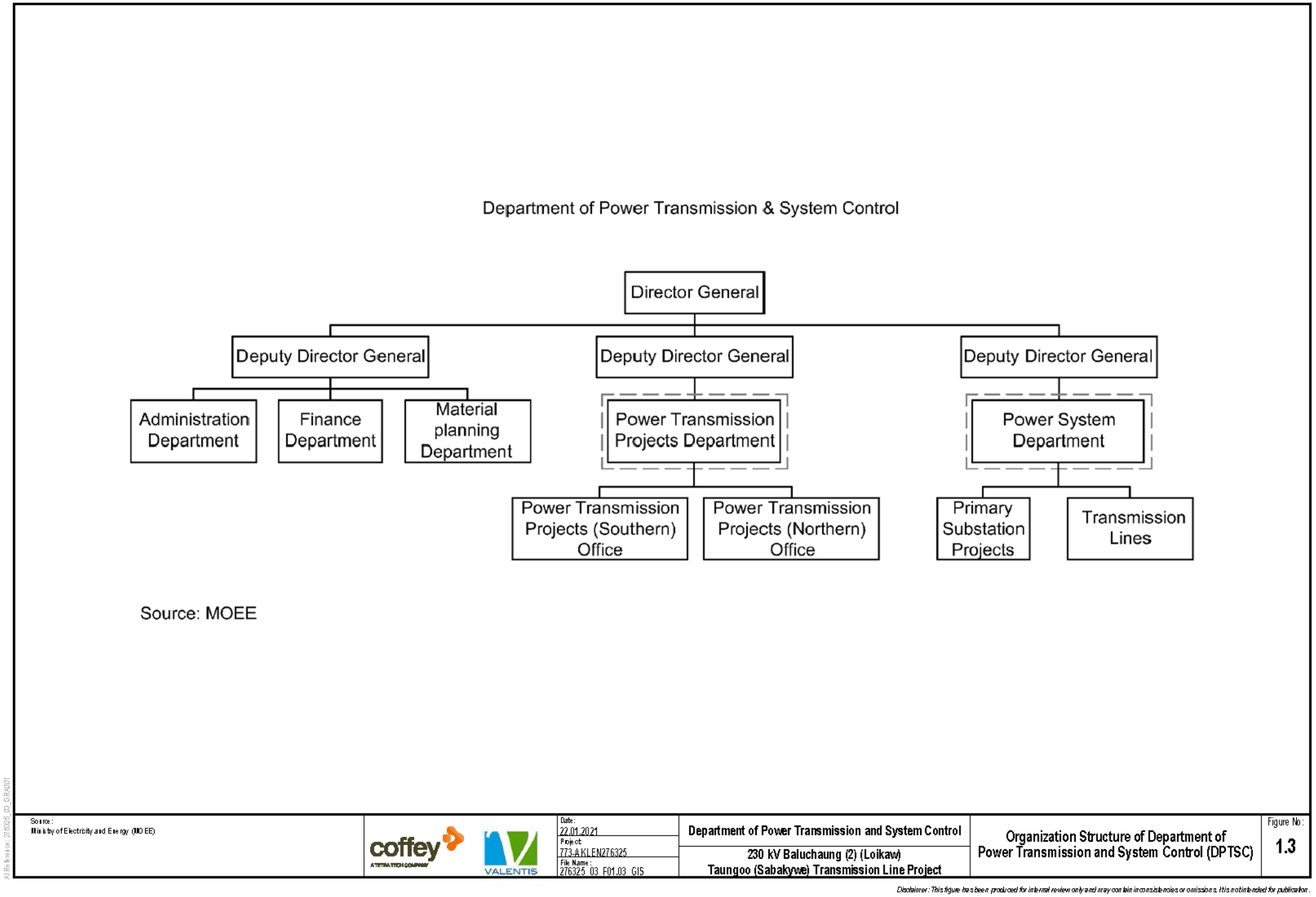


Figure 1.3: Organisation structure of Department of Power Transmission and System Control

1.3. Report Structure

This report includes the IEE and associated EMMP for the Project. The structure of the IEE is outlined in **Error! Reference source not found.**.

Table 1.4: IEE Structure

Chapter	Chapter	Description
	Executive Summary	Summarises key aspects and findings of the IEE.
1.	Introduction	Introduces the Project and provides information on the structure of the IEE, Project proponents and Consults team members and responsibilities.
2.	Project outline	Provides information on the location and scale of the Project, the project objectives, and presenting a description of the Project as well as project alternatives.
3.	Statutory context	Outlines the relevant Myanmar legislation, regulations and policies, and other applicable international standards and guidelines.
4.	Commitments	Include the project proponent and the third party's commitments on the proposed project.
5.	Existing environment	Describes the existing physical, biological, cultural and socio-economic environment in the project area.
6.	Environmental and social impact assessment	Documents the environmental and socio-economic values that may be impacted, and outlines potential impacts, proposed management measures and residual impacts of the project.
7.	Cumulative impact assessment	Documents the assessment of potential cumulative impacts that may result from interaction of elements of the Project with other credible planned and future projects.
8.	Environmental management and monitoring plan	Presents the environmental and social management and monitoring plan for the Project. Discusses the parameters, location, schedule, cost, and responsible organization of monitoring plan during construction, operation, and decommission stages.
9.	Stakeholder consultation	Describes the consultation program undertaken for the Project.
10.	Grievance Redress Mechanism	Describes grievance redress mechanism to the affected people, community and any stakeholder(s) having stake in the project to raise their issues and grievances as well as concerns. It also consists the types of grievance, grievance redress composition and grievance resolution process.
11.	Decommissioning and Rehibition Plan	Decommission and Rehabilitation plan Describes the stakeholder consultation, activities for pre-decommission and decommission process, rehabilitation management measures, responsibility, budget, and monitoring program.
12.	Conclusion	Sets out the conclusions for the IEE highlighting the most significant impacts and proposed measures to effectively manage these impacts.
13.	References	List of references cited in the IEE.
14.	Appendix	

Chapter 2

2. Project Outline

This chapter provides detail on the location, scale and objective of the Project. Information is also provided on the project description and project timeframes.

2.1. Location and Scale of the Project

The new transmission line will be approximately 160 km long and will traverse sections of the Kayah, Shan and Kayin states and the Bago region. The transmission line will run between the existing Loikaw substation in Loikaw township (Kayah State) and Sabakywe substation near Taungoo township (Bago region) (Figure 1.1)

2.2. Objectives of the Project

The DPTSC propose to construct the Project to contribute to upgrading the national electricity system. The Project will enable increased transmission loads and will strengthen the network through construction of a new 230 kV three-phase, double-circuit transmission line with steel towers.

There is an existing 230 kV transmission line from Baluchaung (2) to Taungoo, constructed in the 1960s, that has reduced power transfer capacity due to its age (Byucksan Power and T.L. Engineering 2020). The Project will contribute to efficient transfer of power from existing and future hydropower projects in Kayah State including hydropower schemes on the Baluchaung River and Nam Pawn River. The existing 500 kV Sabakywe substation will be key in transferring future large-scale generation in the north of Myanmar to the southern and Yangon area. The Loikaw substation, where the proposed transmission line starts will support access to electricity in Kayah State and meet future demand in the region.

The DPTSC are responsible for power transmission in Myanmar, whereas the Electricity Supply Enterprise (ESE) are responsible for power distribution. While this project is solely related to electricity transmission and does not include distribution of local villages, the ESE are planning to electrify all villages by 2030. Improving the national electricity system will facilitate power distribution in the future.

2.3. Project Description

Electricity produced by the Baluchaung No.2 Hydropower Plant in Kayah State, operated by MOEE, is currently transferred to the Sabakywe substation in Bago region by the 400-km-long 230 kV Lawpita-Taungoo-Hlawga transmission line. The 33 kV Lawpita-Loikaw-Mobye transmission line connects the Baluchaung No.2 Hydropower Plant to the Loikaw substation approximately 13 km away.

The Baluchaung No. 2 hydropower plant has an installed capacity of 168 MW and can generate 1,190 GWh of electricity annually (IFC 2017d). Over the last 40 years the plant has supplied more than 50% of Myanmar’s electricity (Li et al. 2020). Output from the Baluchaung No. 1 and Baluchaung No. 3 hydropower stations is transported to the Baluchaung No. 2 hydropower plant. Additionally, a hydropower project is proposed for the Nam Pawn River (Nam Pawn Hydro project).

The new 230 kV transmission line will be strung on steel towers to be constructed between the Loikaw substation, and the Sabakywe substation near Taungoo. The new transmission line will be approximately 160 km long and comprised of 490 towers.

The proposed transmission line is a 230 kV three-phase, double-circuit line. The average projected peak load of each circuit is 290 MW with a maximum current per phase of 364 A. When the proposed Nam Pawn Hydro project is completed this is anticipated to increase increasing to 500 MW with a maximum current per phase of 628 A, and the proposed transmission line is required for transmission of the additional energy generated.

The key components that make up the transmission line are:

- Aluminium alloy conductors to carry electricity.
- Steel pole and lattice towers to support the conductors.
- String insulators to connect the conductors to the towers.
- Ground wires for lightning protection.

Feasibility studies are underway that will determine the detailed engineering specifications for the Project. The final alignment of the transmission line will be confirmed upon the completion of the feasibility studies, taking into consideration environmental and social sensitivities along the route, and potential project-related impacts.

DPTSC are following the IEC 60826 Loading and strength of overhead transmission lines international standard, including for the design of the transmission line.

2.3.1. Components

The proposed transmission line is a 230 kV three-phase, double-circuit line. On the steel lattice towers, this would be arranged vertically with two sets of three phases on each side of each tower.

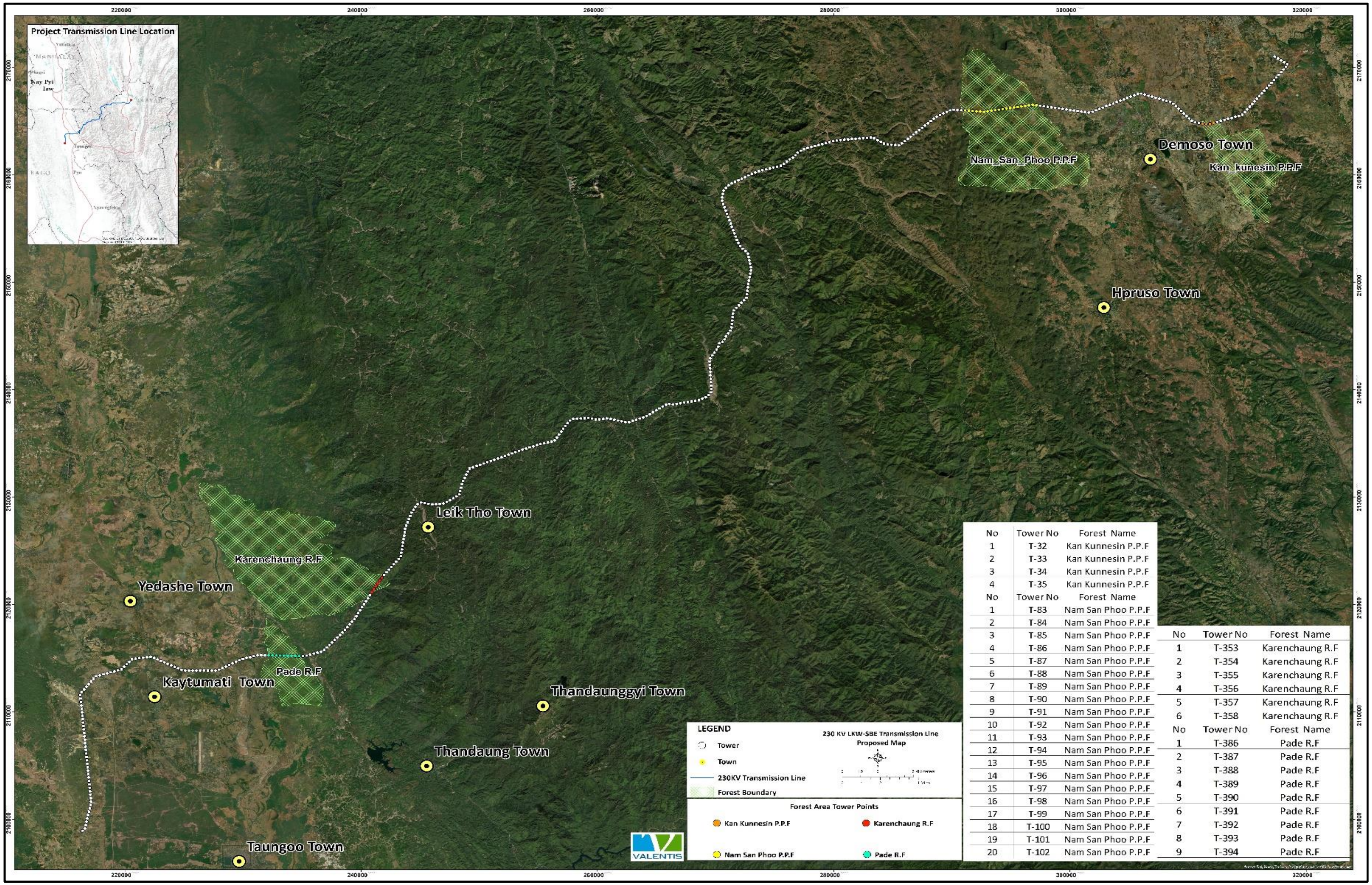
Towers

The towers are proposed to be mostly steel pole towers, with lattice steel towers used where required (i.e. for direction changes). There will be approximately five towers per 1.6 km of transmission line, with an estimated total of 490 towers. The detail tower's location is presented in Figure 2.1 and the tower coordinate points are presented in Appendix 14.3. Some towers will be passed through the reserved forests and public protected forests. The detail towers ID, distances and total towers number is presented in Table 2.1 and the tower coordinate points are presented in Appendix 14.4.

Table 2.1: Detail Transmission Towers in the Forest Area

No.	Forest (PPF/RF) Name	Estimate Distance	Tower Number	Total Towers will be passed through
1.	Kan Kunesin PPF	0.69 miles	T 32 to T 35	4 Towers
2.	Nam San Phoo PPF	3.97 miles	T 83 to T 1012	20 Towers
3.	Karen Chaung RF	1.23 miles	T 353 to T 358	6 Towers
4.	Pade RF	1.65 miles	T 386 to T 394	9 Tower

Therefore, the project proponent and construction contractor must get the permission from the Forest Department to build towers in the reserve forest and public protected forest. The informed letter of transmission tower in the forest area is attached (Appendix 14.5). The average distance between towers will vary between 120 and 400 m, depending on terrain. The height of the transmission towers will range between 20 and 40 m above the ground. Tower footprints (including the foundations) can vary in area and are anticipated to range between 100 and 169 m^2 per tower. The working space required will be up to 400 m^2 per tower. Each tower will have an approved system for preventing climbing after 3 m above ground, and warning signs will be located on all towers.



No	Tower No	Forest Name
1	T-32	Kan Kunnesin P.P.F
2	T-33	Kan Kunnesin P.P.F
3	T-34	Kan Kunnesin P.P.F
4	T-35	Kan Kunnesin P.P.F

No	Tower No	Forest Name
1	T-83	Nam San Phoo P.P.F
2	T-84	Nam San Phoo P.P.F
3	T-85	Nam San Phoo P.P.F
4	T-86	Nam San Phoo P.P.F
5	T-87	Nam San Phoo P.P.F
6	T-88	Nam San Phoo P.P.F
7	T-89	Nam San Phoo P.P.F
8	T-90	Nam San Phoo P.P.F
9	T-91	Nam San Phoo P.P.F
10	T-92	Nam San Phoo P.P.F
11	T-93	Nam San Phoo P.P.F
12	T-94	Nam San Phoo P.P.F
13	T-95	Nam San Phoo P.P.F
14	T-96	Nam San Phoo P.P.F
15	T-97	Nam San Phoo P.P.F
16	T-98	Nam San Phoo P.P.F
17	T-99	Nam San Phoo P.P.F
18	T-100	Nam San Phoo P.P.F
19	T-101	Nam San Phoo P.P.F
20	T-102	Nam San Phoo P.P.F

No	Tower No	Forest Name
1	T-353	Karenchaung R.F
2	T-354	Karenchaung R.F
3	T-355	Karenchaung R.F
4	T-356	Karenchaung R.F
5	T-357	Karenchaung R.F
6	T-358	Karenchaung R.F

No	Tower No	Forest Name
1	T-386	Pade R.F
2	T-387	Pade R.F
3	T-388	Pade R.F
4	T-389	Pade R.F
5	T-390	Pade R.F
6	T-391	Pade R.F
7	T-392	Pade R.F
8	T-393	Pade R.F
9	T-394	Pade R.F

Figure 2.1: Transmission Line Towers' Location

Conductors and Phasing

The conductors are proposed to be 2.7 cm diameter 795 MCM aluminium conductor steel reinforced (ACSR) Tern conductors, with one used for each phase. The horizontal spacing between each set of conductors will vary slightly along the route, but is expected to be approximately:

- 10.8 m between the lower conductors.
- 15 m between the middle conductors.
- 12 m between the upper conductors.

The vertical spacing between conductors is expected to be approximately 6.3 m, and the vertical distance between the ground and conductors will be a minimum of 7.6 m, with an estimated average of 10.6 m conductor-to-ground-clearance between towers. The conductor-to-ground clearance distance will vary based on the conductor temperature, with the minimum clearance distance expected to be greater under normal operating temperatures. These distances may vary once the transmission line design is finalised.

Phase configuration will consider electric and magnetic fields and noise levels, with the intention of meeting guideline limits for electric fields and noise levels, and minimising the magnetic field where practicable.

2.3.2. Construction

Construction of transmission towers typically involves site clearance and access road construction (where required), grading and excavation of soils for foundation installation, transportation of materials to each tower site, and building of foundations and anchors prior to assembly and installation of towers. Once assembled and installed, the transmission line is strung between the towers. Most of the proposed transmission line route is accessible via existing roads, with minor access roads to be constructed where required. Construction work will occur at several sites simultaneously.

At each tower site, vegetation will be cleared to create a working space around the tower foundations. Tall vegetation (above 1 m in height) will be also cleared along the transmission line route within a defined right-of-way (ROW) width of approximately 45 m to maintain a gap between vegetation and the transmission line. Topsoil will be removed and stored in a suitable area to be reused after towers are erected for future revegetation, where possible. The perimeter of the cleared area will be fenced off during construction to prevent unauthorised persons and fauna from entering the construction area. Once the site is cleared and fences are in place, foundation construction can commence

Foundation construction will include excavation and preparation of the footing base, drilling of holes and installing piles, and the setting of the base template and anchor bolts. Concrete for the foundations will be mixed and poured on site or at a batching plant close-by. Construction of the foundations is anticipated to take around 960 hours for every 6.4 km of the transmission line (approximately 20 towers).

After the concrete is set and foundations are established, towers will be constructed. Each tower will be constructed to support the load imposed on it by the conductors. Guy wires may be used to help stabilise the towers, as required. Tower erection is anticipated to take around 480 hours for every 6.4 km of transmission line (approximately 20 towers).

The steel tower parts will be transported to the sites via suitable trucks. The main transport route will be the Taungoo-Leiktho-Yardo Road with access tracks constructed where required. A crane will be used to construct the towers. Tower riggers will bolt the pre-assembled tower sections together as the crane puts each piece in place.

Once enough towers are completed, string insulators will be added, and the stringing process will begin. Conductors will be strung using heavy-duty mechanical winches. Stringing time is dependent upon the number of straight sections on the alignment and the distance between towers. This is anticipated to take around 240 hours for every 6.4 km of transmission line (approximately 20 towers).

Land Requirements

Land will be required for the tower bases and access roads. The final route will be selected to avoid agricultural land and avoid resettlement where possible. Relocation of residences may be required if the transmission line route cannot be realigned to avoid them. Houses are not permitted to be within a 75-foot (approximately 23 m) easement either side of the transmission line for safety reasons.

If required, a resettlement plan will be prepared ahead of any relocation or resettlement. Land acquisition and compensation will be undertaken in accordance with Myanmar laws and regulations.

Access Roads

The main transport route will be the Taungoo-Leiktho-Yardo Road with access tracks constructed where required. (Figure 2.2). In some areas additional access roads have to be built. The planning of these roads has to be done carefully, and public existing access has to be used as much as possible. The access roads shall be natural roads, reinforced by a gravel bed. The cutting of only necessary trees or any other agricultural plants is possible only upon express permit, any direct or indirect damages to any private agricultural production, fencing, private access to properties and land property shall be negotiated and borne by the contractor, in general contractor shall make effort as much as possible in order to avoid the cutting of trees during the access road constructions, erection works, demobilization.

All new access roads required shall be located as far as possible within the ROW easement, and the number of new access routes between existing roads and the easement shall be kept to a minimum. Finger roads are preferable instead of a continuous access along the line. The Contractor will negotiate with the landowners about permission and compensation.

Access Roads Construction

The Contractor shall (after getting permission for the routes) do what is necessary to make the access suitable for his use and shall take all reasonable precautions to avoid damage, including, if required the erection of temporary fences or gates where permanent fences, hedges or gates have been removed. The Contractor shall not be entitled to any additional payment in the event of a particular access being difficult.

Access roads shall not be cut into a hillside immediately below a tower. Plans for access roads in steep terrain will be submitted to the Project Management Unit (PMU) or the Project Implementation Consultant (PIC) for approval. Stability of slopes over 30 percent shall be checked and approved by the PMU/PIC prior to selection of foundation to be used. Access roads will be graded and sloped to prevent unnecessary flow of water across the tower sites and to minimize soil erosion.

New earth access tracks shall be 4 m suitably compacted. The final surface level shall be at least 0.5 m above the existing ground level and shall be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent properties. Junctions between new tracks and existing roads shall not impede or damage the latter nor any associated drainage channels, irrigation infrastructure, etc.

Figure 2.2: Proposed 230kV Transmission Line and Existing Assess Road

Maintenance and Handing Over

The Contractor shall be responsible for maintaining all agreed access routes, without undue widening, in a usable condition for the duration of the Contract and the landowner shall not be put to any inconvenience in gaining access to his land or buildings. All necessary measures connected with the access, transport and maintenance are in the responsibility of the Contractor.

It is expected that some of the access roads will remain for later use in maintenance operations. However, to the extent practicable, temporary access roads will be removed and land restored after construction ends.

The Contractor shall be responsible for maintaining all agreed access routes, without undue widening, in a usable condition for the duration of the Contract and the landowner shall not be put to any inconvenience in gaining access to his land or buildings. All necessary measures connected with the access, transport and maintenance are in the responsibility of the Contractor.

Required Equipment

Equipment required includes:

- Tensioner (90 kN) with 130 hp/2,500 rpm engine.
- Puller (70 kN) with 280 hp/2,200 rpm engine.
- 3 x engine compressors with 5-6 hp engine.
- 2 x engine winches with 5 – 6 hp engine.
- Tractor (90 kN) with 150 hp engine.
- 3 x trucks (for transportation) (140 hp/3,400 rpm engine).
- Mobile crane (5 tonnes, 190 hp).

2.3.3. Workforce

The construction workforce is expected to include up to 880 people, with different teams associated with different stages of the project (foundation construction, tower erection and stringing).

The workforce required for each aspect of project construction varies, and is summarised below:

- Foundation construction will require four to eight teams consisting of 30 people per team.
- Tower erection will require four to eight teams consisting of 35 people per team.
- Stringing will require two to six teams consisting of 60 people per team.

Up to 360 people will be present on site at any stage of the project. Limited personnel will then be required for ongoing maintenance during operation of the Project. The DPTSC will work with relevant authorities and organisations to create opportunities for local people in the provision of goods and services to the Project where appropriate. Where two or more equally skilled and experienced candidates are considered for an applicable position, the DPTSC will preferentially seek to employ candidates in the following order:

1. Residents of local communities.
2. Residents within the applicable state.
3. Other Myanmar citizens.
4. Expatriates.

Some exceptions to this policy may be made to ensure there is an adequate number of appropriately qualified staff at all times to maintain health and safety.

Rosters will be developed to provide adequate coverage for construction and operation considering functions and responsibilities of each position, travel to and from site, fatigue management and good industry practices.

2.3.4. Working Hours

The working hours is 8 hours a day. Working days is 6 days per week.

2.3.5. Campsites and Storage Areas

It is planned that local villages or towns near the work areas will be used for accommodation, equipment staging and storage for the construction stage.

The tentative plan of five camp sites' location are presented in Table 2.2 and Figure 2.3. Near Sabakawe Station, Leik Tho Township, Yar Do Village, near Lwee Ka Hti Village and near That Ta Pa Lu Village may be chosen as the potential place for accommodation, equipment staging and storage during construction period. The work program will be staffed by an Administration officer, a Logistic Officer and a health-care person, and local labours will be employed to assist on the construction program. The construction conductor and its surrounding villages are considered to have sufficient local residents to support the proposed field program.

The camp site location will be planned in advance and the area chosen for the entire camp site will be determined based on the smallest area needed to be cleared of vegetation. If an area which is already naturally clear is available and suitable then this will be the preferred camp site.

The location for the camp site will be selected to avoid clearing any trees with a circumference greater than 3' (diameter 12").

The camp site will also be chosen to as not to block or contaminate any natural waterways, and will be located on flat surfaces to avoid degradation of natural slopes.

Any clearing of small plants and undergrowth will be undertaken using a grader and excavator. All topsoil on the camp site area will be stored in a stockpile beside the camp, and covered with a weather-proof tarpaulin to prevent erosion and loss of the soil. This soil will be re-distributed on the camp site at the completion of the program.

Approximately 200 ft and 80ft of vegetation clearance will be required for camp site areas. The camp site will be temporary. There are 16 buildings will be at camp site. The camp will be built by merchantable wood, bamboo and nipa palm roof, weather proof tarpaulin. Approximately 120 works will stay at camp site and the casual labour will be from near villages. Camp site will be featured with one meeting room, one raw material storage area, three staffs living quarter, one car parking area and one workshop area, one storage room and one kitchen, one oil storage area and one drinking water storage area, one bathroom and one toilet, one rubbish tank area and one clinic for health, one security gate at entrance and three emergency exits for emergency cases. Probably, detail camp site's facilities are described in Table (2.3). The proposed camp site area layout plan is presented in Figure (2.4).

Table 2.2: Tentative Camp Site Location

Name	Latitude	Longitude	Remark
Labour Camp (1)	18°57'30.61"N	96°18'21.77"E	Near Sabakawe Station/Taungoo
Labour Camp (2)	19°13'46.13"N	96°35'5.57"E	In Leik Tho Township
Labour Camp (3)	19°21'38.92"N	96°48'13.30"E	In Yar Do Village
Labour Camp (4)	19°34'32.76"N	97° 0'29.26"E	2 km from Lwee Ka Hti Village
Labour Camp (5)	19°37'35.11"N	97°15'27.36"E	0.5 km from That Ta Pa Lu Village

Table 2.3: Buildings and Facilities at Camp Site

No.	List of Buildings	Length & Width	No. of Buildings
1.	Raw materials storage area	35’ x 30’	1
2.	Car and Truck Parking	50’ x 20’	1
3.	Storage	10’ x 10’	1
4.	Oil storage area	20’ x 15’	1
5.	Car Workshop	20’x 10’	1
6.	Engine	15’ x 10’	1
7.	Meeting room	20’ x 10’	1
8.	Clinic	10’ x 15’	1
9.	Staffs Living Quarters	30’ x 15’	1
10.	Staffs Living Quarters	40’ x 15’	1
11.	Staffs Living Quarters	40’ x 10’	1
12.	Drinking water storage tank	15’ x 10’	1
13.	Toilet	15’ x 10’	1
14.	Bathroom	15’ x 10’	1
15.	Rubbish Tank	8’ x 8’	1
16.	Security	10’ x 10’	1
	Total Area	**200’ x 80’**	**16**

Figure 2.3 : Proposed Camp Sites Location

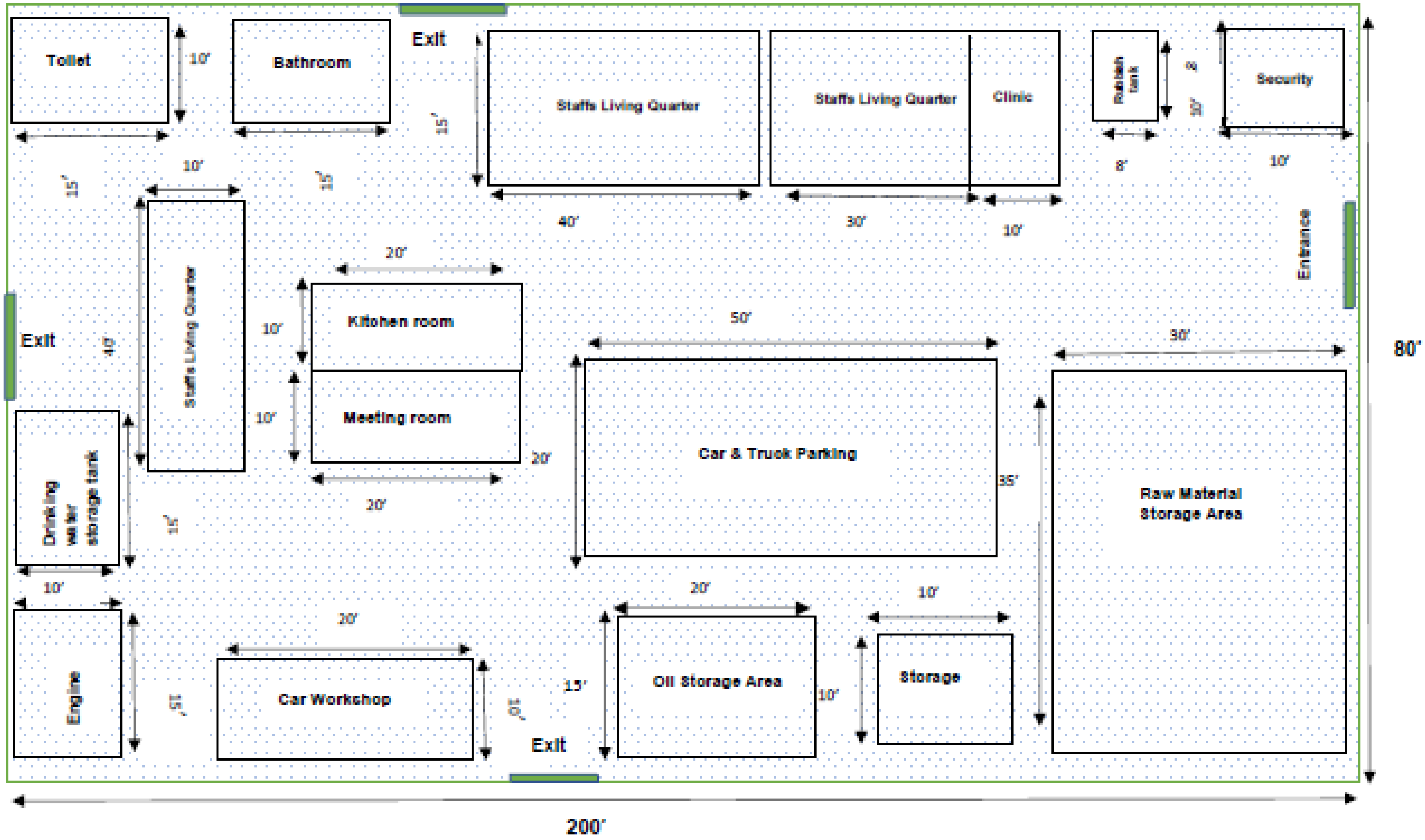


Figure 2.4: Camp Site Layout Plan

2.3.6. Water Supply

Source of Water Supply

Water supply for the project area is obtained from the springs & creeks near the project site by means of pumps. And water from the springs will be collected in water storage tank in order to domestic camp water uses and construction activities water uses.

Water Permitting

Once the site for the construction of the camp has been chosen, a meeting with the relevant Water Authority Department in Taungoo/ Than Daung Gyi/ Loikaw will be arranged to discuss the proposed water supply for the camp and for construction operations. An application for a water permit will be submitted at this meeting, and the camp construction will proceed once the permit has been approved and issued.

Water Usage

Water usage during the construction stages will predominantly be for two main purposes: (A) Domestic (camp) water, and (B) construction water. Detail water usage is presented in Table 2.4.

(A) Domestic Camp Water

The water usage for the camp will vary depending on the number of people in the camp at a particular time. It is estimated that up to 80 L per person per day will be used for personal cleaning, ablutions and equipment maintenance domestic camp water will be sourced locally from municipal water network. Estimate 3 L per person per day bottled potable water will be used for drinking and cooking.

In general, required domestic camp water will be supplied from the nearby waterways close to the camp site area by means of pumps and will be stored in staff living quarters and core shed area by means of portable water storage tanks. 20 L bottled drinking water will be purchased from nearby towns or villages.

(B) Construction Water

The water usage for concrete batching, drilling and piling and dust suppression. Recycle water will be used for dust suppression. The water usage for construction water will be 200 L per day.

Table 2.4: Total Water Required Per Camp Site

No.	Purpose for Water Use	Water Required (Liter)		
		Per day	Per Month	Per Year
1.	General and Personal Use (80 L/person * 120 People)	9,600	288,000	3,456,000
2.	For Construction (200 L/day, 6 days/ week)	200	4,800	57,600
3.	General Cleaning Equipment	300	7,200	86,400
4.	Drinking and cooking Water (3 L/person *120 People)	360	10,800	129,600
	Total	**10,460**	**310,800**	**3,729,600**

2.3.7. Waste Management

Waste will be generated from

(A). Solid Waste from Camp Facilities & Work Site
(B). Liquid Waste from Camp Facilities & Work Site

The following waste management systems will be established and implemented by the HSE Officer for the camp and drill sites before the program commences. No waste will be released to the natural environment and no residual waste will be left on any work sites. All waste and rubbish will be removed and disposed of in designated waste disposal site.

(A). Solid Waste from the Camp Facilities & Work Site

Domestic solid wastes are the main source of solid waste that will be generated from the campsite area. It is estimated that approximately 0.56kg of solid wastes will be generated per person per day and total 68kg of solid wastes will be produced per day. Potential solid wastes that will be generated are:

- Food waste from kitchen
- Paper and cardboard from packaging
- Plastic bottles from drinking water package
- General camp and office wastes

Proponet will incorporate 3R principles in its solid waste management system and will establish the system in accordance with the following waste hierarchy sequences:

Reduce: Reduce waste as far as possible such as using 20L water bottle instead of using 1L plastic bottles, etc.

Reuse: As far as practicable, wastes will be reused such as using recyclable bags instead of plastic bags, reusing one sided used paper waste for draft note taking, etc.

Recycle: Recycle waste into new products such as recycling used tyres into waste bins, etc.

Disposal: Waste will be disposed at the controlled on-site waste disposal site if none of the above is achievable. Waste disposal area will be designed to prevent the inflow of rainwater runoff from upslope areas and will be lined with compacted soil layer together with the suitable drainage structures. Waste will be segregated into wet and dry waste at source prior to disposal. Wet waste includes various organic wastes such as food waste while dry waste includes wood and related products, metals and glasses. Segregation of wastes will be done by providing different waste bins for each waste category. Wet wastes, especially food wastes, will be converted into compost to be used as fertilizer for rehabilitation process. Dry waste will undergo secondary segregation process in order to pick out any useful waste products such as paper and cardboard, that still have some end value after its product life, for sale. Other remaining waste will be disposed of at the designated waste disposal site. Waste disposal site will be collected periodically by waste trucks.

Besides, solid wastes can be generated from the working sites when the workers eat snacks, juice, etc. personal waste generated from the field workers such as plastic bottles for drinking will only be the main waste produced. In these stages, workers will be strongly prohibited from throwing or leaving waste into the surrounding environment. All the waste from field personnel will be taken back to the main camp and will be handled in accordance with the campsite solid waste management system. Therefore, site supervisor will provide small rubbish bins to dispose systematically not to dispose the surroundings of work site. When the workers return to camp site, they will need to take these small rubbish bins and to dispose at the designated disposal site.

(B). Liquid Waste from Camp Facilities & Work Site

The main liquid waste that will be generated from the campsite area are greywater produced from showers, baths, washbasins, washing machines and kitchen sinks and blackwater produced from toilets or urinals. It is estimated that approximately 20 gallons of graywater and 0.4 gallons blackwater will be generated per person per day. Total 2,400 gallons of graywater and 48 gallons of black water will be generated per day.

Greywater produced will be treated and stored in greywater collection tank by using the short retention system and then will be reused for toilet flushing operation in order to reduce project water demand. Short retention system applies a very basic treatment such as skimming debris off the surface and allowing particles to settle to the bottom of the tank (Figure 2.5). Due to the deterioration nature of grey water during the storage, stored greywater will be released to the septic tank if it is not used within a certain time, and the system will be topped up with the mains water.

Black water from toilets or urinals will be directly sent to the septic tank for storage. Septic tank will be periodically cleaned by sewage truck. Systematic drainage system will be employed throughout the campsite area to control stormwater runoff across the campsite area. All waste water will be channeled into the natural jungle vegetation areas using carefully constructed site water drainage, and allowed to evaporate.

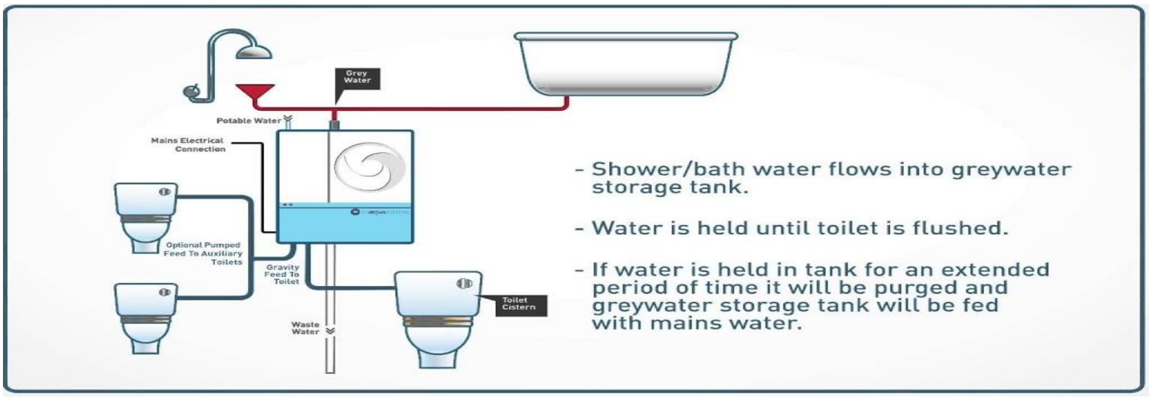


Figure 2.5: Greywater Short Retention System (Source: Reaqua Systems)

2.3.8. Hydrology

The proposed program will not interfere with any natural drainage (e.g. drainage lines, creeks, floodplains) in the project area. All proposed construction programs will be reviewed by the allocated Land Access and HSE Officer before commencing. None of the construction programs will be undertaken within any water protection areas.

2.3.9. Fuel and Chemical Consumption and Storage

Diesel and Petrol fuel and oil will be used for all stages of the construction programs, in the following scopes: (1) Staffs vehicles (2) Construction and associated equipment (3) Generators and water pumps (camp and drilling) (4) Earthwork's machinery (excavator, etc.)

All fuel will be stored in 4-gallon or 44-gallon containers in a designated fuel storage area within the campsite. Warehouse will be the nearest staff building close to the fuel storage and distance between them will be at least 20 feet in straight distance.

One area will be allocated for storage of fuel for vehicles and generators, and the fuel will be contained in 44-gallon drums, with a maximum of 5 drums stored at the camp at any one time. The fuel drums will be stored in a purpose-built bunded area to prevent any fuel leakage from faulty drums.

It is estimated that the construction, associated machinery and transportation will use approximately 10 to 15 gallons of fuel per day (240 to 360 gallons per month). It is estimated that the camp (generator, electricity, water pumping etc.) will use approximately 5 to 10 gallons of fuel per day (150 to 300 gallons per month).

The fuel containers will be stored within portable bunded units which are designed to contain any fuel leaks which may occur, and which protect the environment from leaks and spills. All fuel storage areas will have appropriate fire extinguishers installed, and Material Safety Data Sheets (MSDS) will also be stored with the fuel. The MSD Sheets provide details of the chemical characteristics of the fuel and oil,

2.3.10. Health and Hygiene

Once the site for the construction of the camp has been chosen, a meeting with the relevant Health Department in Taungoo, Leik Tho Township, Yar Do Village, near Lwee Ka Hti Village will be arranged to discuss the camp facilities and management of the health and hygiene for the construction team. Recommendations provided by the Health Department will be implemented at the camp to ensure all camp waste (food, human, consumables) is disposed of according to the guidelines provided.

2.3.11. Timeframe and Budget

The feasibility study for the Project is due for completion in 2021, with construction of the Project anticipated in 2022.

The Republic of Korean EDCF Loan is intended to be implemented. The Feasibility Study of the project will be conducted by the Korean side and the IEE work will be conducted by Myanmar Side. After these processes are completed, the project cost will be evaluated and the loan agreement will be signed.

2.4. Project Alternatives

Alternatives to the project were considered, including not proceeding with the project, alternative routes, and alternative structures and methods of construction.

2.4.1. No project

The main transmission lines in Myanmar are 230 kV, with major transmission networks of 132 kV and local distribution networks of 66 kV. Most of the network is composed of single circuit lines with lattice steel towers. Myanmar’s current power transmission facilities and infrastructure are insufficient to supply increasing nationwide power requirements due to network issues relating to losses and economic dispatch of electricity. Transmission and distribution

n losses accounted for between 17.3 and 28.4% of generated electricity annually between 2007 and 2013 (Table 2.5) (Nam et al. 2015). Degradation of infrastructure and transmission distance can contribute to these losses, and Smart Power Myanmar (2019) indicate a shorter transmission and distribution distance may reduce these losses. Increased demand can overload transmission and distribution lines, and issues with power supply may result in voltage fluctuations and interruption of service (World Bank 2020).

Table 2.5: Transmission and distribution losses in Myanmar between 2007 and 2013

Year	Transmission losses (%)	Distribution losses (%)	Total losses (%)
2013	4.8	12.5	17.3
2012	7.07	16.7	23.77
2011	7.86	19.2	27.06
2010	7.52	19.6	27.12
2009	7.48	19.4	26.88
2008	5.74	22.3	28.04
2007	6.93	21.6	28.53

Source: Nam et al. 2015

The existing 230 kV transmission line from Baluchaung (2) to Taungoo was constructed in the 1960s and has reduced power transfer capacity due to its age. The Project will allow for more efficient transfer of power from existing and future hydropower projects in Kayah State including hydropower schemes on the Baluchaung River. The existing 500 kV Sabakywe substation will transfer future large-scale generation in the north of Myanmar to the southern and Yangon area. The Loikaw substation will support access to electricity in Kayah State and meet future demand in the region.

The Project will improve access to energy resources, improve electric stability of the network and assist in sustainable industrial development with associated social and economic benefits. If the Project does not proceed, these benefits will not be recognised.

2.4.2. Alternative Route

The general location of the Project has been selected to enable improvements to the network in the area in which they are required. The current proposed alignment passes across mountainous terrain with forested areas.

It is important in any development project to aim to strike a well balance among the economic, technical, environmental and social costs and benefits such project brings in consideration of the socioeconomic or other geographical area resides. Under this study, the following two alternative options were proposed and considered. (Figure 2.6)

(1) Route-1 (Pink Line)
(2) Route-2 (Blue Line)

Key constraints considered in the assessment of alternative routes included:

Physical constraints including the location where connectivity is required, access to enabling infrastructure and the climatic, topographic and geotechnical constraints imposed by the landscape.

Prevailing environmental conditions and environmental sensitivities within the project area.

Social constraints including the location of potentially affected communities, their expectations, values and concerns.

Economic constraints driven by factors including project development expenditure, number of towers and the need for the Project to be in a position to supply power in a profitable manner.

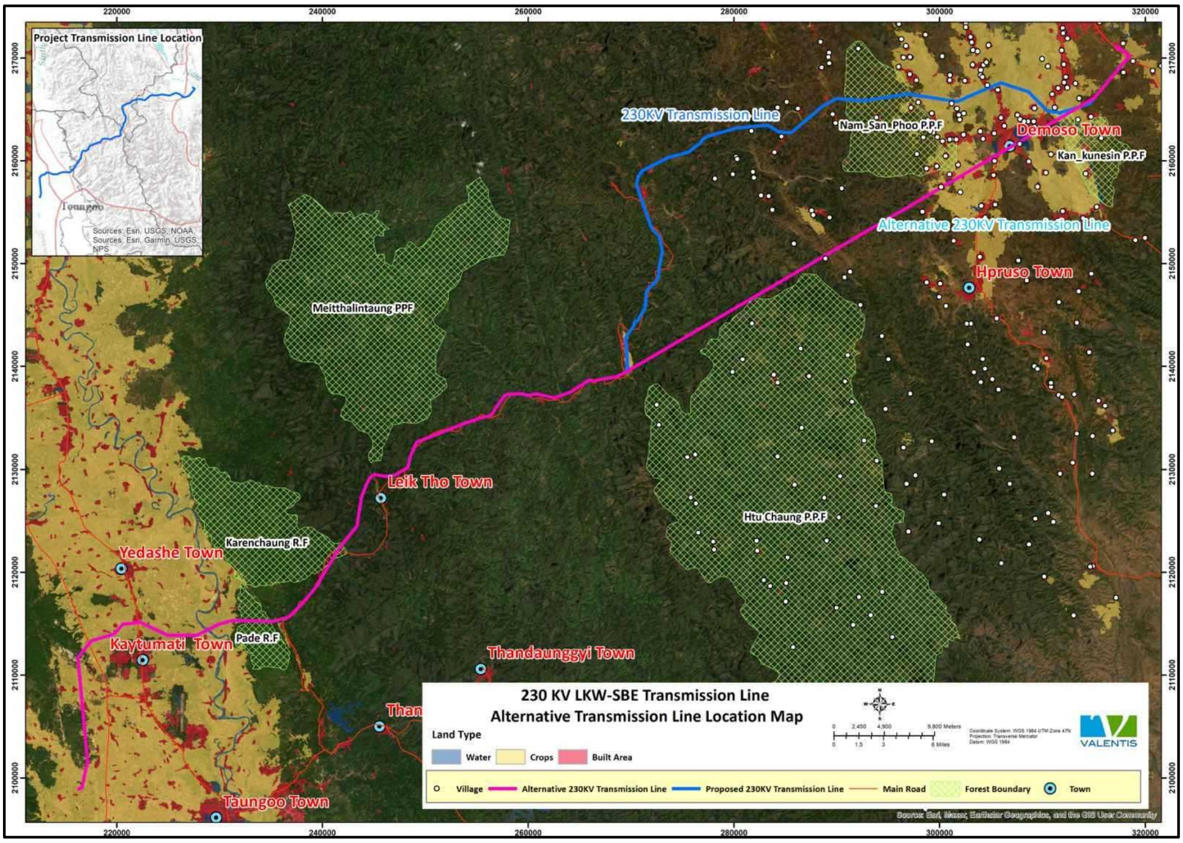


Figure 2.6: Alternative Transmission Line Map

(1) Route-1 (Pink Line)

Advantages- Towers will not passed through Nan Sam Phoo Public Prote Protected Forest. The total number of towers to be constructed is only 436 towers.

Disadvantages- Although the line length of Route-1 is shorter than Route-2, it will be difficult to connect the cables on the mountainous and forested terrain. The significant environmental impact will be expected if the new access road is built passing through the mountains for transmission line Route-1. Route-1 will pass some villages. The location of potentially affected communities, their expectations, values and concerns will be high. As per economic aspect, the construction cost will be much higher than the Route-2 because new access road has to be built to mountainous region although the number of towers to be constructed is less than the Route-2. Project to be in a position to supply power in a profitable manner will be low.

(2) Route-2 (Blue Line)

Advantages- A few new access roads need to be constructed since there has existing road already. It will be convenient to build towers and to connect cables because there are no mountains and valleys along the Route-2. Although it has to cross a number of villages, it will only extend to the side of the farms without passing through the houses. The location of potentially affected communities, their expectations, values and concerns will be low. Project to be in a position to supply power in a profitable manner will be high.

Disadvantages- The number of towers (490 towers) to be constructed which is more than the Route-1. The Route-2 will pass the protected forest named Nam San Phoo Public Protected Forest. Although there is Nan Sam Phoo Public Protected Forest to be passed through to build the transmission line, the migratory birds don't often visit. The medium environmental impacts are expected.

Alternative routes that would avoid the mountainous and forested terrain were considered but resulted in considerable extra distance and required length of the transmission line, meaning that the Project was not economically feasible. Minor adjustments to the proposed route were considered as part of the project feasibility study and environmental and social impact assessment process (described within this report), including where such adjustments might avoid environmental and social sensitivities. Additional refinements may be made during detailed design and as a result of pre-construction surveys if sensitive features are identified.

After consideration of the above two options from physical constraints, social constraints, environmental constraints and economic constraints, the Route-2 is the most suitable transmission route due to the low cost and low environmental and social impacts and high economic benefit.

Therefore, the Route-2 was selected as the proposed option for 230kV Baluchaung (2) Loikaw to Taungoo (Sabakywe) Transmission Line.

2.4.3. Alternative structures

Alternative types of tower structure were considered. However, Lattice steel towers were selected as the preferred choice as they are required to support the proposed 230 kV conductors and they align with most of the existing network.

Chapter 3

3. Policy, Legal and Institutional Framework

This chapter describes the regulatory framework of Myanmar, environmental related Myanmar policies, laws, rules, regulations pertinent and guidelines relevant to the Project along with potentially applicable international standards and principles.

3.1. Regulatory Framework for Environmental Assessment in Myanmar

Constitution of the Republic of the Union of Myanmar (2008) provides several important references to environmental conservation and sustainable development.

National Environmental Policy (1994) ensured the integration of environmental concerns in planning for economic development. The mandates on environmental management formerly rest on the National Commission on Environmental Affairs (NCEA) as a division under the Ministry of Foreign Affairs. In 2005, the NCEA was transferred under the Ministry of Forestry (MOF) and the MOF was restructured as the Ministry of Environmental Conservation and Forestry (MOECAF) in September 2011, and as the Ministry of Natural Resources and Environmental Conservation (MONREC) in 2016. The Environmental Conservation Department (ECD) under MONREC is mainly responsible for implementing the National Environmental Policy, strategy, framework, planning and action plan for the integration of environmental consideration into the national sustainable development process.

Myanmar Agenda 21 (1997) provided the first framework for integrating environmental considerations into national development plans in Myanmar.

Myanmar Engineering Council Law (2013) explains to uphold and upgrade the dignity, ethics and quality of the Myanmar citizen engineers, graduate technicians and technicians who are practising engineering works.

National Sustainable Development Strategy (2009) for Myanmar was developed by NCEA. The aim of NSDS is to achieve sustainable development through three sectors, focused on natural resource management, economic development and social development. Relevant government ministries are expected to institutionalize NSDS principles into their sectoral development through short-term, medium-term and long-term action.

Table 3.1 summarizes the obligations of the relevant commitment for environmental framework in Myanmar.

Table 3.1: Project Relevant Commitment for Environmental Assessment in Myanmar

No.	Section	Description
1.	**Constitution of the Republic of the Union of Myanmar (2008)**	
	Section 45	The Union has proclaimed that it will protect and conserve the natural environment
	Section 390	Every citizen has the duty to assist the Union in carrying out the following matters: (a) Preservation and safeguarding of cultural heritages (b) Environmental Conservation (c) Striving for development of Human Resources (d) Protection and preservation of public property

No.	Section	Description
2.	**National Environmental Policy (1994)**	
	Core Values	• Emphasizes the responsibility of the State and every citizen to preserve the natural resources of the country in the interest of present and future generations. • The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. • It is the responsibility of the State and every citizen to preserve its natural resources in the interests of present and future generations. • Environmental protection should always be the primary objective in seeking development
	Purpose	To provide long-term guidance for government, civil society, the private sector and development partners in Myanmar on environment and sustainable development objectives in Myanmar.
3.	**Myanmar Agenda 21 (1997)**	
	Goals	Sustainable management of natural resources; integrated economic development; and sustainable social development.
	Energy section	• Stresses developing new and renewable sources of energy and making energy distribution and use cheaper, more efficient, and less polluting. • Focuses on creating a system of energy planning, development, and management, and on improving energy conservation and energy efficiency.
4.	**Myanmar Engineering Council Law (2013, 2019)**	
	Objectives	The objectives of this Law are as follows: (a) to uphold and upgrade the dignity, ethics and quality of the Myanmar citizen engineers, graduate technicians and technicians who are practising engineering works; (b) to explore using engineering technology and information technology combined the good methods, research and development activities by which the natural resources and human resources of the State may be beneficially applied with least impact on environment; (c) to carry out guidance and supervision, and to take necessary actions for fulfillment of the requirements of stipulated technical standard, proper method, free from danger, keeping ethic and being dutiful in the fields of engineering and technology education, researches and services; (d) to service engineering and technology ielated functions and duties beneficial for the State assigned by the relevant Ministry and relevant organizations
	Section 20	If the holder of a technological degree or technological diploma, conferred by any engineering university, any technological university, any technological college or any technological institute within the country or abroad, wishes to obtain a registered graduate technologist certificate or a registered technician certificate, he shall apply to the council in accordance with the stipulations.
	Section 34	If, whoever has received a registration certificate, is found to have breached any rules contained in the registration certificate or violated any prohibition contained in a rule, order or directive enacted under this law or in any stipulation of this law, the executive committee may take the following administrative actions (a) giving a warning; (b) assessing a suitable fine; (c) suspending the registration certificate; (d) cancelling the registration certificate.

No.	Section	Description
	Section 37	No one shall perform any engineering work and technological work which are specified as being dangerous to the public by a rule enacted under this law without having received a registration certificate issued by the council, except for engineers appointed in a government department or an organization in the performance of their duties.
	Section 38	No engineer, graduate technologist and technician shall use, together with his name, a title which is not compatible with his status.
	Section 39	No registered engineer, graduate technologist and technician (a) shall transfer his registration certificate to anyone or allow it to be used by anyone; (b) shall fail to return his registration certificate to the council within 30 days from the day on which a decision is passed, or an administrative action is taken, under this law to cancel the registration certificate
5.	**National Sustainable Development Strategy (2009)**	
	Goal 1 Sustainable Energy Production Consumption	• To incorporate environmental considerations in energy production and consumption. • To strive to establish a balance between environmental protection and conservation and meeting of energy needs in the country. • Maintain environmental quality in energy development.

3.2. Environmental Policy, Laws and Rules

National Environmental Policy of Myanmar (2019) was adopted with the aim of mainstreaming environmental considerations into economic and social development.

Mission; to achieve a clean environment, with healthy and functioning ecosystems, that ensures inclusive development and wellbeing for all people in Myanmar.

Vision; to establish national environmental policy principles for guiding environmental protection and sustainable development and for mainstreaming environmental considerations into all policies, laws, regulations, plans, strategies, programs and projects in Myanmar.

The Environment Conservation Law (2012) specifies the environmental conservation basic principles. The objectives of the law are as follows:

To construct a healthy and clean environment and to conserve natural and cultural heritage for the benefit of present and future generation, and

To maintain the sustainable development through effective management of natural resources and to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation.

Environmental Conservation Rules (2014) provides guidance to incorporate environmental conservation into the sustainable development of the country.

The **Environmental Impact Assessment procedure (2015)** to provide guidance for environmental assessment for the development of projects that may have an adverse impact. The EIA procedure outlines the required level of assessment which depends on the nature and scale of the development. All new projects and project expansions having the potential to cause adverse impacts are required to obtain the necessary approval in the form of an Environmental Compliance Certificate (ECC).

Table 3.2 summarizes the obligations of the relevant commitment for environmental Policy, Laws, and Rules in Myanmar.

Table 3.2: Project Relevant Commitment for Environmental Policy, Laws, and Rules

No.	Section	Description
1.	**National Environmental Policy of Myanmar (2017)**	
	Core Value	(a) The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. (b) It is the responsibility of the State and every citizen to preserve our natural resources in the interests of present and future generations. (c) Environmental protection should always be the primary objective in seeking development.
2.	**The Environment Conservation Law (2012)**	
	Section 7	The project proponent has to comply the law and will pay compensation if the project proponent causes environmental impacts.
	Section 14	The project proponent when causing a point source of pollution will treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.
	Section 15	If the project proponent causes a point source of pollution they have to install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it has to be arranged to dispose the wastes in accord with environmentally sound methods.
	Section 24	The project proponent has to allow The Ministry may, in issuing the prior permission, stipulate terms and conditions relating to environmental conservation. It may conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organizations to carry out inspections.
	Section 25	The project proponent has to comply with the terms and conditions included in prior permission.
	Section 29	Project proponent has to not violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law.
	Section 31	Whoever, without the prior permission, operates business, work-site or factory, workshop which is required to obtain the prior permission under this Law shall, on conviction, be punished with imprisonment for a term not exceeding three years, or with fine from a minimum of one hundred thousand kyats to a maximum of one million kyats, or with both.
3.	**Environmental Conservation Rules (2014)**	
	Rule 68 Sub-rule (a)	The project proponent has to avoid emit, discharge or dispose of the materials which can pollute to the environment, or hazardous waste or hazardous material prescribed by notification in the place where directly or indirectly injure to the public.
	Rule 68 Sub-rule (b)	If the project proponent does not comply according to section 69, the project proponent will be prosecuted according to Environmental Conservation Law, Section 31.
4.	**Environmental Impact Assessment procedure (2015)**	
	Section 102 Sub-section (a)	The project proponent has to be liable for all adverse impacts caused by doing or omitting of project owner or contractor, sub-contractor, officer, employee, representative or consultant who is appointed or hired to perform on behalf of the project owner.

No.	Section	Description
	Section 102 Sub-section (b)	The project proponent has to support, after consultation with affected persons by project, relevant government organization, government department and other related persons, to resettlement and rehabilitation for livelihood until the affected persons by the project receiving the stable socio-economy which is not lower than the status in pre-project.
	Section 103	The project proponent has to fully implement all commitments of project and conditions included in EMP. Moreover, the project proponent has to be liable for contractor and sub-contractor who perform on behalf of him/her have to fully abide by the relevant laws, rules, this procedure, EMP and all conditions.
	Section 104	The project proponent has to be liable and fully & effectively implement all requirements included in ECC, relevant laws and rules, this procedure and standards.
	Section 105	The project proponent has to inform the completed information, after specifying the adverse impacts caused by the project, from time to time.
	Section 106	The project proponent has to continuously monitor all adverse impacts in the preconstruction phase, construction phase, operation phrase, suspension phrase, closure phrase and post-closure phrase, moreover has to implement the EMP with abiding all conditions included in ECC, relevant laws & rules and this procedure.
	Section 107	The project proponent has to submit, as soon as possible, the failures of his or her responsibility, other implementation, ECC or EMP. If dangerous impact caused by this failure or failure should be known by the Ministry the project proponent has to submit within 24 hours and other than this situation has to submit within 7 days from knowing it.
	Section 108	The project proponent has to submit the monitoring report dually or prescribed time by Ministry in line with the schedule of EMP.
	Section 109	The project proponent has to prepare the monitoring report.
	Section 110	The project proponent has to show this monitoring report in public places such as library, hall and website and the office of the project for the purpose to know this report by the public within 10 days from the date which the report is submitted to the Ministry. Moreover, has to give the copy of this report, by email or another way which way agreed with the person, to any asked person or organization.
	Section 113	The project proponent has to allow the inspector to enter and inspect in working time and if it is needed by Ministry has to allow the inspector to enter and inspect in the office and work-place of the project and other work-place related to this project in any time.
	Section 115	The project proponent has to allow the inspector to immediately enter and inspect in any time if it is emergency or failure to implement the requirements related to social or environment or caused to it.
	Section 117	The project proponent has to allow the inspector to inspect the contractor and subcontractor who implement on behalf of the project.

3.3. Pertinent Laws, Policy, and Standards for Environmental Management

The Electricity Law (2014) addresses the provision of access to electricity for the economic and social development of Myanmar. Detail also relates to pricing, licenses and penalties as well as the establishment of an electricity regulatory commission along with its functions and duties.

Electrical Rule (2015) address Responsibilities of the Ministry of Electricity, Performance Standards, Technical standards and codes of conduct, Types of permits, Electricity tariff, Other regulatory responsibilities, Quality and standard specifications, Inspection of electrical work and electrical equipment and discipline Penalties and Actions.

National Energy Policy (2014) 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 current without electricity.

Table 3.3 summarizes the obligations of the relevant commitment for pertinent laws, policy and standards for environmental management.

Table 3.3: Project Relevant Commitment for Environmental Management Pertinent Laws, Policy, and Standards

No.	Section	Description
1.	**The Electricity Law (2014)**	
	Section 10 Sub-section (b)	The project proponent needs to implement the project with the best practices to reduce the damages on the environment, health and socio-economy, also will pay compensation for the damages and will pay the fund for environmental conservation.
	Section 18	The project proponent has to take the certificate of electric safety, issued by the chief-inspector, before the commencement of power generation,
	Section 21 Sub-section (a)	The project proponent has to be liable for damages to any person or enterprise by failure to abide by the quality standards or rules, regulation, by-law, order and directive issued under said law
	Section 22 Sub-section (a)	The project proponent has to be liable for damages to any person or enterprise by negligence of project owner.
	Section 26 Sub-section (a), (b)	The project proponent has to comply with the permission for electric searching and generation.
	Section 27	The project proponent has to inform promptly to chief-inspector and head officer of related office while occurring of accident in electricity generation.
	Section 40	The project proponent has to comply with the standards, rules and procedure. Moreover, will allow the inspection by respected governmental department and organization if it is necessary.
	Section 68	The project proponent has to pay the compensation to anyone who is injured or caused to death in electric shock or fire caused by the negligence or omitting of the project owner or representative of project owner.
2.	**Electrical Rule (2015)**	
	Section 3, Sub-section (B 9)	Conducting activities and implementation activities to provide awareness to electricity consumers about efficient use and saving. (Energy Efficiency and Energy Saving)
	Section 3, Sub-section (B 10)	"National Electric Power Development Plan" should be developed with a long-term goal and submitted to the Union Government for approval. This plan must be updated annually and submitted to the Union Government for approval.

No.	Section	Description
	Section 8	The Ministry of Electricity shall promote the improvement of Technical Standards and the Code of Conducts to be uniformly followed by imposing the following: (a) generation of electricity; safety of transmission and distribution facilities; Standards relating to reliance and cost-benefit developments; (b) Electrical Installation and Construction Standards (Electrical Installation and Construction Standards); (c) Operating Standards and Processes (Progress); (d) Coordination of maintenance schedules. (e) Adequate backup power and arrangements to meet power demand. (f) Quality and Norm Specifications of electrical equipment.
	Section 26	The power grid system transmission permit holder must comply with the following points - (a) operate the power transmission system in compliance with all applicable laws and regulatory requirements; maintenance and expansion; (b) The grid code approved by the Ministry of Electricity. Complying with all applicable performance standards and environmental requirements; (c) power grid system and power plants connected to it; Electricity distribution networks are safe; Economically cost-effective and reliable operation.
3.	**National Energy Policy (2014)**	
	Core Values	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.
	Section 21 Sub-section (b)	To expand electric power grid system and to transmit more electricity, available hydro energy, wind energy, geothermal energy, solar energy, and other energy resources will be exploited for possible electricity generation so that electric power can be supplied adequately the whole of Myanmar. To review and systematically manage electric power generation system and transmission system to have minimum impact on environmental and social.

3.4. Other Applicable Laws and Rule

A range of other cross-sectoral laws and rules are potentially applicable to the project including:

(1) Forest Law (1992, 2018)

(2) Forest Rule (1995)

(3) Protection of Wildlife and Conservation of Natural Areas Law (1994)

(4) The Protection of Biodiversity and Natural Protected Areas Law (May 2018)

(5) The Protection of Wildlife and Wild plant and Conservation of Natural Area Rule (2002)

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

(7) Freshwater Fisheries Law (1991)

(8) Land Acquisition Act (1984)

(9) Farmland Law (2012)

(10) Natural Disaster Management Law (2013)

(11) The Union of Myanmar Public Health Law (1972)

(12) The Prevention and Control of Communicable Diseases Law (2015)

(13) The control of Smoking and Consumption of Tobacoo Product Law (2006)

(14) The Myanmar Fire Force Law (2015)

(15) The Myanmar Fire Brigade Law (2016)

(16) Highway Law (2000)

(17) Motor Vehicle Law (2015) and Rules (1987)

(18) Petroleum and Petroleum Products Law (2013)

(19) The Protection and Preservation of Antique Objects Law (2015)

(20) The Protection and Preservation of Ancient Monuments Law (2015)

(21) The Protection and Preservation of Cultural Heritage Regions Law (1998)

(22) Labour Organisation Law (2011)

(23) Employment and Skill Development Law (2013)

(24) Occupational Health and Safety Law (2019)

(25) Workmen's Compensation Act (1923)

(26) Minimum Wages Law (2013)

(27) Payment of Wages Law (2016)

(28) Settlement of Labor Dispute law (2012)

(29) Leaves and Holiday Act (1951)

(30) Social Security Law (2012)

(31) Myanmar Insurance Law (2015)

(32) The Foreign Investment Law (2012)

(33) Export and Import Law (2012)

(34) The Ethnic Rights Protection Law (2015)

Table 3.4 summarizes the obligations of the relevant commitment for other applicable laws, and rules.

Table 3.4: Project Relevant Commitment for Other Applicable Laws, and Rules

No.	Section	Description
1.	**Forest Law (1992, 2018)**	
	Basic Principles	The project proponent has to follow the basic principles. (a) To implement the forestry policy of the Government; (b) To implement the environmental conservation policy of the Government; (c) To promote the sector of public co-operation in implementing the forestry policy and the environmental conservation policy of the Government; (d) To develop the economy of the State, to contribute towards the food, clothing and shelter needs of the public and for perpetual enjoyment of benefits by conservation and protection of forest; To carry out simultaneously conservation of natural forests and establishment of forest plantations;
	Section 12 Sub-section (a)	The project proponent has to within a forest land and forest covered land at the disposal Government if it is desirous of carrying out any development work or economic scheme has to obtain the prior approval of Ministry.
	Section 16	A person having obtained the right to extract forest produce on a commercial scale who has the responsibility of establishing forest plantations or carrying out natural regeneration under a permit for the State shall carry out the same at his own expense and in accordance with stipulation.
2.	**Forest Rule (1995)**	
	Section 20 Sub-section (a)	MONREC can permit performing development (or) project within the area that can be managed by the government, if the development (or) project has no damage on environment.
3.	**Protection of Wildlife and Conservation of Natural Areas Law (1994)**	
	Section 29 Sub-section (d), (e)	The project proponent has to be fined any of the following acts within a natural area or within the zoological garden or botanical garden which is administered by the Government or towards which the Government has subscribed share capital: (d) frightening or willfully disturbing protected wild animals (e) plucking or breaking without permission any kind of wild plants and cultivated plants
	Section 31	The project proponent has to punished 10,000 kyats with fine if there is kills, hunts, wounds or raises a seasonally protected wild animal without permission during the close season.
	Section 35 Sub-section (d), (e)	The project proponent has to be punished with imprisonment for a term which may extend to 3 years or with fine which may extend to kyats 10,000 or with both: (d) causing water and air pollution, causing damage to a water-course or putting poison in the water in a natural area (e) possessing or disposing of pollutants or mineral pollutants in a natural area
	Section 36 Sub-section (b), (c)	The project proponent has to be punished be punished with imprisonment for a term which may extend to 5 years or with fine which may extend to kyats 30,000 or with both: (b) extracting, collecting or destroying in any manner any kind of protected wild plants within the prescribed area without permission (c) destroying ecosystem or any natural state in the natural area
4.	**The Protection of Biodiversity and Natural Protected Areas Law (2018)**	
	Section 39 Sub-section (d)	If the propjet proponent commits any of the following acts, on conviction be punished with imprisonment for a term which may extend to maximum 3 years or with fine which may extend to minimum Kyats 200,000 or maximum Kyats

No.	Section	Description
		500,000 or with both-causing water and air pollution, causing damage to a water-course or putting poison in the water in a natural area, passing through the electric current, and using chemicals and explosive substances and possessing or disposing of pollutants or mineral pollutants in a natural area.
	Section 41 Sub-section (d)	If the project proponent commits any of the following acts shall, on conviction be punished with imprisonment for a term which may extend to minimum 3 years to maximum 10 years or with fine if the project is found that killing, hunting or wounding, collecting, selling a completely protected wild animal or animals controlled in national trade without permission, possessing or transporting or transferring such wild animal or any part thereof or blood of such animals or product deriving from the parts of such animals without permission and extracting, collecting a completely protected natural plants or plants controlled in national trade or destroying, collecting, possessing, selling, transferring and transporting such plant or any parts thereof or product deriving from the parts of such plant without permission.
5.	**The Protection of Wildlife and Wild plant and Conservation of Natural Area Rule (2002)**	
	Section 4	Project proponent must comply with From the day after the minister announce the natural area intended for classification or zoological and botanical garden, some prohibition can be inscribed, except the existing opportunity in that day, relating with the following in which the project proponent must follow: (a) building new infrastructure (b) killing, hunting, wounding or collecting, wild animals, possessing, selling or transporting or transferring such wild animal or any part thereof, and damaging, cutting, extracting and collecting natural plants or forest product. (c) digging, clearing the land (d) crop growing (e) using as pasture land (f) burning (g) fishing (h) hunting polluting water and air, damaging the drainage or poisoning the water, possessing or disposal of any poisonous material and waste metal, without permission.
6.	**The Conservation of Water Resources and Rivers Law (2006)**	
	Aim	The project proponent has (a) to conserve and protect the water resources and rivers system for beneficial utilization by the public; (b) to smooth and safety waterways navigation along rivers and creeks; (c) to contribute to the development of State economy through improving water resources and river system; to protect environmental impact.
	Section 8	No person shall: (a) carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks. cause the wastage of water resources wilfully.
	Section 11	No person shall: (a) dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk.

No.	Section	Description
		(b) catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives. dispose of disposal soil and other materials from panning for gold, gold mineral dredging or resource production in the river and creek, into the river and creek or into the water outlet gully which can flow into the river and creek.
	Section 13	No person shall carry out sand suction, sand dredging, sand excavating, river shingle suction, panning for gold, gold mineral dredging or resource production for commercial purpose in the river-creek boundary, bank boundary and waterfront boundary without the recommendation of the Directorate.
	Section 24 Sub-section (b)	Avoid the violation of conditions stipulated by the directorate for prevention of water pollution.
7.	**Freshwater Fisheries Law (1991)**	
	Section 3	Freshwater fishery shall be carried out in accordance with the following objectives: (a) to further develop the fisheries; (b) to prevent the extinction of fish; (c) to safeguard and prevent the destruction of freshwater fisheries waters; (d) to obtain duties and fees payable to the State; to manage the fisheries and to take action in accordance with the Law
	Section 40	No one shall cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water
8.	**Land Acquisition Act (1984)**	
	Section 5	• The Law sets out basic procedures governing land acquisition, including a preliminary investigation, and a procedure for notification of persons interested in the land. • The Law also includes provision for objections to the land acquisition, in which the objector is granted the 'opportunity of being heard', where the objections raised may be further explained. • However, the President's decision on the objection is final, in practice giving him/her wide discretionary powers.
	Section 6	• Land acquisition for a company may be carried out where it is "likely to prove useful to the public." • In these cases the Government has the responsibility for carrying out the acquisition and distributing the compensation; however, the company acquiring the land has to provide the compensation. • Compensation is based on the market value of the land and also possible damage incurred by the private landowner, such as loss of crops and firewood or the cost of changing residence and place of business. • Land in-kind can also be provided in place of monetary compensation.
	Section 23	These losses should take place "in consideration of the compulsory nature of the acquisition".
9.	**Farmland Law (2012)**	
	Section 30 Sub-section (a)	In respect of application to use the farmland by other means for the interests of the public: (a) the Central Administrative Body of the Farmland may permit to use the low land (paddy land) by other means with the recommendation of the Region or State Administrative Body of the Farmland.
	Section 32	• In confiscating the farmland for the projects of the State interests, only the required minimum area shall be confiscated. • The project shall be implemented to complete as soon as possible within the prescribed period and when the project is not carrying out, it shall be returned to the person or organization which has the original right to use the farmland.
10.	**Natural Disaster Management Law (2013)**	

No.	Section	Description
	Section 13 Sub-section (a)	The project proponent shall undertake the following functions after laying down the plan in accord with the natural disaster management plans in order to reduce damage and losses that are likely to be caused by natural disaster; (i) preparatory and preventive measures for natural disaster risk reduction in pre-disaster period; (ii) emergency responses including search and rescue during natural disaster; (iii) rehabilitation and reconstruction activities for improving better living standard in post disaster period and conservation of the environment that has been affected by natural disaster;
	Section 14 Sub-section (a)	The project proponent has to prioritize of the natural disaster risk reduction by the National Committee and the Local Body respectively.
	Section 14 Sub-section (b)	The project proponent has to carry out better improvement on early warning system of natural disaster.
	Section 14 Sub-section (d)	The project proponent has to carry out together with the measures of natural disaster risk reduction in development plans of the State.
	Section 14 Sub-section (e)	The project proponent has to establishsound preparations to resolve the natural disaster at every level from the National Level to the ward or village tract level.
	Section 25	Whoever if the natural disaster causes or is likely to be caused by any negligent act without examination or by willful action which is known that a disaster is likely to strike, shall be punished with imprisonment for a term not exceeding three years and may also be liable to fine,
	Section 26	Whoever interferes, prevents, prohibits, assaults or coerces the department, organization or person assigned by this law to perform any natural disaster management shall, on conviction, be punished with imprisonment for a term not exceeding two years or with fine or with both
	Section 29	Whoever violates any prohibition contained in rules, notifications and orders issued under this law shall, on conviction, be punished with imprisonment for a term not exceeding one year or with fine or with both
	Section 30	Whoever willful failure to comply with any of the directives of the department, organization or person assigned by this law to perform any natural disaster management shall, on conviction, be punished with imprisonment for a term not exceeding one year or with fine or with both.
11.	**The Union of Myanmar Public Health Law (1972)**	
	Section 3	The project proponent has to abide by any instruction or stipulation for public health.
	Section 5	The project proponent has to accept any inspection, anytime, anywhere if it is needed.
	Section 9	The project proponent will comply with Clause 9, Subsection 1 of Section 3. The project proponent has to provide required infrastructure relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety for all works.
12.	**The Prevention and Control of Communicable Diseases Law (2015)**	
	Section 4	The project proponent has to abide by any instruction or stipulation by Department of health and Ministry of Health.

No.	Section	Description
	Section 9	The project proponent has to inform promptly to the nearest health department or hospital if the following are occurred: 1. Mass death of animals including in birds or chicken; 2. Mass death of mouse 3. Suspense of occurring of communicable disease or occurring of communicable disease; 4. Occurring of communicable disease which must be informed.
	Section 11	The project proponent has to allow any inspection, anytime, anywhere if it is need to inspect by health officer.
13.	**The Control of Smoking and Consumption of Tobacoo Product Law (2006)**	
	Section 12	Whoever commits any of the following acts shall, on conviction, be punished with imprisonment for a term which may extend to two years or with fine or with both: (a) obstruction disturbance, prohibition or commission of assault to any member of Supervisory Body who comes and inspects under this Law; (b) obstruction, disturbance, prohibition or commission of assault on the person-in-charge who supervises to prevent smoking at the non-smoking area.
	Section 14	Whoever commits any of the following acts shall, on conviction, be punished with a fine from a minimum of kyats 10000 to a maximum of kyats 30000 for the first offence and be punished with imprisonment for a term which may extend to one year and shall also be liable to a fine from a minimum of kyats 30000 to a maximum of kyats 100000 for second and subsequent offences: (a) selling cigar within the compound and within 100 yards from the compound of a school; (b) giving in addition, giving as present or jointly giving directly or indirectly, any cigar and tobacco products in distributing or selling any goods, or any article in distributing or selling cigar and tobacco products; (c) selling the cigar by vending machine; (d) selling or giving cigar to a person who has not attained the age of eighteen; (e) employing a person who has not attained the age of eighteen in distributing or selling cigar, (f) exchanging the cigar with any goods from a person who has not attained the age of eighteen; (g) destroying the caption and mark showing the place where smoking is not allowed or where smoking is allowed.
	Section 16	Any person-in-charge who fails to comply with any duty contained in section 9 shall, in conviction, be punished with a fine from a minimum of kyats 1000 to a maximum of kyats 3000 for the first offence and be punished with a fine from a minimum of kyats 3000 to a maximum of kyats 10000 for the second and subsequent offences.
14.	**The Myanmar Fire Force Law (2015)**	
	Section 25 Sub-section (a)	The project proponent has to institute the specific fire services.
	Section 25 Sub-section (b)	The project proponent has to provide materials and apparatuses for fire precaution and prevention.
15.	**The Myanmar Fire Brigade Law (2016)**	
	Section 17	The relevant Government Department or organization shall, for the purpose of precaution and prevention obtain the approval of the Fire force Department before granting permission for the following cases:

No.	Section	Description
		(a) Constructing three-storied and above buildings market and condominium buildings, (b) Operating hotel, motel, guest house enterprise (c) Constructing factory, workshop, storage facilities and warehouse (d) Operating business expose to fire hazard by using in inflammable materials or explosive materials (e) Producing and selling fire-extinguishing apparatuses Doing transport business, public utility vehicles train, airplane, helicopter, vessel, ship, Tonkin tug.
	Section 18	The relevant government department or organization shall obtain the opinion of the Fire Services Department for the purpose of fire precaution and prevention, when laying down plans for construction for town, village and downtown or village development plans.
16.	**The Highways Law (2000)**	
	Section 7	Whoever without the permission of the Public Works commits any of the following acts shall, on conviction, be punished with imprisonment for a term which may extend to 3 years of with fine or with both: (a) building or constructing across the highway; (b) constructing the building within the boundary of the highway; (c) digging a pond within the boundary of the highway.
	Section 8	Whoever commits any of the following acts shall, on conviction, be punished with imprisonment for a term which may extend to months or with fine or with both: (a) disturbing or obstruction the work of constructing, extension, repairing and maintenance of highway; (b) driving a vehicle the traffic of which and the type of the wheel of which is prohibited and a vehicle with a laden weight or using an iron rim of cart wheel on highways; (c) planting, cutting or destroying tree or crops within the boundary of the highway without permission of Public Works; (d) disturbing or obstruction public works in clearing of trees which cause danger.
	Section 9	Whoever commits any of the following acts shall, on conviction, be punished with imprisonment for a term which may extend to 3 months or with fine or with both: (a) violating any prohibition issued to prevent damage of highways; (b) violating any of the terms and conditions prescribed in respect of traffic of carts and animals on highways; (c) intentionally placing of materials that may cause hindrance of danger to traffic on highways; (d) setting up the signboard of advertisement within the boundary of high ways without permission of Public Works.
17.	**Motor Vehicle Law (2015) and Rules (1987)**	
	Purpose	This law is applicable to all vehicles used in construction period as well as in operation and production period. The project proponent has to abide by all necessary provisions of this law and corresponding rules, especially those related to air pollution, noise pollution and life safety.
	Section 2 Sub-section (w)	The project proponent has to comply with the conservation for reduction of the pollution and noisy of air, water and land due to a motor vehicle.
18.	**Petroleum and Petroleum Products Law (2013)**	
	Section 30	No one shall, without having obtained the relevant license, perform any types of business or act which require a license according to this law.
	Section 31	No license holder shall-

No.	Section	Description
		(a) violate or fail to comply with any prohibition in the rules, regulations, notification, order, directive and procedures made according to this law; (b) use a container, transportation vehicle and pipeline which contains dangerous petroleum and any types of dangerous petroleum products without displaying easily visible danger warning signs; (c) import, transport, store and distribute petroleum and petroleum products in other ways than specified in this law, irrespective of whether the petroleum and petroleum products are dangerous or harmless; (d) operate without taking responsibility for damaging the environment during the operation of a petroleum and petroleum products business; (e) distribute petroleum and petroleum products which are not in compliance with the standards, quality and measurement.
19.	**The Protection and Preservation of Antique Objects Law (2015)**	
	Purpose	To ensure the protection of the ancient monument and to inform about it if it was in the project area.
	Section 12	The project proponent has to inform to the village-tract or ward administrator if any antique objective is found in the project area.
20.	**The Protection and Preservation of Ancient Monuments Law (2015)**	
	Section 12	The project proponent has to report to the village-tract or ward administrators if the project proponent will find any ancient monument under the ground or on the ground or under the water.
21.	**The Protection and Preservation of Cultural Heritage Regions Law (1998)**	
	Section 20	The project proponent cannot carry out any of the following in the cultural heritage region: (a) destroying an ancient monument; (b) willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument; (c) excavating to search for antiquities; (d) exploring for petroleum, natural gas, precious stones or minerals.
	Section 23	The project proponent cannot plough and cultivate or carry out any activity which may cause damage to the cultural heritage within the boundary notified by the Department in the cultural heritage region
22.	**Labour Organisation Law (2011)**	
	Section 17	The proponent has to allow the labor organization to negotiate and settle with the employer if the workers are unable to obtain and enjoy the rights of the workers contained in the labor laws and to summit demands to the employer and claim in accord with the relevant law if the agreement cannot be reached.
	Section 18	The proponent has to allow the demand for the re-appointment of worker who is dismissed by the employer without the conformity with the labour laws.
	Section 19	The proponent has to send the representatives to the Conciliation Body in settling a dispute between the employer and the worker.
	Section 20	The project proponent has to allow the labour organization to participate and discuss in discussing with the government, the employer and the complaining employees in respect of employee"s rights or interest contained in the labour law.
	Section 21	The project proponent has to allow the labour organization to participate in solving the collective bargains of the employees in accord with the labour laws.
	Section 22	The project proponent has to allow the labour organization to carry out the holding the meetings, going on strike and other collective activities in line with the procedure, regulation ,by-law and directive of relevant Chief Labour Organization.
23.	**Employment and Skill Development Law (2013)**	
	Section 5	The project proponent has to employ according to Section 5 of the Employment and Skill Development Law (No 29/2013)
	Section 14	The project proponent has to carry out the training program in accord with the work requirement in line with the policy of the skill development team to

No.	Section	Description
		develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
	Section 30 Sub-section (a)	The project proponent has to put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%.
	Section 30 Sub-section (b)	The project proponent has to ensure that put in money paid under subsection (a) has to not be deducted from the wage and salary of the employees.
24.	**Occupational Health and Safety Law (2019)**	
	Purpose:	To effectively implement measures related to safety and health in every industry and to set occupational safety and health standards.
	Section 26 Sub-section (a)	The project proponent has to carry out as necessary the scale assessment management of the equipment used in the industry.
	Section 26 Sub-section (b)	The project proponent has to carry out as necessary to assess the situation of the region of occupational environmental risk capabilities.
	Section 26 Sub-section (c)	The project proponent has to appoint a certified doctor for the employees.
	Section 26 Sub-section (e)	The project proponent has to provide adequate and relevant personal protective equipment to workers free of charge and make them wear it during work so as not to expose workers to any serious occupational diseases or hazards.
	Section 26 Sub-section (f)	The project proponent has to develop a preventive plan and also a plan of action for any emergency situation.
	Section 26 Sub-section (j)	The project proponent has to make systematic arrangements for ensuring safety and the absence of health risks to persons at the workplace and nearby, in connection with the use of machines, any parts of a machine, buildings, tools, substances, or handling and transportation of wastes relating to any process or workplace.
	Section 26 Sub-section (l)	The project proponent has to arrange and display occupational safety and health instructions, warning signs, notices, posters, and signboards.
	Section 26 Sub-section (o)	The project proponent has to formulate a fire prevention plan; arrange fire drills; and train workers on the systematic use of fire extinguishers.
	Section 26 Sub-section (p)	The project proponent has to allow the chief inspector and the inspectors access to the workplace to carry out inspections or investigations and provide them with documents and other forms of evidence on request.
	Section 26 Sub-section (q)	The project proponent has to ensure that workers, who are engaged in any hazardous industries prescribed by the Ministry, work only the hours per day as specified.
	Section 26 Sub-section (r)	The project proponent has to pay for any expenditure regarding occupational safety and health measures.
25.	**Workmen's Compensation Act (1923)**	
	Purpose	To ensure payment of compensations for injuries at work and other kinds of injuries.
	Section 13	The project proponent has to pay the compensation in line with the provisions.

No.	Section	Description
26.	**Minimum Wages Law (2013)**	
	Section 12	The project proponent has to pay the wages in line with prescribed wages.
	Section 13 Sub-section (a)	The project proponent has to clearly notify the workers of the prescribed wages.
	Section 13 Sub-section (b), (c), (d)	The project proponent has to correctly record the lists, schedules, documents and wages, report them to the relevant department and present them if requested while inspecting, in accord with the stipulations.
	Section 13, 18 Sub-section (d), (e)	The project proponent has to allow the inspector to do necessary inspection.
	Section 13 Sub-section (f)	The project proponent has to allow medical leave of absence if the employee's health is not fit to work.
	Section 13 Sub-section (g)	The project proponent has to allow leave of absence without deducting from the wages if one of family dies.
27.	**Payment of Wages Law (2016)**	
	Section 3	• The project proponent has to pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary. • If the project proponent needs to pay the other opportunities or advantages, they can pay cash together with other materials according employee's attitude.
	Section 4	• When the contract finish, the project proponent has to pay the salary (not more than one month) to employees. • For the permanent worker, has to pay per monthly. • If more than 100 employees, has to pay within the 5 days from the end of month. If fire the employees, has to pay salary within two days after fire. • When employee dies due to the accident, has to pay money as insurance to employee's family within two days.
28.	**Settlement of Labor Dispute Law 2012**	
	Section 3	In any trade in which more than 30 workers are employed to obtain the collective agreement by negotiating, the employer shall: (a) if there is any labour organization, shall form the Workplace Coordinating Committee with the view to make a collective bargaining as follows: (i) two representatives of workers nominated by each of the labour organizations; (ii) representatives of worker and an equivalent number of representatives employer; (b) if there is no labour organization, shall form the Workplace Coordinating Committee as follows: (i) two representatives of workers elected by them; (ii) two representatives of employer.
	Section 5	The Coordinating Committee shall promote the good relationship between the employer and worker or labour organization, negotiation and coordination on the conditions of employment, terms and conditions and occupational safety, health, welfare and productivity.
	Section 23	An employer or worker, may complain individual dispute relating to his grievance to the Conciliation Body and if he is not satisfied with the conciliation made by in accord with stipulated manners, such party may apply to the competent court in person or by the legal representative.
	Section 29	Any relevant party who is not satisfied with the decision of the Arbitration Body in respect of the essential services shall apply to the Arbitration Council within

No.	Section	Description
		seven days, not including the official holidays, from the day of receipt of such decision.
29.	**Leaves and Holiday Act 1951**	
	Section 50	The employer… (a) … must provide the worker casual leave, medical leave and maternity leave with respective wages or salary. Moreover, must allow the worker earned leave with respective average wages or average salary. If the employer normally pays the cost of living then the cost of living must also be included. (b) … must provide the worker with earned leave starting from the day of entitlement within 12 months, with respective average wages or with average salary, and also must advance the entitled wage prior to the worker taking leave. (c) … must announce the number of entitled earned leave calculations within three months starting from the last day of the of the 12 month period or entitled earned leave. In this way, workers can take leave by turns (alternatively). Moreover, to fix the eligibility period within which workers can take earned leave. (d) … if the worker resigns or is terminated or in case of death, has to pay the respective wages/salary within two business/working days starting from the date of incidence. (e) … has to pay the eligible wage/salary for earned leave to his/her official representative (if the worker is deceased). (f) … has to pay for the respective earned leave period if there is a temporary or permanent shutdown. … has to allow eligible earned leave if the nature of work is less than twelve months. (g) … is not allowed to suspend, to reduce the salary, to relocate or to terminate a worker due to the worker taking maternity leave or medical leave. (h) … has to fill up Form (1), (2), (3),(4),(5) and (6) according to the law. These forms shall be easily accessible from the inspector. The employer must maintain these documents for up to twelve months period. (i) … has to record the leave taken in Form (7) and submit to the Inspector not later than every seventh day of each month. (j) … wants the worker to work on a gazette holiday, the employer must receive consent from the worker. The employer must submit Form (8) to the Inspector for approval.
30.	**Social Security Law (2012)**	
	Section 11 Sub-section (a)	The project proponent has to register to the respected social security office.
	Section 15 Sub-section (a)	The project proponent has to pay the social security fund for at least four types of social security.
	Section 18 Sub-section (b)	The project proponent has to pay the fund which has to be paid myself and together with the fund which has to be paid from their salary by the employees. Moreover, the project owner will pay the cost for paying the above-mentioned fund only myself.
	Section 48 Sub-section (b)	The project proponent has to pay the fund for accidence.
	Section 75	The project proponent has to make list and record prescribed in section 75 correctly and submit them to respected social security office.
31.	**Myanmar Insurance Law (2015)**	
	Aim	• To overcome financial difficulties by effecting mutual agreement of insurance against social and economic losses which the people may encounter, due to common perils; • To promote the habit of savings individually by effecting life assurance, thus contributing to the accumulation of resources of the State; • To win the trust and confidence of the people in the insurance system by providing effective insurance safeguards which may become necessary in view of the social and economic developments.

No.	Section	Description
32.	**Myanmar Foreign Investment Law, 2012**	
	Section 8	The project proponent has (a) To support the primary objectives of the national economic development plan, and for businesses that cannot yet be run by the State and citizens or businesses that have insufficient funds and technology. (b) Development of employment activities (I) Protection and conservation of the environment. Appearing the required modern services for the Union and citizens
	Section 9	The project proponent has To carry out a joint venture between a foreigner and a citizen or the relevant Government department and organization
	Section 17	The project proponent has (a) To abide by the existing laws of the Republic of the Union of Myanmar. (b) To carry out the business by forming a company under the existing laws of Myanmar by the investor. (h) To carry out not to cause environmental pollution or damage in accord with existing laws in respect of investment business. (i) To carry out the systematic transfer of high technology relating to the business which are carried out by the investor to the relevant enterprises, departments or organizations in accord with the contract
33.	**The Export and Import Law (2012)**	
	Section 5	No person shall export or import restricted, prohibited and banned goods.
	Section 6	Without obtaining license, no person shall export or import the specified goods which is to obtain permission.
	Section 7	A person who obtained any license shall not violate the conditions contained in the license.
	Section 8	Whoever violates the prohibition contained in section 5 or section 6, on conviction, shall be punished with imprisonment for a term not exceeding three years or with fine or with both.
	Section 9	A person who obtained any permit violates the prohibition contained in section 7, on conviction, shall be punished with imprisonment for a term not exceeding three years or with fine or with both.
	Section 10	A person attempts to commit or abets in the commission of any offence contained in this law shall be punished in the same manner as if he had been committed such offence and the exhibits shall also be confiscated.
34.	**The Ethnic Rights Protection Law (2015)**	
	Section 22	No one shall prohibit the rights and privileges of the ethnic groups without credible reasons.
	Section 23	No one shall misuse the provisions of this Law for political purposes.
	Section 24	No one shall behave any act which is intended or is likely to promote feelings of hatred, enmity, and discord among the ethnic groups.
	Section 25	Whoever violates the prohibition in section 22 shall, on conviction, be punished with imprisonment for a term not exceeding one year or with a fine not exceeding one hundred thousand kyats or with both.
	Section 26	Whoever violates the prohibition in section 23 shall, on conviction, be punished with imprisonment for a term not exceeding one year or with a fine not exceeding one hundred thousand kyats or with both.
	Section 27	Whoever violates the prohibition in section 24 shall, on conviction, be punished with imprisonment for a term not exceeding two years or with a fine not exceeding two hundred thousand kyats or with both.

3.5. National Policies and Standards

The **National Environmental Quality (Emission) Guidelines (2015)** (hereafter referred to as NEQ Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health. (Table 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11). These Guidelines have been primarily based on the International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, which provide technical guidance on good international industry pollution prevention practice for application in developing countries.

The wastewater effluent limit for electric power transmission and distribution is presented in Table 3.5. This standard will apply to wastewater that will be generated from the substations.

Table 3.5: Effluent Limits for Electric Power Transmission and Distribution

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

Table 3.6: Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (total residual)	mg/l	0.2
Chromium (hexavalent)	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1
Fluoride	mg/l	20
Heavy metals (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10

pH	S.U.[1]	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	°C	<3[2]
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50
Zinc	mg/l	2

Table 3.7: National Drinking Water Quality Standards

Parameter	Unit	Guideline Value
Aluminum	mg/l	0.2
Ammonia-Nitrogen	mg/l	1.5
Antimony	mg/l	0.02
Arsenic	mg/l	0.05
Barium	mg/l	0.7
Boron	mg/l	2.4
Cadmium	mg/l	0.003
Calcium	mg/l	200
Chloride	mg/l	250
Chloride	mg/l	250
Chromium	mg/l	0.05
Coliforms (total)	MPN/100ml	3
Coliforms (faecal)	MPN/100ml	0
Color	TCU	15
Copper	mg/l	2
Cyanide	mg/l	0.07
Fluoride	mg/l	1.5
Hardness	mg/L as CaCO3	500
Iron	mg/l	1
Lead	mg/l	0.01
Magnesium	mg/l	150
Manganese	mg/l	0.4
Mercury (total)	mg/l	0.001
Nickel	mg/l	0.07
Nitrate (as NO3)	mg/l	50
Nitrate (as NO2)	mg/l	3
Odor	-	Acceptable/No objectionable odor
pH	-	6.5-8.5
Selenium	mg/l	0.04
Sodium	mg/l	200

[1] Standard unit

[2] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge

Sulphate	mg/l	250
Sulphide	mg/l	0.05
Taste	-	Acceptable/No objectionable taste
Total dissolved solids	mg/l	1000
Turbidity	NTU	5
Uranium	mg/l	0.03
Zinc	mg/l	3

Table 3.8: National Environmental Quality Emission Guidelines Values for Air Emission

Parameters	Averaging period	Standard µg/m^3
Sulphur dioxide	24 hours, 10 minutes	20, 500
Nitrogen dioxide	1 year 1 hour	40 200
Particulate matter PM_{10}	1 year 24 hours	20 50
Particulate matter $PM_{2.5}$	1 year 24 hours	10 25
Ozone	8-hour daily Maximum	100

Table 3.9: National Environmental Quality Emission Guidelines Values for Noise Level

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 – 22:00 (10:00 – 22:00 for Public Holidays)	Night-time 22:00 – 07:00 (22:00 – 10:00 for Public Holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Table 3.10: Exposure Limits to Electric and Magnetic fields

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

Notes: V/m3 = volts per cubic meter; µT = micro tesla; Hz = Hertz

Table 3.11: Soil Quality Standards

	Extremely Acid	Strongly Acid	Moderately Acid	Slightly Acid	Near Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	Extremely Alkaline
Soil PH	<4.5	4.5-5.2	5.3-5.9	6.0-6.5	6.6-7.0	7.1-7.5	7.6-8.3	8.4-9.0	>9

Ratings	EC	Organic Carbon	Total N	Exchangeable Cations		Available Nutrients	
				K	Na	P	K2O
Very Low	<0.15	<1	<0.1	<0.1	<0.1	-	-
Low	0.15-0.4	1-2	0.1-0.2	0.1-0.2	0.1-0.3	<15	<10
Medium	0.4-0.8	2-4	0.2-0.5	0.2-0.4	0.3-0.7	15-50	10-20
High	0.8-2.0	>4	0.5-1.0	0.4-0.8	0.7-2.0	>50	>20
>Very High	>2.0	-	>1.0	>0.8	>2	-	-

3.6. International Standards and Guidelines

Various international standards and guidelines exist in relation to management of projects such as transmission lines. At this early stage of the Project, specific international standards and guidelines that might be applicable have not been adopted. As the Project is further defined relevant standards and guidelines will be taken into consideration where appropriate. These may include:

The World Bank Environmental and Social Framework (The World Bank, 2017) – which sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that aim to end extreme poverty and promote shared prosperity.

The Equator Principles (EPFI, 2013) – 10 principles including (but not limited to) environmental and social assessment, stakeholder engagement, and reporting.

IFC Performance Standards on Environmental and Sustainability (IFC, 2012) – provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

Environmental, Health and Safety General Guidelines (IFC, 2007a) – technical reference document describing examples of Good International Industry Practice, and addressing matters such as environmental, occupational health and safety, community health and safety, and construction and decommissioning, as well as sector-specific issues.

IFC Handbook for preparing a resettlement action plan (IFC, 2002) – provides guidance in the planning and execution of involuntary resettlement for private sector projects.

International Labour Organization standards – consist of standards, instruments and codes of practice covering topics related to labour including child labour, employment security, migrant workers, indigenous and tribal peoples, working time, and occupational safety and health.

International Organization for Standardization (IOS) standards including ISO 14000, which outlines standards related to environmental management to minimise impacts on the environment and to promote continuous improvement.

3.7. International Agreements and Conventions

Myanmar is signatory to the international environmental agreements listed in Table 3.12.

Table 3.12: Myanmar and International Environmental Agreements

Theme	Convention/treaty/agreement	Status
Climate	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification (UNCCD), Paris, 1994	Accession (1997)
Air and climate change	United Nations Framework Convention on Climate Change (UNFCCC), New York, 1992	Ratification
	Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997	Accession (2003)
	Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985	Ratification (1993)
	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 + amendments	Amendments (2012)
	ASEAN Agreement on Transboundary Haze Pollution, Kuala Lumpur, 2002	Ratification (2003)
	Paris Agreement to combat climate change and adapt to its effects, 2016	Ratification (2017)
Pollution control	Stockholm Convention on Persistent Organic Pollutants (POPs), Stockholm, 2001	Accession (2004)
	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Basel, 1989	Accession (2015)
	International Convention for the Prevention of Pollution from Ships (MARPOL), London, 1973 + amendments in 1978	Accession (1988)
Biodiversity and natural resources	Convention on Biological Diversity (CBD), Rio de Janeiro, 1992	Ratification (1994)
	Cartagena Protocol on Biosafety to the CBD, Cartagena, 2000	Ratification (2008)
	Nagoya Protocol on Access and Benefit Sharing (ABS) to the CBD, Nagoya, 2010	Accession (2014)
	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, D.C., 1973 + amendments (1979 Bonn, Germany)	Accession (1997)
	Agreement on Establishment of ASEAN Regional Centre for Biodiversity	Ratification (2009)
	ASEAN Agreement on the Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	Signatory (1997)

Theme	Convention/treaty/agreement	Status
	Ramsar Convention on Wetlands of International Importance especially as Water- fowl Habitat, 1971 + amendments in 1982 and 1987	Accession (2004)
	MRC Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin – April 1995	Became Dialog Partner with MRC in 1996
	Agreement between International Union for Conservation of Nature (IUCN), and the government of the Republic of the Union of Myanmar to establish an IUCN Office in Myanmar.	Host Country Agreement (HCA) signed (2016)
	Mangroves for the Future (MFF) – "Healthy coastal ecosystems for a more prosperous and secure future for coastal communities."	Joined (2014)
Cultural heritage	The Convention for the Protection of the World Culture and Natural Heritage, Paris, 1972	Acceptance (1994)
	Declaration on ASEAN Heritage Parks	Signatory (2003)
	Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Trans- fer of Ownership of Cultural Property, 1970	Ratified
	Convention for the Safeguarding of the Intan- gible Cultural Heritage, 2003	Ratified

Chapter 4

4. Commitment

4.1. Proponent

ကနဦးပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းအစီရင်ခံစာ၌ ပါရှိသည့် ပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေများ၊ နည်းဥပဒေများ၊ စံချိန်းစံညွှန်းများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ချရေးလုပ်ငန်းများနှင့် စီမံခန့်ခွဲမှု အစီအစဥ်များကို လိုက်နာဆောင်ရွက်သွားမည်ဖြစ်ကြောင်း ကတိပြုလွှာ

ရက်စွဲ။ ၊စက်တင်ဘာလ၊ ၂၀၂၂

လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန (MOEP) လက်အောက်ရှိ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) မှ ဘီလူးချောင်း (၂) လွိုင်ကော် - တောင်ငူ (စပါးကြွယ်) မဟာဓာတ်အားလိုင်း စီမံကိန်း ဆောင်ရွက်ရန် အဆိုပြုထားပါသည်။ ထိုအဆိုပြုစီမံကိန်းသည် ကယားပြည်နယ်၊ လွိုင်ကော်မြို့နယ်၊ ဘီလူးချောင်းအမှတ်(၂) ရေအားလျှပ်စစ်စက်ရုံမှ ပဲခူးတိုင်းဒေသကြီး၊ တောင်ငူမြို့နယ် စပါးကြွယ် ပင်မဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ မဟာဓာတ်အားလိုင်းကို သံမဏိ ရာဇမတ်တာဝါတိုင်များဖြင့် ဆက်သွယ်သွားမည်ဖြစ်သည်။ ထိုအဆိုပြု ဓာတ်အားလိုင်းသည် ပျမ်းမျှအရှည် ၁၆၀ ကီလိုမီတာခန့်ရှိပြီး ကယား၊ ရှမ်း၊ ကရင်ပြည်နယ်များ နှင့် ပဲခူးတိုင်းဒေသကြီးတို့ကို ဖြတ်သန်းသွားမည်ဖြစ်သည်။

ဤကနဦးပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာ (IEE)သည် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုနည်းလမ်းများသည် တိကျခိုင်မာ ပြည့်စုံစွာဖော်ပြထားပါသည်။ စီမံကိန်း အကောင်အထည်ဖော် ဆောင်ရွက်ရာတွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု နည်းလမ်းများကို လုပ်ထုံးလုပ်နည်းများ အပါအဝင် သက်ဆိုင်ရာဥပဒေများကိုလည်း တိကျစွာလိုက်နာ၍ ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးရေး လုပ်ငန်းများကို အစီရင်ခံစာပါအတိုင်း ဆောင်ရွက်မည် ဖြစ်ပါသည်။ စီမံကိန်းအားအကောင်အထည်ဖော် ဆောင်ရွက်မည့်နေ့မှ စ၍ စီမံကိန်းလုပ်ငန်း ပိတ်သိမ်းချိန် အထိ၊ အစီရင်ခံစာတွင် ပါရှိသည့် ပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေများ၊ နည်းဥပဒေများ၊ စံချိန်စံညွှန်းများ၊ လမ်းညွှန်ချက်များ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ချရေး လုပ်ငန်းများနှင့် အစီအစဥ်များကို အပြည့်အဝ အစဥ်အမြဲ လိုက်နာ ဆောင်ရွက်သွားမည် ဖြစ်ပါကြောင်း ကတိပြုအပ်ပါသည်။

ဦးသူရအောင်ဘို
ညွှန်ကြားရေးမှူးချုပ်
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန
လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန

4.2. Proponent Commitment Detail

ကယားပြည်နယ်၊ လွိုင်ကော်မြို့နယ်၊ ဘီလူးချောင်းအမှတ်(၂) ရေအားလျှပ်စစ်စက်ရုံမှ ပဲခူးတိုင်းဒေသကြီး၊ တောင်ငူမြို့နယ် စပါးကြွယ်ပင်မဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ မဟာဓာတ်အားလိုင်း စီမံကိန်းအတွက် လိုက်နာဆောင်ရွက်မည့် ကတိကဝတ်များကို အောက်ပါ ဇယား (၄.၁) တွင် ဖော်ပြထားပါသည်။

Table 4.1: စီမံကိန်းအတွက် လိုက်နာဆောင်ရွက်မည့် ကတိကဝတ်များ

စဥ်	အကြောင်းအရာ	ကတိကဝတ်များ ဖော်ပြချက်	ရည်ညွှန်းချက်
၁။	စီမံကိန်းအကြောင်းအရာ ဖော်ပြချက်နှင့် အခြားနည်းလမ်းများ ရွေးချယ်ခြင်း	စီမံကိန်းဆိုင်ရာအခြေခံအချက်အလက်များတွင်ဖော်ပြထားသော အကြောင်းအရာများမှာ တိကျမှန်ကန်ပါသည်။ စီမံကိန်း အကောင်အထည်ဖော် ဆောင်ရွက်သူသည် အစီရင်ခံ၌ ဖော်ပြထားသော လုပ်ငန်းတွင် အသုံးပြုမည့် သံမဏိရာဇမတ်တာဝါတိုင်များ၊ မီးကြိုး၊ လျှပ်ကူးပစ္စည်း စသည့်လုပ်ငန်းနှင့် ပတ်သက်သည့် ပစ္စည်းများကို ဖော်ပြပါ အရည်အသွေး ဒီဇိုင်း၊ သတ်မှတ်ချက်များအတိုင်း အသုံးပြုခြင်းနှင့် လုပ်သားများ စခန်းတွင်လည်း ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့နည်းပါစေသောထိန်းသိမ်းခြင်း လုပ်ငန်းများကို လုပ်ဆောင်မည်ဟု ကတိကဝတ်ပြုပါသည်။ စီမံကိန်းအတွက် အခြားရွေးချယ်စရာနည်းလမ်းများကို ထည့်သွင်းစဉ်းစားရာ၌ စီမံကိန်းကို ဆက်လက် မလုပ်ဆောင်ခြင်း၊ အခြားဓာတ်အားလိုင်းလမ်းကြောင်းများ၊ အခြားတည်ဆောက်ပုံနှင့် ဆောက်လုပ်ရေး နည်းလမ်းများ စသည့်တို့ကို ထည့်သွင်းစဥ်းစားပြီး ရွေးချယ်ခဲ့ပါသည်။	အခန်း (၂)
၂။	မူဝါ၊ ဥပဒေနှင့် အဖွဲ့အစည်း ဆိုင်ရာ မူဘောင်	အစီရင်ခံစာတွင် ထည့်သွင်းဖော်ပြထားသော စီမံကိန်းနှင့် သက်ဆိုင်သည့် ဥပဒေ၊ နည်းဥပဒေများ၊ မူဝါဒ၊ မူဘောင်များ၊ နိုင်ငံတကာ ကွန်ဗင်းရှင်းနှင့် သဘောတူညီချက်များနှင့် အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး လမ်းညွှန်ချက်များကို လိုက်နာ ဆောင်ရွက်မည်ဖြစ်ပါသည်။	အခန်း (၃)
၃။	ကတိကဝတ်များ	ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် ဖော်ပြထားသော စီမံကိန်းဆိုင်ရာ အခြေခံအချက်အလက် အကြောင်းအရာများသည် မှန်ကန်မှုရှိပြီး၊ ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးစေရေး လုပ်ငန်းများအား	အခန်း (၄)

		ဆောင်ရွက်မည်ဖြစ်ပြီး၊ စီမံကိန်းနှင့်သက်ဆိုင်သည့် ဥပဒေ၊ နည်းဥပဒေများ၊ လုပ်ထုံးလုပ်နည်းများနှင့် နိုင်ငံတကာ စည်းကမ်းချက်များကို လိုက်နာမည် ဖြစ်ကြောင်း၊ စီမံကိန်းဖော်ဆောင်သူနှင့် စီမံကိန်းအစီရင်ခံစာ ရေးသားသူ တတိယအဖွဲ့အစည်းတို့မှ ကတိပြု ဖော်ပြထားပါသည်။	
၄။	စီမံကိန်းအနီး လက်ရှိပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးဆိုင်ရာ အနေအထားများ	လက်ရှိစီမံကိန်းအနေအထားကို သိရှိနိုင်ရန်အတွက် ရေအရည်အသွေး၊ လေထုအရည်အသွေး၊ ဆူညံသံ၊ မြေအရည်အသွေးတို့၏ ကွင်းဆင်းတိုင်းတာရရှိထားသော ရလာဒ်များကို အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များဖြင့် နှိုင်းယှဥ် ဖော်ပြ ထားပါသည်။ စီမံကိန်း ပတ်ဝန်ကျင်ရှိ ဇီဝမျိုးစုံ မျိုးကွဲ အခြေအနေ နှင့် လူမှုစီးပွားရေး အခြေအနေများကို ကွင်းဆင်လေ့လာ မှတ်တမ်းတင်ခဲ့ပြီး ဖော်ပြထားပါသည်။	အခန်း(၅)
၅။		စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်မည့် ဒေသ အချက်အလက်များဖြစ်သည့် ရုပ်ပိုင်းဆိုင်ရာ ပတ်ဝန်းကျင်အခြေအနေ၊ နှင့် လူမှုစီးပွားရေးအခြေ တချို့တို့ကို မြို့နယ်များ၏ ဒေသဆိုင်ရာ အချက်အလက်များ (MIMU Website)မှ ကိုးကားရယူပြီး ဖော်ပြထားပါသည်။	အခန်း(၅)
၆။	သက်ရောက်နိုင်မှု ဆန်းစစ်ချက်များ	အဆိုပြုစီမံကိန်းလုပ်ငန်းများကြောင့် (တည်ဆောက်လုပ်ငန်းမစမီ၊ တည်ဆောက်ရေးလုပ်ငန်းလုပ်ဆောင်စဥ်၊ လုပ်ငန်းလည်ပတ်စဥ် နှင့် လုပ်ငန်းပိတ်သိမ်းချိန်) ထိခိုက်ဆိုးကျိုးမှု ဖြစ်ပေါ်လာနိုင်ချေရှိသော လေထု ညစ်ညမ်းမှု၊ မြေထုညစ်ညမ်းမှု၊ စွန့်ပစ်အစိုင်အခဲ၊ အရည်နှင့် အန္တရာယ်ရှိ ပစ္စည်းများ စွန့်ပစ်မှု၊ ဆူညံသံနှင့် တုန်ခါမှု၊ မြင်ကွင်းပသာဒ၊ လုပ်ငန်းခွင်နှင့် ဒေသကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး၊ ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်မှု၊ ရှေးဟောင်းအမွေအနှစ်နှင့် ဒေသတွင်း လူမှုစီးပွား အခြေအနေ အပေါ်တွင် ထိခိုက်နိုင်မှုများအား အဓိက ဆန်းစစ်ထားပါသည်။	အခန်း (၆) အပိုဒ်ခွဲ(၆.၄)

၇။	ထိခိုက်မှုများနှင့် လျော့ပါးစေရေး ဆောင်ရွက်မည့် အစီအစဥ်များ	စီမံကိန်းလုပ်ငန်းများကြောင့် (တည်ဆောက်လုပ်ငန်းမစမီ၊ တည်ဆောက်ရေးလုပ်ငန်းလုပ်ဆောင်စဥ်၊ လုပ်ငန်းလည်ပတ်စဥ် နှင့် လုပ်ငန်းပိတ်သိမ်းချိန်) ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်ဆိုးကျိုးဖြစ်လာနိုင်သည့် ရေ၊ လေ၊ မြေ၊ ဆူညံသံ၊ စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲနှင့် အရည်များ)၊ မြင်ကွင်းပသာဒ၊ ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ၊ ဇီဝမျိုးစုံမျိုးကွဲအပေါ် ထိခိုက်မှုနိုင်မှုများ၊ လုပ်ငန်းခွင်နှင့် ဒေသကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး၊ ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်မှု၊ ရှေးဟောင်းအမွေအနှစ်နှင့် ဒေသတွင်း လူမှုစီးပွား အခြေအနေအပေါ် အစီရင်ခံစာတွင်ဖော်ပြထားသည့် လျော့ချရမည့် နည်းလမ်းနှင့် အညီ ဆောင်ရွက်သွားပါမည်။	အခန်း (၆) အပိုဒ်ခွဲ(၆.၅) ဇယား (၆.၄, ၆.၅ နှင့် ၆.၆)
၈။	စုစည်းသက်ရောက်မှု ဆန်းစစ်ချက်များ	အဆိုပြုစီမံကိန်း အကောင်အထည်ဖော်ဆောင်ရွက်သည်မှ ဖြစ်ပေါ်နိုင်ချေရှိသည့် စုစည်းသက်ရောက်မှု ဆန်းစစ်ထားပါသည်။	အခန်း (၇)
၉။	ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဥ်	ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဥ်ကို အကောင်အထည် ဖော်ဆောင်ရွက်သည့်အဖွဲ့ကို အစီရင်ခံစာတွင် ဖွဲ့စည်းထားသည့် အတိုင်း တိကျစွာ လိုက်နာဆောင်ရွက် သွားပါမည်။ ထိုအစီအစဥ်များကို အကောင်အထည် ဖော်ဆောင်ရွက်ရာတွင် လိုအပ်သည့် ရန်ပုံငွေ အမေရိကန်ဒေါ်လာ (၅၀,၀၀၀) ကို အပြည့်အဝ သုံးစွဲသွားပါမည်။ လျာထားရန်ပုံငွေဖြင့် လုံလောက်မှု မရှိပါက ထပ်မံဖြည့်တင်း ဆောင်ရွက်သွားမည် ဖြစ်သည်။	အခန်း (၈)
၁၀။	ပတ်ဝန်းကျင် စောင့်ကြပ်ကြည့်ရှုခြင်း	ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဥ်တွင် ပါဝင်သော စောင့်ကြပ်ကြည့်ရှုမည့် လုပ်ငန်းစဥ်များ အကောင်အထည် ဖော်ဆောင်ရွက်ရန် အတွက် ရန်ပုံငွေ အမေရိကန်ဒေါ်လာ ကျပ်ငွေ (၁၆၀,၀၀၀) အားလျာထား ဆောင်ရွက်သွားပါမည်။ လျာထားရန်ပုံငွေဖြင့် လုံလောက်မှု မရှိပါက ထပ်မံဖြည့်တင်း ဆောင်ရွက်သွားမည် ဖြစ်သည်။	အခန်း (၈)
၁၁။	လူမှုဘဝဝန်းကျင်လူသား အကျိုးအတွက် တာဝန်ယူမှု ဆန်းစစ်ခြင်း	လူမှုရေးဆောင်ရွက်ရန် တာဝန်ရှိမှုအချိုး (CSR %)အား လိုက်နာဆောင်ရွက်မည့် ကဏ္ဍ နေရာ၊ အကြောင်းအရာ၊ အကြိမ် အရေအတွက်နှင့် ငွေပမာဏများကိုလည်း လျာထားသည့် ကျပ်ငွေ အမေရိကန်ဒေါ်လာ (၂၀,၀၀၀) အတိုင်း ဆောင်ရွက်သွားပါမည်။ လျာထားရန်ပုံငွေဖြင့် လုံလောက်မှု မရှိပါက ထပ်မံဖြည့်တင်း ဆောင်ရွက်သွားမည် ဖြစ်သည်။	

၁၂။	အများပြည်သူ သဘောထားရယူခြင်း	အများပြည်သူသဘောထားရယူခြင်း အခမ်းအနား (၆) နေရာတွင်ဒေသခံများ၊ ပြည်သူများနှင့် တွေ့ဆုံဆွေးနွေး တိုင်ပင်ချက်များနှင့် သက်ဆိုင်ရာ အစိုးရဌာန အသီးသီးမှ အကြံပြု ဆွေးနွေးချက်များကိုလည်း လိုက်နာ ဆောင်ရွက်သွား ပါမည်။	အခန်း (၉) အပိုဒ်ခွဲ(၉.၂ မှ ၉.၄)
၁၃။	တိုင်ကြားချက် ဆောင်ရွက်မှု အစီအစဉ်	ရပ်ရွာလူထုနှင့် ဝန်ထမ်းများ တိုင်ကြားချက်များကို ဆောင်ရွက်မည့် အစီအစဉ်များကို ရေးဆွဲဖော်ပြထားသည့် အတိုင်း လိုက်နာဆောင်ရွက်သွားပါမည်။	အခန်း (၁၀) အပိုဒ်ခွဲ(၁၀.၂ နှင့် ၁၀.၅)

အထက်ဖော်ပြပါ ကတိကဝတ်များကို တိကျစွာ လိုက်နာဆောင်ရွက်ပါမည်ဟု ကတိပြုပါသည်။

ဦးသူရအောင်ဘို
ညွှန်ကြားရေးမှူးချုပ်
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန
လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန

4.3. Commitment of Report Prepared Organization

VALENTIS
ENVIRONMENTAL
& GEO-TECHNICAL

Valentis Enviromental and Geotechnical Services Limited
No. ....
Date............

Commitment of Report-prepared Organization

Date – 13h May 2021

The Ministry of Electricity and Energy (MOEE) Department of Power Transmission and System Control (DTPSC) propose to construct a transmission line from Baluchaung (2) Loikaw to Taungoo (Sabakywe) (the Project). The Project will contribute to upgrading the national electricity system by enabling increased transmission loads and strengthening the network.

The Project will involve construction of a new 230 kV transmission line consisting of steel lattice towers between the Loikaw substation in Kayah State and the Sabakywe substation near Taungoo, in Bago region. The new transmission line will be approximately 160 km long and will traverse sections of the Kayah, Shan and Kayin states and the Bago region.

It is true that the data and information described in Initial Environmental Examination (IEE) Report for construction of a new 230kV transmission line in Kayah, Shan and Kayin Sate and Bago region are prepared only after field surveys and inspection together with the officers from relevant government departments into the project area.

Furthermore, we, here, make a commitment that the report is prepared in compliance with Paragraph 64 (h) of Environmental Impact Assessment Procedure (2015) issued by Environmental Conservation Department.

We, here, make a commitment that the IEE report is prepared by exactly following Environmental Conservation Law, Rules, Procedures and Guidelines, regulations requirements and all necessary international laws and Standards. Furthermore, the environmental impact mitigation measures and procedures will be inevitably implemented in compliance with commitments, Laws, Rules, Standards and Guidelines described in the IEE report. All information contained in the report is accurate and a truthful representation of all findings as relating to the Project. We endorse and confirm to Environmental Conservation Department the accuracy and completeness of the IEE report.

Kindly regards,

(La Min Win)

Director

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Chapter 5

5. Existing Environment

This chapter describes the existing baseline environment and socioeconomic in/around which the project area would be constructed and operated.

- **Physical Feature** (covering Topography, Meteorology, Landform, Soil Types, Land Cover, Geology, Hydrology, Hydrogeology, Natural Hazards etc.)
- **Physical Environment** (covering Water Quality, Air Quality, Soil Quality, Noise and Land forms etc.)
- **Ecological Environment** (including protected areas, Park and Flora, Fauna and ecosystem services)
- **Socio-economic Environment** (Demography, Economy and Infrastructure Conditions etc.

5.1. Objectives

The existing environmental and social features of the project area were characterised through a combination of desktop study (including reviewing Google Earth satellite imagery) and targeted field surveys to inform the impact assessment.

The baseline was established through desktop literature and field surveys.

In addition to characterising baseline conditions, field survey objectives included:

- Identifying potential sensitive receptors within the project area.
- Identifying potential environmental or ecological constraints along the proposed route.
- Identifying potential social risks and potential resettlement requirements along the proposed route.

The project area has been defined as the potential area of influence of project activities.

5.2. Environmental Baseline Method

The direct impact zone is 75’ (23 m) and indirect impact zine is 2,640 ‘ (850 m) each side of the proposed transmission line. (Figure 5.1)

Environmental observations in the field focused on surface water, ambient noise and air conditions. Soils, landform (including geotechnical aspects). In addition to water and soil sampling and analysis, ambient air quality and noise levels were recorded. Laboratory transcripts are provided in Appendix 14.5. An ecology and biodiversity and socio-economic survey was also undertaken. The sampling and survey locations for fieldwork completed to date are shown in Figure 5.2.

Study area limits of environmental and socio-economic settings were designated 2 km radius centered from transmission line to be large enough to cope with the most potential environmental and social impact issues of the project construction and operation. The sampling methodologies for the various environmental parameters required for the study, method of sample analysis, etc. The field survey was conducted during September 2020 to February 2021.

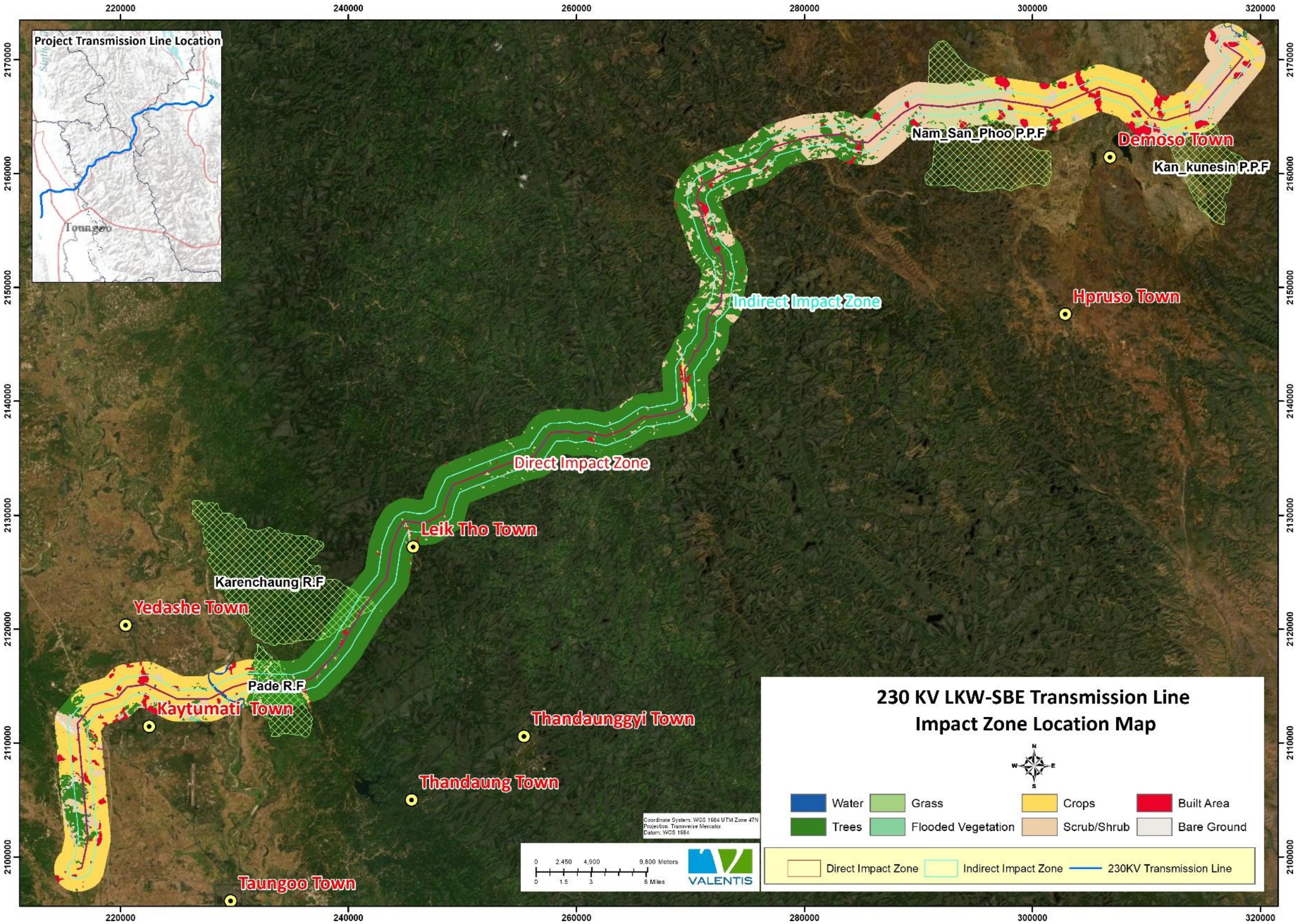


Figure 5.1: Direct and Indirect Impact Zone of the Proposed Transmission Line

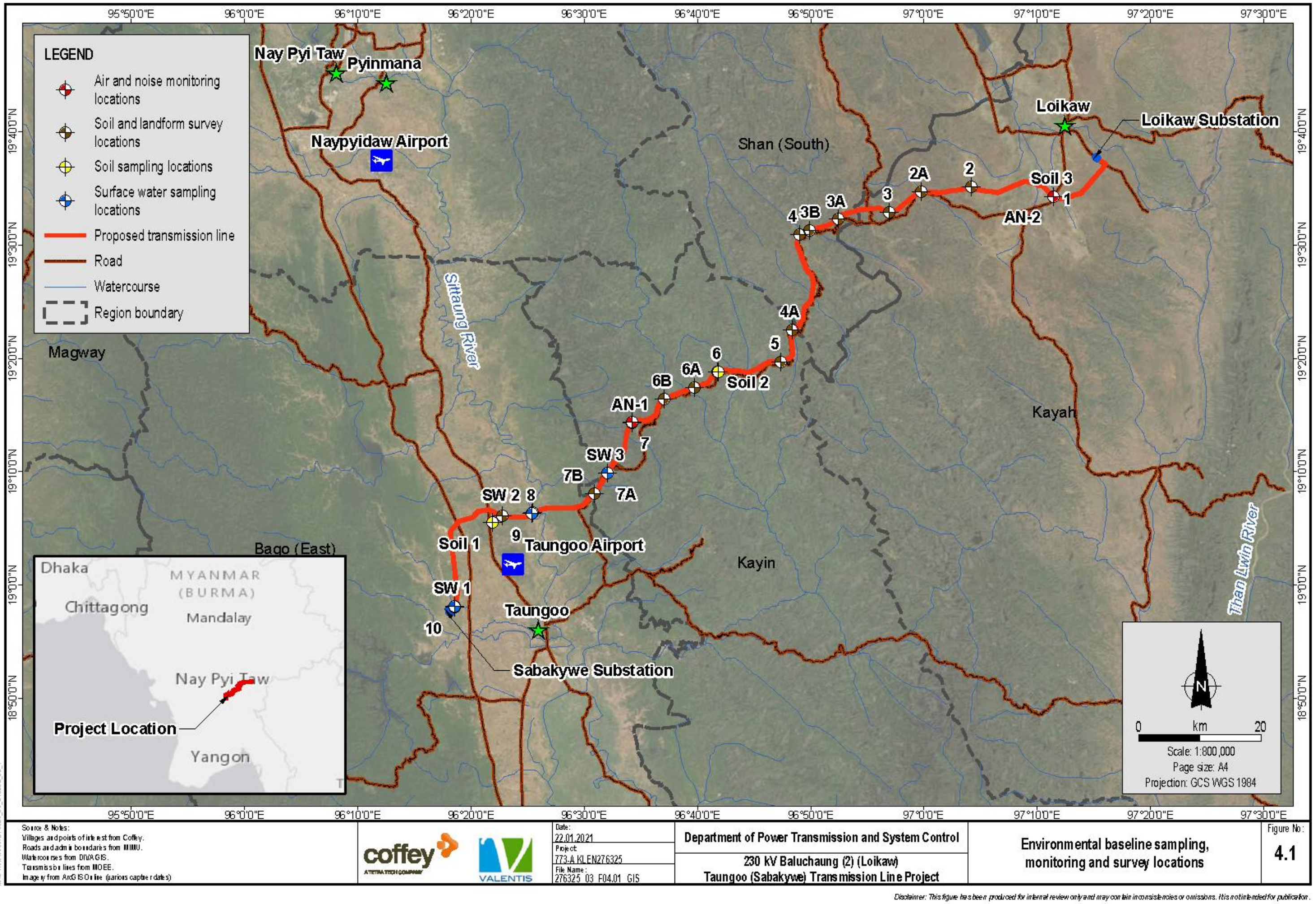


Figure 5.2: Environmental Baseline Sampling, Monitoring and Survey Locations

5.3. Physical Feature

5.3.1. Climate and Meteorology

Myanmar has a tropical climate with three main seasons: Cool season, also known as winter or northeast monsoon season (November to February), summer/hot season (March to mid-May) and wet season, also known as southwest monsoon season (mid-May/June to October) (Aung et al. 2017; Horton et al. 2015).

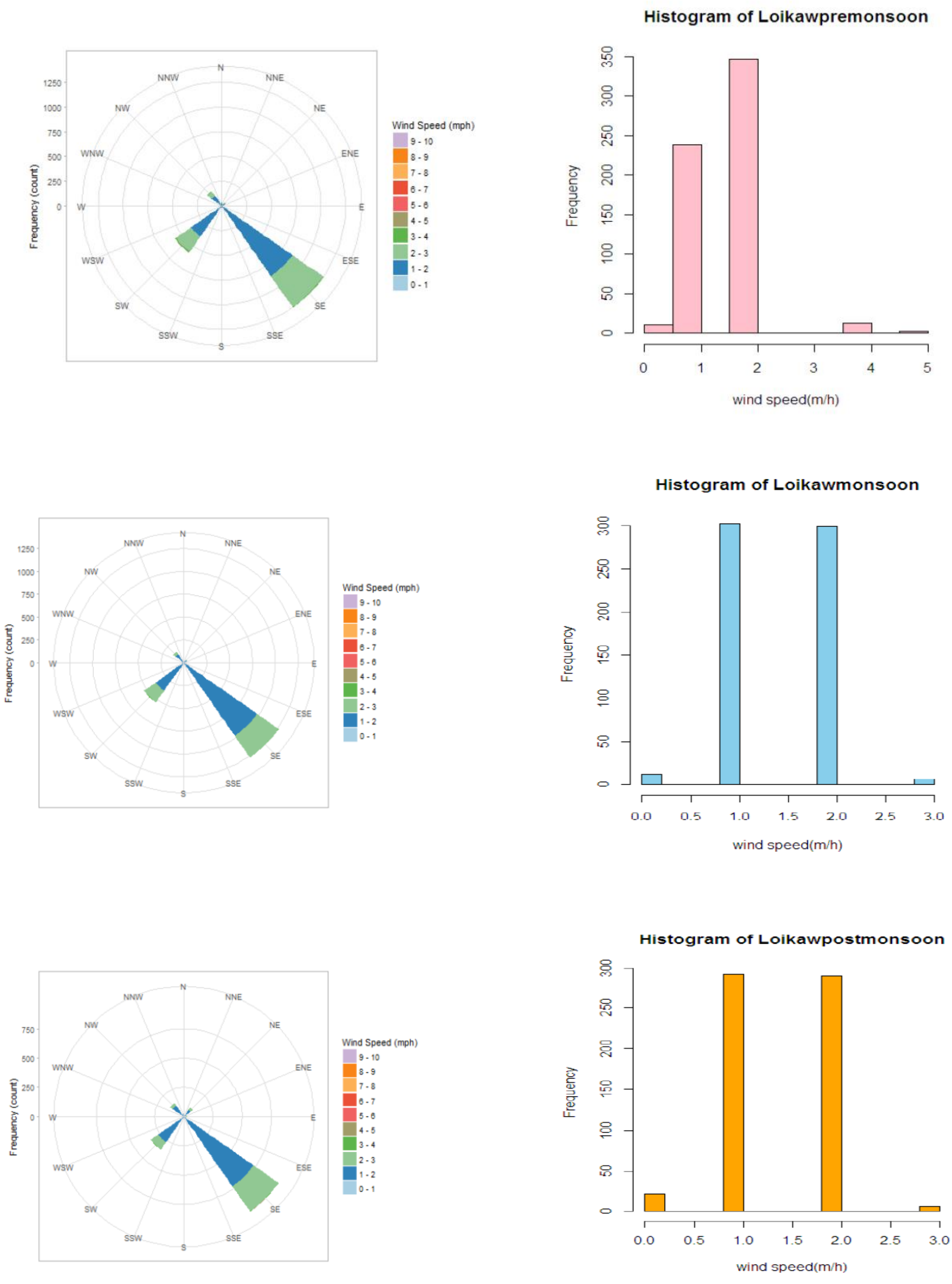
Department of Meteorology and Hydrology (DMH) observation stations at Loikaw and Taungoo have recorded rainfall and temperature data at both ends of the proposed transmission line. Analysis of the climate records at the Loikaw and Taungoo weather stations by Aung et al. (2017) between 1981 and 2010 can be summarised as follows:

- **Loikaw:**
  - Average monthly rainfall ranged between 3.1 mm in February and 210.5 mm in August.
  - Average annual rainfall was 1,046 mm.
  - Average monthly maximum temperature ranged between 26.0°C in December and 33.5°C in April.
  - Average monthly minimum temperature ranged between 9.8°C in January to 20.9°C in June.
  - Prevailing wind direction is south-easterly (Figure 5.3).

- **Taungoo:**
  - Average monthly rainfall ranged between 2.6 mm in January and December and 451.7 mm in August.
  - Average annual rainfall was 1,959 mm.
  - Average monthly maximum temperature ranged between 30.1°C in August and 37.9°C in April.
  - Average monthly minimum temperature ranged between 15.0°C in January to 24.6°C in May.

The highest recorded 24-hour rainfall in Loikaw between 1961 and 1990 was 112 mm on 24 August 1971 (MOECAF 2012). Between 1991 and 2004, high extreme rainfall was recorded at Loikaw in 2004, with a 24.4% departure from normal. Extreme rainfall can be defined by the departure from normal, i.e. considering how much the rainfall deviates from the long term average (three consecutive decades) (MOECAF 2012; WMO 2019). High extreme rainfall is rainfall that deviates at least 20% greater than normal rainfall. Extreme low rainfall, defined as rainfall 20% less than normal, occurred in 1993 and 1998 in Loikaw, with the greatest departure from normal -28.9% in 1998 (MOECAF 2012).

The Karen Hills are located between Taungoo and Loikaw and are part of the Kayah-Karen montane rainforest ecosystem (see Figure 1.1). This ecosystem has a monsoonal climate, with average annual rainfall between 1,500 mm and 2,000 mm (WWF 2020). Temperatures in the Karen Hills are expected to be lower than Loikaw and Taungoo due to their greater elevation.



(source: Aung et al. 2017)

Figure 5.3: Loikaw Wind rose and frequency of wind speed in pre-monsoon season (top), monsoon season (middle) and post-monsoon season (bottom)

5.3.2. Climate Change

The climate risk assessment by Horton et al. (2017) outlines projected changes to mean temperature and precipitation in the pre-defined physiographic regions of Myanmar. The project area lies within the southern interior physiographic region, with projected climate change outlined in Table 5.1 and Table 5.2.

Table 5.1: Average daily mean temperatures between 1980 and 2005, and projected changes (low and high estimates) to mean temperature in the southern interior region compared to 1980-2005

Period	Unit	Annual	Hot season (March to May)	Wet season (June to October)	Cool season (November to February)
1980 - 2005	°C	26.2	28.2	26.7	24.2
2011 - 2040	°C	+0.7 to +1.1	+0.8 to +1.2	+0.6 to +1.1	+0.7 to +1.1
2041 - 2070	°C	+1.3 to +2.3	+1.4 to +2.9	+1.1 to +2.3	+1.3 to +2.7

Source: Adapted from Horton et al. (2017)

Table 5.2: Average precipitation between 1980 and 2005, and projected changes (low and high estimates) to mean precipitation in the southern interior region compared to 1980-2005

Period	Unit	Annual	Hot season (March to May)	Wet season (June to October)	Cool season (November to February)
1980 - 2005	mm	1900	300	1600	100
2011 - 2040	mm	+1 to +11	-11 to +11	+1 to +13	-28 to +14
2041 - 2070	mm	+7 to +25	-5 to +11	+7 to +29	-6 to +15

Source: Adapted from Horton et al. (2017)

The highest temperature in Loikaw and Taungoo occurred in 1998, at 38°C and 42.9°C, respectively (MOECAF 2012). High temperatures occurred across Myanmar in 1998 in association with an El Niño event. (MOECAF 2012). Climate change may make areas more vulnerable to El Niño events, which may exacerbate seasonal weather patterns, however there are no predictions for the occurrence of future events in Myanmar.

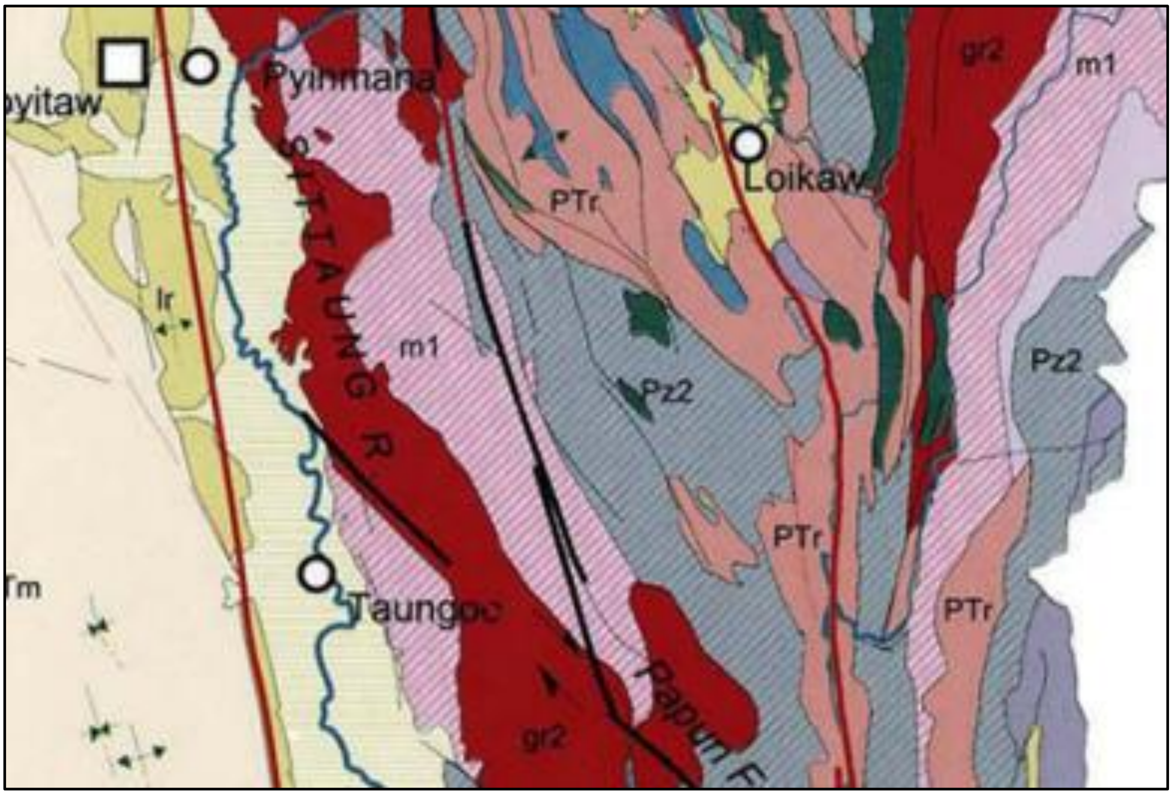
5.3.3. Geology

Myanmar is geologically complex, with zones of collision, subduction and strike slip faulting (Zaw et al. 2017). The proposed route crosses the Karen Hills, located on the southwestern edge of the Shan Plateau on the Shan-Thai block. The Shan-Thai block extends eastwards from the Sagaing Fault and is comprised of Cambrian to Triassic sedimentary rocks (Searle et al. 2007).

Based on the geological map from Myanmar Geosciences Society (2014), the eastern end of the proposed route near Loikaw traverses Upper Miocene to Pliocene Irrawaddy Formation, whereas the geology traversed through the Karen Hills is more variable (Figure 5.4). From east to west, the geological units present include: limestone of the Plateau Limestone Group and Moulmein Limestone; sedimentary and meta-sedimentary rocks of the Taungnyo Formation, Lebyin Group and Mergui Group; metamorphosed units, including the Mogok Metamorphic Belt; and Mesozoic and Lower Tertiary granitoids. The geology of the Sittaung River valley to the west of the Karen Hills is young, dominated by Holocene alluvium (Myanmar Geosciences Society 2014). In the Taungoo area, underlying the Holocene alluvium is older alluvium, sandstones of the Irrawaddy Formation, sandstone and shale of the Upper Pegu Group, and igneous and metamorphic granites and granite-gneiss (JICA 2014).

Karst landscape features, such as caves, may be found in soluble rocks such as limestone and dolomites, formed as a result of the rock dissolving. Karst features can be found in the vicinity of the project area, near Hprusi. The transmission line route is approximately 20 km north of Hprusi, where the Hprusi plateau karst is located. This is an area encompassing Hprusi and Demoso at 900 to 1500 m above sea level which includes Kwaing Ngant Cave, Phruso Cave, as well as sinking and resurging rivers (Dreybrodt and Aung 2019).

The proposed transmission line route will pass over limestones of the Plateau Limestone Group and Moulmein Limestone (Figure 5.4).



(Source: Myanmar Geosciences Society 2014)

Figure 5.4: Regional Geology

5.3.4. Landforms

The Loikaw and Sabakywe substations are situated in lowland areas, separated by the Kayah-Karen Mountains, also known as the Karen Hills. The western section of the project area lies in the Sittaung River valley. The Kayah-Karen Mountains is rugged mountain terrain, with the Kayah-Karen montane rainforest ecosystem typically steep and reaching elevations of over 2000 m (WWF 2020). Deforestation and resource extraction practices have degraded the natural environment over time.

The heavy forest characteristics of the Karen Hills in the project area. (Plate 5.1 & 5.2). The lowland areas either side of the Karen Hills have mostly been cleared for agriculture and cultivation, with rice as the dominant crop.

The plains around Loikaw and Demoso are relatively flat and characterised by swampy land (Plate 5.3), grass and bush (Plate 5.4). The plains in Loikaw and Demoso often have access to irrigation water and are suitable for agriculture and/or animal husbandry (Cartmell 2019).

The area around Taungoo has been significantly disturbed by human activity and is characterised by grass, farmland and bush (Plate 5.5 and Plate 5.6).

5.3.5. Soil

According to the map of dominant soil types of Myanmar published by Open Development Myanmar (2007) (Figure 5.5) the main regional soil types present along the proposed route are:

- Orthic acrisols on most of the Karen Hills and eastern half of the proposed transmission line route. Acrisols are soils with subsoils enriched in low activity clay, strongly weathered, often from weathering of acidic parent material. Mostly found on hilly and undulating topography with monsoonal or subtropical climates (IUSS Working Group WRB 2015). In Myanmar, these soils are often red sandy to silty clay loam, and may support forests, gardens and flowers (Htwe 2015).

- Eutric gleysols west of the Karen Hills. Gleysols are soils saturated with groundwater for long periods, mainly comprising fluvial, marine and lacustrine sediments. These are found in low positions on landscapes, such as river plains.

- Dystric nitisols near the Sabakywe substation. Nitisols are well drained soils with a clay nitic horizon, often found on flat to hilly land (IUSS Working Group WRB 2015). In Myanmar, these soils are rich in nutrients and suitable for crops including rice, maize and sugarcane (Htwe 2015).

Plate 5.1: Heavy Forest in the Karen Hills at Landform Survey Site 6

Plate 5.2: Grass and Trees in the Forest in the Karen Hills at Landform Survey Site 7

Plate 5.3: Swampy land near Loikaw at Soil and Landform Survey Site 1

Plate 5.4: Grass and Brush near Loikaw at Landform Survey Site 2

Plate 5.5: Grass and farmland near Taungoo at Landform Survey Site 8

Plate 5.6: Grasses and Bush near Taungoo at Landform Survey Site 9

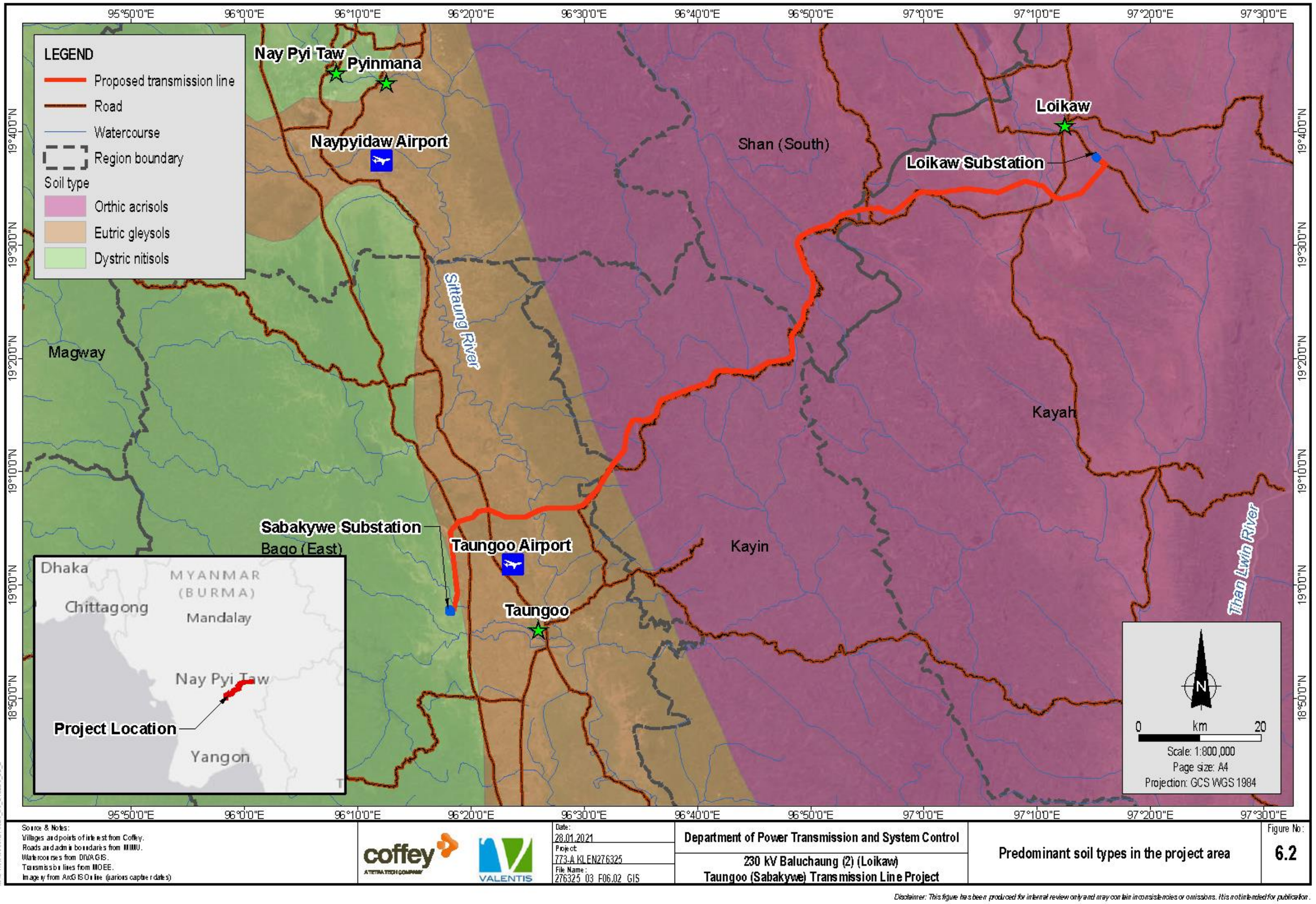


Figure 5.5: Predominant Soil Types in the Project Area

5.3.6. Land Cover

Figure 5.6 shows land cover in the project area. Most of the route crosses scrubland, with small areas of evergreen forest and agricultural land near Loikaw and Taungoo. The biodiversity survey identified the majority of forest types in the project area were secondary evergreen forests, deciduous forests in the Kayah-Kayen mountainous region and scrubland and agriculture in the lowlands near Loikaw and the Sabakywe substation. Plantations and shifting cultivation on hillsides were also recorded along some parts of the route. Plate 5.7, Plate 5.8 and Plate 5.9 show a range of land covers in the project area.

5.3.7. Protected Areas, Reserved and Public Protected Forests

The Forest Law (1992) allows forests to be designated at reserved forest and protected public forests. These are forested areas owned by the government, with reserved forests able to be designated for specific uses including timber supply for commercial or local use, or designated to protect natural features such as watersheds, catchments, environment, biodiversity and conservation (Clarke 1999), including supporting feeding and breeding grounds and biodiversity offsets for birds and mammals. The reserved and two protected public forests traversed by the proposed transmission line route (Figure 5.7) are:

- Pade Reserved Forest just east of the Sittaung River.
- The edge of the Karenchaung Reserved Forest on the western side of the Karen Hills.
- Nam San Phoo Public Protected Forest on the eastern side of the Karen Hills, southwest of Loikaw.
- The northern edge of Kan Kunesin Public Protected Forest, south of Loikaw.

The Sabakywe substation is located in a heavily disturbed area near the Kabani Reserved Forest to the west of Taungoo (Figure 5.6) In the Kabani Reserved Forest and adjacent forested areas, further inland and at a distance from the Project, predominantly evergreen forest and mixed deciduous forest is present, with fauna species including Asiatic wild dog, Sunda pangolin, reptile species, wild boar, barking deer and hog deer (Instituto Oikos and BANCA 2011).

Upland rice cultivation and timber trade have resulted in deforestation and degradation of portions of habitat in the project area, including from soil erosion. More than 70% of forested areas in Myanmar are classified as vulnerable or critical/endangered (IFC 2017a).

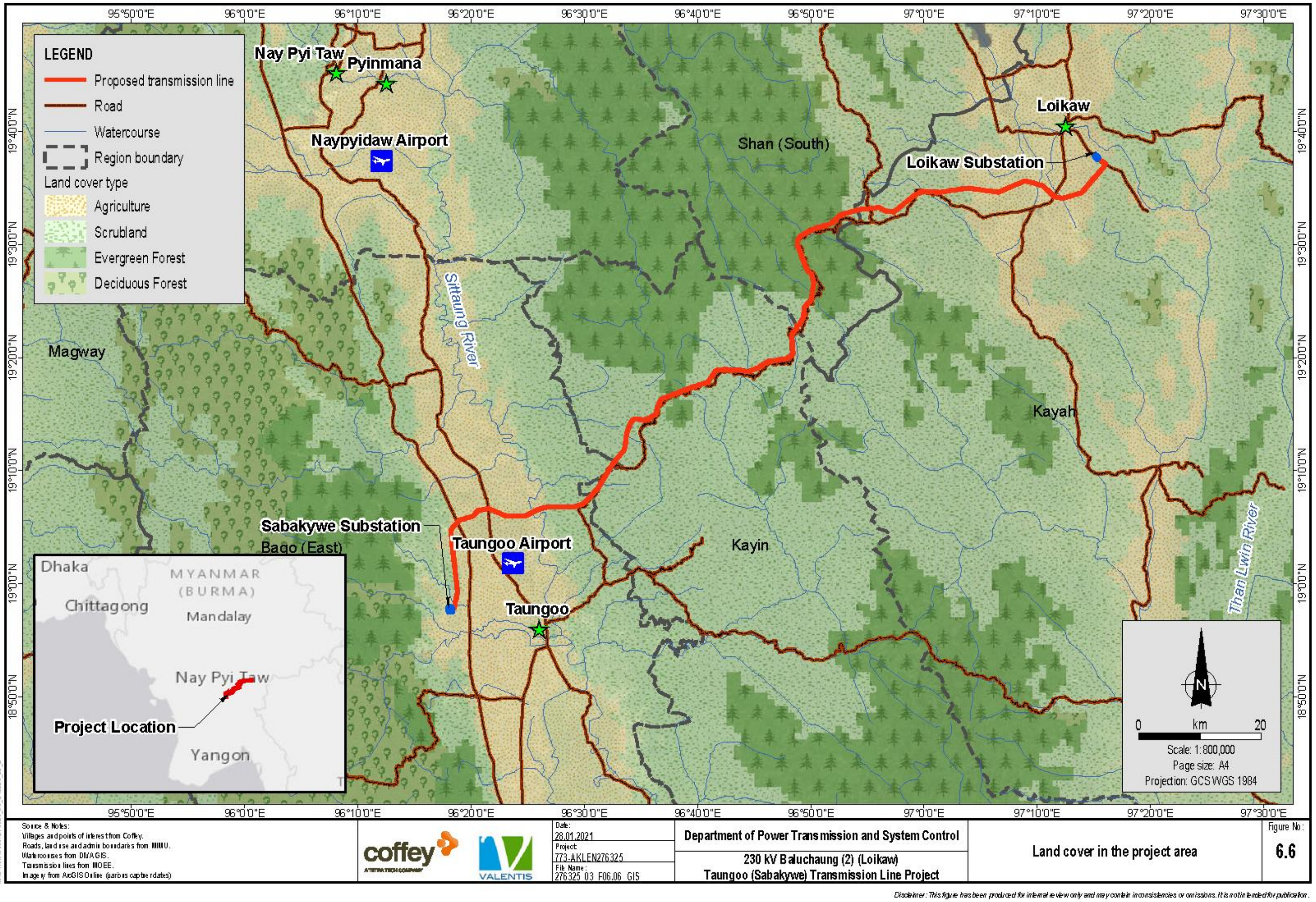


Figure 5.6: Land Cover in the Project Area

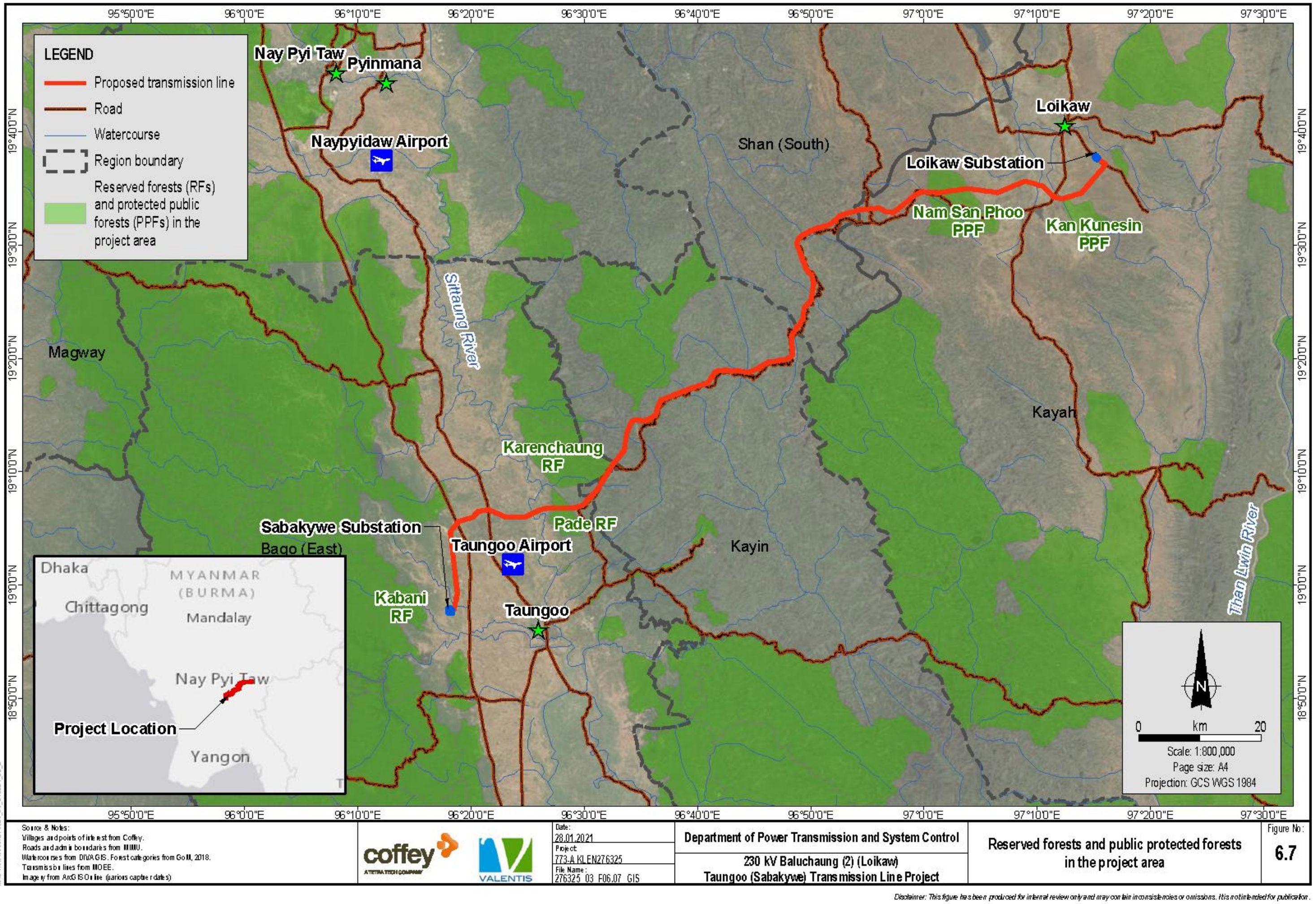


Figure 5.7: Reserved Forest and Public Protected Forests in the Project Area

Plate 5.7: Rainforest and Upland Cultivation

Plate 5.8: Secondary Rainforest

Plate 5.9: Scrubland near Loikaw, Showing a Scrub Fire

5.3.8. Seismicity

Seismicity in Myanmar is largely related to the subduction of the Indian Plate beneath the Burma micro-plate at an average rate of 3.5 cm per year and spreading in the Andaman Sea due to the movement of the Burma micro-plate northwards at an average rate of 2.5 to 3 cm per year (DMH et al. 2009). This tectonic movement has resulted in a range of thrust and strike-slip earthquakes associated with the faults in the region (DMH et al. 2009).

The Sagaing Fault is a strike-slip fault west of Taungoo near the Sabakywe substation, which extends 1,200 km north to south through Myanmar (UN Habitat 2015). Several large seismic events have occurred on this fault, including the magnitude 7.3 Swa earthquake in 1929 near Taungoo. This earthquake caused bending of railroad tracks and collapses of bridges and culverts (DMH et al. 2009). Several other faults are in the vicinity of the proposed transmission line, including the Kyaukkyan Fault near Loikaw, a 600 km long fault zone which extends north from Thailand. Earthquakes e Sagaing Fault is a strike-slip fault west of Taungoo near the Sabakywe substation, which extends 1,200 km north to south through Myanmar (UN Habitat 2015). Several large seismic events have occurred on this fault, including th on this fault include a magnitude 7.7 event in 1912 (Sloan et al. 2017). The Papun Fault and Taungoo Fault also extend northwest from Thailand (Zaw et al. 2017), with the Papun Fault located midway along the proposed transmission line route (Figure 5.3).

A seismic zone map of Myanmar developed by Maung Thein et al. (2005) divides Myanmar by probable seismic intensity. The proposed transmission line route passes through Seismic Zones II, III and IV, considered moderate, strong and severe, respectively. Zone IV, near Taungoo corresponds to probable ground accelerations of 0.3 to 0.4 g (units of gravity). The probable range of ground acceleration is 0.2 to 0.3 g in zone III through the Karen Hills, and 0.1 to 0.15 g in seismic zone II near Loikaw (Maung Thein et al. 2005).

5.3.9. Hydrology

The Project is located within the Sittaung and Thanlwin river basins.

(A) Sittaung River and Watercourses West of the Karen Hills

The western segment of the proposed transmission line route will cross the Sittaung River, approximately 28 km northeast of the Sabakywe substation (Figure 5.8; Plate 5.10, 5.11) as well as two smaller unnamed waterways on the western side of the proposed route, one approximately 1 km northeast of the Sabakywe substation (Figure 5.9; Plate 5.12) and one approximately 6 km west of Kyun Kone. The Sittaung River extends for approximately 420 km from Yamethin, in the Mandalay region, southwards to the Gulf of Martaban in the Andaman sea, with a catchment area of 48,100 km^2 (IFC 2017d). Water from the Shan Plateau to the east drains to the river via several steep tributaries (IFC 2017c).

The section of the Sittaung River the proposed transmission line crosses is approximately 320 m wide, flowing down the low-gradient valley between the Karen Hills and Bago Yoma Ranges. The Sittaung River is reported to have a strong current (Win et al. 2012) and only 40 to 90 km of the river is considered suitable for navigation, depending on the time of year (IFC 2017b). Nine hydropower stations are located in the Sittaung River tributaries (IFC 2017b).

The smaller unnamed waterway northeast of the Sabakywe substation is approximately 25 to 35 m in width and flows south to the Kha Paung River south of Taungoo. Approximately 65 m of the proposed transmission line route crosses this river obliquely. The smaller waterway to the west of Kyun Kone flows southeast towards Taungoo. The transmission line crosses an 8 to 10 m wide section of this stream.

(B) Unnamed Waterways and Drainage Channels - Karen Hills

The transmission line will cross several small unnamed creeks and drainage channels in the Karen Hills, including one approximately 6 km west of Breplo (near Yado Sacred Heart Church). Plate 5.12 shows a stream in the Karen Hills at soil and landform survey site 7A south of Kaw Bat Chan Village.

(C) Ngwedaung Chaung Stream and watercourses east of the Karen Hills

To the east, the proposed transmission line route crosses the Ngwedaung Chaung Stream near Demoso. The Ngwedaung River flows between the Ngwe Daung Dam in Demoso north and the Baluchaung River and is 10 to 15 m in width where the proposed transmission line route crosses. The Baluchaung River flows south from Lake Inle, through Loikaw, eventually discharging into the Thanlwin River. The Thanlwin River is part of the Nu-Thanlwin (Salween) River which flows through China, Myanmar and Thailand. The 2,400 km river has a basin approximately 324,000 km^2 in area, 42% of which is in Myanmar (IFC 2017d).

5.3.10. Hydrogeology

The proposed route extends over several hydrogeological units, primarily the Plateau limestone aquifer near Loikaw, sedimentary/metasedimentary aquifers along the central part of the route, and igneous and alluvial aquifers on the western end of the route near the Sittaung River (Pincetti-Zúniga et al. 2020). In Taungoo, the Irrawaddy Formation, comprised of loosely cemented sandstones, is an aquifer with high groundwater discharge at a depth of 15 m to over 30 m (JICA 2014).

The plateau limestone aquifer extends through large areas in the Shan Plateau, and sedimentary formations (including limestone) may be up to several thousand metres thick (Viossanges et al. 2017). Groundwater from this aquifer is often extracted with tubewells and used for domestic and irrigation purposes. The plateau limestone aquifer is characterised by the presence of calcareous alluvial sediments, limestones and dolomites, which are reflected in the groundwater composition present at Loikaw. This groundwater reflects carbonate (calcite and dolomite) dissolution, and is dominant in Ca(Mg)-HCO3 (Pincetti-Zúniga et al. 2020). Lake Inle, approximately 100 km north-northwest of Loikaw at the closest point has had shallow (less than 70 m depth) groundwater levels recorded within its sub-basin. These groundwaters had elevated levels of arsenic and were slightly more alkaline and oxidised than groundwater studied in other areas of Myanmar (Pincetti-Zúniga et al. 2020).

Groundwater systems may support groundwater dependent ecosystems and contribute baseflow to watercourses. Groundwater levels increase during monsoon season (DMH et al. 2009) due to the increase in rainfall.

Data from the 2014 census indicates that the townships the project intersects utilise groundwater resources, with wells, springs and boreholes used by 85.7% of respondents in Taungoo, 68.2% of respondents in Loikaw, and 73.9% of respondents in Demoso (DOP 2015-2016). This suggests the availability of groundwater resources in these areas is relatively high in comparison to the townships located in more hilly terrain.

Figure 5.8: Indicative transmission line route crossing the Sittaung River, south of Karenchaung township. Note that route refinement may occur during the proposed scope of work. Source: Google Earth 2004.

Figure 5.9: Unnamed watercourse to the northeast of Sabakywe substation. The red square indicates the substation location, with an indicative transmission line route heading north. Note that route refinement may occur during the proposed scope of work. Source: Google Earth 2004

Plate 5.10: Sittaung River

Plate 5.11: Unnamed Creek Near the Sabakywe Substation

Plate 5.12: Thauk Yekhat

5.4. Physical Environment

5.4.1. Water Quality

Three water quality samples were taken from the project area for analysis, as described in Table 5.4 and shown in plates, Plate 5.13, Plate 5.14 and Plate 5.15 and in Figure 5.2.

Table 5.3: Water quality samples

Site number	Date sampled	Coordinates	Description
SW-1	7/9/2020	18° 58' 07.72" N, 96° 18' 31.97" E	Watercourse approximately 700 m northeast of the Sabakywe substation.
SW-2	6/9/2020	19° 06' 19.61" N, 96° 25' 23.17" E	Sittaung River approximately 18 km north of Taungoo.
SW-3	6/9/2020	19° 09' 53.10" N, 96° 32' 03.38" E	Small creek south of Kaw Bat Chan Village in the Karen Hills.

Samples were sent to the Iso Tech Laboratory (Yangon, Myanmar) and Land Use Laboratory (Department of Agriculture, Yangon, Myanmar) for analysis of the following parameters. The lab results are presented in Appendix 14.6 (A).

- pH, turbidity and colour.
- Dissolved concentrations of selected metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.
- Total coliforms and faecal coliforms.
- Biochemical oxygen demand (BOD) and chemical oxygen demand (COD).
- Total ammonia (NH_3-N) and nitrate (NO_3-N).
- Free chlorine, total chlorine and dissolved chloride (Cl^-).

In-situ measurements of the following parameters were taken using a pH meter, turbidity meter and Aquacheck Silver Test Strips:

- Total hardness.
- Total alkalinity.
- EC.
- pH.
- Temperature.
- Turbidity.
- Colour.
- Total dissolved solids (TDS).

Plate 5.13: Water sampling at site SW-1

Plate 5.14: Water sampling at site SW-2

Plate 5.15: Water sampling at site SW-3

Water samples were taken from three locations along the proposed transmission line route (Table 5.4). SW-1 is located in the watercourse approximately 13.5 km west-northwest of Taungoo. SW-2 is located in the Sittaung River approximately 18 km north of Taungoo (Figure 5.7). SW-3 is located in a small creek south of Kaw Bat Chan Village in the Karen Hills.

Comparison to National Environmental Quality Emission Guidelines (NEQEG) and National Drinking Water Quality Standard which allows for understanding whether metals are elevated with respect to typical healthy aquatic ecosystems. Tables 5.5 and 5.6 show the results of water quality analysis.

Table 5.4: In-situ water quality results

Parameter	Unit	SW-1 (Kabaung River)	SW-2 (Sittaung River)	SW-3 (Karen Hills)
Total hardness	ppm	100	0	0
Total alkalinity	ppm	60	60	30
Electrical conductivity	µs	144	196	42
pH	pH units	7.6	7.4	8.52
Temperature	°C	29.5	34**	24.2
Turbidity	NTU	<0.01*	562	32.7
Total dissolved solids	mg/L	72	96	21

* Value appears to be an instrumentation error, with higher levels of turbidity noted through visual observations.

** Value appears to be an instrumentation error based on site observations and expected temperature.

According to national drinking water, coliforms should not be detectable in 100 mL samples. The coliform count at all three sites exceeded these limits.

The second most common source of drinking water in Leiktho is from rivers and streams. The proposed transmission line passes through Leiktho near the location of SW-3, where the water quality laboratory results indicate that the stream sampled may not be suitable for drinking due to its high turbidity (480 NTU) and presence of coliforms (80 CFU/100 mL). The socio-economic survey identified that respondents often source drinking water from streams.

Dissolved metal concentrations were relatively consistent between the three sites, with 0.004 mg/L of cadmium, 0.003 to 0.009 mg/L of nickel, and 0.00081 to 0.00091 mg/L of mercury. Arsenic was only detected at SW-2 (0.025 mg/L).

Baseline water quality results in the Sittaung River appear to be relatively consistent with previous water quality data in 2011 and 2012 reported by JICA and Sanyu (2014), at a site near the Sittaung Bridge in Taungoo. The 2011-2012 data indicated that over the four monitoring events, the Sittaung River had an average pH of 7.2, EC of 187 µS/cm, turbidity of 323 NTU and TDS of 120 mg/L. Additionally, the data indicates the river has moderate hardness (average of 72 mg/L) and an average dissolved oxygen concentration of 5.5 mg/L (JICA and Sanyu 2014).

Observations of the watercourses surveyed in the biodiversity survey observed rubbish disposed of in the unnamed creek near the Sabakywe substation and an inlet of the Sittaung River (Plate 5.16 and Plate 5.17).

Table 5.5: Water Quality Laboratory Results

Parameter	Unit	National Drinking Standards	NEQEG	SW-1	SW-2	SW-3
Physical parameters						
pH	pH units	6.5 – 8.5	6 – 9	7.7	7.5	7.4
Turbidity	NTU	<5	5	480	292	28
Colour	TCU		15	220	180	10
Chlorine						
Free chlorine	mg/L		-	0	0	0
Total chlorine	mg/L		-	0	0	0
Chloride (as Cl^-)	mg/L	250	0.2	2	3	2
Nutrients and microorganisms						
Total Nitrogen	mg/L		10*/10	0	0	0
Nitrate	mg/L	50	-	0.4	0.3	0.2
Total coliforms	CFU/100 mL	3	400*/400	80	60	40
Faecal coliforms	CFU/100 mL	0	-	30	20	10
Biochemical oxygen demand	mg/L		30*/50	96	64	64
Chemical oxygen demand	mg/L		125*/250	30	22	20
Dissolved metals						
Arsenic (As)	mg/L	<0.05	0.1	0	0.025	0
Cadmium (Cd)	mg/L	<0.003	0.1	0.004	0.004	0.004
Copper (Cu)	mg/L	<2	0.5	0	0	0
Lead (Pb)	mg/L	<0.01	0.1	0	0	0
Nickel (Ni)	mg/L	<0.07	0.5	0.004	0.003	0.008
Mercury (Hg)	mg/L	<0.001	0.01	0.00082	0.00091	0.00081
Chromium (Cr)	mg/L	<0.05	0.5	0	0	0
Zinc (Zn)	mg/L	<3	2	0	0	0

* Effluent Limits for Electric Power Transmission and Distribution

Plate 5.16: Rubbish in the Small Unnamed Creek near the Sabakywe Substation

Plate 5.17: Rubbish in an Inlet of the Sittaung River

5.4.2. Ambient Air Quality

In-situ air quality and noise measurements were taken at site AN-1 near Leik Tho Town on 4 and 5 September 2020 and site AN-2 near Demoso Town on 1 and 2 September 2020 (Plate 5.18 and Plate 5.19 and Figure 5.2). Site AN-1 is located within a relatively undisturbed area on the western side of the Karen Hills, on the outskirts of Leik Tho Town, approximately 400 m away from main village areas, near an area where trees were being cut down. AN-2 was located approximately 15 m from the main road between Loikaw and Demoso, in a more disturbed, inhabited area closer to industrial activity. Table 5.7 shows the air and noise monitoring locations.

Table 5.6: Air and Noise Monitoring Locations

Site number	Date monitored	Coordinates	Description
AN-1	4/9/2020 – 5/9/2020	19°14'21.09"N 96°34'13.88"E	Leik Tho Town
AN-2	1/9/2020 – 2/9/2020	19°34'17.49"N 97°11'26.05"E	Demoso Town

A high-volume air sample meter (Haz-Scanner) was used to measure the one-hour average concentration of nitrogen dioxide (NO_2) and the 24-hour average concentrations of the following parameters:

- Particulates with a diameter less than 2.5 µm ($PM_{2.5}$).
- Particulates with a diameter less than 10 µm (PM_{10}).
- Sulphur dioxide (SO_2).
- Carbon monoxide (CO).
- Carbon dioxide (CO_2).

The following meteorological conditions were also recorded at each site:

- Wind speed.
- Wind direction.
- Temperature.

A digital sound level meter was used to measure noise levels (L_{Aeq}) over a 24-hour period at both sites.

Plate 5.18: Air and Noise Quality Monitoring at Leik Tho Town

Plate 5.19: Air and Noise Quality Monitoring at Demoso Town

Table 5.8 compares the air quality monitoring results against NEQEG for ambient air quality. The 24-hour average concentrations of PM_{10}, $PM_{2.5}$ and SO_2, and the one-hour average concentration of NO_2 at both monitoring sites were below NEQEG guideline values for ambient air quality. The monitoring graphs are presented in Appendix 14.6 (B).

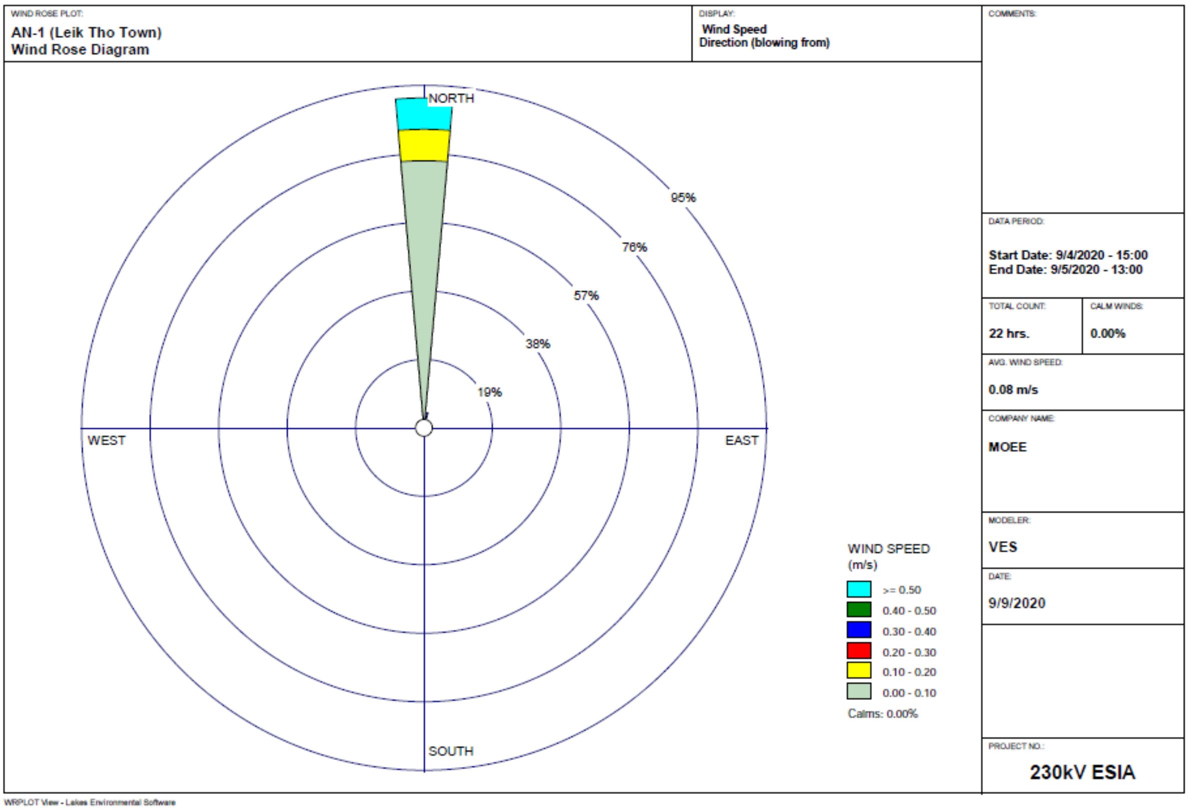
Leik Tho Town is located in a relatively undisturbed area along the transmission route, however recorded higher concentrations of $PM_{2.5}$, NO_2 and SO_2 than Demoso. Demoso Town is more urban than Leik Tho with the monitoring site located in an area where vehicles, including motorcycles and trucks, frequently passed and monitoring occurring during a period of heavy rain. Monitoring indicated slightly higher concentrations of PM_{10} and CO_2 at Demoso. The maximum recorded concentration of $PM_{2.5}$ at Demoso was over six times greater than the maximum recorded concentration at Leik Tho, although the 24-average of $PM_{2.5}$ was similar.

Table 5.7: Ambient Air Quality Monitoring Results

Parameters	Unit	NEQEG	Leik Tho Town		Demoso Town	
			24-hour average	**Range**	**24-hour average**	**Range**
PM_{10}	µg/m³	50	10.6	2 – 44	11.5	2 – 385
$PM_{2.5}$	µg/m³	25	11.6	1 - 54	10.1	1 – 340
SO_2	µg/m³	20	15.8	2.6 – 181	9.7	2.6 – 131
CO	ppm		0.01	0 – 0.11	0.01	0 – 0.1
CO_2	ppm		325	137 – 661	417	176 – 1,076
			1-hour average	**Range**	**1-hour average**	**Range**
NO_2	µg/m³	200	67.3	3.76 – 730.14	60.6	3.76 – 730.14

Over the monitoring period, average wind speeds were greater at Demoso (0.61 km/h) than Leik Tho (0.08 km/h). Results are shown in Figure 5.10. Average relative humidity was 98% at Demoso and 83.5% at Leik Tho during monitoring.

The air quality field survey by Valentis recorded meteorological data over 24-hours in September 2020 at two sites in the project area: AN-1 (Leik Tho Town) and AN-2 (Demoso Town). Over the monitoring period, average wind speeds were greater at Demoso (0.61 km/h) than Leik Tho (0.08 km/h). Results are shown in Figure 5.10. Average relative humidity was 98% at Demoso and 83.5% at Leik Tho during monitoring.



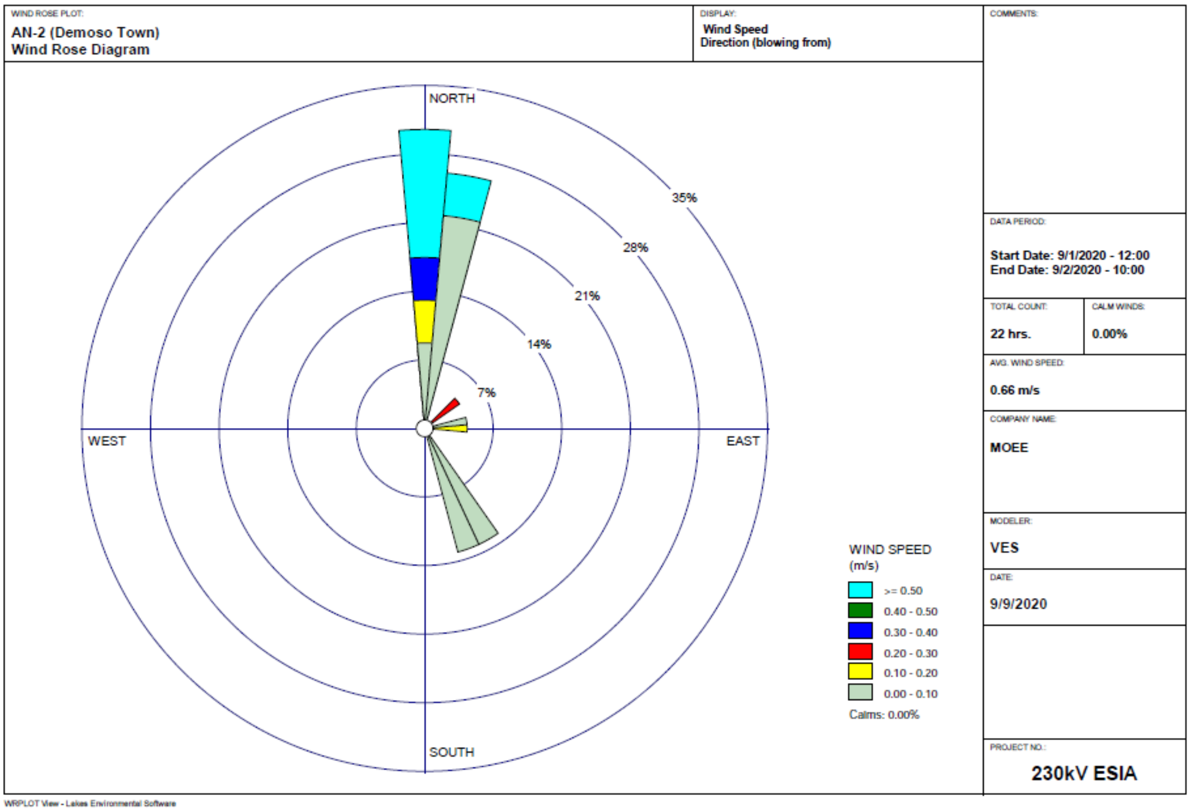


Figure 5.10: Leik Tho (Top) and Demoso (Down) Wind Roses for the Monitoring Period

5.4.3. Noise Quality

Noise measurements were taken at site AN-1 near Leik Tho Town on 4 and 5 September 2020 and site AN-2 near Demoso Town on 1 and 2 September 2020 (Plate 5.18 and Plate 5.19 and Figure 5.2). Site AN-1 is located within a relatively undisturbed area on the western side of the Karen Hills, on the outskirts of Leik Tho Town, approximately 400 m away from main village areas, near an area where trees were being cut down. AN-2 was located approximately 15 m from the main road between Loikaw and Demoso, in a more disturbed, inhabited area closer to industrial activity. Table 5.9 shows noise monitoring locations.

A digital sound level meter was used to measure noise levels (L_{Aeq}) over a 24-hour period at both sites.

Table 5.8: Noise Monitoring Locations

Site number	Date monitored	Coordinates	Description
AN-1	4/9/2020 – 5/9/2020	19°14'21.09"N 96°34'13.88"E	Leik Tho Town
AN-2	1/9/2020 – 2/9/2020	19°34'17.49"N 97°11'26.05"E	Demoso Town

Noise sources along the route crossing the Karen Hills are likely to be limited to natural sources, such as wind and wildlife, localised noise associated with villages, and vehicular noise from traffic on the unnamed road from Demoso to Taungoo. Forestry and logging may also be a source of noise in parts of the Karen Hills.

Near Loikaw and Taungoo there is likely to be more anthropogenic noise due the routes proximity to larger residential areas, industrial areas and major roads, including Ah Myan Lan (Express Road) near Taungoo and National Highway 5 near Loikaw.

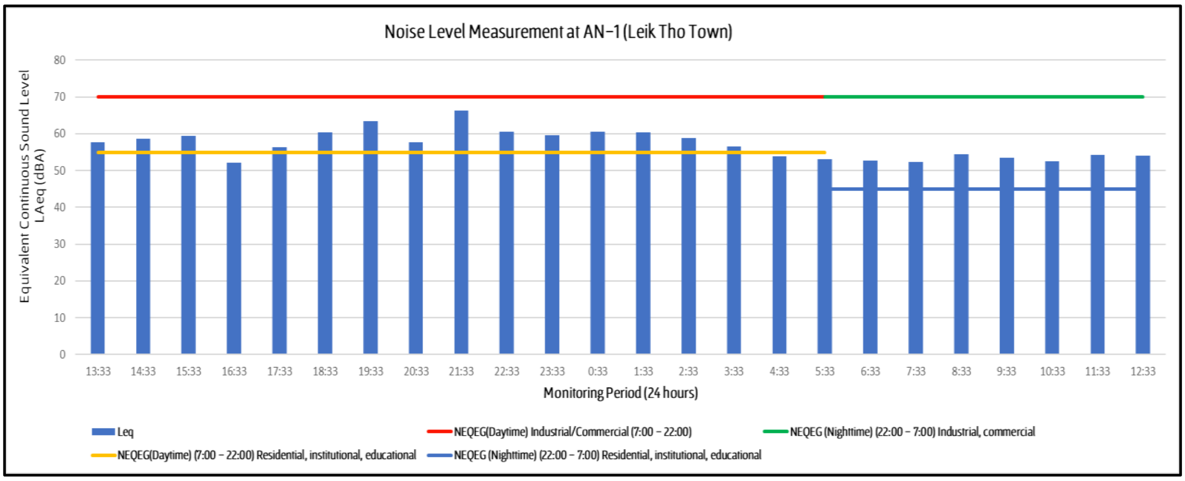
Noise pollution may have environmental and social impacts, with the potential to affect the breeding cycles and behaviour of animals and cause hearing impairment, stress, sleep disturbances and psychological harm to people. The A-weighted equivalent sound level (L_{Aeq}), in decibels (dBA) is the equivalent to the total sound energy measured over a given period of time, with an A-weighting filter applied to it. A weighting is applied to account for the sensitivity of the human ear to sound and how it responds to different frequencies.

The Myanmar NEQ Guidelines (MOECAF 2014) and IFC (2007a) noise management guidelines both outline guideline values that noise impacts should not exceed at residential, institutional and educational receptors, and industrial and commercial receptors. (Figure 5.11) Noise monitoring was undertaken over a 24-hour period in September 2020 by Valentis at Leik Tho Town and Demoso Town. Average one-hour L_{Aeq} values recorded during the monitoring period are compared against these guidelines to describe ambient noise conditions at the time of monitoring. The monitoring data is presented in Appendix 14.6 (C).

Table 5.9: Noise Monitoring Results and Noise Impact Guidelines Values

Receptor	One-hour L_{Aeq} (dBA)	
	Daytime (07:00 – 22:00)	Night-time (22:00 – 07:00)
Residential, institutional and educational guideline	55	45
Industrial and commercial guideline	70	70
Leik Tho (range (mean))	52.1 – 66.3 (59.23)	52.3 – 54.5 (53.4)
Demoso (range (mean))	55.7 – 65.3 (62.07)	48.6 – 62 (55.83)

Average one-hour L_{Aeq} levels during daytime and night-time in Leik Tho and Demoso both exceeded the noise impact guideline values of 55 dBA during the day and 45 dBA at night for residential, institutional and educational receptors, however were below industrial and commercial guideline of 70 dBA (Figure 5.10). At Leik Tho, one-hour L_{Aeq} levels were more variable than Demoso, peaking at 3:33 p.m. to 4:33 p.m. at 66.3 dBA. At night the one-hour L_{Aeq} levels were relatively consistent, only varying by 2.2 dBA. At the monitoring site at Leik Tho, sources of noise rain and thunder at night. There was also some evidence of logging activities in the wider area which would have contributed to noise. Conversely, at Demoso, one-hour L_{Aeq} levels were relatively consistent during the day, also peaking mid-afternoon (3:14 p.m. to 4.14 p.m.) at 66.3 dBA and quietening in the evening. At Demoso, sources of noise included traffic and rain, as the site was located next to a main road from Loikaw to Demoso.



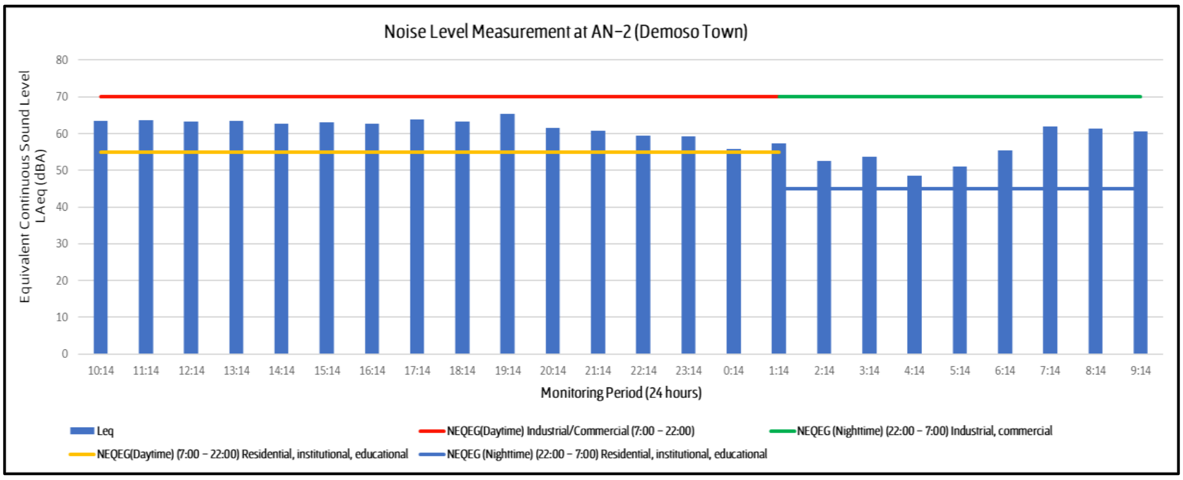


Figure 5.11: Noise Monitoring Results

5.4.4. Soil Quality

Soil baseline monitoring samples were taken by Valentis field staff in three locations along the proposed transmission line route, (S-1, S-2 and S-3). Soil quality samples were taken and assessed at three sites, described in Table 5.10 and shown in Plate 5.20 Plate 5.21 and Plate 5.22 and Figure 5.2. Samples were sent to the Land Use Laboratory (Department of Agriculture, Yangon, Myanmar) for analysis of:

- pH, electrical conductivity (EC) and texture.
- Organic carbon content.
- Total nitrogen.
- Exchangeable cations (potassium and sodium).
- Available nutrients (phosphorous and potassium oxide).
- Concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.

Table 5.10: Soil Sampling Points

Site number	Date sampled	Coordinates	Description
S-1	9/6/2020	19° 05' 31.34" N, 96° 21' 56.79" E	Near Technological University (Taungoo) in Kyun Kone.
S-2	9/5/2020	19° 18' 48.32" N, 96° 41' 49.32" E	Undisturbed site near Ka Saw Pa Lo (Middle) Village in the Karen Hills.
S-3	9/1/2020	19° 34' 17.71" N, 97° 11' 26.09" E	Loi Kaw-Demoso Road, approximately 4.5 km northeast of Demoso Township.

All three samples are considered sandy clay loam with very low conductivity. Results from soil quality analysis are presented in Table 5.12 and 5.13. Table 5.12 Soil metal concentrations are compared to Health based investigation levels for soil contaminants in residential areas with access to gardens/soils (NEPC 2011). These guidelines are used to screen for potential risks to humans from contaminant exposure.

Plate 5.20: Soil Sampling at Site S-1

Plate 5.21: Soil Sampling at Site S-2

Plate 5.22: Soil Sampling at Site S-3

Table 5.11: Soil metal concentrations

Metal	Unit	Health based investigation levels (NEPC 2011)	S-1 (near Taungoo)	S-2 (Karen Hills)	S-3 (near Demoso)
Arsenic (As)	mg/kg	100	0.64	4.97	7.43
Cadmium (Cd)	mg/kg	20	0	0	0.002
Chromium (Cr)	mg/kg	100*	0.5	0.11	0.12
Copper (Cu)	mg/kg	7,000	20.25	0.75	0.63
Lead (Pb)	mg/kg	300	0.8	1.36	1.04
Mercury (Hg)	mg/kg	200*	0.06	0.15	0.02
Nickel (Ni)	mg/kg	400	0.44	0.05	0.06
Zinc (Zn)	mg/kg	8,000	0.35	0.16	0.26

*Cr guideline value is for Chromium (VI), Hg guideline value is for inorganic mercury

Table 5.12: Soil Quality Results

Parameter		Unit	S-1	S-2	S-3
Moisture		%	5.1	9.62	6.65
pH		pH units	4.85	4.88	7.58
Electrical conductivity (EC)		mS/cm	0.03	0.04	0.08
Organic carbon		%	1.03	0.63	1.18
Total nitrogen		%	0.17	0.23	0.15
Exchangeable cations	Potassium (K)	meq/100g	0.19	0.31	0.19
	Sodium (Na)	meq/100g	0.56	0.57	0.57
Available nutrients	Phosphorous (P)	ppm	4	2.88	3.86
	Potassium oxide (K_2O)	mg/100g	8.85	14.6	9

The soil quality lab results are presented in Appendix 14.6 (D). Table 5.12 indicates there are higher levels of arsenic in the soil sample near Demoso (S-3), however this may be reflective of the underlying geology. The arsenic concentration in the sample taken in the Karen Hills (S-2) is also elevated compared to the sample near Taungoo (S-1), though to a slightly lesser degree than S-3. Soil from S-1 near Taungoo is considerably higher in copper (20.25 mg/kg) than soil from S-2 and S-3 (less than 1 mg/kg). All concentrations are below Australian health-based investigation levels, indicating contaminants in these soils are unlikely to have health risks associated with chronic exposure.

Table 5.13 indicates the samples have similar properties, with the exception of soil pH. Site S-3 is considered slightly to moderately alkaline (pH 7.58), whereas S-1 and S-2 are strongly acidic (pH 4.85 and 4.88, respectively).

5.4.5. Landform and Soil Type

A landform was conducted by a Valentis geotechnical engineer at 18 locations along the proposed route between 1 and 7 September 2020 (Table 5.13; Figure 5.2; Plate 5.23, 5.24 and 5.25). The soil lab results and survey form are presented in Appendix 14.6 (E). Alongside general observations and selected soil sampling, the proposed transmission line route was inspected for geotechnical constraints that could potentially impact construction. Several numbers of soil samples have been collected to test sulphate condition and acidic condition of the soil.

Table 5.13: Landform and Soil Type Survey Locations

ID	Coordinates	Description
1	19°34'17.4"N97°11'26.5"E	Next to the Loikaw-Taungoo Road near Demoso.
2	19°35'07.9"N 97°04'11.1"E	Access road approximately 5.8 km from Loikaw-Taungoo Road.
2A	19°34'41.0"N 96°59'47.5"E	Next to the Loikaw-Taungoo Road.
3	19°32'53.5"N 96°56'57.4"E	Access road (dirt) approximately 2 km from Loikaw-Taungoo Road.
3A	19°32'15.2"N 96°52'25.8"E	Next to the Loikaw-Taungoo Road.
3B	19°31'18.7"N 96°49'55.4"E	Next to the Loikaw-Taungoo Road.
4	19°30'56.0"N 96°49'00.7"E	Access road approximately 1.3 km from Loikaw-Taungoo Road near Khwee Ka Loke Village.
4a	19°22'28.8"N 96°48'21.0"E	Next to the Loikaw-Taungoo Road.
5	19°19'42.9"N 96°47'20.7"E	Next to the Loikaw-Taungoo Road.
6	19°18'48.5"N 96°41'48.3"E	Gorge located 0.5 km from Loikaw-Taungoo Road and 2.2Km from Tha Kwe Pa Lo Village. No access road.
6A	19°17'24.2"N 96°39'42.0"E	Bullock cart track approximately 0.12 km from Loikaw-Taungoo Road near Ba Hone/Mhae Thali Chaung Village.
6B	19°16'24.4"N 96°37'02.4"E	Access road (dirt) approximately 0.5 km from Loikaw-Taungoo Road near Lower Kyae Min Village.
7	19°14'17.4"N 96°34'11.3"E	Access road approximately 2.7 km from Loikaw-Taungoo Road near la Bet Inn Gyi Village.
7A	19°09'51.9"N 96°32'03.2"E	Next to the Loikaw-Taungoo Road approximately 0.8 km from Za Le (lower) Village.
7B	19°08'04.6"N 96°30'55.4"E	Next to the Loikaw-Taungoo Road approximately 0.25 km from Me Khat Chaung Village.
8	19°06'21.2"N 96°25'28.1"E	Dirt road approximately 3 km from Kayin Chaung Village near the Sittaung River.
9	19°06'05.2"N 96°22'46.9"E	Dirt road approximately 2.3 km from the Yangon-Mandalay Highway, near Baung Din Village.
10	18°58'01.3"N 96°18'32.9"E	Dirt road approximately 700 m from Kan Thar Village and 200 m from the stream north of the Sabakywe substation.

Loikaw-Taungoo Road near Demoso (Survey Site 1)

Flat Land near Loikaw (Survey Site 2)

Flat land near Loikaw (Survey Site 2A)

Access road (dirt) approximately 2 km from Loikaw-Taungoo Road (Survey Site 3)

Next to the Loikaw-Taungoo Road (Survey Site 3A)

Next to the Loikaw-Taungoo Road (Survey Site 3B)

Plate 5.23: Landform and Soil Type Survey Location (1)

 **Access road approximately 1.3 km from Loikaw-Taungoo Road (Survey Site 4)**	 **Next to the Loikaw-Taungoo Road (Survey Site 4A)**
 **Next to Loikaw-Taungoo Road (Survey Site 5)**	 **Heavy Forest in the Karen Hills at Landform (Survey Site 6)**
 **Bullock cart track approximately 0.12 km from Loikaw-Taungoo Road (Survey Site 6A)**	 **Access road (dirt) approximately 0.5 km from Loikaw-Taungoo Road (Survey Site 6B)**

Plate 5.24: Landform and Soil Type Survey Location (2)

	
Access road approximately 2.7 km from Loikaw-Taungoo Road **(Survey Site 7)**	Nex**t to the Loikaw-Taungoo Road approximately 0.8 km from Za Le (lower) Village** **(Survey Site 7A)**
	
Next to Loikaw-Taungoo Road approximately 0.25 km from Me Khat Chaung Village **(Survey Site 7B)**	**Dirt road approximately 3 km from Kayin Chaung Village near the Sittaung River.** **(Survey Site 8)**
	
Dirt road approximately 2.3 km from the Yangon-Mandalay Highway **(Survey Site 9)**	**Dirt road approximately 700 m from Kan Thar Village** **(Survey Site 10)**

Plate 5.25: Landform and Soil Type Survey Location (3)

Table 5.14: Summary of Landform and Soil Type Survey

ID	Landform	Soil Type
1	Both sides of the road are irrigated paddy fields with flat plain.	Top soil covered that area is mostly alluvium deposit or sandy clay.
2	Access road condition is good and can be easily accessible by car. Left side of this survey point has irrigated fields. Right side of the road is covered with grass and small to medium treas. Both side of the point are rather flat plain with no significant sloping detected.	Top soil with Sandy/Clayey with no rock outcrops can be found at that point.
2A	Both left and right of the survey point are rather flat surface covered by vegetation and trees.	About 100m away lime stone outcrops can be seen.
3	Access road towards cable tower construction site is only a dirt road and mostly suitable for 4W drive especially in raining season. Localized sugar cane plantation has been noticed at the area with relatively flat plain	Soil cover is mostly Sandy/Clayey soil.
3A	ground is heavily covered with thick bushes and forested area. No tension cracks are existed but bedding planes are sloping toward the road. No potential slope failure in near future is noted.	At the slope face, highly weathered limestone formation is noted together with completely weathered residual soil.
3B	The road is passing through the valley on the left and slope on the right. At the survey point, ground is heavily covered with thick bushes and forested area. No tension cracks are existed at the slope face. The valley beside the road is deep and thick with vegetations and difficult to make survey.	At the slope face, highly weathered limestone formation is exposed from road extension cutting together with completely weathered residual soil.
4	Khwee Ka Loke Village is 1 Km away from Survey points. Left and right sides of the roads are thickly covered with vegetation and trees.	
4A	Slope or hill are estimated 13m from the survey point.	Clayey/Sandy top soil are found at that area.
5	One lane small bridge is located along the road at the survey point constructed over the small stream. Both side of the survey points are heavily covered with forest and No access road to go transmission line.	
6	The survey point is located at the valley which is estimated 0.5km away from Loikaw-Taungoo road and 2.2Km from Tha Kwe Pa Lo village. The area is covered with small farm and very thick vegetation	Erosion scar or remnants of soil erosion are not noted.
6A	Small cluster of houses are located near to the bridge. The area is covered with thick	No soil erosion or wet lands encountered.

ID	Landform	Soil Type
	vegetation. Access road to transmission line is seasonal dirt road.	
6B	Survey area is covered with thick vegetation.	
7	Access road condition might not be favorable in raining season for cars. Nearest village is La Bet Inn Gyi Village.	Slope is stable and made with Clayey SILT, no tension crack exists and direction is opposite roadside. No sign of erosion occurred at the survey area.
7A	The point located at the bottom of hill and found existing stream in nearby location. Area is thickly covered with vegetation and where less vegetation	no sign of soil erosion is detected.
7B	Left and right sides of the road is valley and slope covered with thick vegetation.	At some road side, exposed soil with completely weathered granite residual soil are exposed from road widening processes.
8	The survey area can be easily access from Laikaw-Taungoo Road to Kayin Chaung Village which is (7.5Km away. Survey area is situated on flat plain. Access road to proposed transmission line is seasonal small cart road.	
9	Flat plain with coverage of bushes and small plants.	No slope or erosion occurred.
10	The survey point is at the flat plain with grasses.	Alluvium soil deposit covers the area.

Landform

- The proposed transmission line survey elevation map is presented in Figure 5.12.
- The terrain between survey sites 1 and 3 (Plate 5.23) between Loikaw and the Karen Hills is relatively flat.
- The terrain at and between survey sites 3A and 7B is hillier, with some slopes near sites 3A, 3B and 5 exceeding 40 degrees. Between sites 3A and 7B the proposed route crosses the Karen Hills, with several valleys, gorges and areas of undulating land. The slopes at the survey points appear to be stable, with no tension cracks. (Figure 5.13). There is no observed potential for slope failure.
- Sites 8, 9 and 10 are located on the Sittaung River floodplain between the Karen Hills and Taungoo. This terrain is largely flat, primarily with a 0-to-5-degree slope. (Figure 5.14)

Soil Type

The soil and landform survey identified a limestone outcrop near site 2A (Plate 5.26), and completely weathered limestone at 3A and 3B on the eastern side of the Karen Hills, with completely weathered residual soils (Plate 5.26). The outcrop at 3A had closely spaced joints and the outcrop at 3B was well jointed.

The soil and landform survey identified strong, moderately weathered granite (Mesozoic and Lower Tertiary age) at site 7A (Plate 5.26) and weak, well jointed, highly to completely weathered granite (Mesozoic and Lower Tertiary age) at site 7B, located on the western side of the Karen Hills. No evidence of erosion or landslip were identified in the landform and soil survey.

Soils identified in the landform and soil survey were primarily silts and clays overlain by topsoil. The soils surveyed were described as:

- Sites 1 to 4 and 6 to 7: Silty clay.
- Site 5: Gravelly clay.
- Sites 7A and 7B: Clayey silt.
- Sites 8 and 10: Sandy silt.
- Site 9: Gravelly silt.

As part of the soil and landform survey, soils from sites 1, 3, 6, 7 and 9 were sampled and analysed to determine the pH and sulphate content (Table 5.16). Soils from sites 3, 6 and 9 were considered strongly acidic, defined as between pH 4.5 to 5.2, and soil from site 7 was considered extremely acidic, defined as a pH lower than 4.5. All samples had low sulphate content, ranging between 0.01 and 0.29 meq/100g.

Table 5.15: Soil acidity and Sulphate Content

Parameter	Site 1	Site 3	Site 6	Site 7	Site 9
pH	7.43	4.88	4.78	4.3	4.76
Water soluble sulphate ($SO_4^{=}$) (meq/100g)	0.21	0.1	0.18	0.14	0.29

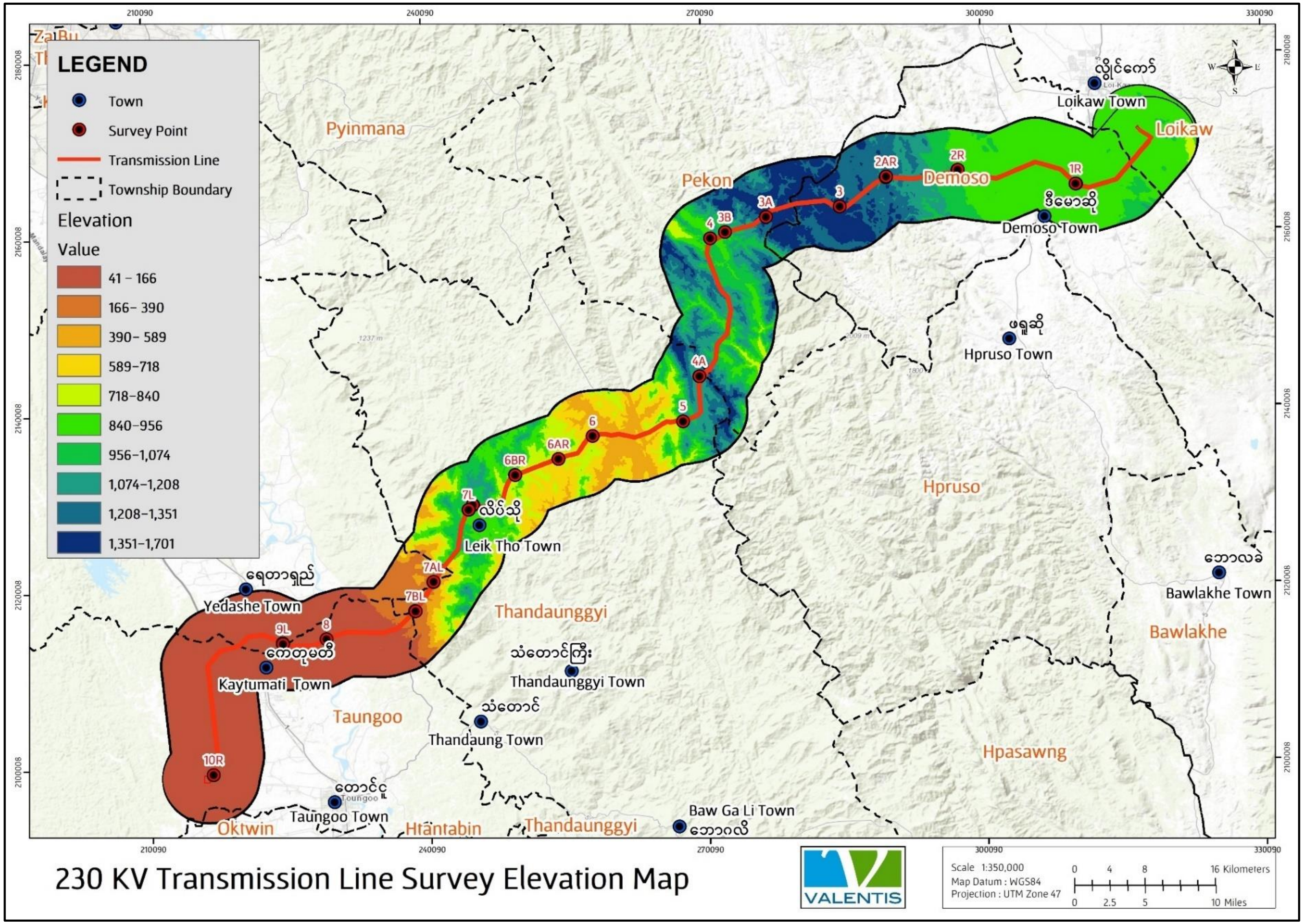


Figure 5.12: 230kV Proposed Transmission Line Survey Elevation Map

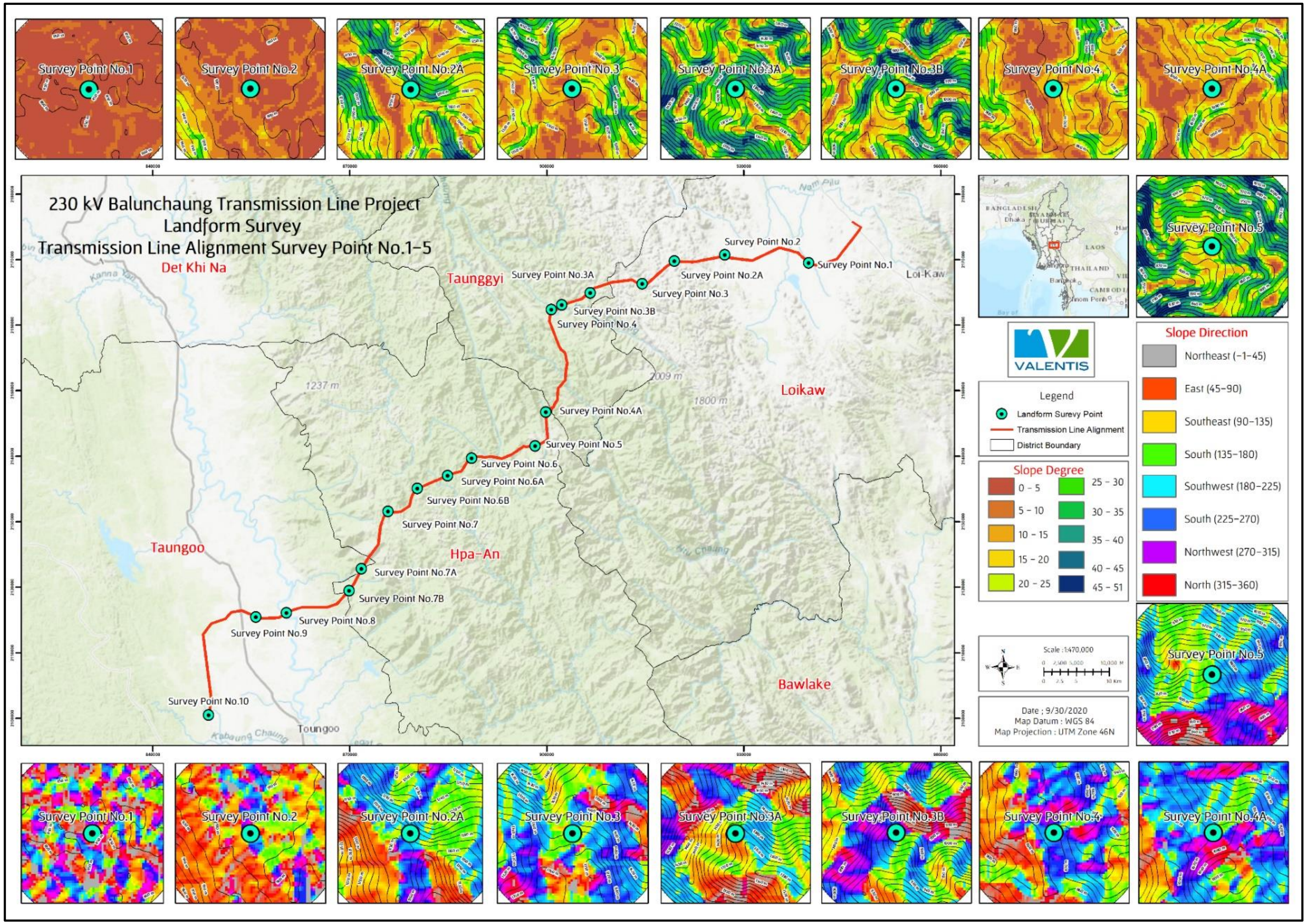


Figure 5.13: Landform Survey Transmission Line Alignment Survey Point (No.1-5)

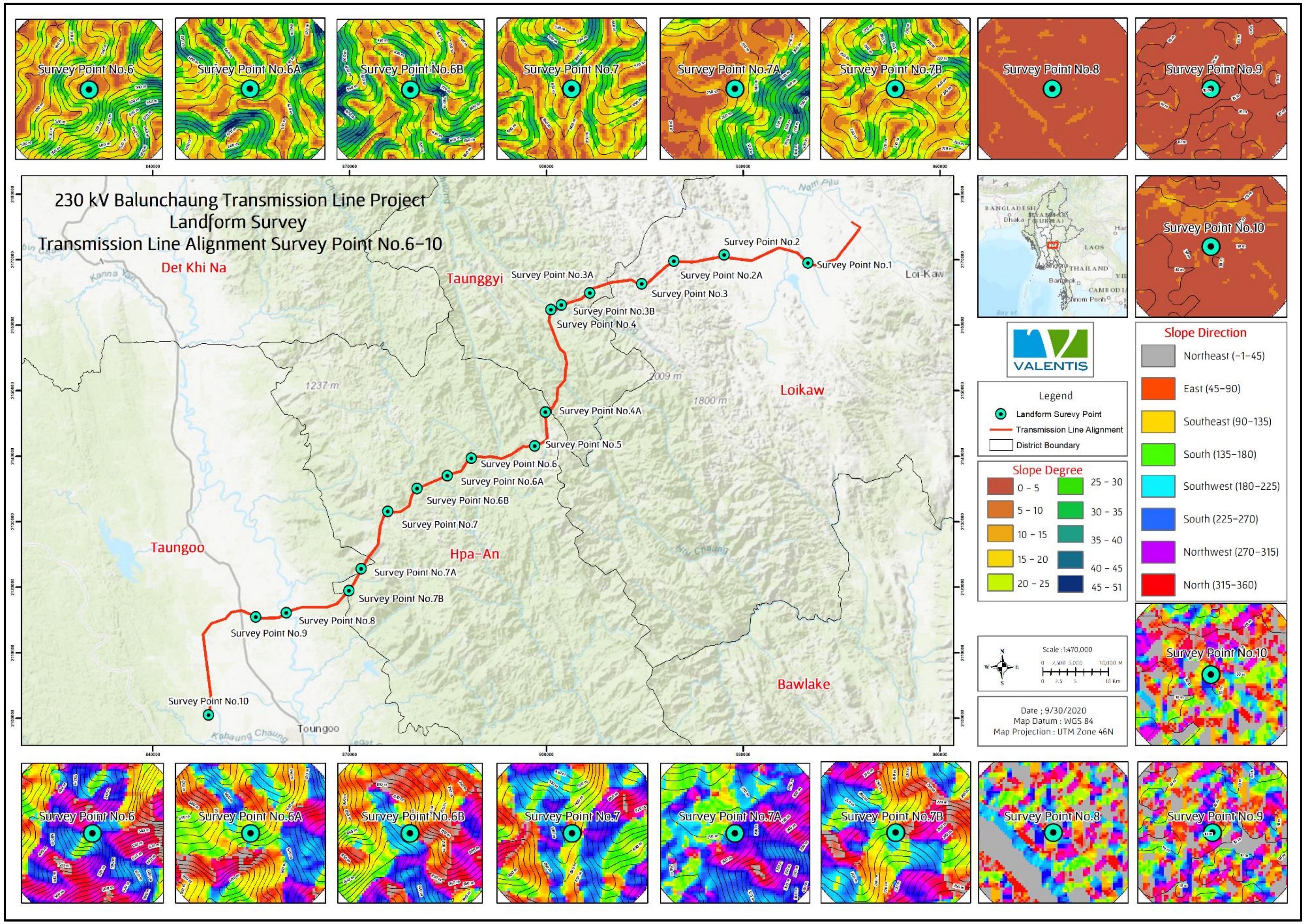


Figure 5.14: Landform Survey Transmission Line Alignment Survey Point (No.6-10)

	
Limestone outcrop at landform and soil Survey Site 2A	**Exposed oil and limestone outcrop adjacent to millet farm at landform and soil Survey Site 2A**
	
Exposed soil on a cut slope at landform and soil Survey Site 3A	**Completely weathered limestone and exposed soils at a road cut adjacent to Loikaw to Taungoo Road at landform and soil Survey Site 3B**
	
Granite outcrop and stream at landform and soil Survey Site 7A	**Completely weathered granite and exposed soils at landform and soil Survey Site 7B**

Plate 5.26: Soil Types at Survey Site

5.4.6. Visual

The area near Loikaw is flat, with some agricultural use, irrigated paddy fields near Demoso, and small settlements with more dense housing in the urban areas compared to those further along the route. Closer to the Karen Hills there is more bush and forest on the flat terrain, including teak near site 2. Hilly terrain can be seen from parts of these plains.

Further along the route in the Karen hills the terrain is hilly and mountainous with areas of relatively undisturbed evergreen forest and some small settlements. Further west, closer to the Sittaung River, the land cover is typically scrub, grass and farmland. There are some small settlements with scattered housing along the unnamed road that joins National Highway 5.

Near Taungoo the landscape is fairly flat, with the Karen Hills to the east and Bago Yoma Ranges to the west. Settlements near Taungoo are larger than those in the Karen Hills with residential and industrial areas, as well as Taungoo airport. Aside from these residential and industrial areas, significant amounts of the land to the west of the Karen Hills is used for agriculture.

Figure 5.4 shows land cover in the project area. Most of the land along the proposed transmission line route is scrubland and forest, however the land in more populated areas at each end of the proposed route (near Loikaw and west of the Sittaung River) is primarily used for agriculture.

Electrical distribution lines can be seen in some areas along the route, including near sites 1, 2, 2A and 7A. The Sapalkywal to Taungoo 230 kV transmission line and towers are visible from site 10 and are likely to be viewed from the surrounding settlements.

5.5. Ecological Environment

5.5.1. Biodiversity Survey

A biodiversity survey was undertaken between 23 and 29 January 2021 by locally based specialists. This involved high-level characterisation of terrestrial and riparian habitats, identification of key species of flora and fauna (where observed), description of the general structural composition of vegetation and documenting any sensitivities, such as protected species. This survey was undertaken when the COVID-19 pandemic enabled safe travel to site.

A desktop study was also undertaken and involved a search of the IUCN Red List for threatened fauna species that may occur in the area. The search area was an approximately 2,000 km^2 area along the route, within a 2 km buffer. Due to the large area required to search the IUCN Red List and the final alignment of the route not yet being determined, pre-construction surveys will be required to determine the presence of identified species of conservation significance along the final selected alignment. Throughout this report this area is termed the project area and surrounds, as it includes a portion of the surrounding area that is unlikely to be impacted by the project.

The biodiversity survey involved sampling and specimen collection, photographs, and interviews with local residents and hunters. Species of flora and fauna were identified, and selected samples were collected and photographed for further verification. Specific survey methods included the following:

- **Flora/vegetation.** Recorded vegetation was categorised into trees, shrubs, herbs and bamboo according to their size, characteristics and uses. Main species and any threatened species were documented.

- **Amphibians, reptiles and mammals.** Surveys were undertaken to identify the presence or absence of these groups of animals using stationary observation sites, walking transects, the point count method and interviews with local residents and hunters.

- **Birds**. An avifaunal survey was conducted. Birds were identified and enumerated according to the Fixed Radius Point Count Census Method, based on the principle of counting individuals from a defined location and estimating the distance to the individual contact. A point was selected from where all bird contacts (seen and heard) were recorded, and the distance estimated (within 25 m or beyond 25 m) for each contact.

- **Fish.** A fish survey was undertaken at Thauk Yekhat creek, Sittaung River and small unnamed creek near Sabakywe.

- **Aquatic macroinvertebrates (benthos).** A rapid biomonitoring method was used. The macroinvertebrates were collected in the sediment near the bank and within the main flow of two creeks and the Sittaung River. Sediment was collected using a benthos net (scoop net). An equal volume of 100% ethanol was added and stirred, left for 10 minutes and the sample then examined under a hand lens/dissecting microscope. The type and number of larvae were recorded and used to calculate the biotic index and water pollution levels.

The biodiversity study area was determined based on site maps and development plans to analyse the presence or absence of ecologically or commercially important areas of species diversity. The terrestrial and aquatic biodiversity survey locations are shown in Figure 5.15. The Bird Survey and aquatic biodiversity locations are also described in Table 5.17 and Table 5.18.

Table 5.16: Bird Survey Location

No	Survey Area	Latitude	Longitude
1.	Taung Oo 1 Study Area	18°57'54.00"N	96°27'57.60"E
2.	Taung Oo 2 Study Area	18°57'43.20"N	96°18'10.80"E
3.	Leik Tho 1 Study Area	19°14'16.80"N	96°34'40.80"E
4.	Leik Tho 2 Study Area	19°12'3.60"N	96°34'15.60"E
5.	Thauk-Ye-Khat Study Area	19°18'25.20"N	96°44'16.80"E
6.	Sibu Study Area	19°25'12.00"N	96°49'58.80"E
7.	Sibu	19°29'56.40"N	96°49'30.00"E
8.	Demoso Study Area	19°32'52.80"N	97° 2'9.60"E

Table 5.17: Aquatic Biodiversity Survey Locations

No	Survey Location	Latitude	Longitude
1.	Thauk Yekhat creek	19° 18’ 39” N	96° 43’ 39” E
2.	Sittaung River	18° 56’ 34.76” N 96°	26’ 46.41” E
3.	Unnamed creek (Sabakywe)	18° 57’ 23" N	96° 19’ 26" E

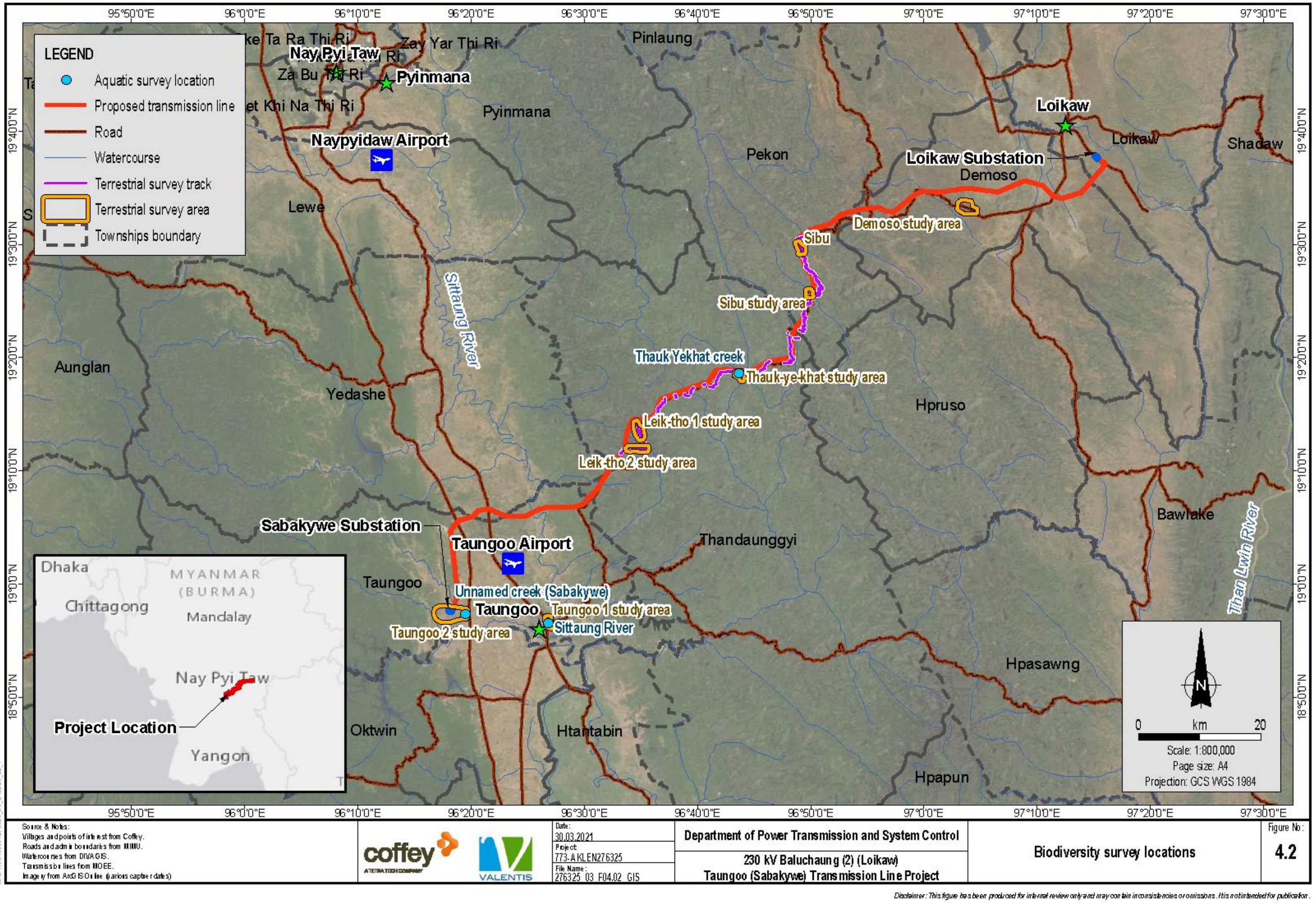


Figure 5.15: Biodiversity Survey Locations

5.6. Terrestrial Biodiversity

This section summarises the terrestrial biodiversity characteristics along the proposed transmission line route. Upon completion of the biodiversity field surveys, detail information provided in this section is primarily sourced from desktop study.

5.6.1. Ecoregions

This section describes the type of ecoregions present in the project area. The three main ecoregions include the Northern Indochina subtropical forest ecoregion, the Kayah-Karen moist forests/montane rain forests ecoregion, and the Irrawaddy moist deciduous forest ecoregion.

(A) Northern Indochina subtropical forests ecoregion

At the Loikaw end of the alignment, the proposed transmission line crosses into the Northern Indochina subtropical forests ecoregion (Figure 5.16), a broader ecoregion of 136,723 km^2 which is classified as vulnerable (IFC 2017a). Large areas east of the Karen Hills have been cleared by logging and for agriculture (IFC 2017a).

(B) Kayah-Karen moist forests/montane rain forests ecoregion

The Karen Hills hold dense montane rainforest within the Kayah-Karen moist forests/montane rain forests ecoregion (Figure 5.16). This ecoregion forms one of the 14 defined ecoregions in Myanmar and covers a total area of approximately 55,000 km^2 (IFC 2017a). The Kayah-Karen montane rainforest is considered relatively stable and intact (IFC 2017a), with a rich forest community at high elevations, supporting both evergreen and deciduous communities (WWF 2020).

Most of the project area is within the Kayah-Karen montane rainforest ecoregion. The Kayah-Karen montane rainforest ecoregion has a high diversity of bird and mammal species. It is the fourth richest ecoregion in the Indo-Pacific region for mammal species, with 168 known species and the second richest in bird species, with 569 known species (IFC 2017a; WWF 2020). As well as two endemic/near-endemic species, Deignan's babbler (*Stachyris rodolphei*) and Burmese yuhina (*Yuhina humilis*) (Least Concern) found in the Kayah-Karen rainforest, several threatened species are reported to be found in the ecoregion. About one third of the entire ecoregion has been cleared or degraded, often for shifting cultivation and rice cultivation (WWF 2020). The heavy forest characteristics of the Karen Hills in the project area. (Plate 5.27)

(C) Irrawaddy moist deciduous forest ecoregion

The western side of the proposed transmission line route is in the Irrawaddy moist deciduous forest ecoregion (Figure 5.16), which is 137,909 km^2 in area and classified as vulnerable (IFC 2017). Large areas of this ecoregion have been cleared and utilised for agriculture (IFC 2017).

5.6.2. Plains

The plains around Loikaw and Demoso are relatively flat and characterised by swampy land grass and bush (Plate 5.27). The plains in Loikaw and Demoso often have access to irrigation water and are suitable for agriculture and/or animal husbandry (Cartmell 2019).

The area around Taungoo has been significantly disturbed by human activity and is characterised by grass, farmland and bush

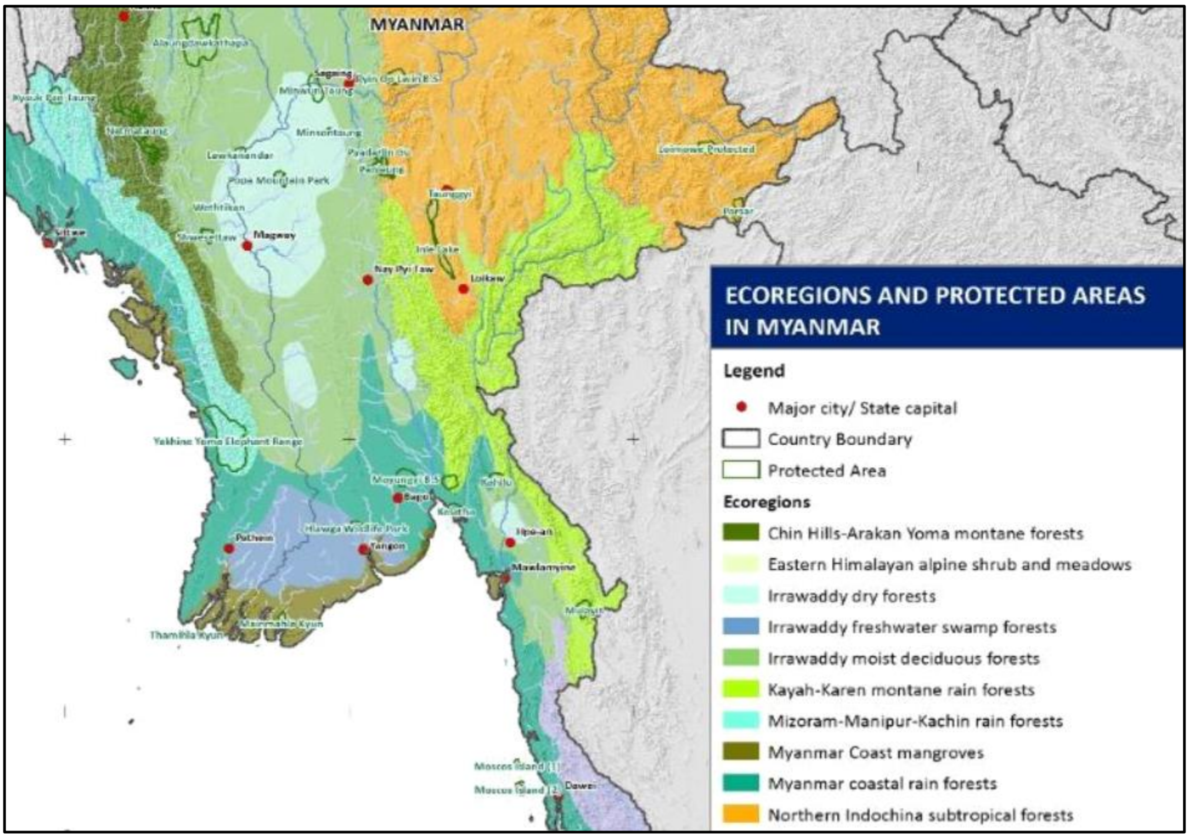


Figure 5.16: Extent of the Kayah-Karen montane rain forests and Northern Indochina subtropical forests ecoregions in Myanmar. Source: IFC 2017a

 **Heavy forest in the Karen Hills**	 **Grass and trees in the forest in the Karen Hills**
 **Swampy land near Loikaw**	 **Grass and bush near Loikaw**

Plate 5.27: Biodiversity around the Project Area

5.6.3. Flora

The biodiversity field survey identified 199 plant species in the study area (Appendix 14.7 (A)), including 39 species listed as threatened on the IUCN Red List, listed in Table 5.19.

A range of flora which provide ecosystem services were identified, including 84 edible species, 97 medicinal species and 63 ornamental species. A complete list of these species is provided in the Biodiversity Report (Appendix 14.7 (A)).

Table 5.18: Flora species listed as threatened or near threatened on the IUCN Red List recorded in the biodiversity study area

No.	Scientific Name	Family	Common Name	Type	IUCN Status
1.	*Borassus flabellifer*	Arecaceae	Htan	Tree	Endangered
2.	*Calamus sp.*	Asteraceae	Kyein	Climber	Endangered
3.	*Agave sp.*	Agavaceae	Unknown	Shrub	Endangered
4.	*Diplazium tomentosum*	Athyriaceae	Fern-pin	Herb	Endangered
5.	*Tamarindus indica*	Caesalpiniaceae	Magyi	Tree	Endangered
6.	*Cycas pectinata*	Cycadaceae	Mondaing	Small tree	Endangered
7.	*Opuntia sp.*	Cataceae	Sha-zaung- let-war	Herb	Endangered
8.	*Davallia solida*	Davalliaceae	Fern-pin	Herb	Endangered
9.	*Didymochlaena truncatula*	Didymochlaenaceae	Fern-pin	Herb	Endangered
10.	*Shorea obtusa*	Dipterocarpaceae	Thit-ya	Tree	Endangered
11.	*Croton tiglium*	Euphorbiaceae	Kanakho	Small tree	Endangered
12.	*Baccaurea sapida*	Euphorbiaceae	Kanaso	Tree	Endangered
13.	*Erythrina lithosperma*	Fabaceae	Ye-kathit	Tree	Endangered
14.	*Erythrina stricta*	Fabaceae	Kathit	Tree	Endangered
15.	*Duabanga grandiflora*	Lythraceae	Thitkazaw	Tree	Endangered
16.	*Toona ciliata*	Meliaceae	Thit-kado	Tree	Endangered
17.	*Swietenia macrophylla*	Meliaceae	Mahogany	Tree	Endangered
18.	*Azadirachta indica*	Mimosaceae	Tama	Tree	Endangered
19.	*Artocarpus lakoocha*	Moraceae	Myauk-laung	Tree	Endangered
20.	*Dendrobium chrysotoxum*	Orchidaceae	Thitkhwa-ahwa	Epiphyte	Endangered
21.	*Eria sp.*	Orchidaceae	Unknown	Epiphyte	Endangered
22.	*Pholidota imbricata*	Orchidaceae	Unknown	Epiphyte	Endangered
23.	*Pinus khasya*	Pinaceae	Tinshu	Tree	Endangered

No.	Scientific Name	Family	Common Name	Type	IUCN Status
24.	*Gmelina arborea*	Verbenaceae	Yemane	Tree	Endangered
25.	*Bouea burmanica*	Anacardiaceae	Mayan	Tree	Vulnerable
26.	*Spondias mangifera*	Anacardiaceae	Gwe-thi-pin	Tree	Vulnerable
27.	*Casuarina equisetifolia*	Casuarinaceae	Pin-le-kabwe	Tree	Vulnerable
28.	*Phyllanthus pomiferus*	Euphorbiaceae	Zinbyu	Small tree	Vulnerable
29.	*Lagerstroemia reginae*	Lythraceae	Pyin-ma	Tree	Vulnerable
30.	*Cedrela febrifuga*	Meliaceae	Ye-tama	Tree	Vulnerable
31.	*Ficus cunia*	Moraceae	Ka-dut	Tree	Vulnerable
32.	*Ficus elastica*	Moraceae	Nyaung-kyet-paung	Tree	Vulnerable
33.	*Bambusa vulgaris*	Poaceae	Shwe-wa	Bamboo	Vulnerable
34.	*Bambusa polymorpha*	Poaceae	Kyathaung-wa	Bamboo	Vulnerable
35.	*Bambusa wamin*	Poaceae	Wamin	Bamboo	Vulnerable
36.	*Bambusa marginata*	Poaceae	Wa-me	Bamboo	Vulnerable
37.	*Dendrocalamus giganteus*	Poaceae	Wabo-gyi	Bamboo	Vulnerable
38.	*Aquilaria agallocha*	Thymelaeaceae	Thit-hmwe	Small tree	Vulnerable
39.	*Tectona grandis*	Verbenaceae	Kyun	Tree	Vulnerable

5.6.4. Fauna

The project area contains records for a number of vulnerable, endangered and critically endangered species. Critically endangered terrestrial species include bird, mammal and reptile species (IUCN 2020). An IUCN Red List search identified several threatened species that may occur in the project area.

Mammals

A wildlife survey in northern Kayin State in 2014 by Karen Wildlife Conservation Initiative (KWCI) and WWF found at least 31 mammal species including tigers (*Panthera tigris*), leopards (*Panthera pardus*), Asian Elephants (*Elephas maximus*), Asiatic golden cat (*Catopuma temminckii*), sun bear (*Helarctos malayanus*), and dhole (*Cuon alpinus*) present, 17 of which are categorised as Near Threatened, Vulnerable or Endangered on the IUCN Red List (Moo et al. 2018). Of these species, 13 were identified in an IUCN Red List search of the project area: Phayre's leaf monkey (*Trachypithecus phayrei*), pig tailed macaque (*Macaca leonina/ Macaca nemestrina*), dhole (*C. alpinus*), Asiatic black bear (*Ursus thibetanus*), sun bear (*H. malayanus)*, hog badger (*Arctonyx collaris*), binturong (*Arctictis binturong*), marbled cat (*Pardofelis marmorata*), Asian golden cat (*C. temminckii)*, clouded leopard (*Neofelis nebulosa*), leopard (*P. pardus*), sambar (*Rusa unicolor*) and gaur (*Bos gaurus*). Threats to mammal species in this rainforest include hunting, with some species previously found in the ecoregion, such as the Sumatran rhinoceros, no longer reported (WWF 2020).

Pre-construction surveys will be undertaken prior to clearance and construction activities to identify potential caves near the alignment and characterise their biodiversity (e.g. presence of bat colonies). Bats have previously been observed in the Ye Ngote Gu cave in Loikaw township (Dreybodt 2017).

An IUCN search of the project area and surrounding area identified two Critically Endangered species, eight Endangered species, 12 Vulnerable species and seven Near Threatened species that may be present in the project area.

The biodiversity survey recorded 33 species of mammals in total, including 11 listed as threatened (four Endangered and seven Vulnerable), and one listed as Near Threatened on the IUCN Red List (Table 5.19 5.20).

Table 5.19: Recorded IUCN Read List of Mammal Species in the Study Area.

No.	Scientific Name	Common Name	Local Name	IUCN Status
1.	*Trachypithecus obscurus*	Capped Langur	Myauk-Myet-Kwin-Phyu	Endangered
2.	*Canis alpinus*	Dhole	Taw- Khwe	Endangered
3.	*Viverra megaspila*	Large-spotted Civet	Kyaung-Myin-Kyut	Endangered
4.	*Bos javannicus*	Banteng	Tsaing	Endangered
5.	*Macaca nemestrina*	Pig-tailed macaque	Myauk-padi	Vulnerable
6.	*Ursus thibetanus*	Asiatic-Black Bear	Wat-Won-Gyi	Vulnerable
7.	*Arctonyx collaris*	Hog Badger	Kyut-tu-Wat tu	Vulnerable
8.	*Lutrogale perspicillata*	Smooth-coated-Otter	Hpan	Vulnerable
9.	*Bos frantalis*	Gayal	Nwa-nauk	Vulnerable*
10.	*Cervus unicolor*	Sambar deer	Satt	Vulnerable
11.	*Capricornis sumatraensis*	Southern Serow	Taw Sake	Vulnerable
12.	*Pardofelis marmorata*	Marbled Cat	Kyaung-tha-lin	Near Threatened

*Considered Vulnerable on the 2000 IUCN Red List but is not evaluated in the most recent version. The domesticated form of Gaur (*Bos frontalis*) is now considered by IUCN as a separate species to the wild Gaur and occurs as feral, semi-feral, and domestic animals. This animal is excluded from the red-listing considerations for the wild Gaur (*Bos gaurus*).

Individual and group hunting is undertaken along the transmission line route. Group hunting is undertaken in mountainous areas and valleys, often for mammals such as wild pig, southern serow, monkeys and sambar deer. Mammals and birds are also hunted by individuals, often by the use of guns (Tumee) and catapults. Interviews with villagers during the biodiversity survey reported that souvenirs were often kept by hunters, including skulls, horns, bones and tails (Plate 5.28, Plate 5.29 and Plate 5.30)

Plate 5.28: Bones of red muntjac (*Muntiacus muntjak*)

Plate 5.29: Horn of southern serow (*Capricornis sumatraensis*)

Plate 5.30: Skull of pig-tailed macaque (*Macaca nemestrina*)

Birds

The WWF considers some birds in the Kayah-Karen Hills ecoregion indicators of habitat integrity (WWF 2020). Of these birds, an IUCN search of the project area and surrounding area has indicated the following threatened species may be present: green peafowl (*Pavo muticus*) (Endangered), great hornbill (*Buceros bicornis*) (Vulnerable) and wreathed hornbill (*Aceros undulatus*) (Vulnerable). Additionally, the great slaty woodpecker (*Muellerpicus pulverulentus*) (Vulnerable), may be present in lowland forests and hills in this ecoregion and may be found in the project area. This species resides in large dead trees, so is sensitive to forest degradation (WWF 2020). These species were not recorded in the project area during the biodiversity survey.

The biodiversity survey identified 77 terrestrial bird species and 10 marine bird species in the study area. (Appendix 14.7 (B)), Muscicapidae (10 species) were the dominant family of terrestrial birds in the study area, while Ardeidae (7 species) were the dominant family in the aquatic environment studied (Plate 5.31). The vegetation observed along the route is suitable habitat for a range of bird species.

An IUCN search of the project area and surrounding area identified six Critically Endangered bird species, seven Endangered bird species, 10 Vulnerable bird species and 30 Near Threatened bird species that may occur in the project area. The biodiversity survey only recorded two bird species in the study area considered Near Threatened on the IUCN Red List, *Psittacula finschii* (Grey-headed parakeet) and *Psittacula alexandri* (Red-breasted parakeet) (Plate 5.32 and Plate 5.33). No threatened species (Critically Endangered, Endangered or Vulnerable) were recorded.

Herpetofauna

An IUCN search of the project area and surrounding area identified two Critically Endangered herpetofauna species, two Vulnerable species and one Near Threatened species that may occur in the area. The biodiversity survey recorded 13 herpetofauna species in total, either observed directly or reported during interviews. (Table 5.20) The biodiversity survey only recorded one threatened herpetofauna species in the study area, *Platysternon megacephalum* (Big-headed turtle), listed as Endangered on the IUCN Red List.

Table 5.20: Recorded Herpetofauna during Survey Period

	Order		Family		Scientific Name	Common Name	IUCN Status	Location Point
1	Anura	1	Dicroglossidae	1	*Occidozyga martensii*	Round-tongued floating frog	LC	19º18'39"N 96º43'39"E
		2	Bufonidae	2	*Duttaphrynus melanostictus*	Asian common toad	LC	19º18'39"N 96º43'39"E
3	Testudines	3	Platysternidae	3	*Platysternon megacephalum*	Big-headed Turrtle	EN	19º25'30"N 96º49'53"E
4	Squamata	4	Scincidae	4	*Eutropis multifasciata*	Common Sun Skink	NE	19º11'31"N 96º33'14"E
		5	Colubridae	5	*Oreocryptophis porphyraceus*	Black-banded trinket snake	NE	19º12'00"N 96º34'40"E
		7	Viperidae	6	*Daboia russelii*	Russell's viper	LC	19º13'22"N 96º34'51"E
		8	Elapidae	7	*Naja kaouthíü.*	Monocellate cobra	LC	19º13'22"N 96º34'51"E
		9	Gekkonidae	8	*Gekko gecko*	Tokay gecko	LC	18º56'36"N 96º26'46"E
				9	*Hemidactylus brooki*	Brook's gecko	LC	18º56'36"N 96º26'46"E
				10	*Hemidactylus frenatus*	Common house gecko	LC	18º56'36"N 96º26'46"E
		10	Agamidae	11	*Calotes htunwini*		LC	18º57'21"N 96º19'27"E
				12	*Calotes irawadi*		LC	18º57'23"N 96º19'26"E
				13	*Calotes mystaceus*	Blue ceasted lizard	LC	18º57'25"N 96º18'59"E

Plate 5.31: *Ardeola bacchus* (Chinese Pond Heron), a marine bird species in the dominant Ardeidae family

Plate 5.32: *Psittacula finschii* (Grey-headed parakeet) (Near Threatened)

Plate 5.33: *Psittacula alexandri* (Red-breasted parakeet) (Near Threatened)

5.7. Aquatic Biodiversity

The project lies within the Sittaung River basin to the west and the Thanlwin River Basin to the east. The aquatic biodiversity of these basins is outlined in this section.

5.7.1. Sittaung River Basin

Part of the western section of the project area lies within the Sittaung-Irrawaddy freshwater ecoregion, comprised of tropical and subtropical floodplain rivers and wetland complexes (Abell et al. 2008). The Sittaung River is considered to have low ecological sensitivity (IFC 2017b).

Fauna

There are nine existing hydropower stations located in the Sittaung River basin, resulting in the main Sittaung River having the highest degree of regulation in Myanmar, at 13.90% (IFC 2017b). The degree of regulation is the proportion of the annual flow which can be stored and released later. A high degree of regulation indicates there is greater potential for changes to the flow regime to occur than a low degree of regulation.

River fragmentation is the disruption and loss of continuity of a river, in this case by the presence of hydropower dams. Impacts of river fragmentation include changes to fish migration, flow, sedimentation and water quality. The degree of fragmentation in the Sittaung north of Taungoo due to hydropower dams is 80% to 90%, and 60% to 70% south of Taungoo. Tributaries to the east and west of Taungoo have a degree of fragmentation of 90% to 100% (IFC 2017b).

The Sittaung River is considered to have the lowest percentage of fish species suitable for commercial purposes in Myanmar, with 14% to 20% of fish species considered commercial and 39% to 46% of species used for subsistence (IFC 2017b). Two of these species are considered threatened on the IUCN Red List, *Garra flavatra* and *Yunnanilus brevis*, which are both Vulnerable. An IUCN Red List search indicates *Yunnanilus brevis* may be found in the Sittaung River near the project area. An aquatic survey of the Sittaung River and tributaries near Taungoo by Win et al. (2012) identified 48 fish species across the three survey locations. These were mostly cypriniformes (18 species) and the commercially important siluriformes (17 species) (Win et al. 2012).

The Sittaung River ecosystem has high macroinvertebrate biodiversity. There are 112 species of Odonata and 28 species of decapods crustacea thought to be found in the Sittaung sub-basins, including one Odonata species considered Near Threatened on the IUCN Red List (IFC 2017b). There are 43 bivalve species and 63 gastropod species that may also be found in the Sittaung sub-basins, including 11 Unionoida species (IFC 2017b). A tributary of the Sittaung River in the Karen Hills is habitat to *Margaritifera laosensis*, a freshwater pearl mussel which is considered Endangered (IFC 2017b).

Flora

The Sittaung River has a wide range of aquatic flora, including four Polypodiopsida species, 47 Magnoliopsida species, and 51 Liliopsida species. These plants are widely distributed and are not considered threatened (IFC 2017b).

5.7.2. Thanlwin (Salween) River Basin

Part of eastern section of the project area is located in the Lower and Middle Salween freshwater ecoregion, comprised of tropical and subtropical upland rivers (Abell et al. 2008). Most of the Thanlwin River is considered to be of medium ecological sensitivity, though Lake Inle and some tributaries, including the Baluchaung River are considered highly sensitive (IFC 2017b).

Fauna

There are four hydropower dams in the Thanlwin River basin, including the three Baluchaung hydropower dams. The degree of regulation of the Baluchaung River is 0.02, with the dam essentially disconnecting the Baluchaung River from the Thanlwin River (IFC 2017b).The Thanlwin River basin has high endemism and biodiversity near Lake Inle and surrounding tributaries in the karst landscape. Lake Inle is approximately 100 km from the proposed transmission line and has 31 restricted range species present (IFC 2017b). The Thanlwin River basin has 212 fish species present, including eight Endangered, four Vulnerable, eight Near Threatened species. Of the fish species found in the Thanlwin River, 19% to 50% are used for commercial purposes and 15% to 50% are used for subsistence (IFC 2017b). There are 189 species of Odonata, including two Vulnerable species and one Near Threatened species, and 48 freshwater crustacea species that may occur in the Thanlwin Basin. There are 50 bivalve species and 92 gastropod species that may be found in the basin, including one Critically Endangered gastropod, one Critically Endangered bivalve, and one Vulnerable gastropod. A large portion of these mollusc species can be found near or within the Lake Inle sub-basin (IFC 2017b).

Flora

The aquatic flora assemblage of the Thanlwin River includes 69 Liliopsida species, 83 Magnoliopsida species and six Polypodiopsida species (IFC 2007b). Four of these species are considered threatened, however have only previously been found in Thailand.

5.7.3. Fishes, Molluscs and Inset

The survey recorded 23 species of fish across the three watercourses. Thauk Yekhat Creek was very clear with small boulders and a sandy bed, and is likely to be an unfavourable habitat for larger fish in the dry season. The smaller unnamed creek near Sabakywe substation was not reliable for fishing due to the low water flow. (Appendix 14.7 (B)) Two of the species recorded in the biodiversity survey are listed as Vulnerable on the IUCN Red List, *Devario browni* (Danio Brownovo) and *Walllago attu* (Boal fish) (Plate 5.34 and Plate 5.35). One species recorded is listed as Near Threatened on the IUCN Red List, *Ompok pabo* (Pabda catfish) (Plate 5.36).

An IUCN search of the project area identified 7-Endangered species, 3- Vulnerable species and 6- Near Threatened species of fish, as well as 2- species of Critically Endangered molluscs and 1- Near Threatened species of Odonata. Several of these are endemic to Lake Inle and are unlikely to occur in the watercourses crossed by the proposed transmission line. Table 5.21 shows the threatened aquatic species that may occur in the project area. Species only found in Lake Inle are not displayed as Lake Inle is approximately 100 km from the proposed transmission line and is unlikely to be impacted by the project.

Table 5.21: Threatened aquatic species that may occur in the project area

No.	Common name	Species name	IUCN Red List Category	Notes (Fishbase, IUCN, marinespecies.org)
Fish				
1.	-	*Devario auropurpureus*	Endangered	Lake Inle basin
2.	-	*Cyprinus intha*	Endangered	Shallow lakes, dense vegetation and muddy lake bottom
3.	-	*Wallago attu*	Vulnerable	Freshwater and tidal waters including large rivers and lakes
4.	-	*Bagarius yarrelli*	Vulnerable	Rivers - Swift, clear rivers with a substrate of rocks and sand
5.	Inle loach	*Yunnanilus brevis*	Vulnerable	Inle Lake and the nearby He-Ho plain in the Southern Shan States, Salween basin
6.	Butter catfish	*Ompok bimaculatus*	Near Threatened	Plains and submontane regions, and is found in rivers, lakes, tanks and ponds.
7.	-	*Osteobrama belangeri*	Near Threatened	Rivers and lakes
8.	Burmese snakehead	*Channa harcourtbutleri*	Near Threatened	Freshwater lakes
9.	Indonesian shortfin eel	*Anguilla bicolor*	Near Threatened	Estuaries, brackish waters, freshwater lakes, streams, pools and small rivers, preferring marshy habitats but can also be found over rock bottoms and in deeper pools
10.	Indian mottled eel	*Anguilla bengalensis*	Near Threatened	River systems from quiet undisturbed areas containing mud substrate to deep water, fast-flowing rock pools of river
Molluscs				
1.	-	*Physunio ferrugineus*	Critically Endangered	Lake Inle and connected waters
Insects				
1.	-	*Asiagomphus personatus*	Near Threatened	Hill streams

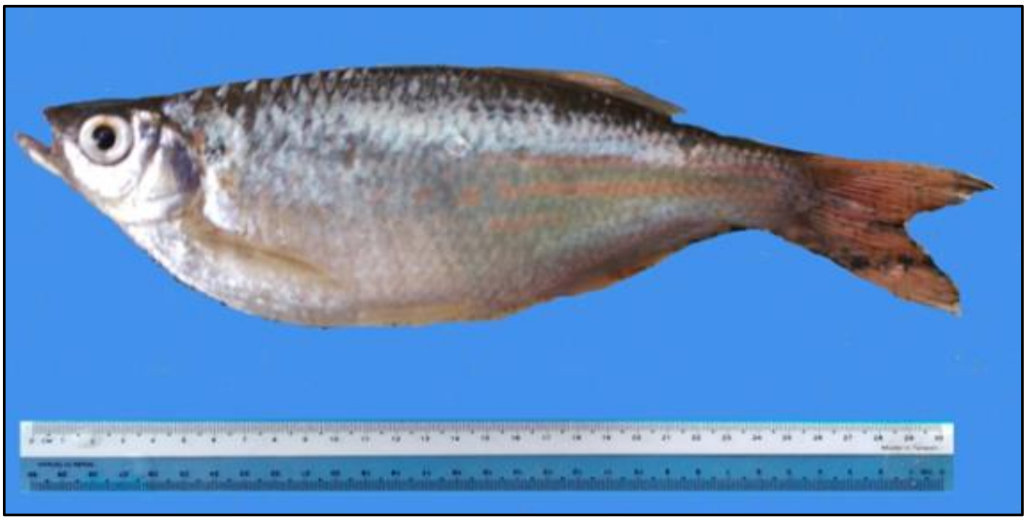


Plate 5.34: *Devario browni* (Danio Brownovo) (Vulnerable)

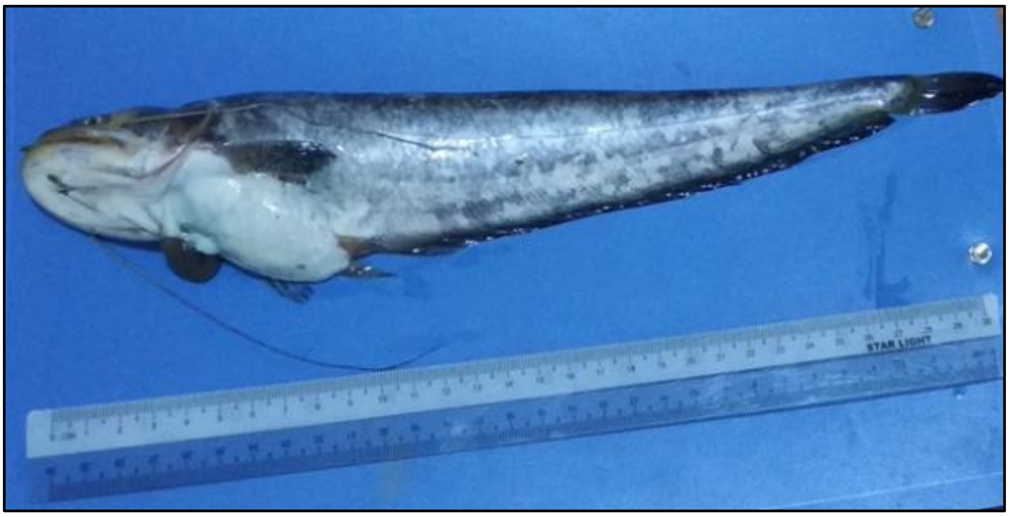


Plate 5.35: *Walllago attu* (Boal fish) (Vulnerable)

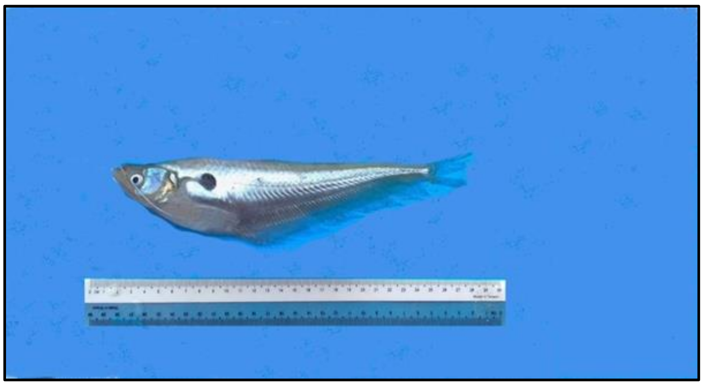


Plate 5.36: Ompokpabo (Pabda Catfish) (Near Threatened)

5.7.4. Macroinvertebrate Taxa

The biodiversity survey recorded eight macroinvertebrate taxa in the Thauk YeKhat Creek, five macroinvertebrate taxa in the Sittaung River near Taungoo, and three macroinvertebrate taxa in the small unnamed creek near Sabakywe substation (Table 5.22). The biotic index of the three watercourses was 4.8, 5.5 and 5.2, respectively. This indicates water quality of the Thauk YeKhat Creek is likely to be good with some organic pollution, and the water quality of the Sittaung River and unnamed creek is likely to be fair with substantial organic pollution. (Table 5.23). Plate 5.37, Plate 5.38 and Plate 5.39 show three of the macroinvertebrates recorded during the survey.

Table 5.22: Recorded Macroinvertebrates in the Survey Area

No.	Taxa	Thauk YeKhat Creek	Sittaung River	Small Creek
1.	Trichotera	+	+	-
2.	Diptera	+	-	+
3.	Mayfly	+	-	-
4.	Odonata	+	+	+
5.	Hemiptera	-	-	-
6.	Bivalvia	+	+	-
7.	Decapoda	+	-	-
8.	Gastropoda	+	+	-
9.	Plecotera	+	-	
10.	Coleoptera	-	+	+

+ (present) - (absent)

Table 5.23: Biomonitoring of Aquatic Ecology with Macroinvertebrates (benthos)

Study Sites	No of Texa	Biotic index	Degree of Organic pollution	Water Quality
Thauk YeKhat Creek	9	43.4/ 9 = (4.8)	Some organic pollution	good
Sittaung River	5	27.4/5 = (5.5)	Substantial pollution likely	Fair
Unnamed creek (near Sabakywe Station)	3	15.6/3 = (5.2)	Substantial pollution likely	Fair

Plate 5.37:Dragonfly (Odonata)

Plate 5.38: Gastropoda

Plate 5.39: Bivalvia

5.8. Socio-Economic Environment

The transmission line route passes through various different states and regions, rich in both natural resources and cultural heritage:

- The eastern section of the project area is in Kayah State. This state is rich in both natural resources and cultural heritage. The main crop is rice, which is mostly irrigated. The state has a history of timber trade and the forests have been largely cleared by illegal logging.
- The central section of the project area covers rugged mountain terrain of the Karen Hills. Deforestation and human extraction practices have degraded the natural environment over time. Teak and other hardwoods are logged and local communities use cultivation to grow upland rice, corn and millet.
- The western section of the project area lies in the Sittaung River valley in Bago region. The Bago region is strongly dependent on the timber trade. Taungoo is bordered by mountain ranges covered by teak and other hardwoods. Land use in the middle of the valley is largely rice cultivation with the Yangon to Mandalay road and railway also present.

Key towns within 2 km of the proposed route include Loikaw, Demoso, Yedashe and Kyun Kone, with numerous smaller settlements located close by. Figure 5.17 shows the townships the proposed transmission line runs thorough and nearby villages.

5.8.1. Socio-economic Baseline Survey Method

A dedicated survey was undertaken to gather socio-economic data on project-affected people. This included key informant interviews at villages and households, and interviews at community centres. The following information was recorded during the survey:

- Characteristics of household residents (e.g., demographics).
- Education status.
- Employment, income and expenditure.
- Land ownership and use.
- Household living standards (e.g. housing, sanitation, water sources, energy sources and transportation).
- Health issues.
- Village living standards (housing, road condition, energy sources, water sources, solid wase management system, communication, services and vulnerable groups).
- Household and village needs, concerns, awareness and expectations of the project.

Observations were made regarding physical infrastructure (i.e., road networks, drainage, water supply, sanitation and sewerage, waste management, energy source, telecommunications, and housing and accommodation) and social infrastructure (i.e., education services, health care facilities, emergency services, government services, and law and order) and their accessibility in the study area.

This survey was undertaken when the COVID-19 pandemic enabled safe travel to site. Survey Form and Results are provided in Appendix 14.8. Table 5.24 and Figure 5.16 show the villages surveyed.

Table 5.24: Villages Surveyed in the Socio-Economic Baseline Survey

Region	Township	Village tract	Village
Kayah	Demoso	Lo Bar Kho	Saung Du
	Loikaw	Ma Htaw Khu	Law Pi ta San Pya
Kayin	Thandaunggyi, Leik Tho sub-township	Ka Lay Ta	Ka Lay Ta (Yar Do)
		Ka Lay Kho	Thauk Yae Khat
		Kyay Min	Kyay Min (Lower)
		Ka Zaw Pa Lo	Ka Zaw Pa Lo (Lower)
		Kyay Min	Ma Sa (Upper)
		La Bet Inn Gyi	La Bet (Phet) Inn Lay Ywar Haung
		Za Le	Za Le (Lower)
		Za Le	Kaw Pat Chan
		Thar Moe Taung	Thar Moe Taung (Ywar Ma)

The socio-economic survey was undertaken in 11 villages along the transmission line route (Plate 5.40). These populations ranged in size from 108 residents to 1,700 residents. Within each village, household surveys were undertaken at between four and 18 households. The villages surveyed (see Figure 5.16), their population and the number of households surveyed are provided in Table 5.25.

Table 5.25: Villages Surveyed in the Socio-economic Study

Area (Village)	Population	Households	Households surveyed
Thout Yay Khet	1250	228	9
La Phet Inn	280	40	15
Out Zela	252	30	10
Ma Sa (Upper)	460	107	15
Kyay Min	356	63	18
Kaw Phet Chan	600	120	6
Thar Moe Taung	108	38	7
Ka Zaw Palo (Low)	235	56	10
Yar Do	1700	400	8
Law Pi Ta	900	210	4
Soun Du	827	157	5
Total	**6968**	**1449**	**107**

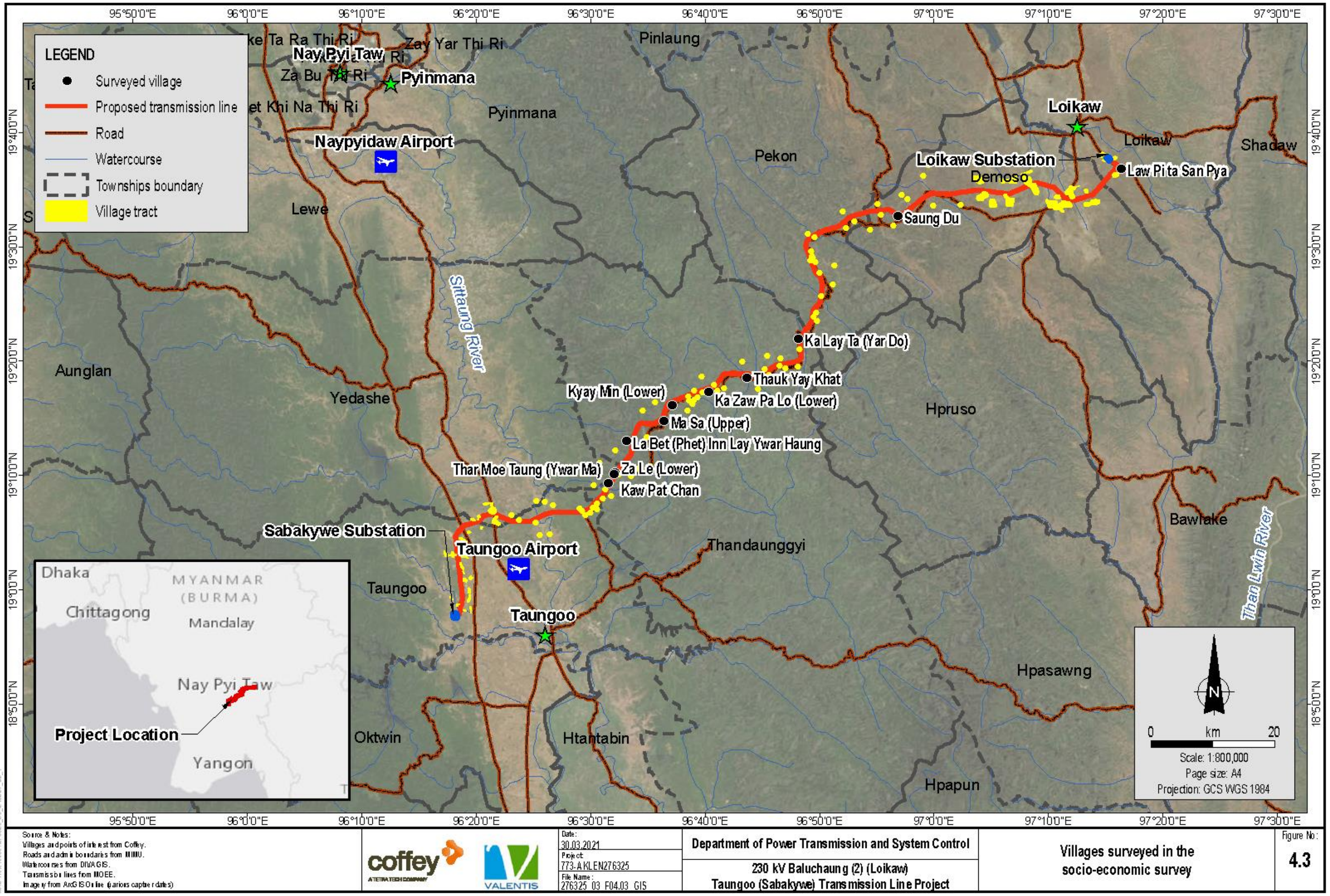


Figure 5.17: Villages Surveyed in the Socio-Economic Survey

Socio-economic survey at Kaw Bat Chan Village

Socio-economic survey at Thout Yay Khet

Socio-economic survey at Ka Saw Pa Lo Village

Socio-economic survey at Kyay Min Village

Socio-economic survey at Yar Do Village

Socio-economic survey at Ma Sa Village

Plate 5.40: Socio-economic Survey at Project Area

5.8.2. Survey Results

General Information

(1) Respondents' by Gender Distribution

The survey was conducted using above survey methodology. With a well-prepared questionnaire the survey team interviewed members of selected households to obtain socioeconomic information. While the socioeconomics surveys are conducted, most of the respondents are households' members who are always living in their house. The following figure breaks down of the respondents by gender according to the survey results. There are 288 (50%) male respondents and 291 (40%) female respondents out of total of (107) households surveyed.

(2) Age Distribution by Respondents

In the primary zone, the ages of most respondents surveyed are between 41 and 60 with 50 households, followed by the age class between 21 and 40 with 35 households out of a total of 107 households surveyed. Under ages of 20 is only 1 household while the respondents aged of above 60 are 20 households. It is therefore found that the ages of respondents are mainly distributed within the range of working age between 20 and 60.

(3) Household Distribution by Religion

Christian is the main religion with 98 respondents who answered out of the total survey 107 households surveyed. There are only nine Buddhist respondents according to the survey results.

(4) Education Level of Respondents

Out of a total of 107 households surveyed, 38 households and 1 household have primary and monastic level education respectively. 7 households are illiterate, 33 households reach middle school level, and 26 households have high school level education while only 2 households reach university level. Therefore, it is discovered that literacy rate of surveyed households is 87%.

Employment Status of Households

Main employment status of households is self-employed with 80 households out of 107. The remaining households from surveyed households are wage worker with 14 households, seasonal worker away from home with 10 households and employee with 3 households.

Employment Type of Households

Main occupation of respondents is crop farming with 61 households out of 107. The second mainly distributed occupation is others with 33 respondents which households are doing gardening, homemade soap making and grocery. The remaining households from surveyed households are doing animal husbandry, fishery, sales, services (private sector), and government sector. Since farming is the main occupation of households, possible disturbances to the agricultural production should be considered by the project proponent.

Land Ownership and Use

The types of ownership are categorized into four classes such as agricultural, ancestor, grant, and residential. According to the survey results, 35 households out of 107 households are living on their agricultural land, 29 households on ancestor land, and 15 households on granted land respectively.

The survey results break down the area extent of agricultural land used by households. 26 out of 107 households own lands less than 1 acre and 37 households have lands between 1 acre and 5 acres respectively while 16 households own lands between 5 acres and 20 acres. Only 2 households have lands above 50 acres. Respondents who did not answer are 21 households out of 107 respondents. In contrast, there are only 5 households who have no own land.

Household and Village Needs, Concerns, Awareness and Expectations of the Project

The first priority need for households is job opportunities with 42 respondents answered out of 107 respondents. The electricity requirement follows the second priority needs for households with 34 respondents answered while the third priority for households' need is health and education services which were answered by 15 respondents. 10 respondents asked for water supply system while 6 respondents asked for transportation needs.

The first priority need for village is electricity which was answered by 33 households out of 107 respondents. The second most necessary for village is health and education answered by 30 households while the third priority for village is transportation answered by 21 respondents. 20 respondents asked for water supply system while 3 respondents asked to support job opportunities to their village by the project proponent.

Impact of the Project by Respondents' Opinions

32 respondents out of 107 respondents concerned about electrical hazards and electrocution while 26 respondents worried about agricultural land losses. 19 respondents did not answered about the potential impact and 24 respondents did not expect the significant impact due to project implementation respectively while 5 respondents worried about the fire hazards.

5.8.3. Data sources

The following sections refer to data obtained from the Myanmar Information Management Unit (MIMU 2020) and 2014 Census (DOP 2015-2016). The Myanmar Information Management Unit (MIMU) has consolidated data from the 2014 census, Department of Basic Education, Ministry of Education, Department for the Promotion and Propagation of the Sasana, Ministry of Religious Affairs and Culture, Ministry of Home Affairs, and General Administration Departments (GAD) of townships to provide profiles of these townships. The information in this section is supplemented by the results of the socio-economic survey.

5.8.4. Administration, Social Service and Governance

Myanmar is divided into seven states, seven regions, and six self-administered zones. Within these there are several districts which comprise several townships. Townships consist of wards and village tracts comprising several villages.

The proposed transmission line route crosses through six townships. The townships are shown in Figure 5.18 and include:

- Yedashe and Taungoo in Bago region.
- Leiktho subtownship in Thandaunggyi Township in Kayin State.
- Pekon in Shan State.
- Demoso and Loikaw in Kayah State.

Townships are comprised of wards and/or village tracts. Village tracts are groups of several individual villages. There are 53 village tracts within 2 km of the proposed transmission line. Table 5.26 outlines the population characteristics of these village tracts.

Table 5.26: Village tracts in the project area

State and township	Village tract	No. of Households	Total population	Male	Female
Bago		**13,083**	**54,973**	**26,820**	**28,153**
Taungoo	Wet Khauk Sein	810	3,667	1,834	1,833
Yedashe	Kyan Tha Nwe	1,410	5,945	2,978	2,967
-	War Yon Taw	483	2,043	995	1,048
Taungoo	Bo Ka Taw	724	2,885	1,329	1,556
Taungoo	Sa Par Kywei	1,017	4,436	2,219	2,217
Taungoo	Pa De	697	2,696	1,288	1,408
Taungoo	Doe Inn	938	3,991	1,905	2,086
Taungoo	Pe Chet Kone	360	1,524	749	775
Taungoo	Myauk Yae Kyi	924	4,150	2,051	2,099
Taungoo	Nay Pu Kone	830	3,482	1,676	1,806
Taungoo	Ka Nyin Myaung	848	3,486	1,737	1,749
-	Khin Tan Gyi	627	2,428	1,156	1,272
-	Mi Chaung Aing	798	3,148	1,504	1,644
-	Kywe Yaing Pyin	846	3,578	1,771	1,807
Taungoo	Kayin Chaung	873	3,772	1,850	1,922
Yedashe	Boe Taw Kone	898	3,742	1,778	1,964
Kayah		**13,802**	**67,922**	**33,692**	**34,230**
	Lo Bar Kho	405	2,244	1,143	1,101
	Ho Wan	86	503	248	255
	Lo Pu	225	1,305	656	649
	War Ban Pa Loet	403	2,233	1,163	1,070
	Mya Le	465	2,431	1,201	1,230
	Daw Taw Ku	517	2,681	1,297	1,384
	Naung Pale	454	2,388	1,246	1,142
	Daw Ka Law Du	538	2,631	1,331	1,300
	San Pya Chauk Maing	1,072	5,390	2,516	2,874
	Law Pi Ta	1,902	8,233	4,100	4,133
	Demoso	1,225	6,631	3,220	3,411
	Ngwe Taung	1,673	7,955	3,901	4,054
	Ma Htaw Khu	888	4,144	2,096	2,048

State and township	Village tract	No. of Households	Total population	Male	Female
	War Thaw Kho Ywar Thit	256	1,449	739	710
	Pan Kan	3,023	14,354	7,149	7,205
	Pan Pet	183	930	489	441
	Thay Su Le	487	2,420	1,197	1,223
Kayin		**5,265**	**25,941**	**13,121**	**12,820**
	Thar Moe Taung	411	1,748	873	875
	Kya Maing	749	3,558	1,774	1,784
	Za Le	474	2,262	1,175	1,087
	Leik Tho Gyi	171	778	387	391
	La Bet Inn Gyi	169	785	405	380
	Kyay Min	324	1,598	813	785
	Kha Mar Di Hpo Li	209	1,082	541	541
	Ka Saw Pa Lo	180	881	460	421
	Ah Doe Thea Pyaw	159	803	418	385
	Dar Yoe	255	1,193	593	600
	Meik Tha Lin Taung	349	1,815	898	917
	Ka Lay Kho	367	1,931	1,010	921
	Ka Lay Ta	435	2,318	1,191	1,127
	Chee Thu Saw (Lower)	276	1,397	699	698
	Hta Mon	485	2,475	1,221	1,254
	Hnget Pyaw Taw	252	1,317	663	654
Shan		**3,333**	**18,317**	**9,356**	**8,961**
	Thi Kyeik	899	4,732	2,502	2,230
	Byeat Taik	203	1,047	537	510
	Ah Lel Pa Daung	1,212	6,937	3,538	3,399
	Yi Long Yi Kan	1,019	5,601	2,779	2,822

Source: DOP (2015-2016)

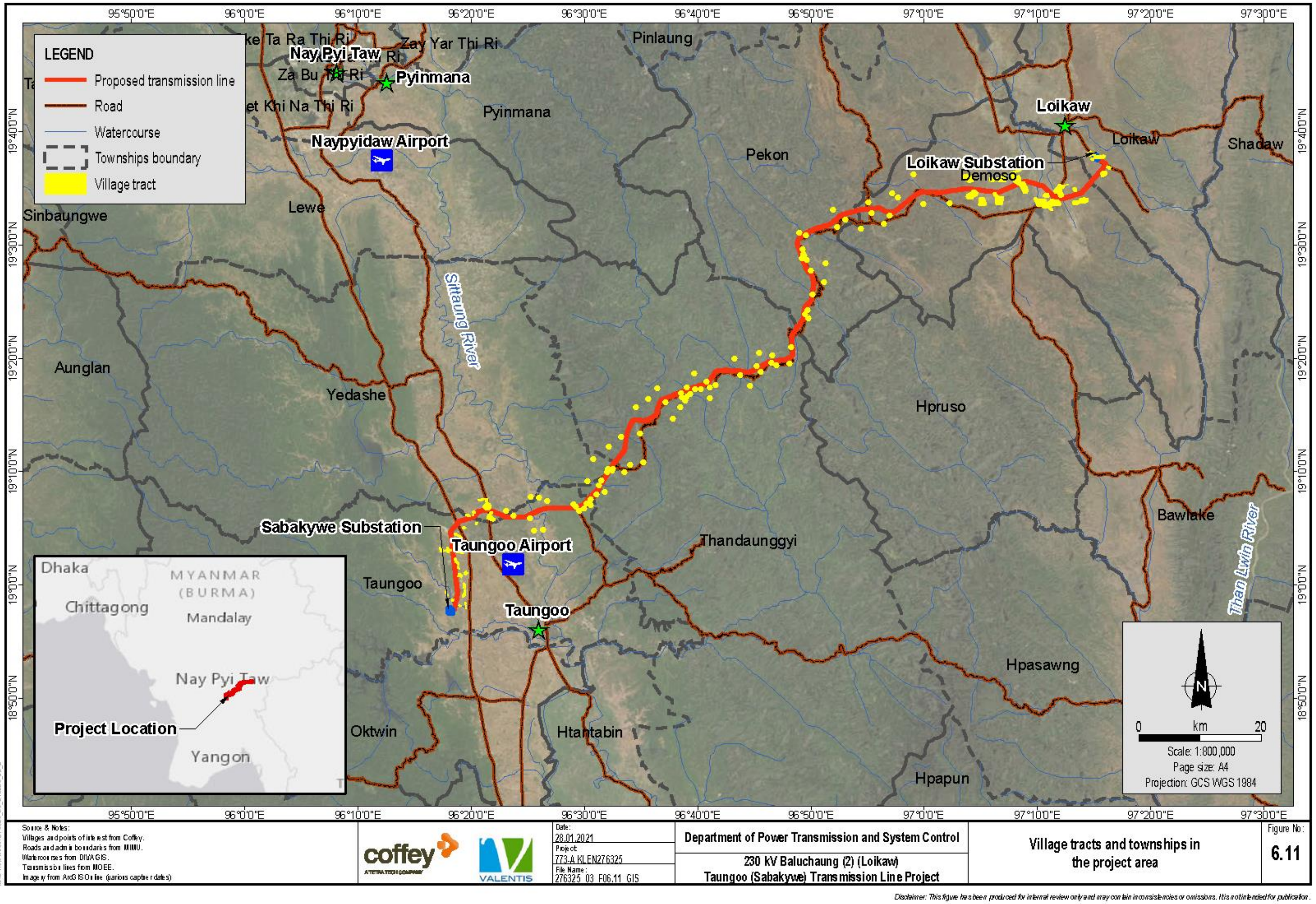


Figure 5.18: Village Tracts and Townships in the Project Area

5.8.5. Place and People

This section describes the demography of the project area including detail on vulnerable groups and levels of education.

Demography

Table 5.27 5.27 shows the population of the towns the proposed transmission lines will pass through according to GAD 2019 data (MIMU 2020). GAD data is not available for Leiktho, so 2014 census data is reported (DOP 2015-2016). Taungoo and Loikaw townships are located at either end of the proposed transmission line route in more urban areas than the majority of the route. As a whole, the Taungoo and Loikaw urban population is 40% and 50% of the total population of each of these townships, respectively. In comparison, the other townships had much larger rural populations, in particular, Leiktho, Pekon and Demoso townships, at 94%, 86% and 94%, respectively.

Table 5.27: Population of Townships the Proposed Route Passes Through

	Taungoo	Yedashe	Leiktho*	Pekon	Demoso	Loikaw
Population	245,036	215,019	48,606	107,841	87,610	118,264
Urban population	40.3%	22.8%	6.4%	14.2%	6.3%	50.3%
Rural population	59.7%	77.2%	93.6%	85.8%	93.7%	49.7%
Village tracts	77	40	31	12	25	12
Villages	264	224	-	211	173	122
Wards	7	11	6	7	1	19
Households	49,751	49,231	9,926	20,584	16,458	22,279

Source: MIMU (2020), *DOP (2015-2016)

Gender and Vulnerable Groups

Demographic data indicates the more rural townships of Leiktho, Pekon and Demoso have a slightly higher proportion of males (50.1% - 50.8%) than Taungoo, Yedashe and Loikaw (47.9%, 48.6% and 49.1%, respectively) (Table 5.28). Additionally, the proportion of elderly people is lower and proportion of children is higher in the rural townships than in the urban townships. Vulnerable people are considered those who have a walking, seeing, hearing and/or remembering disability. The proportion of vulnerable people varies between townships, with the highest proportion in Leiktho, where an eighth of the population is considered vulnerable.

Table 5.28: Demographic Data of Townships the Proposed Route Passes Through

	Taungoo	Yedashe	Leiktho	Pekon	Demoso	Loikaw
Female	52.1%	51.4%	49.2%	49.8%	49.9%	50.9%
Male	47.9%	48.6%	50.8%	50.2%	50.1%	49.1%
Elderly population (>65)*	6.1%	5.3%	3.1%	2.9%	3.6%	4.2%
Children (<15)*	27.8%	30.4%	39.7%	37.9%	38.5%	31.6%
Vulnerable people* **	4.0%	3.7%	12.5%	3.4%	6.6%	6.0%

Source: MIMU (2020), *2014 Census https://themimu.info/mimu-township-profiles-dashboard
**Vulnerable people defined as having walking, seeing, hearing and/or remembering disability.

Particularly vulnerable people in this survey were defined as those with blindness, deafness, polio or other unspecified disabilities. Less than 1% of the population of the villages that were surveyed for the purposes of this project had people present who were considered to be vulnerable.

Education

Table 5.29 presents the number of schools and literacy rates in the project area. Literacy rates are highest in Taungoo (93.7%).

Table 5.29 shows the highest levels of education for people aged 25 and over within the townships. Tertiary education facilities are located in Loikaw (Loikaw University, Computer University and Technology University Loikaw) and Taungoo (Taungoo Technological University and University of Computer Studies Taungoo). These townships have the highest proportion of people with university or college level education (10.6% and 10.9%, respectively) compared to the rural townships (between 2.0% and 6.6%).

Table 5.29: Number of Schools and Literacy Rates in the Project Area

	Taungoo	Yedashe	Leiktho	Thandaunggyi	Pekon	Demoso	Loikaw
Primary Schools	8	32	-	192	137	81	74
Middle Schools	167	213	-	49	42	34	29
High Schools	17	17	-	13	12	15	20
Monastic schools	4	7	-	2	4	3	5
Total schools	196	269	-	256	195	133	128
Literacy rates*	93.7%	93.0%	88.8%	-	80.8%	79.3%	85.9%

Source: MIMU (2020); * DOP (2015-2016).

Table 5.30: Highest Level of Education (aged 25 and over)

	Taungoo	Yedashe	Leiktho	Pekon	Demoso	Loikaw
None	11.3%	15.9%	12.9%	26.8%	26.2%	18.1%
Primary School (grade 1-4)	20.5%	<0.1%	29.5%	25.2%	24.7%	18.5%
Primary School (grade 5)	21.2%	42.9%	23.4%	16.0%	12.7%	13.5%
Middle School (grade 6-9)	21.2%	9.4%	22.1%	16.9%	20.9%	21.4%
High School (grade 10-11)	14.0%	9.4%	9.6%	9.0%	11.2%	16.2%
Diploma	0.3%	0.3%	0.2%	0.3%	0.3%	0.4%
University/college	10.6%	6.6%	2.0%	4.4%	3.4%	10.9%
Post-graduate and above	0.5%	0.2%	0.1%	0.2%	0.2%	0.5%
Vocational training	0.1%	0.2%	0.1%	0.2%	0.2%	0.3%
Other	0.3%	<0.1%	0.0%	0.9%	0.1%	0.3%

Source: DOP (2015-2016)

Religion and Ethnicity

The main religion in Myanmar is Buddhism, with approximately 88% of people identifying as Buddhist according to the 2014 Census (Table 5.31). Buddhism is also the main religion in most of the regions/states the proposed transmission line route passes through, including Bago Region (93.5%), Kayin State (84.5%), and Shan State (81.7%). The route terminates in Kayah State, where most people are Buddhist (49.9%) or Christian (45.8%).

Table 5.31: Religions of Myanmar and within States the Proposed Transmission Line Passes Through

	Myanmar	Bago Region	Kayin State	Shan State	Kayah State
Buddhist	87.9%	93.5%	84.5%	81.7%	49.9%
Christian	6.2%	2.9%	9.5%	9.8%	45.8%
Islam	4.3%	1.2%	4.6%	1.0%	1.1%
Hindu	0.5%	2.1%	0.6%	0.1%	0.1%
Animist	0.8%	0.1%	0.1%	6.6%	1.9%
Other	0.2%	0.3%	0.7%	0.5%	1.2%
None	0.1%	<0.1%	<0.1%	0.4%	0%

Source: DOP (2015-2016)

There are 135 ethnic groups within 8 major national ethnic races in Myanmar (Embassy of Myanmar, unknown date). These are Kachin, Kayah, Kayin, Chin, Bamar, Mon, Rakhine and Shan. Most people throughout the country identify as Bamar, with the distribution of the remaining seven ethnic races largely corresponding to geographic regions and the administrative states of Myanmar. Recent data regarding the ethnic composition of Myanmar people is unavailable as the 2014 census did not collect data on ethnicities. The World Factbook (CIA 2020) has reported that the majority of Myanmar people identify as Bamar (68%), with the remainder identifying as Shan (9%), Karen (7%), Rakhine (4%), Chinese (3%), Indian (2%) Mon (2%), or other ethnicities (5%), though the age and origin of this data is unknown.

Health Profile

The number of healthcare workers and facilities in each township the proposed transmission line will pass through are outlined in Table 5.32. Loikaw General Hospital is located in Loikaw township, and provides health care to residents of Kayah State and the southern part of Shan State (The Global New Light of Myanmar 2015).

Table 5.32: Number of Health Care Workers and Facilities Accessible in Townships the Proposed Transmission Line will Pass Through

	Taungoo	Yedashe	Thandaunggyi	Pekon	Demoso	Loikaw
Doctors	75	7	6	9	6	81
Nurses	153	23	22	30	36	310
Health assistants	8	5	6	8	7	11
Hospitals*	3	7	6	11	5	5
Rural health centre	7	8	10	8	7	7
Sub health centre	36	32	38	32	30	29

*Hospitals include general, specialist, 300/100/50/25 bedded and station hospitals
Source: MIMU 2020

As reported in JICA (2016), the Loikaw General Administrative Department reported the most common diseases recorded in Loikaw township in 2015 were diarrhea (1,854 cases), dysentery (761 cases), tuberculosis (473 cases), HIV/AIDS (160 cases) and malaria (150 cases).

The socioeconomic survey recorded health issues reported by survey respondents. These results are shown in Table 5.33. The most commonly reported issues were malaria, cough and diarrhoea. Other issues reported included seasonal infections, fevers, phthisis, hypertension, diabetes and kidney problems. Several survey respondents reported suffering from multiple health issues.

Table 5.33: Health Issues Reported During the Socio-economic Survey

Health issue	Number of times reported
Diarrhoea	14
Dysentery	1
Eye infection	2
Typhoid	0
Gastroenteritis	4
Cough	17
Allergy/skin infection	3
Malaria	22
Respiratory tract infection	2
Dengue	1
Tuberculosis	6
Other	30
No issues	35

Source: Socio-economic survey

5.8.6. Built Environment and Infrastructure

This section outlines the type of housing and access to infrastructure in the villages along the proposed transmission line route.

Housing

According to the 2014 census, most houses in the townships the proposed transmission line passes through have bamboo, wood or tile, brick or concrete walls, with corrugated sheet roofs (DOP 2015-2016). Most houses of survey respondents are wooden (36%), a combination of timber and bamboo (33%) or pucca/semi-pucca (27%). Of the survey respondents, 57% of houses have two or less bedrooms, 37% have three or four bedrooms and 6% have five or six bedrooms. Plate 5.41 show some of the houses in the villages surveyed.

Roads and traffic

Trucks, including 10-wheelers, can be seen travelling on the Loikaw-Taungoo Road. It is not widely used due to the security concern of landmines in the area (WFP 2017). A 2017 report by JICA stated approximately 40 vehicles used this road per day (JICA 2017). Sections of this road are susceptible to landslides, resulting in closures. Additionally, as sections of the road are approximately 3.7 m wide it can be difficult to pass or overtake large vehicles (JICA 2017). Plate 5.41 show Loikaw-Taungoo Road, including a bridge.

Most of the villages surveyed had earth/dirt roads. Kaw Phet chan, Thar Moe Taung and Yar Do had both dirt and asphalt roads Law Pi Ta and Saung Du both had gravel roads. An example of a dirt access road into a village is shown in Plate 5.41

Za Le (Village)

Houses in Saung Do Village

Houses in Kyay Min Village

Loikaw-Taungoo Road at Site 3A

Taungoo-Loikaw road at Site 7A

Access road to La Bet Inn Gyi Village at site 7

Plate 5.41: Type of Housing and Access Road in the Project Area

Access to Electricity

Electricity for government offices, schools and hospitals is prioritised, while residential areas are often only able to access electricity at night (JICA 2016). Common issues with electricity in urban areas include poor voltage and insufficient supply for increasing demand. Demand in Loikaw District in the 2017-2018 financial year was 17.55 MW (MMRD 2018). MMRD (2018) also reported that in the 2016-2017 financial year, 117 of the 123 villages in Loikaw were electrified and 157 of the 165 villages in Demoso were electrified. According to the 2013 census, just over half of Taungoo residents (51.5%) and two-thirds of Loikaw residents (67.7%) reported using electricity as the main source of lighting in the 2014 census (Table 5.42). In Demoso and Pekon townships the proportion of residents using electricity for lighting is 33.5% and 39.0%, respectively. Leiktho has very few residents using electricity as a source of lighting, with the highest percentage of people using candles (43.4%).

Table 5.34: Main Source of Lighting

	Taungoo	Yedashe	Leiktho	Pekon	Demoso	Loikaw
Electricity	51.5%	30.7%	2.9%	33.5%	39.0%	67.7%
Candle	23.5%	34.7%	43.4%	22.2%	19.2%	14.6%
Solar system/energy	5.1%	8.2%	18.7%	36.7%	27.1%	12.1%
Battery	10.4%	9.6%	7.5%	2.3%	3.9%	2.2%
Private water mill	<0.1%	0.2%	8.1%	2.2%	<0.1%	1.7%
Kerosene	7.0%	8.2%	16.9%	0.8%	8.9%	0.9%
Other	1.5%	1.9%	2.0%	1.3%	1.2%	0.7%
Generator	1.0%	6.5%	0.6%	1.0%	0.7%	0.3%

Source: Census (2014)

Fewer people use electricity for cooking than lighting, with firewood being the most common cooking fuel used in all townships.

Table 5.35 Main Type of Cooking Fuel Used

	Taungoo	Yedashe	Leiktho	Pekon	Demoso	Loikaw
Firewood	53.5%	79.1%	97.8%	84.7%	92.0%	56.9%
Electricity	14.7%	10.5%	0.1%	14.3%	7.4%	39.2%
Charcoal	29.5%	9.2%	2.0%	0.7%	0.4%	3.6%
BioGas	0.2%	0.1%	<0.1%	0.1%	<0.1%	0.1%
Coal	0.9%	0.2%	0.1%	0.0%	0.10%	0.1%
Other	0.9%	0.7%	0.0%	0.1%	<0.1%	0.1%
LPG	0.2%	<0.1%	<0.1%	<0.1%	<0.1%	0.1%
Kerosene	0.2%	0.2%	0.1%	<0.1%	0.10%	<0.1%
Straw grass	<0.1%	-	0.0%	0.0%	0.0%	<0.1%

Source: Census (2014)

The socio-economic survey undertaken in 11 villages along the proposed route identified the main source of energy for lighting and cooking in the villages (Table 5.36). The main energy source for lighting in the surveyed villages is solar panels. Overall, of the 107 responses, 98 (92%) use firewood as the main source of energy for cooking, with the remaining 9 (8%) using firewood and an additional source such as electricity or generators. The Existing electricity infrastructure in some of the villages surveyed.

Table 5.36 Main source of energy for lighting and cooking in surveyed villages

Village	Main source of energy for lighting	Main source of energy for cooking
Thout Yay Khet	Solar panels	Firewood
La Phet Inn	Solar panels (50%) and candles (50%)	Firewood
Out Zela	Solar panels	Firewood
Ma Sa (Upper)	Solar panels	Firewood
Kyay Min	Solar panels	Firewood
Kaw Phet Chan	Electricity	Firewood
Thar Moe Taung	Solar panels	Firewood
Ka Zaw Palo (Low)	Solar panels and candles	Firewood
Yar Do	Generator (6 to 9 p.m.) and solar panels	Firewood
Law Pi Ta	Electricity	Firewood and electricity
Saung Du	Electricity (90%) and solar panels (10%)	Firewood

Source: Socio-economic survey

The socio-economic survey recorded the priority needs of households and the villages. Of the 107 people surveyed, electricity was mentioned as a household need in 37 responses and a village need in 41 responses. Of the 107 people surveyed 71 responses indicated their expectation for the proposed project involved getting access to electricity.

Access to Water

The main source of drinking water varies between townships. In Loikaw, Demoso and Pekon, protected wells and springs are primarily used, whereas in Leiktho and Taungoo the main source is waterfall/rain and tubewells/boreholes respectively (Table 5.37). Of these water sources, protected wells and springs, piped water, tubewells, boreholes and rain are considered improved water sources by UNICEF and WHO (2012) and are protected from outside contamination.(Plate 5.43)

Table 5.37: Source of Drinking Water

	Taungoo	Yedashe	Leiktho	Pekon	Demoso	Loikaw
Protected well/spring	20.0%	26.6%	0.7%	32.7%	34.7%	25.3%
Tap water/piped spring	2.1%	1.1%	13.8%	8.9%	10.4%	20.9%
Bottle water/water purifier	8.7%	1.8%	-	3.9%	1.5%	17.5%
Unprotected well/spring	10.8%	11.7%	1.7%	10.0%	24.6%	17.1%
River/stream/canal	2.4%	7.9%	38.9%	5.6%	9.2%	5.7%
Other	3.1%	6.2%	0.9%	9.0%	2.2%	5.6%
Tube well, boreholes	52.8%	44.0%	<0.1%	2.1%	4.2%	4.9%
Waterfall/rain	<0.1%	0.3%	42.5%	26.8%	8.1%	1.6%
Pool/pond/lake	0.2%	0.4%	1.5%	0.8%	4.3%	1.3%
Tanker/truck	<0.1%	-	-	0.2%	1.0%	0.2%

Source: Census (2014)

Villages within hilly areas have water access from spring sources, while it is common for villages in other areas to experience water shortages, particularly in summer (JICA 2016).

The socio-economic survey identified that the majority of respondents have piped water, which is often sourced from streams and stored in tanks. Other sources of water include collecting it directly from streams and purchasing water. Approximately 65% of respondents consider the water quality as good, 22% as average, and 12% as poor.

Solar Panel in Yar Do Village

Information Board for an Existing Electrification project in Yar Do Village

Existing Transmission Tower in Ma Sa Village

Electricity Infrastructure at Law Pi Ta Village

Existing Electricity lines in Kaw Bat Chan Village

Existing Electricity Lines in Kyay Min Village

Plate 5.42: Existing Electricity Infrastructure in the Project Area

	
Protected Well at Kaw Bat Chan	**Tubewells Water at Ma Sa Village**
	
Drinking Water Bottle at Soun Du Village	**Protected Well at Tar Moe Taung Village**

Plate 5.43: Water to Access in the Project Area

Sanitation and Waste Management

People living in Loikaw Township within the sewerage service area generally use on-site disposal systems such as septic tanks and pit latrines (JICA 2016). The socio-economic survey of 107 households in 11 villages along the proposed route identified that of these, the majority (87%) used septic tanks, with the remainder (13%) using open pits.

The socio-economic survey identified the solid waste management systems used by the villages. Of the 11 villages, seven burn their waste, three villages burn their waste and have a regular waste collection system, and one village buries their waste and uses a regular waste collection system. (Plate 5.44).

Septic Tanks at School (Ma Sa Village)

Pit Latrines at Village

Septic Tanks at School (Yar Do Village)

Pit Latrines at Village

Waste Management Signboard

Rubbish Bin on the Road

Plate 5.44: Sanitation and Waste Management at Project Area

5.8.7. Economic Environment

Economic Activity

Table 5.38 provides 2014 census data that gives an indication of the proportion of the population economically active and inactive, and the type of employment in the townships the proposed transmission line route passes through.

Table 5.38: Economic Activity

	Loikaw	Demoso	Pekon	Thandaunggyi	Leiktho	Yedashe	Taungoo
Economically active	**61.1%**	**61.3%**	**70.9%**	**54.6%**	**57.2%**	**55.7%**	**50.8%**
Sought work	7.9%	2.2%	1.0%	2.7%	-	3.3%	2.1%
Employer	1.8%	1.1%	2.3%	0.7%	-	4.5%	2.1%
Employee (government)	6.6%	3.2%	3.0%	3.3%	-	8.1%	5.6%
Unpaid family worker	9.3%	19.3%	24.0%	11.4%	-	15.5%	4.9%
Employee (private)	12.2%	7.0%	5.2%	4.2%	-	29.3%	18.4%
Own account worker	23.4%	28.5%	35.4%	32.3%	-	39.2%	17.7%
Economically inactive	**38.9%**	**38.7%**	**29.1%**	**45.4%**	**42.8%**	**44.3%**	**49.2%**
Did not seek work	0.3%	0.5%	0.1%	0.4%	-	0.7%	0.3%
Ill, disabled	0.7%	0.9%	0.5%	0.8%	-	1.9%	0.7%
Other	2.3%	1.2%	1.5%	2.6%	-	11.6%	5.0%
Pensioner, retired, elderly	4.7%	4.2%	2.6%	3.7%	-	11.3%	6.3%
Household worker	13.5%	13.3%	5.8%	19.8%	-	45.3%	21.6%
Full-time student	17.4%	18.6%	18.5%	18.2%	-	29.2%	15.3%

Source: Census (2014)

Employment and income

Employment

In all townships that the proposed transmission line passes through, the main industry of employment for people aged 15 to 64 is agriculture, forestry and fishing. The proportion of employed people in this industry in Demoso (80.5%), Pekon (82.5%), Leiktho (87.9%) and Yedashe (58.1%) was greater than the more urban Loikaw and Taungoo townships, at 47.9% and 32.7%, respectively. In Loikaw and Taungoo the second most common industry was wholesale and retail trade, and repair of motor vehicles and motorcycles, at 10.8% in Loikaw and 13.8% in Taungoo (DOP 2015-2016).

The GAD in Loikaw Township reported that in 2015, 44.1% of the Loikaw workforce were in the agriculture industry, 26.0% casual laborers, 13.6% in the livestock industry and 7.39% as government employees (JICA 2016).

Most socioeconomic survey respondents were self-employed (81 respondents) or wage workers (48 respondents). The remainder were seasonal workers (30 respondents) and employees (nine respondents. Note that 55 respondents reported having two or three forms of employment. The type of employment largely involved crop farming and working in gardens.

Income

The socio-economic survey recorded reported income over the previous year and the previous two weeks. Sources of income reported in the socio-economic survey included income from garden produce, animals, cash crops, wage work and handicrafts, among others. Overall, income ranged from 112,000 MMK to 7,000,000 MMK over the previous year, averaging 1,765,788 MMK per household surveyed. Household income in Myanmar averaged 3,470,000 MMK in 2017 quarter 1 (CSO, UNDP and WB 2020).

The socio-economic survey indicated in the previous year 51 households earned income from garden produce. This ranged between 150,000 and 3,000,000 MMK. In the two weeks prior to the survey, 16 households earned income from garden produce, ranging from 2,000 to 800,000 MMK.

In the last year, 42 households earned income from cash crops. In the two weeks prior to the survey 20 households earned income from cash crops. Common cash crops reported include cardamom, coffee, jengkol, turmeric and betel nut. (Plate 5.45)

Land Ownership

The socio-economic study surveyed 104 households regarding land ownership and use. Of these households, all but four owned their own land. Over a third of these households own agricultural land, and just under a third own ancestral land. Table 5.39 summarises land ownership of surveyed people.

Table 5.39: Land ownership

Land ownership documents	Number of responses
Agricultural Land	35
Ancestral Land	29
Grant Land	18
Residential and Agricultural land	8
Residential Land	10
Total	100

Of the 104 people surveyed, land was primarily used for residential or agricultural purposes, or more commonly, a combination of both (Table 5.40).

Table 5.40: Land use

Land use	Number of responses
Residential	23
Residential and agricultural	45
Residential, agricultural and animal raising	7
Residential and animal raising	2
Agricultural	26
No response	1
Total	104

Land Use, Agriculture, Forestry and Fisheries

In Loikaw township, 54,773 acres, or 14% of the total area, is cultivated. Of this land, 36,148 acres are used for rain-fed rice, 18,256 acres are used for flooded rice, and the remaining land is used for orchards and rain-fed land, usually in hilly areas and used for rotational crops (JICA 2016).

Near Loikaw, subsistence farming is common, including irrigated rice on lowland alluvial plains and cash crops (such as sesame, maize or pigeon beans) and rice in highland areas (Lanjouw 2015). In the highland areas, access to communication infrastructure limits accessibility to markets and the viability of growing cash crops. In addition to farming, economic activity in the area also involves animal breeding, hunting, fishing and crafts (Lanjouw 2015).

Land Use in the project area is presented in Figure 5.19.

Tourism

In 2019, tourism was reported to be a growing industry in Myanmar, with 3.4 million international visitors in 2017, primarily from Thailand, China and Japan (OBG 2019). In 2014, 505,000 (1.8% of total employment) in Myanmar were estimated to be directly related to travel and tourism (Noakes et al. 2017).

There are six main tourism destinations in Myanmar, including Lake Inle, located approximately 100 km from Loikaw. Loikaw is also considering an emerging area for tourism, with cultural attractions including pagodas and ethnic heritage buildings (MCRB et al. 2015). The limestone terrain near Demoso is host to several karst landscapes, including several caves which are a site for research and ecotourism (Myanmar Caves 2016).

	
Crops at soil and landform survey site 2A	**Sugarcane farm at soil and landform survey site 3**
	
Farmland and livestock at soil and landform survey site 8	**Produce at Ka Saw Pa Lo Village**
	
Produce at Kyay Min Village	**Produce at Saung Du Village**

Plate 5.45: Farmland, Cropland and Crops along the Proposed Route

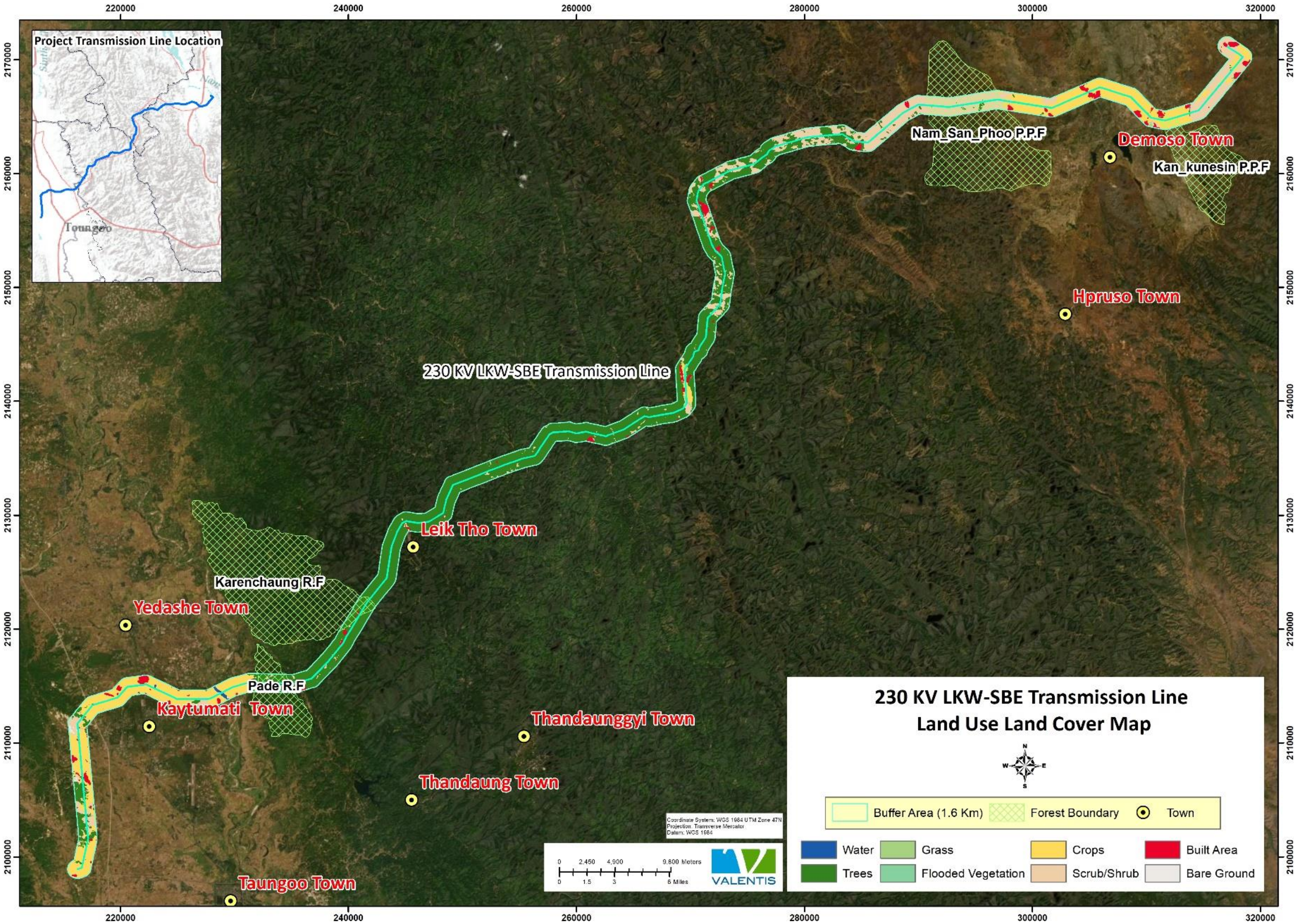


Figure 5.19: Land Use and Land Cover Map in the Project Area

5.9. Cultural Heritage

Myanmar has rich cultural heritage reflecting its complex history, however the investigation, documentation, management and conservation of cultural heritage in Myanmar is limited. Archaeological sites in Myanmar have often been neglected or politicised (Facchinetti 2014). Myanmar is a ‘State Party’ to the UNESCO World Heritage Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO, 1972). As a State Party, Myanmar has a duty to ensure the identification, protection, conservation, presentation and transmission to future generations of the country’s cultural and natural heritage. Myanmar legislation applicable to cultural heritage management includes The Protection and Preservation of Ancient Monuments Law (2015) and The Protection and Preservation of Antique Objects Law (2015). Under these pieces of legislation an ‘ancient monument’ means “building sites, lived, made, used and built by human beings including geological environments where fossils of over one hundred years old are found above or under the ground or above or under the water;” and an ‘antique object’ means “objects which are used by human beings including fossils over 100 years old in above or under the ground or in above or under the water.” Key requirements of both laws include informing the relevant Ward or Village-Tract Administrative Office when a known (or reasonably suspected to be) ancient monument which has no owner or custodian is found.

A number of cultural heritage sites of interest exist within the project area. Unknown cultural heritage or archaeological sites may also exist along the proposed transmission line route. Pre-construction surveys will be implemented prior to clearance and construction activities to further characterise the existing cultural heritage environment. Taungoo was the capital of the Toungoo dynasty until 1540 and cultural heritage sites from this period remain, including the ruins of moats and official buildings.There are 93 pagodas and 99 monasteries in Loikaw Township (JICA 2016), as well as two museums, the Ethnic group Museum and Kachin State Cultural Museum. The socio-economic survey identified several religious institutions across the villages surveyed. (Table 5.41). A selection of these is shown in Figure 5.20 and Plate 5.46.

Table 5.41: Recorded Religious Institution across the Villages

No.	Religious Institution	Lattitude	Longitude
1.	Church at Leik Tho	19°13'51.82"N	96°34'49.10"E
2.	Pagoda at Leik Tho	19°13'7.02"N	96°35'1.63"E
3.	Church at Leik Tho	19°13'6.38"N	96°34'54.57"E
4.	Church at Kaw Bat Chan	19°10'5.77"N	96°32'4.83"E
5.	Church at La Bat Inn	19°14'4.90"N	96°34'21.18"E
6.	Church at Kyay Min	19°16'7.43"N	96°37'1.31"E
7.	Church at Ka Saw Pa Lo	19°17'16.19"N	96°40'18.67"E
8.	Religious place	19°18'30.79"N	96°43'46.52"E
9.	Church at Yar Do	19°21'29.74"N	96°48'10.57"E
10.	Pagoda	19°33'54.32"N	97°11'21.88"E
11.	Ngwe Taung Dam	19°33'4.82"N	97°10'5.43"E
12.	Church at Saung Du	19°32'23.26"N	96°56'57.59"E
13.	Kayan Matyrs' Mausoleum	19°28'53.04"N	96°49'32.65"E

Saint Joseph Church in Kaw Bat Chan Village

Mother of God Church in Saung Du Village

Sacred Heart Church in Yar Do Village

Plate 5.46: Religious Institutions Around Project Area

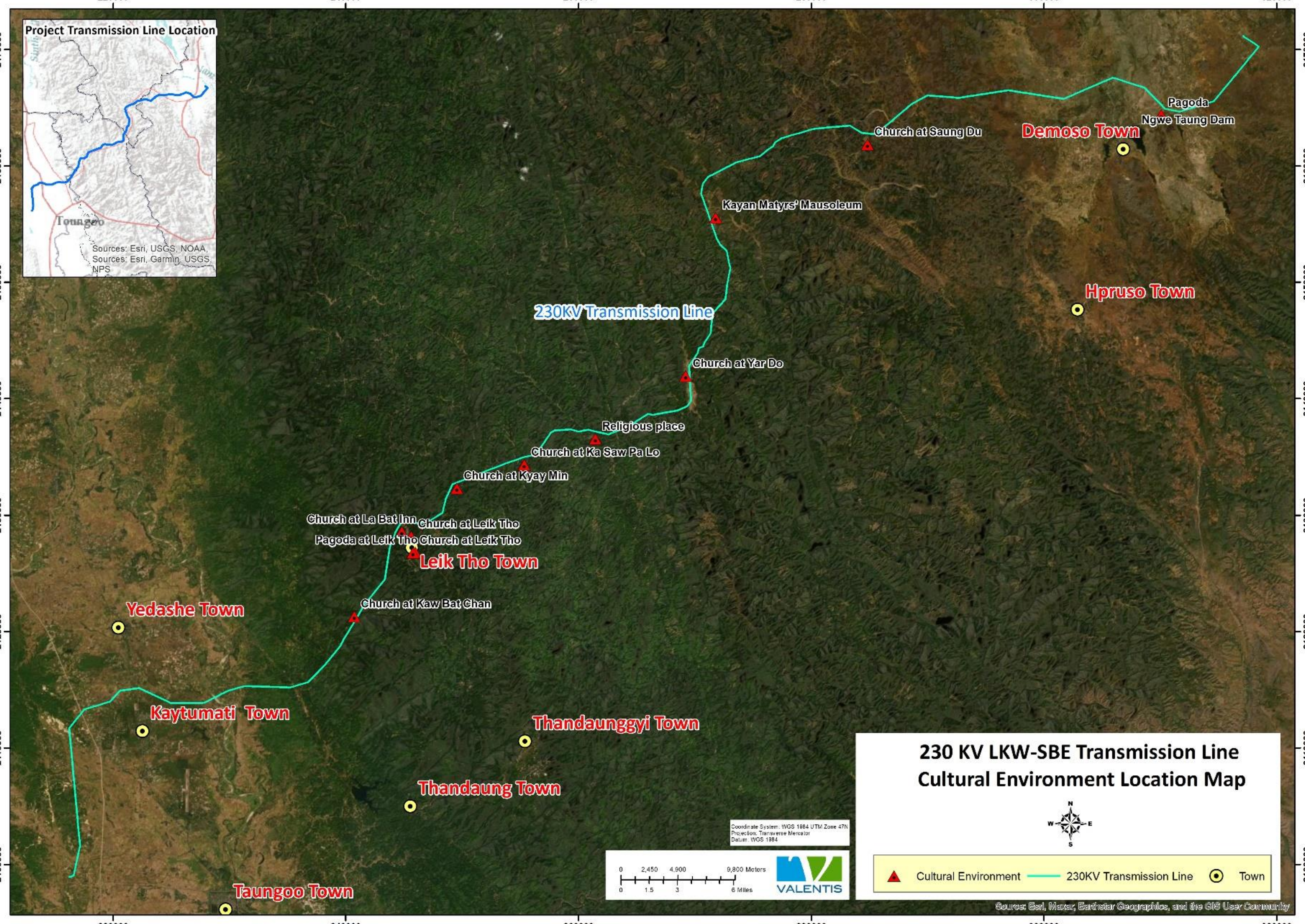


Figure 5.20: Some Religious Institutions along the Project Area

5.10. Security

Regional

Regional security, conflict and vulnerable parties in the project area require assessment in the social impact assessment proposed for the Project as part of the IEE. The project area has experienced long-term social conflict which has impacted the lives and livelihoods of residents. Many thousands of people have left the state in the past 60 years.

Most of the proposed transmission line route passes through Kayin and Kayah states, which have a history of conflict and Tatmadaw (military) presence. Long-term social conflict has impacted the lives and livelihoods of residents in the area with many people having moved away. Historically, sub-national conflict in Loikaw township has been associated with the development of hydropower dams, notably the Baluchaung hydropower dam in the 1950s (The Asia Foundation 2017). The construction of the Baluchaung hydropower plants involved confiscation of land and consequent conflict with landowners (JICA 2016).

Ethnic armed organisations (EAOs) are present in four of the six townships the proposed transmission line route passes through: Loikaw, Demoso, Thandaunggyi and Taungoo. These four townships are known to have land mines present (MIMU 2016), which is discussed further with respect to project security in the following subsection. The dominant EAOs in these townships are the Karenni National Progressive Party in Demoso and Loikaw, the All Burma Student's Democratic Front and Karen National Union in Thandaunggyi, and the Karen National Union in Taungoo (The Asia Foundation 2017).

EAOs generally pursue state autonomy, and consequently clash with the Tatmadaw or other EAOs. In order to reduce conflict, a nationwide ceasefire agreement (NCA) was developed and signed by several EAOs in 2015. Despite EAOs in these townships having signed bilateral ceasefire agreements or the NCA, there were up to six armed clashes in the Thandaunggyi township between 2015 and 2016 (The Asia Foundation 2017). Between 2019 and 2020 there were 18 protests in the townships the transmission line passes through (CSP Analytics 2021). In January 2019 two police officers were shot along the Lawpita Highway in Demoso (CSP Analytics 2021). There is currently heightened unrest in Myanmar associated with events which occurred on 1 February, 2021. There is a correlation between conflict and altitude, with more frequent conflict in high elevation areas (The Asia Foundation 2017).

Project Area Security

Land mines have been used by the Myanmar Tatmadaw to protect state-owned factories, bridges and transmission line towers, with warning signs erected (Myanmar News Agency 2016). Demarcation of hazardous areas near towers is reported to be inconsistent in Kayah State (Fasth and Simon 2015), and land mines placed by insurgent groups are unlikely to be marked out.

Land mines are believed to have been placed by Myanmar authorities in the area surrounding the Baluchaung Dam, with local residents required to guard nearby transmission line towers (The Asia Foundation 2017). The existing transmission line between Baluchaung (2) hydropower plant and Taungoo was protected from insurgents by the installation of landmines around tower bases, with timber fences erected around the towers and landmines, and local residents required to guard the towers (JICA 2016). Despite this, insurgents have caused tower collapses with the placing of further land mines. Since commissioning of the existing transmission line in 1960, tower collapse due to land mines has occurred 54 times, including seven times between 2000 and 2009 and five times between 2010 and 2016 (JICA 2016).

Landmines are reported to have been placed in the surrounding forested areas, and there have been several incidents reported of death or injury of people and livestock caused by landmines. In 2012, two children were killed by a land mine beneath a transmission line tower along the existing Lawpita to Taungoo Transmission line (The Irrawaddy 2012). The exact locations of remaining landmines are reported to be unknown, and according to JICA (2016) would require the land to be surveyed and landmines to be destroyed by the Ministry of Defence. The proposed transmission line route overlaps with some sections of the existing line and closely follows in other parts.

Chapter 6

6. Environmental and Social Impact Assessment and Mitigation Measures

This section identifies the potential impacts from project activities on the environmental and social aspects and recommended mitigation measures based on the considerations of baseline survey reported earlier in this report (Chapter 5). Potential impacts for preconstruction, construction, operation, and decommission phases have been assessed in accordance with the impact and assessment methods mentioned in this section. While identifying the key features, the section also discusses the type and range of impacts likely to result from the different project activities, measuring its extent and severity and proposed mitigation measures.

The main aims of Impact Assessment are to inform decision-makers of the environmental effects of the Scheme on people and the environment, and to minimize the adverse effects of a project. The project impact assessment is undertaken with the following specific objectives:

(i) To identify, predict and evaluate the physical, environmental and socio-economic impacts of development activities

(ii) To determine environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures to avoid or reduce the significance of negative impacts

(iii) To provide information on the environmental consequences for decision making

(iv) To prepare an Environmental Management Plan for the project

6.1. Phase of the Project

Potential impacts of the project are generally identified for three phases; construction phase, operation phase and decommissioning phase.

Pre-Construction and Construction Phase: In this phase, the activities will involve site clearance and access road construction (where required), grading and excavation of soils for foundation installation, transportation of materials to each tower site, and building of foundations and anchors prior to assembly and installation of towers. Once assembled and installed, the transmission line is strung between the towers. The construction of a transmission line involves both long-term and temporary impacts. Long-term impacts can exist as long as the line is in place and include land use restrictions, loss of woodland, and aesthetic impacts. Temporary impacts occur during construction or at infrequent intervals such as during line repair or ROW maintenance. They can include noise or crop damage during construction. Short-term impacts can become long-term impacts if not properly managed or mitigated.

During the stage of the construction works deterioration of air quality and increase of noise levels often occur as a result of, among others, mobilization of vehicles and machinery and loading and unloading and transporting of materials. These impacts do not necessarily occur only at the construction sites, but can take place near the transport routes. Water may also be contaminated as a result of civil works. Nevertheless, the impacts are generated by this stage are temporary and thus considered to be manageable. No significant environmental impacts on the surrounding water bodies are expected at this stage.

Operation Phase: During the operation period, the Project will contribute to efficient transfer of power from existing and future hydropower projects in Kayah State including hydropower schemes on the Baluchaung River and Nam Pawn River. The existing 500 kV Sabakywe substation will be key in transferring future large-scale generation in the north of Myanmar to the southern and Yangon area.

The Loikaw substation, where the proposed transmission line starts will support access to electricity in Kayah State and meet future demand in the region. No significant impacts on physical environment are expected at this stage. During operations, collisions with operating transmission lines may result in electrocution and fauna mortality. Impacts to IUCN listed threatened species are expected to be limited to individuals and are predicted to be of moderate magnitude to the overall population of affected fauna species.

Decommissioning Phase: This is the final phase of the project, and it will be end in relation to the conditions as stated in the investment contract. Decommissioning would require the use of equipment such as backhoes and pile drivers to break up and remove existing asphalt and concrete, heavy equipment such as cranes, bulldozers, and excavators, and heavy trucks to haul away large amounts of debris. Where needed, any existing hazardous materials used in construction of these buildings would be properly handled and disposed of in accordance with governing authority requirements. In case of closing, the company has to have a close out plan before ending operation immediately so that the environmental and socio-economic impacts could be mitigated.

6.2. Methodology of Assessment

The assessment of each impact is based on consideration of the magnitude, duration, extent and probability of activities, which are going to be carried out during two phases and characteristics of the project site. The assessment is qualitative and the significance of each impact is classified into five categories.

The following methodology has been applied to assess the environmental impacts of the project mainly on air, water, soil, biodiversity including human beings and waste generation. Each source of impact has been assessed by four parameters; magnitude, duration, extent and probability and each assess have five scales as mentioned below Table 6.1.

Table 6.1: Impact Assessment Parameters and Its Scale

Assessment	**Scale**				
	1	**2**	**3**	**4**	**5**
Magnitude (M)	Insignificant	Small and will have no effect on working environment	Moderate and will result in minor changes on working environment	High and will result in significant changes on working environment	Very high and will result in permanent changes on working environment
Duration (D)	0-1 year	2-5 year	6-15 year	Life of operation	Post Closure
Extent (E)	Limited to the site	Limited to the local area	Limited to the region	National	International
Probability (P)	Very improbable	Improbable	Probable	Highly probably	Definite

Then, the Significant Point (SP) is calculated by following formula.

Significant Point (SP) = (Magnitude+ Duration+ Extent) * Probability

Impact Significance: Based on calculated significant point, impact significance can be categorized as follow Table 6.2.

Table 6.2: Impact Significance

Significant Point (SP)	Impact Significance
<15	Very Low
15-29	Low
30-44	Moderate
45-59	**High**
>60	**Very High**

6.3. Positive Impacts

Pre- Construction and Construction Phase

Employment Opportunities**:** the pre-construction and construction activities of the project will create employment and job opportunities for the different professionals involved in respective activities such as (1) Aluminum alloy conductors to carry electricity. (2) Steel Pole and lattice towers to support the conductors. (3) String Insulators to connect the conductors to the towers. (4) Ground wires for lightning protection. These include engineers, electrical experts, landscaper and gardeners, supervisors, masons, truck drivers and crane operators and other positive impact such as creation of local employment is predicted.

Business Opportunities**:** the pre-construction and construction activities of the project will create business opportunities for the contracting company that will construct the towers and transporting the construction materials. Additionally, transportation companies will also benefit from being contracted to transport equipment and materials from the project. All of these contractors' income will be taxed; therefore, it generates income for the government and leads to development of the country.

Operation Phase

Business Opportunities**:** the operation activities will contribute improved electricity supply and more stable electricity service in rural area and also support the quality of livelihoods of local people.

Decommissioning Phase

Employment Opportunities*:* the decommissioning activities of the project will create employment and job opportunities for the different professionals involved in respective activities such as demolition the towers, uninstallation the machines and equipment, transportation of demolished materials and wastes and keeping the landscape after project closure. These include engineers, demolition experts, landscaper and gardeners, supervisors, masons, truck drivers and crane operators.

Business Opportunities**:** the decommissioning activities of the project will create business opportunities for the contracting company that will demolish the buildings and transporting the demolished materials and wastes. Additionally, transportation companies will also benefit from being contracted to transport equipment and materials from the project. All of these contractors' income will be taxed, therefore, it generates income for the government and leads to development of the country.

6.4. Negative Impacts

6.4.1. Impacts on Air Quality

***Pre- Construction and Construction Phase*:** the main sources dust emissions from the proposed project are construction works, vegetation clearance and project vehicle movements. Earthworks and ground disturbance may generate dust. Traffic along unsealed roads may generate dust. $PM_{2.5}$ may be present in transient and short-term vehicle and machinery emissions during construction. On the other hand, the main sources of gaseous emissions like CO, SO_2, and NO_2 are transient and short-term vehicle and machinery emissions during construction. NO_x formed by corona activity is unlikely to be at detectable concentrations for a 230 kV transmission line (CPUC 1999). VOC emissions will be minor due to the small amounts of fuel stored and transferred as part of the project. VOCs are not expected to be generated in sufficient quantities to cause air quality impacts. Ozone formed by corona activity is unlikely to be at detectable concentrations for a 230 kV transmission line (CPUC 1999).

***Operation Phase**:* The operation of transmission lines does not usually result in significant air emissions (IFC 2007a), and air quality impacts are expected to be negligible during operation of the transmission line.

Decommissioning Phase: The main sources of dust emissions can be improper demolition the existing towers, operating trucks for transporting demolished materials and wastes. Furthermore, gaseous emissions from trucks for transporting demolished materials and wastes and decommissioning machines can also be anticipated during the decommissioning phase of the project.

6.4.2. Impacts on Noise and Vibration

***Pre- Construction and Construction Phase*:** Potential sources of noise and vibration during construction of the transmission line includes:

- **Construction-related traffic**. This includes traffic transporting materials to and around tower construction sites and laydown areas.
- **Site preparation**. This includes vegetation clearance, and the construction of foundations and access roads.
- **Tower construction and conductor stringing**. This includes equipment and machinery.

The typical noise level of construction equipment that may be used during project construction is outlined in Table 6.3. These are indicative noise levels of equipment that may be used. Noise levels of actual equipment used for the project may vary. Vibration levels generated by project activities are not expected to be significant. An indicative list of the major equipment required by project teams is outlined in Section 2.3.2.

Table 6.3: Typical Noise Level of Construction Equipment

Equipment	Typical noise level range at 15 m from the source (dBA)
Earth moving (e.g., front loaders, backhoes, tractors, scrapers, pavers, dozers and trucks).	72-96
Materials handling (e.g., concrete mixers and pumps, cranes and forklifts).	75-88
Stationary equipment (e.g., pumps, generators, compressors and drill rigs).	69-86
Impact equipment (e.g., pneumatic tools, jack hammers, rock drills and compactors).	81-98

Source: Adapted from CPUC (1999)

Construction is expected to occur at several sites concurrently, as there will be several teams working on foundation construction, tower erection and stringing. While the schedule hasn't yet been completed, each 6.4 km stretch of transmission line (approximately 20 km) is anticipated to take 1,680 hours in total.

Construction-related traffic noise may occur intermittently along the Loikaw-Taungoo road throughout the construction period. Trucks, including 10-wheelers, can be seen travelling on this road. It is not widely used due to the security concern of landmines in the area (WFP 2017) with a 2017 report stating approximately 40 vehicles used this road per day (JICA 2017). Project traffic is not expected to significantly increase the amount of traffic travelling on this road. This impact is assessed as negligible and is not discussed further.

Operation Phase*:* Potential sources of noise during operation of the transmission line includes:

- **Corona noise**. Corona noise is a crackling or humming sound that may emanate from transmission lines in association with corona discharge. Corona discharge is an electrical discharge caused by ionisation of the air surrounding a transmission line (CPUC 1999). Corona noise becomes a significant issue on transmission lines greater than 350 – 500 kV (EirGrid 2016) and is usually not noticeable on 230 kV lines (CPUC 1999). Corona noise is expected to be greatest during rain. Measurements of noise associated with a 230 kV transmission line in the USA determined L50 (noise level exceeded 50% of the measured time) during rain was 45.5 dBA 15 m from the line, and 41 dBA 32.2 m from the line (Chartier et al. 1995, as cited in EirGrid 2016).

- **Maintenance noise**. This is noise associated with intermittent maintenance and repairs of the transmission line throughout its operational life. This may involve noise associated with vegetation removal along the ROW, machinery and vehicles.

- **Aeolian noise**. This is noise generated by wind as it blows over transmission lines or through transmission towers and infrastructure (EirGrid 2016). This is not as common as corona noise and to occur, high winds must be blowing from a specific direction relative to the infrastructure. Often the noise generated is masked by the noise of the wind or any associated rain (EirGrid 2016). As this is uncommon and not likely to be noticeable, aeolian noise is not considered further.

Decommissioning Phase: operating heavy-duty demolition machines and equipment can generate noise mainly and other sources are uninstalling existing machines and equipment of the project as well as transporting these machines and equipment. Moreover, transportation vehicles for demolished materials and waste can also cause noise pollution during the decommissioning phase of the project.

6.4.3. Impacts on Hydrology, Hydrogeology and Water Quality

Pre- Construction and Construction Phase*:* Vegetation clearing, and earthworks will be required for the construction of the transmission line towers and access roads. High rainfall can cause erosion of disturbed areas of bare ground which may generate sediment-laden runoff. This runoff would follow natural drainage patterns and may enter surface watercourses such as the Sittaung River. This could impact surface water quality, resulting in increases in total suspended solids and turbidity. This is expected to be a temporary impact at the location of tower sites, estimated to last for approximately a month at each site.

Increased sediment in watercourses (i.e. due to increases in sediment-laden runoff) may cause changes in the form and behaviour of the watercourse, resulting in changes to surface water flow. Increased sediment may cause increased downstream sedimentation and subsequent changes in deposition and erosion patterns. Sediment deposition is less likely to occur in the highland channels than low-energy lowland channels which favour deposition, and significant sediment is not expected to be generated by temporary construction activities.

Groundwater and surface water features may be impacted from accidental spills or leaks of hazardous materials and wastes from project equipment, vehicles and waste management areas. These materials and wastes may include fuels, oils, lubricants and solvents. Inappropriate disposal of rubbish may release toxic substances into soil or water or increase nutrient loads. Contaminants may seep into groundwater or surface water features.

Operation Phase: Operation activities that may affect the surface water and groundwater values include:

- Accidental spills and leaks to land.
- Physical disturbance to land features including vegetation clearing and erosion.

Accidental spills and leaks to land may occur during operation in association with project equipment and vehicles required for maintenance. The impact pathway during operation is the same as construction, and it is not expected that hazardous materials will be stored or used along the operational transmission line.

Local hydrological conditions could be altered as a result of changes to drainage patterns and connections between surface water features caused by construction of access roads. This may alter surface water quantity, depending on the degree of changes to drainage and runoff.

Potential impacts on groundwater quality during operation of the transmission line are unlikely.

Decommissioning Phase: Groundwater quality can be contaminated due to sewage discharged at the toilets by decommissioning workers and oil spill and leakage from decommissioning machines and trucks for transporting demolished materials and waste. Moreover, direct disposed of demolished materials and wastes to the drainage system can disturb water flow and pollute water during the decommissioning phase of the project.

6.4.4. Impacts on Landform and Soil Values

This section describes the potential impact to landform and soil values that may occur during construction and operation because of project activities.

Pre-Construction and Construction Phase: Pre construction and Construction of the Project will cause physical disturbance to land features, including vegetation clearing and earthworks, and may result in contamination of soils due to accidental spills and leaks of hazardous materials (e.g., fuel).

The potential impacts project activities may have to the identified values include:

- **Physical disturbance of landforms and soils:**
  - Reduced landform stability due to ground disturbance.
  - Direct loss of soil and changes to landform due to earthworks.
  - Loss of topsoil/humus due to increased erosion and disturbed land (vegetation clearance).
- **Contamination of soils:**
  - Reduced capacity to support plant growth due to contamination of soils.

Ground will be disturbed during vegetation clearing and earthworks required constructing the transmission towers and line. Considering a working area of up to 400 m^2 is required for construction of each transmission tower (including the 100 to 169 m^2 foundation footprint area), the total working area to be disturbed for construction of the towers is up to 196,000 m^2 (0.196 km^2). The construction of access roads will also require the compaction of soils to achieve a suitable surface for the operation of vehicles and plant. Additional disturbance will be associated with the working and laydown areas, access roads and disturbance where vehicles travel along the ROW.

Ground disturbance may lead to landform instability, with the potential to cause increased erosion or slope failure. Any instances of increased erosion or reduced stability are likely to be localised in nature, isolated to the areas of ground disturbance. These changes are likely to be permanent and to have higher intensity in the hilly terrain than on the alluvial plains due to the steeper slopes and greater amount of vegetation clearance (i.e., more natural vegetation location in the hilly terrain).

Earthworks associated with project construction may result in direct removal of soil and subsequent changes to the landform, reducing the soils capacity to support growth. This impact is expected to be localised to areas of earthworks and either temporary during construction or permanent where infrastructure is placed.

Ground disturbance and vegetation removal may result in increased erosion and loss of topsoil and humus in areas of disturbance. This can reduce the soils capacity to support growth and may occur temporarily during construction or permanently where infrastructure is placed. The impact is expected to be localised to areas of disturbance throughout the project area.

Spills and leaks of hazardous materials and wastes from project equipment, vehicles and waste management areas could occur during construction activities. These materials and wastes may include chemicals, fuels, oils and lubricants. Inappropriate disposal of rubbish or waste from bathroom facilities may also release toxic substances into soil, increasing nutrient loads or bacteria. These will likely be localised events and contamination is expected to be short term. A site-specific hazardous material management and spill response plan will be established for the Project which will outline the procedures to be undertaken in response to any spills and leaks of hazardous material on site. Management measures will also be in place to minimise the chance of a spill or leak occurring.

Operation Phase*:* After construction is complete, further impacts to landform stability are not anticipated to occur. Ongoing minor erosion from sites that were unable to be revegetated (i.e., within the ROW adjacent to the base of the transmission towers) may occur. Ongoing inspection and maintenance will be undertaken throughout operation of the transmission line to identify and address any observable erosion occurring at transmission tower sites.

Contamination of soils may occur during operation in association with maintenance activities. Minor spills and leaks of hazardous material may occur from project equipment or vehicles. Impacts associated with these events are expected to be localised and short term. The hazardous material management and spill response plan will be implemented throughout operation of the transmission line. Other management measures to be implemented to minimise the risk of contamination of soils are presented in Section 6.5.

Decommission Phase: Phase Temporary soil contamination due to oil leakage that may be caused from using fuel for heavy machines and vehicles. However, the amount of oil use is limited and impact is considered to be insignificant.

6.4.5. Impacts of Solid Waste Generation

Pre- Construction and Construction Phase: Solid waste produced from the manufacturing processes of the proposed project includes rejected materials (window and door profiles) as well as residual bags and cans of raw materials. General waste and excreta will be generated from base camp site. such as Domestic waste, including (1) food scraps, plastic packaging and water bottles. (2) Paper and cardboard packaging (3) Scrap metal, electrical wire or other components. however, domestic solid waste from office, meeting rooms, security houses, dining area, Beno Cafe (canteen) and dormitory can be considered. On the contrary, daily domestic solid waste generation is 5 kg per day during the operation phase of the project. However, rejected materials are recycled by crushing, powdering and reused as raw materials, rejected profiles are stored temporarily at temporary storage places before crushing and powdering. It is predicted that construction waste such as soil and deforestation trees are generated.

Operation Phase: Solid waste produced from the manufacturing processes of the proposed project includes rejected materials as well as residual bags and cans of raw materials. However, rejected materials are recycled by crushing, powdering and reused as raw materials, rejected profiles are stored temporarily at temporary storage places before crushing and powdering. Therefore, only bags and cans of raw materials are produced as operation solid waste from the project.

Decommissioning Phase: The main sources of solid waste are demolished waste such as electrical wire, scrap metal, steel and other components. General waste and excreta will be generated from demolition camp site.

6.4.6. Impacts of Liquid Waste Generation

***Pre- Construction and Construction Phase*:** Turbid water will be generated at lakes and surface water near the camp site due to civil work and installation of transmission lines. It is estimated that approximately 15 gallons of graywater and 0.3 gallons blackwater will be generated per person per day. Total 800 gallons of graywater and 16 gallons of black water will be generated per day. Greywater produced will be treated and stored in greywater collection tank by using the short retention system and then will be reused for toilet flushing, car and floor cleaning in order to reduce project water demand. There is no possibility of being discharged organic wastewater at an installed base camp site.

Negative impact for water quality will be occurred if construction waste is left for a long time illegally.

Operation Phase: there is no significant liquid waste generation in operation phase.

Decommissioning Phase: there is no significant liquid waste generation except from black waster from toilets of decommissioning workers. However, the time is very limited during the decommissioning phase of the project.

6.4.7. Impacts of Hazardous Waste Generation

Pre- Construction and Construction and Decommission phase: large spills or leaks of hazardous materials are an environmental hazard associated with the project. Relatively small volumes of hazardous material will be stored at project sites, so this is unlikely to occur. Management of waste including hazardous materials (fuel, oils, chemicals) is required during both construction and operation to manage any remaining risk.

Residual of raw materials (chemicals) as well as used oil and lubricants from the maintenance of vehicles and machines used in demolition activities can be considered as hazardous wastes during the decommissioning phase of the project.

Operation Phase: No notable impact is expected.

Decommissioning Phase: groundwater quality can be contaminated due to sewage discharged at the toilets by decommissioning workers and oil spill and leakage from decommissioning machines and trucks for transporting demolished materials and waste. Moreover, direct disposed of demolished materials and wastes to the drainage system can disturb water flow and pollute water during the decommissioning phase of the project.

6.4.8. Visual

Impacts to visual amenity are inherently subjective as the value or importance of visual landscapes may differ between people or groups based on individual perspectives. Visitors to the area are likely to be less impacted by changes than permanent residents, for example. Furthermore, impacts may be less significant in areas where visual amenity is already impacted by existing transmission lines. This assessment assumes people are moderate to visual changes in the natural landscape and will be negatively impacted, however it should be noted that changing views and landscapes may be perceived as positive by some individuals.

Pre- Construction and Construction Phase: During construction, visual amenity may be impacted by vegetation clearance and temporary construction works. Construction works will involve the use of project vehicles and other machinery, temporary lighting, temporary waste disposal sites and construction material storage areas, which may have a short-term impact on visual amenity of the area where works are taking place. Vegetation clearance will be permanent along the ROW, and temporary in laydown areas and other areas which aren't required to be cleared for safe operation of the transmission line.

Operation Phase**:** Vegetation will be permanently managed along the ROW and the transmission line will be visible from nearby settlements, permanently impacting the landscape. The visibility of the transmission line will be lowered with increasing distance from the line and may be screened by vegetation (outside the ROW) and topography. Existing transmission lines may also be visible from some of the settlements along the proposed route. Receptors closest to the transmission line will typically experience a greater degree of impact.

Decommission Phase: There is a possibility of temporary impact on visual because of the temporary waste disposal sites from base camps and demolition material from demolition process.

6.4.9. Occupational and Community Health and Safety

Pre- Construction and Construction, Operation and Decommissioning*:* For the Transmission Line construction, the workforce will be 880 workers. The nature of the activities means that there is the potential for accidents and injuries to occur if occupational health and safety systems are not developed and strictly enforced for all Project personnel. The potential impacts on the workers of the Project are likely to result from the construction activities including derrick, ROW, stringing of ground wire and line conductor, Project vehicle movement, falling objects, and working at height that may occur during the construction phase of the Project. These impacts are likely to increase in proportion to the increase in activity. Unplanned event (including falling of transmission tower, electric shock) could affect workers who are working directly or proximately to the Transmission Line. Impact during operation are limited compare to those identified for construction phase and include falling of transmission tower and electric shock.

6.4.10. Terrestrial and Aquatic Biodiversity

Potential impacts during the construction and operation phases are outlined in this section.

Pre- Construction, Construction, and Decommissioning Phase: Areas of native habitat, which may contain flora, and fauna of conservation interest, including those on the IUCN Red List, will be impacted by construction of the Project. The following impacts to terrestrial biodiversity may occur due to construction of the Project:

- **Habitat loss**
  - Permanent vegetation clearance will be required for tower bases and along the ROW, and for access tracks.
- **Habitat fragmentation and degradation**
  - Changes to the structure and quality of habitats due to vegetation clearance.
  - Edge effects.
  - Erosion.
  - Reduced air quality.
  - Contamination due to discharges or accidental spills and leaks.

  - Fire.
  - Introduction or spread of invasive species, pests and pathogens.

- **Disturbance or loss of flora and fauna**
  - Permanent removal of flora and less mobile fauna species during vegetation clearance.
  - Fauna mortality due to vehicle strikes from increased vehicle movements.
  - Construction dust, noise and light impacts.
  - Introduction or spread of invasive species, pests and pathogens.
  - Hunting and plant collection by project personnel or through opening up new areas to the community.

Impacts to surface water quality and quantity, as discussed in Section 7.2, may impact the health of aquatic ecosystems. The project may impact aquatic ecoregions and species of conservation significance through:

- **Habitat degradation**
  - Physical disturbance from clearing of riparian habitat and watercourse crossings.
  - Ground disturbance and erosion in construction areas, leading to increased sedimentation in run-off to waterbodies.
  - Contamination due to waste disposal, discharges or accidental spills and leaks
  - Introduction or spread of invasive species, pests and pathogens.
- **Disturbance or loss of aquatic flora and fauna**
  - Habitat degradation.
  - Permanent removal of flora during riparian and in-stream vegetation clearance.
  - Contamination due to waste disposal, discharges or accidental spills and leaks.
  - Introduction or spread of invasive species, pests and pathogens.
  - Fishing by project personnel or through opening up new areas to the community.

Potential impacts will depend on construction procedures, including the span between transmission towers, and the type of habitat which will require clearing or other types of disturbance at tower bases and along the ROW. Avoiding or minimising impacts to sensitive habitat will be undertaken by micro-siting of towers and poles. Pre-construction surveys will be implemented to check for sensitive flora, fauna and habitat immediately prior to construction and sensitive habitat avoided where possible through micro-siting and realignment of the ROW where necessary. Habitat destruction occurs during the construction of access roads, the clearing of power line servitudes and construction of substations. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds, breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat.

Operation Phase: Impacts during operation will be significantly less than during construction, with infrastructure established. The overhead transmission line may cause bird mortality through collisions and electrocution. Some maintenance of vegetation, e.g. trimming of taller trees, may be necessary within the ROW. Electrocution is a significant mortality factor among medium-sized and large birds.

Collisions are another significant threat posed by overhead lines to birds. Those that would be mostly impacted are bustards, storks, cranes and various species of ducks observed. These species are mostly heavy-bodied birds with limited maneuver ability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Habitat destruction is expected during the construction phase and maintenance of the transmission line and substation.

6.4.11. Culture Heritage

Potential impacts to cultural heritage sites or artefacts include loss or damage of the site or feature, or visual impacts altering the aesthetics of a culturally significant site.

Pre-Construction and Construction Phase*:* The transmission line route will be designed/adjusted to avoid known features, such as temples. This means it is unlikely that there will be any impact to known cultural heritage sites. Construction of the transmission line may temporarily impact the visual aesthetics of known cultural heritage sites as construction moves along the route.

Pre-construction surveys will be implemented to check for cultural heritage sites, prior to any construction or clearance. Micro-siting and realignment of the ROW will be undertaken where necessary to limit impacts to any identified sites.

Currently unknown cultural heritage sites or artefacts may be encountered during earthworks and ground disturbance. This is likely to be limited to any potential subsurface features not identified in pre-construction surveys. This may result in permanent damage or destruction of the features and complete or partial loss of its value.

Operation Phase: Operation and maintenance of the transmission line is not expected to physically damage any known cultural heritage features, including those discovered and appropriately managed during construction. Unknown sites are not expected to be encountered during operation or maintenance activities.

As for construction, the presence of the transmission line and towers may impact the visual aesthetics of known cultural heritage sites. The presence of existing infrastructure and their impacts to visual amenity should be considered when determining the final transmission line route.

Decommissioning Phase: Decommissioning of the transmission line may temporarily impact the visual aesthetics of known cultural heritage sites as construction moves along the route.

6.4.12. Socio-Economic

Project activities have the potential to impact on the social values of communities within the project area. Potential project-induced impacts on the three social values are described in Table 6.4.

The prime purpose of the Project is to deliver improvement to the electricity network and facilitate the transmission of electricity generated from hydropower projects on the Baluchaung River to other parts of Myanmar. At this stage, the Project does not plan to install distribution and service lines to local communities, limiting the benefits to local communities from the Project.

In relation to direct construction opportunities, while there may be some scope for local people to be engaged in short-term employment with the Project, construction of transmission towers and the stringing of conductors is a high-skilled activity with significant safety issues and the capacity to employ local residents may be limited. There may be the potential for local employment for ongoing maintenance and

vegetation clearance during operation of the transmission line, however this will depend on the skillset and availability of suitably skilled/qualified locals due to the safety requirements and skills required to undertake work around live transmission lines.

Table 6.4: Potential Project-Related Impacts to Social Values

Social value	Potential impacts
Support of quality livelihoods	**Alienation of land and associated habitat required for project infrastructure** Villagers and settlers near the transmission line corridor are still largely dependent on access to land and forest areas for livelihoods. Subsistence agriculture and cash crops are significant for the livelihoods of most villagers, and access to agricultural land is required for this. Hunting is undertaken by villagers, particularly across the Karen Hills. Any alienation of land required to develop the Project may have an adverse impact on villagers who are land-dependent for their livelihoods.
	Impairment of stream water quality due to construction sediment runoff The environmental integrity of watercourses and water bodies is important to sustain the harvest of aquatic fauna and flora for subsistence purposes. Small-scale fishing is undertaken in the Sittaung River system. If the Project disturbs ground near watercourses, there is the potential for disturbed soils to be carried in rainfall runoff (particularly during periods of high rainfall) and enter watercourses as sediment. Such changes may degrade water quality, particularly during construction, and for a period in operations until vegetation re-establishes on the disturbed areas.
	Requirement to relocate people away from project facilities and infrastructure Transmission line planning, including the siting of towers, laydown areas and access tracks, has sought to avoid disruption to existing settlement areas. In some locations, part of the settlement area may be required for accommodating the project footprint. Relocation of residences will be required if they are located within 75 feet (approximately 23 m) either side of the transmission line and where the transmission line cannot be realigned. Access may also be temporarily restricted in some areas during construction due to safety requirements. A resettlement plan will be required in the event that resettlement cannot be avoided by route selection.
	Increased local economic activity and income during construction During project construction, workers will need to be provided with services from villages along the route, including accommodation, food and consumables. This will provide people in the villages with some job and income opportunities during the construction period. There may be opportunities for local people to assist with project maintenance works and this would also provide income to those people.
Amenity of settlement areas (villages, informal settlements and urban residential areas)	**Construction activity disruption to village/settlement/urban residential life (noise, dust, vehicle movements etc.)** Construction work will occur at several sites simultaneously, with vehicular traffic to and from the sites and between sites on a regular basis. Several laydown areas will be established, and numerous access tracks constructed off the main road to tower locations. The amenity of settlements near these activities may be adversely affected while the activity is underway, although for short, intermittent periods during the construction period.
	Proximity of power lines – visual amenity Households near the proposed transmission line currently enjoy relatively uninterrupted views to the surrounding areas, depending on their location within

Social value	Potential impacts
	settlements, proximity to roads, topography and forest cover. Some villages may have their visual amenity impacted by the existing transmission line, however as the final alignment of the proposed route is not yet determined it is unclear whether visual amenity impacts will further affect these villages or currently unimpacted villages. The transmission line tower locations, ROW, and access tracks will need to be cleared of vegetation during construction and kept clear of tall vegetation during operation. The steel-lattice tower structures and suspended conductors will be noticeable features within the landscape, with potential for reduced visual amenity.
Community cohesion and stability	**Adverse non-local worker interaction with local community** The contractor workforce is likely to be drawn from across Myanmar and may comprise expatriate workers. These workers may not understand local cultural norms and expectations which may lead to misunderstandings and conflict with local communities, particularly should these workers be seen as displacing local employment. Additionally, an influx of workers may lead to an increase in the use of alcohol, drugs, and gambling in the local communities. Adverse interactions could include impacts on women or children, or other vulnerable groups.
	Landowner disputes about compensation and benefit sharing entitlements Compensation associated with resettlement (if required) may be seen as a 'benefit'. Grievances from landowners may arise where non-landowner settlers are required to be relocated, either a short or long distance from project infrastructure, receiving associated entitlements that are not available to landowners who have consented to the initial settlement. Where land ownership is contested between villages or groups, compensation for disturbance and other 'benefits', such as the engagement of local people for employment, may also be contested impairing community cohesion. The development of the transmission line may be seen as conferring benefits on grid customers in Loikaw and Taungoo which, in the absence of firm plans for the installation of distribution and service lines to local communities, may induce community disquiet and potential disruption to the Project should expectations for access to power not be met.
	Ineffective local training and employment process/program There may be limited scope for employing local villagers in the construction workforce due to the skills required. Unmet local expectations for casual project employment, or the absence of a concerted effort to train local employees, may result in community grievances. If not addressed effectively or equitably, these grievances may induce conflict between villagers, or between villagers and the Project.
Community health and safety	**Uncontrolled community interaction with construction vehicles and equipment** The development of access roads for project construction and use of those roads by construction and other traffic, may promote a higher-risk environment in terms of safety.
	Proximity of power lines - electric and magnetic field exposure High voltage transmission lines emit electric and magnetic fields (EMF). The strength of the fields depends on the voltage and on how much current is passing through the line. The field is stronger in the immediate vicinity of the line and

Social value	Potential impacts
	decreases significantly further away. A 75 foot (approximately 23 m) easement from the nearest conductor (power line) to a residence will be included in the transmission line design. The easement will prohibit people living in proximity to the transmission line. The transmission line design will be undertaken in accordance with international standards (i.e., IEC 60826 Loading and strength of overhead transmission lines. The Myanmar NEQ (emission) guidelines outline maximum electric and magnetic field (EMF) exposure limits associated with electric power distribution and transmission (**Error! Reference source not found.**). These outline the maximum a mount of exposure the general public should have to electric fields (measured in volts per metre, V/m) and magnetic fields (measured in microteslas, μT). Occupational guidelines for workers associated with the Project are outlined in the IFC EHS guidelines for electric power transmission and distribution (IFC 2007b); however, impacts associated with occupational exposure are not discussed in this IEE and will instead be covered in the Project's health and safety plan. While the Australian Radiation Protection and Nuclear Safety Agency states there is no established scientific evidence that EMF at any distance from a high voltage power lines causes health effects to humans (ARPANSA 2020), the Myanmar NEQ guidelines must be adhered to.
	Increased prevalence of disease The contractor workforce is likely to be drawn from across Myanmar and may comprise expatriate workers. The influx of workers may lead to increased prevalence of disease in villages along the route, particularly if accommodation is required.

6.5. Mitigation and Measures

Consideration of potential environmental and socio-economic issues requires an understanding of the current baseline conditions and of the potential effects of the transmission line project.

This section identifies the potential impacts from project activities on the environmental and social aspects and their associated values. Potential impacts have been assessed in accordance with the impact and assessment methods described in Section 6.4. Mitigation and management measures are described Pre-construction and construction Phase in Table 6.5, Operation Phase in Table 6.6 and Decommissioning Phase in Table 6.7 that aim to reduce the significance of these impacts on the identified values.

Table 6.5: Impact Assessments and Mitigation Measures for the Project (Pre- Construction and Construction Phase)

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
A.	***Pre- Construction and Construction Phase***														
1.	**Air Quality**	• Earthworks and ground disturbance may generate dust. • Traffic along unsealed roads may generate dust • $PM_{2.5}$ may be present in transient and short-term vehicle and machinery emissions during construction. • Transient and short-term vehicle and machinery emissions during construction. • VOC emissions will be minor due to the small amounts of fuel stored and transferred as part of the project.	4	2	2	5	40	**Moderate**	• Clearance/removal of the vegetation, earthworks and ground disturbance • Enrichment planting of removed vegetation area as soon as possible • Avoid burning of cleared vegetation • Regular preventive maintenance service of construction equipment and machinery will strictly comply with and will require conducting daily routine equipment and machinery check-ups to ensure that there are in the optimum working conditions. • To reduce the dust, the periodical water spray must be taken. • Provide barriers in locations where strong winds are likely to blow away dust and debris • If local people complain about the dust and gas, the consultant of the supervision and contractors must reconsider the construction technique. • When the air pollution levels exceeds significantly the	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									environmental standards, the regulation on fuel quality, importing old cars and emission gas control must be prepared on necessity						
2.	**Noise and Vibration**	**Construction-related traffic**. • This includes traffic transporting materials to and around tower construction sites and laydown areas. **Site preparation**. • This includes vegetation clearance, and the construction of foundations and access roads.	4	2	2	5	40	**Moderate**	• Inform potentially affected people prior to noisy activities being undertaken. • Avoid construction works at night, where practicable. • Select construction equipment based on good industry practice, with noise suppression devices where appropriate. • Limit the use of compression brakes and horn signals. • If the local people complain about noise and vibration, the consultant of the supervision and contractors should reconsider the construction technique.	2	2	1	3	15	**Low**
3.	**Hydrology, Hydrogeology and Water Quality**	Construction activities that may affect the surface water and groundwater values include: • Physical disturbance to land features including vegetation clearing and earthworks. • Groundwater and surface water features may be impacted from	4	2	2	4	32	**Moderate**	• Avoid using machinery near watercourse • Prohibit direct discharge of wastewater to ground or watercourses.	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment M	D	E	P	SP	Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment M	D	E	P	SP	Residual Impact Assessment Ranking
		accidental spills or leaks of hazardous materials and wastes from project equipment, vehicles and waste management areas. • There is a possibility of temporary impact on water because of the organic waste water discharging from demolition of base camps, toilets and site offices.							• Provide induction and training for project personnel on the importance of controlling erosion from areas disturbed during construction. • Discharge diverted runoff to a suitable vegetated area • Site access roads to avoid crossing watercourses where practicable. • Ensure flow is maintained in watercourses where access road construction cannot avoid crossing watercourses by developing and using an approach appropriate for each crossing. • At the construction site, water quality should be monitored and controlled as necessary.						
4.	**Landform and Soil**	The potential impacts project activities may have to the identified values include: • Physical disturbance of landforms and soils: • Reduced landform stability due to ground disturbance.	4	2	2	4	32	**Moderate**	• Avoid locating towers and other areas of construction in erosion prone areas as far as practicable. • Demarcate areas of vegetation clearance prior to clearance works and minimize the area disturbed • Revegetate disturbed areas as soon as possible, maximizing the	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Direct loss of soil and changes to landform due to earthworks. • Loss of topsoil/humus due to increased erosion and disturbed land (vegetation clearance). Contamination of soils: • Reduced capacity to support plant growth due to contamination of soils. • Negative impact on soil contamination will occur if construction waste is left for a long time illegally Diesel storage area and emergency diesel generators: • Oil spill and leakage from the vehicles and trucks which are used for transporting raw materials.							cleared area that is allowed to regenerate or that is to be revegetated after construction, as far as practicable. • Avoid sensitive soils and landforms through route and site selection. • Appropriate drainage design, where required, to minimize erosion. • Regular preventive maintenance service of construction equipment and machinery should be strictly implemented and should require conducting daily routine equipment and machinery check-ups to ensure that they are in the optimum working conditions. • Spoil soil must be disposed at designated dumping site. • Soil quality testing must be performed. • Proper oil disposal measure must be implemented so that there will be no leakage occurs • Refueling place must be constructed with concrete floor to prevent leakage						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• To control temporary soil contamination, sanitation facilities and garbage bins must be provided in base camps. • Construction of foundations should be undertaken in the dry season • Implement effective site drainage on the construction yard to allow for the directed flow of surface water off site. • This shall include cut-off drains to divert surface runoff from exposed soils or construction areas.						
5.	**Solid Waste Generation**	• General waste and excreta will be generated from base camp site. • Paper and cardboard packaging (3) Scrap metal, electrical wire or other components. • Construction waste such as soil and deforestation trees are generated.	4	2	2	5	40	**Moderate**	• some of demolished solid wastes must be recycled and the other solid wastes must be stored in dedicated waste storage area in the project site temporally • Waste generated from the construction and camp sites must be disposed according to the instructions of related township municipal. • Development and implementation of a Waste Management Plan to ensure that wastes are disposed of correctly	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
6.	**Liquid Waste Generation**	• Black water from toilets of camp site within construction period. • Grey water from basins and showers of camp site. • Turbid water will be generated at lakes and surface water near the camp site due to civil work and installation of transmission lines.	4	2	2	5	40	**Moderate**	• Adequate sanitation facilities such as toilets, washing basins and septic tanks must be provided. • The project proponent makes sure that the untreated site runoff water does not flow into the nearby water body and manage it systematically.	1	2	1	3	12	**Very Low**
7.	**Hazardous Waste Generation**	• Large spills or leaks of hazardous materials are an environmental hazard associated with the project. • Engine oil leakage from vehicles • Improper diesel storage	4	2	2	4	32	**Moderate**	• Fuel and lubricants for construction machines and vehicles must be kept and handled systematically. • Used oil must be disposed of by collecting with leak proof containers and machineries maintenance area must be identified with paved ground in the project. • Residual cement, solvent-based paints and other lubricants must be collected separately at designated area and final disposal of hazardous waste must be transferred to the Related Township Municipal.	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Store and handle hazardous substances in accordance with applicable guidelines and standards. • Avoid or reduce the use of hazardous materials where practicable, and avoid any such materials subject to international bans or phase-out. • Avoid the use of lead-based materials, fluorescent lights containing mercury, asbestos, chlorinated solvents and chromate corrosion inhibitors, as well as other heavy metals where practicable. • Establish site-specific hazardous material management and spill response plans. Continually review plans to assess the level of risk based on the type and amount of materials, potential releases, and their consequences • Refuel trucks and machinery at approved facilities. • Minimize the volume of hazardous materials stored on project sites. • Locate safety data sheets for all stored substances at each storage area						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Provide spill kits at each work site and in vehicles, commensurate to the level of risk. Replace items as required. • Conduct emergency drills to practice timely and effective spill response at sites where hazardous materials are stored. • Clean up accidental spills and leaks as soon as practicable including disposing of contaminated soils as soon as practicable.						
8.	**Visual**	• Vegetation clearance alongside the ROW. • Temporary construction works which involve temporary worker camps, the use of project vehicles and other machinery, temporary lighting, temporary waste disposal sites and construction material storage areas	5	2	2	4	36	**Moderate**	• Vegetation clearance will be permanent along the ROW, and temporary in laydown areas and other areas which aren't required to be cleared for safe operation of the transmission line	4	2	2	4	32	**Moderate**
9.	**Occupational and Community Health and Safety**	• Electrocution from direct contact with high-voltage electricity.	4	2	2	4	32	**Moderate**	• Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education/public outreach to	3	2	2	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Electrocution from indirect contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity. • Lack of supervision and cooperating on related labor laws and regulations by workers will lead a negative impact on labor environment including labor safety. • Using construction related equipment and construction activities may lead to electrical hazards and other accidents on labor and local people.							prevent public contact with potentially dangerous equipment; • Grounding conducting objects (e.g. fences or other metallic structures) installed near power lines, to prevent shock; • For safety and reliability reasons, the workers must obtain the required authorizations before starting any activity or work in a right of way (ROW); • Right of way should maintain a safe distance between the lines and the surrounding vegetation to prevent accidents and fires by making sure that vegetation does not come too close to the lines; • Workers must be equipped with relevant personal protective equipment (PPE) while working at heights; • Trees which can serve as shielding should be planted alongside the ROW to prevent radiations emitting from high voltage lines which can cause insomnia, anxiety, headache, skin burns, and muscle pain according to the research of the						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									World Health Organization (WHO) • Towers carrying live conductors must not be climbed as it can cause electric shock if the tower is energized; • Any object made up of metal or conducting material must not be thrown on overhead lines • During rain, towers or poles must not be touched by any person because the tower body becomes energized due to the conductivity of water; • If any person sees any spark on overhead live conductors, they first responsibility should be to inform the relevant authorities to avoid any accident; • Any construction work should not be carried out under or near high-voltage transmission lines. • First aid stations supervised by the safety health officer of the contractor will be located within the construction site office • Traffic enforcers will be designated along these areas to assist in directing traffic flow						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Parking time of construction equipment such as dump track and agitator car along the major thorough fare must be limited, especially during peak hours to minimize traffic congestions						
10.	**Terrestrial and Aquatic Biodiversity**	• Human behaviors such as flushing and aerial hunting, avian behaviors such as repeated flights between nesting, feeding, and roosting areas in proximity to power lines. • Susceptibility to collisions is partially the physical features of birds such as function of wing and body size and vision. • Environmental conditions such as foggy weather and darkness may distract the visibility of birds and may lead to cause exposure to collision. • Engineering aspects including design such as diameter of lines, line placement, line orientation, and line configuration (wire	4	2	3	4	32	**Moderate**	• Limit the project footprint as far as practicable during the design phase, including the proposed area of disturbance for tower foundations, laydowns and access roads • Limit machinery and vehicle movements to defined work areas and designated tracks and roads • If clearing is required, revegetate construction laydown areas as soon as possible, maximising the area that is allowed to regenerate or to be revegetated after construction, as far as practicable. • Control speed limits on unsealed roads to 40 km/h and keep vehicles to marked trafficable areas. • Prohibit harvesting of forest plant products by project personnel while working on the Project.	3	2	3	3	24	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		diameter and span length), structure type and lighting are one of the exposures to collision. • Removal of Permanent flora and less mobile fauna species during vegetation clearance along the ROW. • Introduction or spread of invasive species, pests and pathogens. • Hunting and plant collection by project personnel or through opening up new areas to the community							• Direct any lighting to reduce illumination of surrounding habitat, as far as security allows. • Avoid clearing and disruption to riparian vegetation within 50 m of a watercourse, where practicable. • Use native plant species for revegetation and rehabilitation, where practicable. • Transmission line should not be located between the flightways of feeding area and resting area; • Avoide the wildlife species breeding and nesting seasons • Considering the installation of underground transmission and distribution lines in sensitive areas; • Suitable Line Marking devices (visibility enhancement objects such as marker balls, bird deterrents, or diverters) must be used to improve line visibility and to reduce risk of collision and electrocution.						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Human activities such as frightening and flushing birds into the power lines must be forbidden • To reduce the incidence of avian mortality, make reasonable efforts to construct the related infrastructures as avian-safe construction while sitting and designing related facilities • To monitor avian mortality incidents • Personal training should encompass the reasons, needs, and methods for reporting avian mortalities.						
11.	**Cultural Heritage**	• Construction of the transmission line may temporarily impact the visual aesthetics of known cultural heritage sites as construction moves along the route. • Currently unknown cultural heritage sites or artefacts may be encountered during earthworks and ground disturbance.	3	2	2	3	21	**Low**	• Conduct pre-clearance surveys to check for unknown cultural heritage sites prior to construction. • Prohibit the disturbance of known cultural heritages sites by project workers or contractors while working, travelling in project vehicles, and residing in project accommodation. • Conduct engagement with local communities regarding the development of appropriate management measures in relation to their cultural heritage sites, if any.	2	2	2	2	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Provide inductions and training to workers that include cultural heritage awareness briefings on individual obligations to protect cultural heritage in accordance with Myanmar law. • Avoid disturbance of any known cultural heritage sites.						
12.	**Socio-economic**	Positive Impact • Positive impact is predicted due to the local employment.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Negative Impact Potential Project related impacts to social value can be seen in (Table 6.4)	4	2	2	4	32	**Moderate**	• Develop and implement a project grievance management procedure as part of a stakeholder engagement plan that provides effective communication links from affected communities to operational managers. • Work with the Myanmar government and support government led processes to resolve land disputes as they arise. • Use water sources (e.g., for dust control) in a manner that reduces impacts on local supply and use, and aquatic ecosystems.	3	2	2	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Avoid sensitive receptors within 20 m of the alignment through route and site selection. • Site temporary laydowns away from areas of settlement where practicable. • Minimize heavy traffic movements near sensitive receptors (e.g. villages) where feasible. • Locate fixed and mobile equipment sensitively with respect to sensitive receptors, where practicable. • Install fencing around the perimeter of work areas so that disturbance does not encroach onto other areas.						

Table 6.6: Impact Assessments and Mitigation Measures for the Project (Operation Phase)

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
B.	***Operation Phase***														
1.	**Air Quality**	The operation of transmission lines does not usually result in significant air emissions (IFC 2007a), and air quality impacts are expected to be negligible during operation of the transmission line.													
2.	**Noise and Vibration**	**Corona noise** • Corona noise is a crackling or humming sound that may emanate from transmission lines in association with corona discharge. Corona discharge is an electrical discharge caused by ionisation of the air surrounding a transmission line (CPUC 1999). Corona noise is expected to be greatest during rain. **Maintenance noise** • This is noise associated with intermittent maintenance and repairs of the transmission line throughout its operational life. • This may involve noise associated with vegetation removal along the ROW, machinery and vehicles. **Aeolian noise**	2	4	1	4	28	**Low**	• Provide relevant PPEs for maintenance workers. • Limit the use of compression brakes and horn signals.	2	4	1	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• This is noise generated by wind as it blows over transmission lines or through transmission towers and infrastructure (EirGrid 2016). • This is not as common as corona noise and to occur, high winds must be blowing from a specific direction relative to the infrastructure. Often the noise generated is masked by the noise of the wind or any associated rain (EirGrid 2016). As this is uncommon and not likely to be noticeable, aeolian noise is not considered further.													
3.	**Hydrology, Hydrogeology and Water Quality**	• Accidental spills and leaks to land may occur during operation in association with project equipment and vehicles required for maintenance. • Local hydrological conditions could be altered as a result of changes to drainage patterns and connections between surface water features caused by construction of access roads. This may alter surface water quantity,	2	4	2	3	24	**Low**	• Avoid using machinery near watercourses. • Ensure flow is maintained in watercourses where access road construction cannot avoid crossing watercourses by developing and using an approach appropriate for each crossing. • Divert runoff, to the greatest extent practicable, around disturbed areas, including roads, through the use of diversion drainage such as berms and swales. Discharge	1	4	1	2	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		depending on the degree of changes to drainage and runoff.							diverted runoff to a suitable vegetated area.						
4.	**Landform and Soil**	• Minor erosion from sites that were unable to be revegetated (i.e., within the ROW adjacent to the base of the transmission towers) may occur, • Contamination of soils may occur during operation in association with maintenance activities. • Minor spills and leaks of hazardous material may occur from project equipment or vehicles.	2	4	1	4	28	**Low**	• Demarcate areas of vegetation clearance prior to clearance works and minimize the area disturbed • Revegetate disturbed areas as soon as possible, maximizing the cleared area that is allowed to regenerate or that is to be revegetated after construction, as far as practicable.	1	4	1	2	12	**Very Low**
5.	**Solid Waste Generation**	• Vegetation clearance alongside the ROW during operation in association with maintenance activities.	2	4	1	3	21	**Low**	• Vegetation debris should be disposed at designated place and composted. • Electrical wastes generated from maintenance activities must be	1	4	1	2	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Solid wastes such as old towers, electrical wastes generated from maintenance activities							disposed according to the instructions of related township municipal.						
6.	**Liquid Waste Generation**	No Liquid Waste Generation during Operation Phase													
7.	**Hazardous Waste Generation**	• Spills or leaks of hazardous materials are an environmental hazard associated with the project. • Engine oil leakage from vehicles during maintenance.	4	2	2	4	32	**Moderate**	• Fuel and lubricants for construction machines and vehicles must be kept and handled systematically. • Used oil must be disposed of by collecting with leak proof containers and machineries maintenance area must be identified with paved ground in the project. • Residual cement, solvent-based paints and other lubricants must be collected separately at designated area and final disposal of hazardous waste must be transferred to the Related Township Municipal • Store and handle hazardous substances in accordance with applicable guidelines and standards.	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Avoid or reduce the use of hazardous materials where practicable, and avoid any such materials subject to international bans or phase-out. • Avoid the use of lead-based materials, fluorescent lights containing mercury, asbestos, chlorinated solvents and chromate corrosion inhibitors, as well as other heavy metals where practicable. • Establish site-specific hazardous material management and spill response plans. Continually review plans to assess the level of risk based on the type and amount of materials, potential releases, and their consequences • Refuel trucks and machinery at approved facilities. • Minimize the volume of hazardous materials stored on project sites. • Locate safety data sheets for all stored substances at each storage area						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Provide spill kits at each work site and in vehicles, commensurate to the level of risk. Replace items as required. • Conduct emergency drills to practice timely and effective spill response at sites where hazardous materials are stored. • Clean up accidental spills and leaks as soon as practicable including disposing of contaminated soils as soon as practicable.						
8.	**Visual**	• Vegetation will be permanently managed along the ROW and the transmission line will be visible from nearby settlements, permanently impacting the landscape.	4	4	2	4	40	**Moderate**	• The permanent impacts during operation of the transmission line due to tower placement can be reduced to some extent, with a residual magnitude of medium	4	4	2	4	40	**Moderate**
9.	**Occupational and Community Health and Safety**	• Electrocution from direct contact with high-voltage electricity • Electrocution from indirect contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity	4	4	2	4	40	**Moderate**	• Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education/public outreach to prevent public contact with potentially dangerous equipment; • Grounding conducting objects (e.g. fences or other metallic structures)	3	4	2	3	27	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Lack of supervision and cooperating on related labor laws and regulations by workers will lead a negative impact on labor environment including labor safety. • Electric and magnetic fields from transmission line							installed near power lines, to prevent shock; • For safety and reliability reasons, the workers must obtain the required authorizations before starting any activity or work in a right of way (ROW); • Right of way should maintain a safe distance between the lines and the surrounding vegetation to prevent accidents and fires by making sure that vegetation does not come too close to the lines; • Workers must be equipped with relevant personal protective equipment (PPE) while working at heights; • Trees which can serve as shielding should be planted alongside the ROW to prevent radiations emitting from high voltage lines which can cause insomnia, anxiety, headache, skin burns, and muscle pain according to the research of the World Health Organization (WHO) • Towers carrying live conductors must not be climbed as it can cause						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									electric shock if the tower is energized; • Any object made up of metal or conducting material must not be thrown on overhead lines • During rain, towers or poles must not be touched by any person because the tower body becomes energized due to the conductivity of water; • If any person sees any spark on overhead live conductors, they first responsibility should be to inform the relevant authorities to avoid any accident; • Any construction work should not be carried out under or near high-voltage transmission lines. • First aid stations supervised by the safety health officer of the contractor will be located within the construction site office • Traffic enforcers will be designated along these areas to assist in directing traffic flow						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Parking time of construction equipment such as dump track and agitator car along the major thorough fare must be limited, especially during peak hours to minimize traffic congestions • To collaborate with related governmental departments to do the public awareness associated with electrical hazards and risks • Identification of potential exposure levels of EMF in the workplace. • Training of workers in the identification of occupational EMF levels and hazards. • Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers. • Personal exposure monitoring equipment should be set to warn of exposure levels that are below occupational exposure reference level.						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Limiting exposure time should be done through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials. • Regular maintenance and inspection for the health and strength of power tower transmission lines						
10.	**Terrestrial and Aquatic Biodiversity**	• The overhead transmission line may cause bird mortality through collisions and electrocution. • Human behaviors such as flushing and aerial hunting, avian behaviors such as repeated flights between nesting, feeding, and roosting areas in proximity to power lines. • Susceptibility to collisions is partially the physical features of birds such as function of wing and body size and vision. • Environmental conditions such as foggy weather and darkness may distract the visibility of birds and	4	4	3	4	44	**Moderate**	• Impacts during operation will be significantly less than during construction, with infrastructure established. • Suitable Line Marking devices (visibility enhancement objects such as marker balls, bird deterrents, or diverters) must be used to improve line visibility and to reduce risk of collision and electrocution • To monitor avian mortality incidents • Personnel training should encompass the reasons, needs, and methods for reporting avian mortalities.	3	4	3	3	33	**Moderate**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		may lead to cause exposure to collision and electrocution. • Permanent removal of flora and less mobile fauna species during vegetation clearance along the ROW. • Introduction or spread of invasive species, pests and pathogens.							• Monitor right-of-way vegetation according to the level of fire risk along the transmission line. • Prohibit project staff and contractors from possessing firearms or other hunting equipment while engaged in project activities. • Prevent wildlife and exotic fauna from accessing waste storage and management areas through proper storage and handling, and securing/closing these areas. • Develop and implement wildfire management measures specific to the Project and project area that address the prevention and response to fire. • Manage/dispose of cleared vegetation to minimize the risk of wildfire.						
11.	**Cultural Heritage**	• Operation and maintenance of the transmission line is not expected to physically damage any known cultural heritage features, including those discovered and appropriately managed during construction.	3	4	2	3	27	**Low**	• Prohibit the disturbance of known cultural heritages sites by project workers or contractors while working, travelling in project vehicles, and residing in project accommodation.	2	4	2	2	16	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Unknown sites are not expected to be encountered during operation or maintenance activities.													
12.	**Socio-economic**	**Positive Impact** • Positive impact is predicted due to get electricity	-	-	-	-	-	-	-	-	-	-	-	-	-
		Negative Impact • Potential Project related impacts to social value can be seen in (Table 6.4)	4	4	2	4	40	**Moderate**	• Monitor corridor and asset condition regularly ensuring timely maintenance is undertaken and appropriate land use is maintained within the corridor easement. • The proximity of power lines affecting visual amenity in rural communities along the route is considered likely to occur with moderate consequences should it occur. Overall, this is a high risk to rural communities along the route, however the risk will be limited to those households which have the proposed transmission line or towers within their viewshed. • The project proponent will annually check quality and condition of both electric wire, transmission legs and transmission tower;	3	2	2	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• The project proponent will provide warning sign around the Transmission Tower in order to increase awareness and warn local people about risks; • Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area;						

Table 6.7: Impact Assessments and Mitigation Measures for the Project (Decommissioning Phase)

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
C.	***Decommissioning Phase***														
1.	**Air Quality**	• Clearance/removal of the vegetation, earthworks and ground disturbance • Earthworks and ground disturbance may generate dust. • Traffic along unsealed roads may generate dust. • $PM_{2.5}$ may be present in transient and short-term vehicle and machinery emissions during demolition. • Transient and short-term vehicle and machinery emissions during demolition. • VOC emissions will be minor due to the small amounts of fuel stored and transferred as part of the project.	4	2	2	5	40	**Moderate**	• Enrichment planting of removed vegetation area as soon as possible. • Avoid burning of cleared vegetation. • Regular preventive maintenance service of demolition equipment and machinery will strictly comply with and will require conducting daily routine equipment and machinery check-ups to ensure that there are in the optimum working conditions. • To reduce the dust, the periodical water spray must be taken. • Provide barriers in locations where strong winds are likely to blow away dust and debris. • If local people complain about the dust and gas, the consultant of the supervision and	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									contractors must reconsider the demolition technique. • When the air pollution levels exceeds significantly the environmental standards, the regulation on fuel quality, importing old cars and emission gas control must be prepared on necessity						
2.	**Noise and Vibration**	**Demolition-related traffic**. • This includes traffic transporting materials to and around tower construction sites and laydown areas. **Demolition-activities**	4	2	2	5	40	**Moderate**	• Inform potentially affected people prior to noisy activities being undertaken. • Avoid demolition works at night, where practicable. • Select demolition equipment based on good industry practice, with noise suppression devices where appropriate. • Limit the use of compression brakes and horn signals. • If the local people complain about noise and vibration, the consultant of the supervision and contractors should reconsider the demolition technique.	2	2	1	3	15	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
3.	**Hydrology, Hydrogeology and Water Quality**	Demolition activities that may affect the surface water and groundwater values include: • Physical disturbance to land features including demolition and earthworks. • Groundwater and surface water features may be impacted from accidental spills or leaks of hazardous materials and wastes from project equipment, vehicles and waste management areas. • There is a possibility of temporary impact on water because of the organic waste water discharging from demolition of base camps, toilets and site offices.	4	2	2	4	32	**Moderate**	• Avoid using machinery near watercourse • Prohibit direct discharge of wastewater to ground or watercourses. • Provide induction and training for project personnel on the importance of controlling erosion from areas disturbed during demolition. • Discharge diverted runoff to a suitable vegetated area. • Site access roads to avoid crossing watercourses where practicable.	1	2	1	3	12	**Very Low**
4.	**Landform and Soil**	The potential impacts project activities may have to the identified values include: • Physical disturbance of landforms and soils: • Reduced landform stability due to ground disturbance. • Direct loss of soil and changes to landform due to earthworks. Contamination of soils:	4	2	2	4	32	**Moderate**	• Revegetate disturbed areas as soon as possible, maximizing the cleared area that is allowed to regenerate or that is to be revegetated after demolition, as far as practicable. • Regular preventive maintenance service of demolition equipment and machinery should be strictly implemented and should require conducting daily routine equipment and machinery check-ups to ensure that they	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Reduced capacity to support plant growth due to contamination of soils. • Negative impact on soil contamination will occur if demolition waste is left for a long time illegally Diesel storage area and emergency diesel generators: • Oil spill and leakage from the vehicles and trucks which are used for demolition.							are in the optimum working conditions. • Spoil soil must be disposed at designated dumping site. • Soil quality testing must be performed. • Proper oil disposal measure must be implemented so that there will be no leakage occurs. • To control temporary soil contamination, sanitation facilities and garbage bins must be provided in base camps. • Demolition should be undertaken in the dry season						
5.	**Solid Waste Generation**	• General waste and excreta will be generated from base camp site. • Paper and cardboard packaging, Scrap metal, electrical wire or other components. • Demolished solid wastes and spoil soil are generated.	4	2	2	5	40	**Moderate**	• Some of demolished solid wastes must be recycled and the other solid wastes must be stored in dedicated waste storage area in the project site temporally. • Waste generated from the demolition and camp sites must be disposed according to the instructions of related township municipal. • Development and implementation of a Waste	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									Management Plan to ensure that wastes are disposed of correctly						
6.	**Liquid Waste Generation**	• Black water from toilets of camp site within demolition period. • Grey water from basins and showers of camp site. • Turbid water will be generated at lakes and surface water near the camp site due to civil work and installation of transmission lines.	4	2	2	5	40	**Moderate**	• Adequate sanitation facilities such as toilets, washing basins and septic tanks must be provided. • The project proponent makes sure that the untreated site runoff water does not flow into the nearby water body and manage it systematically.	1	2	1	3	12	**Very Low**
7.	**Hazardous Waste Generation**	• Large spills or leaks of hazardous materials are an environmental hazard associated with the project. • Engine oil leakage from vehicles • Improper diesel storage	4	2	2	4	32	**Moderate**	• Fuel and lubricants for demolition machines and vehicles must be kept and handled systematically. • Used oil must be disposed of by collecting with leak proof containers and machineries maintenance area must be identified with paved ground in the project. • Residual cement, solvent-based paints and other lubricants must be collected separately at designated area and final disposal of hazardous waste must be transferred to the Related Township Municipal • Store and handle hazardous substances in accordance with	1	2	1	3	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									applicable guidelines and standards. • Avoid or reduce the use of hazardous materials where practicable, and avoid any such materials subject to international bans or phase-out. • Avoid the use of lead-based materials, fluorescent lights containing mercury, asbestos, chlorinated solvents and chromate corrosion inhibitors, as well as other heavy metals where practicable. • Establish site-specific hazardous material management and spill response plans. Continually review plans to assess the level of risk based on the type and amount of materials, potential releases, and their consequences. • Refuel trucks and machinery at approved facilities. • Minimize the volume of hazardous materials stored on project sites. • Locate safety data sheets for all stored substances at each storage area						

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Provide spill kits at each work site and in vehicles, commensurate to the level of risk. Replace items as required. • Conduct emergency drills to practice timely and effective spill response at sites where hazardous materials are stored. • Clean up accidental spills and leaks as soon as practicable including disposing of contaminated soils as soon as practicable.						
8.	**Visual**	• Temporary demolition works which involve temporary worker camps, the use of project vehicles and other machinery, temporary lighting, temporary waste disposal sites and demolition material storage areas	5	2	2	4	36	**Moderate**	• Rehabilitation and reforestation should be done along the transmission line	4	2	2	4	32	**Moderate**
9.	**Occupational and Community Health and Safety**	• Electrocution from direct contact with high-voltage electricity. • Electrocution from indirect contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity. • Lack of supervision and cooperating on related labor laws	4	2	2	4	32	**Moderate**	• Use of signs, barriers in demolition site • For safety and reliability reasons, the workers must obtain the required authorizations before starting any activity or work in a right of way (ROW);	3	2	2	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		and regulations by workers will lead a negative impact on labor environment including labor safety.							• Workers must be equipped with relevant personal protective equipment (PPE) while working at heights; • Towers carrying live conductors must not be climbed as it can cause electric shock if the tower is energized; • During rain, towers or poles must not be touched by any person because the tower body becomes energized due to the conductivity of water; • If any person sees any spark on overhead live conductors, they first responsibility should be to inform the relevant authorities to avoid any accident; • First aid stations supervised by the safety health officer of the contractor will be located within the demolition site office • Parking time of demolition equipment such as dump track and agitator car along the major thorough fare must be limited, especially during peak hours to minimize traffic congestions						
10.	**Terrestrial and Aquatic Biodiversity**	• Air and noise emissions and light emissions may impact terrestrial fauna species during demolition phase.	4	2	3	4	32	**Moderate**	• Limit machinery and vehicle movements to defined work areas and designated tracks and roads	3	2	3	3	24	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
		• Domestic wastewater from camp site and site runoff water may flow and contaminate the nearby watercourse and impact on aquatic biodiversity.							• Dust generated during demolition activities is expected to have a short-term, localized impact so this impact is predicted to be very low magnitude to IUCN listed threatened flora species. • Appropriate drainage system must be provided within the project site systematically.						
11.	**Cultural Heritage**	• Demolition of the transmission line may temporarily impact the visual aesthetics of known cultural heritage sites as demolition moves along the route. • Currently unknown cultural heritage sites or artefacts may be encountered during earthworks and ground disturbance.	3	2	2	3	21	**Low**	• Prohibit the disturbance of known cultural heritages sites by project workers or contractors while working, travelling in project vehicles, and residing in project accommodation. • Conduct engagement with local communities regarding the development of appropriate management measures in relation to their cultural heritage sites, if any. • Provide inductions and training to workers that include cultural heritage awareness briefings on individual obligations to protect cultural heritage in accordance with Myanmar law.	2	2	2	2	12	**Very Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									• Avoid disturbance of any known cultural heritage sites.						
12.	**Socio-economic**	**Positive Impact** • Workers will need to be provided with services from townships along the route. • Local people will get some job and income opportunities during the construction and decommission. • Local people may be opportunities to assist with project maintenance work and provide income.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Negative Impact Potential Project related impacts to social value can be seen in (Table 6.4)	4	2	2	4	32	**Moderate**	• Develop and implement a project grievance management procedure as part of a stakeholder engagement plan that provides effective communication links from affected communities to operational managers. • Use water sources (e.g., for dust control) in a manner that reduces impacts on local supply	3	2	2	3	21	**Low**

No.	Potential Adverse Impacts	Project Activities	Impact Assessment					Impact Assessment Ranking	Mitigation Measures	Residual Impact Assessment					Residual Impact Assessment Ranking
			M	D	E	P	SP			M	D	E	P	SP	
									and use, and aquatic ecosystems. • Minimize heavy traffic movements near sensitive receptors (e.g. villages) where feasible. • Locate fixed and mobile equipment sensitively with respect to sensitive receptors, where practicable. • Install fencing around the perimeter of work areas so that disturbance does not encroach onto other areas.						

Chapter 7

7. Cumulative Impact Assessment

The assessment of potential cumulative impacts of the Project draws on the findings of the impact assessments for relevant environmental, social and cultural aspects. Publicly available information on other projects in the area was also reviewed. Projects distant from the transmission line and substation sites were excluded as they are unlikely to have impacts that will overlap with the area of influence of this Project.

The method followed for the cumulative impact assessment is based on the approach set out in the International Finance Corporation's Good Practice Handbook for Cumulative Impact Assessment and Management (IFC 2013). The IFC (2013) defines cumulative impacts as:

> *… those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.*

The IFC (2013) approach to cumulative impact assessment puts valued environmental and social components at the centre of the assessment and identifies other projects that also have the potential to impact (directly and/or indirectly) the future condition of those values. The influence of natural environmental and social stresses on those key values is also considered.

The steps in assessing cumulative impacts include:

- **Steps 1 and 2. Scope of the assessment:** Determine the key environmental, socio-economic and cultural values to be assessed, the spatial and temporal boundaries of the assessment, and the other credible projects, natural environmental stressors and other human activities that have the potential to contribute to cumulative impacts on the identified key values.
- **Step 3. Baseline condition of key values:** Determine the baseline condition of each value with the potential for cumulative impacts through a review of baseline information for the Project, together with available information and data for other projects.
- **Step 4. Impact assessment:** Identify the cumulative impacts on the key values and assess the significance of the cumulative impacts.
- **Step 5 Cumulative impact management strategies:** Identify the management approaches and strategies that would potentially reduce the significance of the identified cumulative impacts.

The cumulative impact assessment can consider a project only where there is verified publicly available information relating to the design, construction and operation of the project, and/or verified publicly available information on the impacts of the Project.

The method identifies credible cumulative impact pathways, values which may be impacted, the spatial and temporal boundaries for the assessment, and other projects and factors that could contribute to cumulative impacts. Key potential cumulative impacts are then assessed and strategies identified to manage any key impacts and risks.

7.1. Scope of the Assessment

This section presents the scoping phase of the cumulative impact assessment (steps 1 and 2). The spatial and temporal extents were determined from understanding the various pathways or mechanisms that may lead to impacts, their area of influence and the potentially impacted values. This step also includes identifying the projects, natural environmental stressors and other human activities with the potential to contribute to cumulative impacts.

7.1.1. Pathway/Mechanism

The pathways or mechanisms identified from project activities that might lead to cumulative impacts include:

- **Physical Disturbance:** Ground disturbance activities such as vegetation clearance, earthworks and construction will generate dust and noise which may contribute to a cumulative impact to nearby sensitive receptors. Physical disturbance and vegetation clearance may also lead to increased erosion and runoff into watercourses.

- **Habitat Loss:** The loss of habitat from various projects could cumulatively impact threatened species in the area, if present. Edge effects may also contribute to a cumulative impact on a particular habitat and species. Habitat loss can include removal of areas of intact vegetation communities decreasing the area of intact vegetation within the region and loss or damage to focal sites i.e., important habitat features such as large trees.

- **Runoff and Discharges to Watercourses:** High rainfall can cause erosion of disturbed areas of bare ground which may generate sediment-laden runoff. This runoff would follow natural drainage patterns and may enter surface watercourses such as the Sittaung River and smaller channels and drainage lines in the alluvial plains. Proposed projects that discharge sediment, wastewater and hazardous materials (through accidental spills) to watercourses in the subcatchments of these rivers could contribute to cumulative effects on the stability and behaviour of watercourses and water quality.

- **Public Road Use:** Public Road usage would be required for the transport of people and materials to and from site. Increases in traffic volumes also increase the risk of accidents and disturbance to roadside residents, businesses and nearby communities. Project construction will result in increased traffic along the Loikaw to Taungoo Road (see Figure 1.1).

These pathways/mechanisms could lead to cumulative impacts on environmental, socio-economic or cultural values.

7.1.2. Key Environmental, Socio-economic and Cultural Values

Key environmental, socio-economic and cultural values that were identified during the impact assessment process (Chapter 6) were reviewed for relevance to the cumulative impact assessment. The key values taken forward to the cumulative impact assessment were those that were potentially subject, or exposed to, a cumulative impact, determined to be sensitive to change and/or considered most significant to local communities.

The key values most at risk of cumulative impacts include:

- **Community amenity and wellbeing:** Aspects that will affect peoples’ quality of life, such as noise and vibration, dust/air quality, landscape/visual change and traffic safety. Specific receptor locations include residences and other community buildings within the area of influence of the project.

- **Terrestrial species and habitat:** Both threatened and non-threatened terrestrial flora and fauna and the habitats in which they live.

- **Stable watercourse form and behaviour:** Important for supporting aquatic ecosystems, supplying water and agricultural and recreational use.

- **Surface water quality:** The quality of surface water important for the beneficial uses of watercourses.

The sensitivity and baseline conditions of the key values are described in detail in the relevant sections in Chapter 5.

Understanding the potential impact pathways/mechanisms and values which may be impacted forms the basis for identifying and evaluating cumulative impacts that may arise from the Project and other credible projects.

7.1.3. Spatial and Temporal Boundaries

Spatial Boundary

The spatial boundary (area of influence) for the assessment includes the area within which the key values identified above could be impacted by this and other projects. The area of influence differs depending on the value that is impacted and the pathway/mechanism that led to the impact.

Spatial boundaries for the Project were determined based on understanding of the construction and operation activities. The spatial boundaries relevant for the cumulative impact assessment are presented in Table 7.1.

There is a potential for a cumulative impact if there is overlap with the area of influence from the Project and the area of influence from surrounding credible projects.

Temporal Boundary

The temporal boundary of the assessment has been defined as between 2021 and 2053. This period encompasses the timeframe expected for the Project, including a construction period between 2021 and 2023 and an operating period of up to 50 years (2023 to 2053). Impacts are unlikely to extend past this point, and further assessment beyond this date is not useful given it is over 50 years in the future. Decommissioning is not planned at this stage.

The temporal boundaries for each of the pathways/mechanisms of the Project are also outlined in Table 7.1

Table 7.1: Spatial and Temporal Boundaries for Relevant Pathways/Mechanisms

Pathway/Mechanisms	Spatial Boundary	Temporal Boundary
Physical Disturbance	Dust impacts would be localised and are not expected to have material impacts to sensitive receptors unless in particularly windy conditions when dust suppression measures would be implemented. Noise and vibration impacts will be localised to areas near roads and tower locations as construction moves from one section to another.	Dust, noise and vibration impacts would be temporary and transient throughout the construction period with negligible impact in the operational phase.
Habitat loss	Vegetation will be cleared within a 45-m-wide corridor along the entire transmission line route, as required. Loss of habitat will also occur as a result of access road construction (5-m-wide access roads are expected to be required for the Project).	Vegetation clearance will occur throughout the construction phase. Additional vegetation clearance during operations will be of regrowth and will only occur as required to protect the transmission line.
Runoff and discharges to watercourses	Watercourses within the project's area of influence include the Sittaung River and smaller channels and drainage lines in the alluvial plains, as well as the highland channels, including minor streams, creeks and drainage channels in the Karen Hills.	This pathway will be primarily limited to the construction period, noting that works shall not be undertaken immediately adjacent to watercourses.

Pathway/Mechanisms	Spatial Boundary	Temporal Boundary
Public road use	The Loikaw to Taungoo Road that will experience project-related traffic, as well as other smaller public roads.	Transport of people and materials to and from site is expected to occur primarily in the morning and evening during the construction phase, with very few trips required for maintenance in the operational phase of the Project.

7.1.4. Other Credible Projects

A desktop search and analysis of aerial imagery was undertaken to identify projects within a buffer of 75 foot (25 km) surrounding the project area with the potential to contribute to cumulative impacts. Table 7.2 lists the approved, proposed and currently operating projects that were found within the area that may have the potential to contribute to cumulative impacts on the identified values. The table includes a brief analysis of whether the projects fall within the assessment's spatial and temporal boundaries, as described in Table 7.1.

Information on the current and potential impacts of each of these projects was reviewed where readily available. The information for the projects listed in Table 7.2 was gathered online from Myanmar Project Bank, which provides information on the major investment projects in Myanmar.

Each of the projects listed in Table 7.2 will be in the process of either construction or operation during the life of the Project.

These projects combined with proposed infrastructure and facilities for the Project, potential natural environmental stressors (discussed in Chapter 5) and other human activities in the area may lead to cumulative impacts to the identified key values.

7.2. Cumulative Impact Assessment

This section presents the results of the cumulative impact assessment. The potential impacts are identified at a high level with a focus on those with the greatest potential to affect change in the condition of the key value. Impacts were assessed in relation to the values that they will affect.

The projects identified in step 2 of this assessment were found to be within both the spatial and temporal boundaries of the Project for at least one aspect. No other projects are known to exist or are planned within the area of influence of the Project and no anticipated cumulative impacts on valued environmental, socio-economic or cultural components from other projects are expected.

7.2.1. Mechanism of Change

Mechanisms of change from the other projects are likely to be similar in type and scale to the transmission line project, including:

- Physical disturbance during construction including vegetation clearance, erosion and associated dust.
- Minor emissions from construction equipment.
- Small-scale leaks from hazardous substances such as fuel.
- Potential impacts on biodiversity from physical disturbance and vegetation clearance or project personnel.
- Socio-economic impacts relating to influx of workers and increases in traffic along the road between Taungoo and Loikaw.

Table 7.2: Approved and Proposed Projects that may Potentially Contribute to Cumulative Impacts

Project / Operator	Project overview	Spatial relationship	Temporal relationship	Included in assessment?
National Power Transmission Network Development Project (Phase I) – 500 kV kankaung (Meikthila) and Sabakywe (Taungoo) Substation.	The project aims at increasing power transmission capacity to Lower Myanmar by upgrading two substations in Meiktila and Taungoo, which consists of national power grid network.	Upgrades to the Sabakywe substation in Taungoo. Direct relationship as the transmission line project connects to the same substation.	Start FY2018-2019 End: FY2022-2025.	Possible – some works at the substation for both projects could be conducted at the same time.
Yangon-Mandalay Railway Line Improvement Project	Upgrading the existing 620 km double track railways. Renovation and modernisation of rail facilities and equipment along the rail route.	The railway passes through Taungoo and crosses the transmission line route at one location near Kyun Kone. There is no available information on the exact location of where railway line works will be done.	Start: FY2018-2019 End: FY2024-2025	Possible – exact location and timing of railway upgrades is unknown.
Upgrading of Taungoo – Latetho – Yardo – Loikaw – Hopong Road	Upgrading the 78 km road connecting Bago Region; and Kayin, Kayah and Shan States. 18 km of 12 ft wide pavement from current gravel and earth to concrete; and construct new box culverts, 8,532 m stone masonry drain and 367 m retaining wall.	The road passes through Taungoo and Loikaw. It is not clear what 18 km section of the road will be upgraded so unable to determine spatial relationship.	Start FY2020-2021 End: FY2023-2024	Possible – unable to determine spatial relationship, so conservatively included in the cumulative impact assessment.
Taungoo, Tharyargone, Thephyu, Kamarnat and Minhla Solar Power Project	Solar power plant in Taungoo, Tharyargone, Thephyu, Kamarnat and Minhla. Installed capacity of 150 MW and average annual generation of 308 GW hours.	Solar power plant in Taungoo, exact location is unknown.	Start FY2020-2021 End FY2021-2022	Possible – insufficient information is available to determine the spatial relationship.

7.2.2. Summary of Cumulative Impacts on Values

The other projects in the wider area are relatively small-scale and the nature of impacts expected are expected to be similar to the proposed transmission line project. As the transmission line project and railway and road upgrade projects are all linear, with works moving along a linear route, works at individual sites are unlikely to occur within the same spatial and temporal location. As discussed in Section 7.3, liaison with other project proponents should be undertaken to minimise the likelihood of this occurring.

The results of the assessment are summarised below:

- **Community amenity and wellbeing:** The predicted residual impact significance to residences and other buildings from reduced amenity as a result of physical disturbance and increased public road use in construction is low.
- **Terrestrial species and habitat**: No terrestrial habitats, including hill forest, or flora or fauna species of conservation significance are expected to experience significant cumulative impacts.
- **Water resources:** Cumulative impacts on water resources are expected to be negligible, given the transmission line project avoids watercourses through route and site selection. It is not expected there will be a significant cumulative impact.

The cumulative impacts are likely to be insignificant given the generally low magnitude of impacts to key values determined in the impact assessment sections in chapters 6. No significant cumulative impacts are predicted when considering other projects operating, in construction or planned in the area.

7.3. Cumulative Impact Management

The DPTSC will minimise the contribution of the Project to cumulative impacts by implementing management measures contained within the EMMP (Chapter 8) and listed throughout relevant sections of chapters 6 and 7 and by liaising with proponents of other projects in regard to project timing and potential overlap. Liaison with the railway operator and road upgrade proponent should be undertaken when scheduling project works.

DPTSC will also ensure providers of goods and services to the Project meet safety, environmental and social performance standards, further limiting the potential contribution to cumulative impacts.

If similar approaches to management of impacts are implemented by the operators of the projects included in this assessment, where relevant, potential significant negative cumulative impacts (although are none anticipated) will be further reduced.

Chapter 8

8. Environmental Management and Monitoring Plan

This chapter presents the environmental management and monitoring plan (EMMP) for the Project.

8.1. Introduction

The aims of the EMMP are to document the Project's approach to environmental and social management, including the environmental management system, schedule for environmental and social management and organisational structure and responsibilities.

The EMMP describes how the Project's environmental risks will be addressed, based on commitments described in the IEE and details a program to monitor, manage, audit and report on the Project's impacts and its compliance with regulatory permits and licences, namely the ECC.

The plans and procedures contain detailed guidance regarding specific elements (such as land, water, air, socio-economic), all appropriate laws and rules, and good practice international standards and guidelines. Performance criteria, and inspection and monitoring requirements will also be set out in the plan.

This EMMP will be used as a framework for preparing a series of detailed management plans for each worksite and/or group of worksites during construction activities. The EMMP shall also be used as the basis for managing the impacts of operational activities.

8.2. Environmental Management Framework

The project EMMP provides a framework for environmental and social management, monitoring, auditing and reporting for the Project. The framework considers the requirements under which the Project will be constructed and operated, along with relevant regulatory requirements.

The four key components of environmental and socio-economic management are:

- **Health**: Promoting the health of the workforce and local communities.
- **Safety**: Limiting exposure of hazards that pose a risk of harm to the workforce and local communities.
- **Environment**: Reducing and preventing pollution to the environment and rehabilitating disturbed land.
- **Socio-economic**: Treating the workforce and local communities fairly and with respect, upholding ethical business practices and fundamental human rights, and promoting benefits to the community.

The approach taken towards environmental and social management involves, monitoring/inspections, reporting results and evaluating results, the effectiveness of the EMMP and procedures within, and compliance of the Project with regulatory/permit requirements.

Management measures will be based on a hierarchical approach prioritising avoidance of the impact, and mitigation where avoidance is not possible.

8.2.1. Organisation and Responsibilities

Responsibilities will need to be delegated to key project personnel prior to project construction to ensure there is accountability for environmental and social management, and that the procedures and requirements outlined in this EMMP are being followed. Specific responsibilities that need to be assigned to personnel may include:

- Ensure project activities comply with health, safety, security and environment (HSSE) requirements and regulations.
- Ensure EMP is implemented, monitoring and reporting requirements are completed and issues are addressed.
- Ensure required site inductions and training is implemented and recorded.
- Ensure incidents and non-conformances are investigated and corrective actions are implemented.

The MOEP is the Executing Agency (EA) while the DPTSC is the Project Management Unit (PMU). With assistance from an overall Project EA, the PMU will implement the transmission line and the EMP which is developed by the Environmental Team. Overall responsibility for implementation of the EMP falls to the EA and PMU for this project.

There are five agencies that are involved in the implementation, supervision, and monitoring of the EMP: (1) MOEP (EA), (2) DPTSC (PMU), (3) Construction Contractors (4) Ministry of Natural Resources and Environmental Conservation (MONREC) (5) Environmental Consultant Team.

1) **MOEP (EA)** will be responsible for:

(i) Overall responsibility for implementation of EMP
(ii) Provide coordination and supervision for environmental and social safeguards
(iii) Coordinate with PMU on the resolution of issues arising from the implementation of EMP
(iv) Lead for the effective facilitation among all stakeholder agencies on the resolution of issues arising from the implementation of EMP and follow-up meetings
(v) Monitor the Grievance Redress Mechanism implementation, grievances, status of resolution of complaint, and document all grievances

2) **DPTSC (PMU)** will be responsible for:

(i) Ensuring implementation of all mitigation and monitoring measures
(ii) Supervision and monitoring of the implementation of the EMP
(iii) Operation of the Grievance Redress Mechanism for the transmission line
(iv) Meeting all the conditions of the Environmental Compliance Certificate (as issued by MONREC)
(v) Oversee design and delivery of training and capacity development of staffs and all related persons from EA/PMU and contractor(s) on environmental management, implementation of EMP and monitoring
(vi) Meeting all the conditions of the Environmental Compliance Certificate (as issued by MONREC)
(vii) Supervise, monitor, and report on the contractor implementation of the EMP
(viii) Orient the contractors on the implementation of EMP and on the monitoring and reporting of implementation of mitigation measures
(ix) Submitting semi-annual Monitoring Reports to EA, and MONREC

3) **Construction Contractors** will be responsible for:

(i) Fully understanding and aware of the EMP

(ii) Implementation of the EMP mitigation measures and regularly monitor the compliances
(iii) Prepare and submit monthly reports on mitigation and monitoring activities of EMP any environmental issues at construction sites to the EA and PMU
(iv) Coordinate with PMU and Environmental team in conducting meaningful public consultations
(v) Immediately act and resolve complaints received from the community and through GRM
(vi) Implement any corrective actions recommended by PMU, YCDC, and MONREC

4) **MONREC** will be responsible for:

(i) Review of the periodic environmental safeguard monitoring reports submitted by DPTSC to ensure that adverse impacts and risks are mitigated as planned
(ii) Conduct monitoring and inspection of projects to determine compliance with all environmental and social requirements
(iii) Impose penalties and/or require Project Proponent to undertaken corrective action
(iv) Where Projects are not in compliance with its environmental and social requirements, take appropriate enforcement actions including (a) suspension of project operation, and (b) employing third parties to correct non-compliance

5) **Environmental Consultant Team** will be responsible for conducting water quality, air quality, noise, soil and geotechnical survey, biodiversity monitoring programs on behalf of the DPTSC PMU.

8.2.2. Inspection and Monitoring Requirements

Monitoring will be undertaken throughout the Project. The frequency of monitoring and criteria monitoring aims to meet is dependent on the parameter/aspect of environmental performance being monitored. The monitoring program outlines the aspect that will be monitored throughout the project, the frequency of monitoring, and the criteria to be met. The frequency may be on an ongoing basis, at regular intervals or on an ad hoc basis. Ad hoc monitoring will be undertaken in the following circumstances:

- In the event of a leak or spill to ensure these are responded to appropriately.
- In response to complaints/community grievances.
- Following environmental incidents.

Inspections will be carried out to ensure the EMMP and procedures within, including monitoring requirements, are followed. Records of monitoring and inspections will be kept, and results may be reported as required.

8.2.3. Evaluation and Reporting

Results of monitoring will be reviewed and evaluated to ensure effectiveness and environmental commitments and compliance responsibilities are being achieved. The EMMP will be regularly reviewed to ensure project activities are being completed in accordance with the plan, environmental and social commitments are being kept, management measures are being effectively implemented, and that new information and responses to community grievances are addressed or incorporated. Updates to the EMMP may also be made in response to evaluation of monitoring results.

Reports will be produced as required by permit conditions. This will include the results of the monitoring program outlined in Section 8.4, and usually assess environmental management performance and compliance with regulatory requirements.

8.3. Management Objectives, Measures and Sub-plans

The EMMP contains the measures and procedures to mitigate the impacts of the Project identified in Chapter 6 Environmental and social impact assessment, and to maximise the potential benefits of the project. Management measures are based on a hierarchical approach to mitigating impacts, which is avoid, minimise, reduce and compensate. Environmental management in the pre-construction/design, construction and operation phases of the Project will be addressed independently due to the differing impacts in each phase.

8.3.1. Objectives

The measures implemented ensure proper planning for environmental and socio-economic management of project-related activities and ensure project activities avoid, minimise, reduce and compensate for environmental and socio-economic impacts. The environmental management objectives are outlined in Table 8.1.

Table 8.1: Environmental Management Objectives

Aspect	Environmental Management Objectives
Air quality	• Limit dust emissions and dust nuisance to sensitive receptors. • Limit combustion emissions.
Noise and vibration	• Limit noise and vibration nuisance to sensitive receptors. • Avoid adverse impacts to communities and fauna.
Water Quality	• Limit the increase in the loads and/or concentrations of pollutants (including sediment) entering watercourses downstream of construction activity. • Maintain existing water flow regimes. • Limit the generation of contaminated surface water. • Limit the contamination of groundwater resources.
Biodiversity	• Reduce the impacts of the Project on terrestrial and aquatic habitats. • Reduce habitat fragmentation and degradation due to project activities. • Reduce disturbance to terrestrial and freshwater fauna from project activities.
Landform and soils	• Maintain the integrity, ecological function and environmental values of soils, as far as practicable. • Avoid soil contamination associated with project activities.
Erosion and sediment	• Limit soil erosion from areas disturbed by project activities. • Limit the transport of sediment in runoff from project areas. • Manage all soil stockpiles, if any, in order to prevent erosion and downstream sedimentation. • Protect downstream beneficial uses of surface water and water resources.
Hazardous materials and fuel handling	• Ensure hazardous materials required for construction activities are identified, stored, transported, handled and disposed of safely and in an environmentally responsible manner. • Prevent accidental hazardous material release that may cause injury and/or exposure to people and the environment. • Provide procedures for the control of leaks, containment of spillages and recovery in the event of an accident hazardous material release.
Traffic and transport	• Limit the potential for traffic accidents.

Aspect	Environmental Management Objectives
Waste management	• Limit waste generation. • Maximise the reuse of waste products in a safe and effective manner. • Limit the adverse effects of waste disposal on the local environment. • Ensure waste management activities comply with legislative requirements, waste industry standards and company guidelines.
Weed, pest and disease control	• Ensure personnel are aware of prohibited activities relating to the import or movement of exotic plants and animals during construction and operation of the Project. • Prevent exotic weeds, pests and diseases from entering, spreading or becoming established in the project area. • Identify and contain, suppress or manage significant weeds, pests and diseases already in the project area to limit their spread by project activities. • Limit the potential for the Project to cause a significant reduction in the abundance of native species.
Cultural heritage	• Identify sites and artefacts of historical, cultural and archaeological significance (registered and non-registered) that may be disturbed by project activities. • Avoid or limit disturbance to registered and unregistered sites of historical, cultural and archaeological significance. • Manage all found historical, cultural and archaeological artefacts and sites in accordance with relevant legislation and an established chance finds procedure.
Socio-economic	Demonstrate on-going community support for infrastructure development by: • Minimising any impairment of community amenity due to project activities. • Implementing initiatives for community participation (e.g. through local employment and the placement of access tracks and laydown sites in locations for mutual benefit) through a separate workforce participation plan. • Many of the environmental objectives above also protect socio-economic values, through protecting environmental values of importance to the community and/or managing community health and safety.

The management measures to be implemented for the Project to meet these objectives are outlined in the earlier chapters 6 of the IEE.

8.3.2. Training and Capacity Development

DPTSC needs to provide capacity development and/or training programs (i) to enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effects, and (ii) to understand and to be capable their responsibilities. As DPTSC have limited environmental and social management staff, DPTSC needs to hire a qualified consultancy team to conduct necessary training and capacity development programs and the relevant institutions/agencies can also be consulted for some technical trainings.

8.4. Contractors Environmental Management Plan

Before the construction starts each Contractor will prepare a Contractor Environmental Management Plan (CEMP) consistent with the EMP. The CEMP is to include all mitigation measures and monitoring requirements to be carried out by the Contractor. The CEMP will be submitted to the Project Implementation Consultant for review and approval. Approval will be required one month prior to the start of construction. Contract documents shall explicitly indicate the requirement for the CEMPs Construction cannot start until all CEMPs. To ensure that the Contractor allocates sufficient funds to prepare and implement the CEMP, the Tender and Bid documents will require that the cost of implementing the EMP and CEMP is included in the Contractor Bid price.

The CEMP is to include mitigation measures and monitoring programs for:

- Construction camp management;
- Borrow pits, quarries, and waste disposal sites;
- Access road construction, use, and rehabilitation;
- Dust and noise management;
- Erosion control;
- Solid waste management;
- Hazardous waste management;
- Traffic management;
- Emergency response planning and management;
- Occupation Health and Safety; and
- Community Health and Safety; and
- Public Consultation.

8.5. Environmental Management Plans

The Environmental Management Plan (EMP) is essential for successfully implanting the Project's environmental and social performance throughout the life of the Project.This EMP will be used as a framework for preparing a series of detailed management plans for each worksite and/or group of worksites during project activities. The EMP is a management tool that provides a set of directives and guidelines that the project implementation organization follows to prevent or minimize unnecessary environmental impacts of the 230 kV transmission line. This EMP will be reviewed regularly throughout the project.

(A) Waste Management Plan

A waste management hierarchy including 3Rs system should be conducted as a good practice, especially for industrial waste and hazardous waste to collect efficiently, dispose at designated site, to prohibit dumping any contaminating materials. Final disposal must be undertaken in an environmentally sound manner.

The relevance policies, legislations and guidelines, which are described in Chapter 3 will be committed to perform waste management plan.

<u>Solid Waste</u>

Land clearing will be carried out and all merchantable wood will be removed along the right of way. Thus, wood such as timber, slash, stumps etc. will be generated and the removed merchantable wood should be sold for lumber or firewood by the concerned party and all other woody material will be managed in compliance with the related law.

Solid waste generated from different sources like base camps and construction sites must be efficiently collected, disposed at designated dump site. Recycle and re-use of waste should be carried out as a good practice.

The following management measures need to be implemented;

- Provide bins for general wastes at each camp sites

- Combustible items must be burned in the designated area and non-combustible items should be back filled or recyclable and reusable;
- Appropriate signage must be used to identify potential spill risk and other hazards; and
- Where recycling/reuse is not possible, the material should be taken to the nearest Township Municipal Waste Dump of the transmission line.
- Other excavated materials must be stored in a pile, properly compacted and wetted regularly.
- Most of the excavated materials for foundation works will be used to backfill the foundation and any excess material will be used to raise the ground level around the foundations.

Liquid Waste

Construction and decommissioning activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved.

The liquid waste management should be included following measures.

- Using machinery near watercourse should be avoided.
- Direct discharge of wastewater to ground or watercourses should be prohibited.
- Awareness and training on the importance of controlling erosion from areas disturbed during construction and demolition period should be provided to workers.
- Sanitation facilities such as toilets, washing basins and septic tanks must be provided adequately.
- Untreated site runoff water should be ensured not to flow into the nearby water body and managed systematically.

Hazardous Waste

The hazardous waste management is not to avoid, or when avoidance is not feasible, minimize uncontrolled releases of hazardous materials or accidents (including explosion and fire) during their production, handling, storage and use.

Used materials such as welding rods, empty paint containers, and solvent containers must be properly collected, packed and stored in a secure place if there are no disposal facilities for toxic and hazardous wastes.

Hazardous materials management priorities should be established based on hazard analysis to control release and accidents. The level of risk should be identified according to the types and amounts of hazardous materials used in the project. Those materials should be classified and potential spill and release should be analyzed. Analysis of potential consequences should be carried out on the physical-geographical characteristics of the project site, including water resources and other environmentally sensitive areas.

The management plan should be included following actions

- All used petroleum products shall be collected in tank marked “Waste Oil” and disposed of under the direction of the site manager;
- Empty petroleum containers shall be disposed by collecting with leak proof containers and stored on site in a designated area;
- All hazardous materials (diesel oil) should be stored in a properly self-bunded tank as appropriate for the volume and nature of the materials

- Some types of the hazardous waste, used cans, bottles and plastics from using chemicals for water treatment processes, must be disposed systematically by cooperating with related departments.
- Safe transfer and filling of the hazardous should be practiced.
- To prevent spills, written procedures for transfer operations that includes a checklist of measures to follow during filling operations should be prepared.
- Incompatible materials should be stored in separate areas.
- Prohibition of all sources of ignition from areas near flammable storage tanks.
- Secondary containment systems should be constructed with materials appropriate for the waste being contained and adequate to prevent loss to the environment.

(B) Hazardous Materials Management Plan

Large spills or leaks of hazardous materials are an environmental hazard associated with the project. Relatively small volumes of hazardous material will be stored at project sites, so this is unlikely to occur. Management of waste including hazardous materials (fuel, oils, chemicals) is required during both construction and operation to manage any remaining risk.

- Store and handle hazardous substances in accordance with applicable guidelines and standards.
- Avoid or reduce the use of hazardous materials where practicable, and avoid any such materials subject to international bans or phase-out
- Avoid the use of lead-based materials, fluorescent lights containing mercury, asbestos, chlorinated solvents and chromate corrosion inhibitors, as well as other heavy metals where practicable.
- Establish site-specific hazardous material management and spill response plans. Continually review plans to assess the level of risk based on the type and amount of materials, potential releases, and their consequences.
- Refuel trucks and machinery at approved facilities.
- Minimize the volume of hazardous materials stored on project sites.
- Locate safety data sheets for all stored substances at each storage area.
- Maintain inspection logs and incident response logs.
- Provide spill kits at each work site and in vehicles, commensurate to the level of risk. Replace items as required.
- Conduct emergency drills to practice timely and effective spill response at sites where hazardous materials are stored.
- Clean up accidental spills and leaks as soon as practicable including disposing of contaminated soils as soon as practicable.
- Conduct response investigations following spills to evaluate the performance of spill prevention measures.
- Hazardous substances shall be transported in suitable containers in accordance with guidance contained in the relevant safety data sheet.
- Train and induct all project personnel in procedures for the safe handling, transport, storage, transfer and disposal of hazardous materials.
- Design and operate hazardous materials transfer and storage facilities in accordance with applicable guidelines and standards.

- Maintain a register that will include information cards (which will be displayed as required in Burmese as well as English) and safety data sheets prepared by manufactures or suppliers for all hazardous materials on site. Containers of hazardous substances will be labelled in both English and Burmese.
- Store fuel, lubricating oils and chemicals in correctly bunded (i.e., contained) and appropriated sized designated areas that have impervious liners, and use double hulled tanks where necessary.
- Use chemical storage containers only for the storage of the chemical labelled.
- Hazardous materials will not be stored or handled within 50 m of a waterbody or a drainage line leading to a waterbody.
- Display appropriate warning signs when storing, handling or using hazardous materials.
- Develop and implement a waste management plan for hazardous and non-hazardous waste, including sewage.

(C) Electromagnetic Wave and Electrocution Prevention Management Plan

The corona of overhead transmission line conductors and high-frequency currents of overhead transmission lines may result in the creation of radio noise. Typically, transmission line rights-of-way and conductor bundles are created to ensure radio reception at the outside limits remains normal. However, periods of rain, sleet or freezing rain sharply increases the streaming corona on conductors and may affect radio reception in residential areas near transmission lines.

According to the American National Standards Industry (ANSI), 230kV transmission line can be determined as a High-voltage Line. Overhead high voltage transmission lines are not insulated and if a person comes in contact or even closer to them through a ladder, crane, they may get a life threatening electrical shock.

Hazards most directly related to power transmission and distribution lines and facilities occur as a result of electrocution from direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity. Recommended techniques to prevent these hazards include:

- Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education/public outreach to prevent public contact with potentially dangerous equipment;
- Grounding conducting objects (e.g. fences or other metallic structures) installed near power lines, to prevent shock;
- For safety and reliability reasons, the workers must obtain the required authorizations before starting any activity or work in a right of way (ROW);
- Right of way should maintain a safe distance between the lines and the surrounding vegetation to prevent accidents and fires by making sure that vegetation does not come too close to the lines;
- Workers must be equipped with relevant personal protective equipment (PPE) while working at heights;
- Trees which can serve as shielding should be planted alongside the ROW to prevent radiations emitting from high voltage lines which can cause insomnia, anxiety, headache, skin burns, and muscle pain according to the research of the World Health Organization (WHO);

There are some precautions for nearby community which must be followed to avoid electrical hazards and risks:

- Towers carrying live conductors must not be climbed as it can cause electric shock if the tower is energized;
- Any object made up of metal or conducting material must not be thrown on overhead lines
- During rain, towers or poles must not be touched by any person because the tower body becomes energized due to the conductivity of water;
- If any person sees any spark on overhead live conductors, they first responsibility should be to inform the relevant authorities to avoid any accident;
- Any construction work should not be carried out under or near high-voltage transmission lines.

There are some precautions for the linemen who work on high voltage line which must be followed to avoid hazards and risks:

- Linemen must be familiar with all the safety rules and regulations;
- Linemen who are going to do any operation must be trained well;
- A lineman must be equipped with all necessary PPEs before staring operation;
- It should be made sure that the tower on which the lineman is going to work is completely de-energized before the start of work;
- A lineman must be in continuous communication with other team members when doing an operation.

(D) Electromagnetic Field (EMF) Prevention Management Plan

Electromagnetic Field (EMF) - Electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines. Occupational EMF exposure should be prevented or minimized through the following components:

- Identification of potential exposure levels in the workplace;
- Training of workers in the identification of occupational EMF levels and hazards;
- Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;
- Personal exposure monitoring equipment should be set to warn of exposure levels that are below occupational exposure reference levels;
- Limiting exposure time should be done through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials.

ICNIRP exposure limits for occupational exposure to electric and magnetic fields		
Frequency	**Electric Field (V/m)**	**Magnetic Field (µT)**
50 Hz	10,000	500
60 Hz	8300	415
Source: ICNIRP (1998): “Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)		

(E) Avian and Bat Collision and Electrocution Management Plan

Understanding the nature of bird collisions and electrocution is important for minimizing and mitigating them. Collision exposure can be increased due to the human behaviors such as flushing and aerial hunting, avian behaviors such as repeated flights between nesting, feeding, and roosting areas in proximity to power lines. Some bird species have a greater collision and electrocution risk than others. Susceptibility to collisions is partially the physical features of birds such as function of wing and body size and vision. For example, larger-heavy-bodied birds with short wing spans and poorer vision are more susceptible to collisions than smaller-lighter-weight birds with large wing spans and good vision. Environmental conditions such as foggy weather and darkness may distract the visibility of birds and may lead to cause exposure to collision and electrocution. Engineering aspects including design such as diameter of lines, line placement, line orientation, and line configuration (wire diameter and span length), structure type and lighting are one of the exposures to collision and electrocution. The project proponent needs to implement the following management actions;

- To understand what kind of bird species are migrating and foraging, and their flightways from feeding area to resting area nearby project area;
- Aligning transmission corridors to avoid critical habitats (e.g. nesting grounds, heronries, rookeries, bat foraging corridors, and migration corridors);
- Transmission line should not be located between the flightways of feeding area and resting area;
- Considering the installation of underground transmission and distribution lines in sensitive areas;
- Maintaining 1.5 meter (60 inches) spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware;
- When planning power line routes, topographical features such as mountain ridges, river valleys and flight corridors must be considered to reduce collision and electrocution risk. If there is mountain near transmission route, the line should be constructed below the height of mountain;
- Suitable Line Marking devices (visibility enhancement objects such as marker balls, bird deterrents, or diverters) must be used to improve line visibility and to reduce risk of collision and electrocution.
- Where climate and location allows, planting native trees that will grow to or above the height of nearby power lines, without interfering with line operations, should be done to prevent collision and electrocution by forcing birds to gain enough altitude to clear the more visible tree line.
- Human activities such as frightening and flushing birds into the power lines must be forbidden.
- To compliance with related laws, regulations and policies to ensure that personnel are consistently following company procedures for avian-safe construction, mortality reporting, nest management, training, etc.
- To reduce the incidence of avian mortality, make reasonable efforts to construct the related infrastructures as avian-safe construction while sitting and designing related facilities
- To monitor avian mortality incidents
- The Bird Strike Indicator (BSI) is an automated vibration sensing and recording tool designed by Electric Power Research Institute (EPRI) to detect bird strikes on overhead transmission line. It can be installed on phase conductors or shield wires. Manually monitoring bird collision and electrocution is labor-intensive and expensive,
- Personnel training should encompass the reasons, needs, and methods for reporting avian mortalities.
- The project proponent should encourage birds to nest in desired areas. For example, installing nest platforms in safe areas on or near utility structures is effective for both nest management and line maintenance.

- To implement Avian Reporting System to document bird injuries, fatalities, and nest management activities
- To implement Collision and electrocution monitoring system which should be included considering potential affected species, magnitude of risk, biological, environmental and engineering factors, and effective mitigation and management measures to minimize.
- To collaborate with related governmental departments to educate the public about avian and bats collision issues, avian protection and habitat enhancement.

(F) Fire and Exploration Management Plan

- Manage/dispose of cleared vegetation to minimise the risk of wildfire.
- Prohibit the unauthorised lighting and use of fire by project workers and contractors.
- Implement a permitting procedure for hot work.
- Equip sites with flame, heat and smoke detectors and firefighting systems where the accidental leak of flammable gases or liquids could result in fire or explosion.
- Design infrastructure to withstand potential lightning events.
- Provide sufficient safety clearance between conductors.
- Notify fire departments prior to energising the transmission line and undertaking appropriate maintenance of the line.
- Clear vegetation around transmission lines to reduce likelihood of vegetation catching alight or falling onto transmission lines, and regularly undertake maintenance.
- Emergency response procedures including site-specific emergency response plans at facility sites and availability of fire extinguishers at sites and/or in vehicles during construction and maintenance activities.

(G) Risk Related to Occupational Health and Safety Plan

The following section describes occupational health and safety hazards plan which specific to electric power transmission and distribution projects.

Live Power Lines

Workers may be exposed to occupational hazards from contact with live power lines during construction, maintenance, and operation activities. Prevention and control measures associated with live power lines include:

- Only allowing trained and certified workers to install, maintain, or repair electrical equipment.
- Ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards.
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines.
- Workers not directly associated with power transmission and distribution activities who are operating around power lines or power substations should adhere to local legislation, standards, and guidelines relating to minimum approach distances for excavations, tools, vehicles, pruning, and other activities.

Working at Height

Workers may be exposed to occupational hazards when working at elevation during construction, maintenance, and operation activities. Prevention and control measures for working at height include:

- Testing structures for integrity prior to undertaking work.
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others.
- Installation of fixtures on tower components to facilitate the use of fall protection systems.
- Provision of an adequate work-positioning device system for workers. Connectors on positioning systems should be compatible with the tower components to which they are attached.
- Hoisting equipment should be properly rated and maintained and hoist operators properly trained.

Electric and Magnetic Fields

Electric utility workers typically have a higher exposure to electric and magnetic field than the general public due to working in proximity to electric power lines. Occupational electric and magnetic field exposure should be prevented or minimized through the preparation and implementation of an electric and magnetic field safety program including the following components:

- Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities.
- Training of workers in the identification of occupational EMF levels and hazards.
- Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers.

(H) Aircraft Safety Plan

The proposed transmission line route comes within 6 km of the Taungoo Airport runway and Loikaw Airport. Transmission lines and towers may impact aircraft safety and have subsequent socio-economic impacts through collisions or radar interference.

- International Finance Cooperation (IFC) Environmental Health and Safety (EHS) guidelines for electric power transmission and distribution (IFC 2007B) outline mitigation measures to be considered to minimize this risk.
- Utilities can route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the conductors. Large brightly colored balls or markers may be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision.

(I) Revegetation Plan

- Avoid disturbing large mature trees;
- Select specific trees to be cleared and avoid causing damage to the surrounding vegetation;
- Tree species selection are carried out according to report from Forest Department.
- Leave the rootstock of existing vegetation intact to promote regrowth;
- Reseed and revegetate areas with local vegetation as consider appropriate and necessary by the Environmental Manager.
- In establishing revegetation corridors (~50m wide), tube stock is hand planted in rip lines at approximately 4-6m spacing.
- To be designed for erosion control, aesthetic improvement and ecosystem regeneration.
- This is to be undertaken on all constructed landforms and revegetation activities.
- Depending on the proposed land use, this will involve direct seeding or planting of selected shrub, grass and tree species.
- Sowing and planting is dependent on seasonal factors and will be scheduled, where possible, in end of summer or early of raining season. (June or July)
- Progressive rehabilitation conducted onsite is integrated with the surrounding owned land and is managed with a view to enhancing the regional landscape and native habitat values. These areas are primarily identified through:
- Annual reviews by the environment team in conjunction with the HSE officer and relevant site planning personnel.
- Ongoing revegetation plans aim to provide appropriate linkages between areas of adjoining vegetation and wildlife corridors to enhance ecosystem function.
- Wildlife corridors are established or improved along fence lines, road verges, creeks and drainage lines.

(J) Additional Management plans

The following additional management plans will be prepared prior to construction, in accordance with commitments made in the mitigation measures. These plans will further describe the environmental objectives and management measures that will be implemented to mitigate potential impacts identified in the IEE:

- Air and noise management plans.
- Erosion and sediment management plans.
- Traffic management plan.
- Health, safety and security plan.
- Biodiversity management plan (where required, based on the findings of pre-construction surveys).
- Cultural heritage management plan (where required, based on the findings of pre-construction surveys).
- Cultural heritage chance finds protocol.
- Contractor workforce management plan.
- Community safety plan.

- Project security plan.

These management sub-plans will be prepared separate to the EMMP and prior to commencement of construction activities.

8.6. Emergency Preparedness and Response Plan

The DPTSC shall nominate an appropriately trained and equipped emergency response team for the Project. This team shall consist of staff that can be mobilised rapidly at any time (24 hours a day) to deal with containment and remediation of spills, electrical hazards and other environmental incidents within the contract area.

Emergency response shall be undertaken in accordance with the DPTSC's overarching emergency response plan for construction and operational activities associated with the transmission line network, taking into consideration risks at transmission lines and substations.

The emergency preparedness and response plan help to minimize the human suffering and economic losses that can result from emergencies. The main objective of an emergency response plan is to reduce human injury and damage to property in an emergency.

The emergency response plan has to address nature and industrial hazards and need to be developed. The new transmission line construction contractors will need to have emergency response plan for:

(i) Fire and explosions
(ii) Landslides and Slop failures during construction of towers
(iii) Extreme event (i.e., earthquake, typhoons and floods)
(iv) Electrocution accidents

The emergency response plan should include

(i) Emergency resources (e.g., fire-fighting equipment; spill clean-up equipment; first aid supplies; medical clinics; emergency vehicles
(ii) Communication systems;
(iii) Administration of the plan;
(iv) Emergency response procedures (e.g., emergency notification, evacuation, fire suppression, spill clean-up; medical support);
(v) Communication of the procedures;
(vi) Emergency preparedness training; and
(vii) Debriefing and post-traumatic stress procedure.

It also specifies the general responsibilities and duties of the personnel during emergency and potential emergency. it is outlined the minimum requirements about emergency management to ensure that the appropriate resources and plans are prepared and available for an effective response to mitigate, control, and recover from incidents. And it is to be ensured that a system is available to minimize the risks to people on site, the local community, the environment and assets in the event of an emergency, and to ensure that sufficient resources are maintained in a state of readiness to give adequate response for the control of emergency situations. Summary of Emergency Preparedness and Response Plan is provided below Table (8.2).

Table 8.2: Summary of Emergency Preparedness and Response Plan

<table>
<tr><th>Title</th><th colspan="4">Emergency Preparedness and Response Plan</th></tr>
<tr><td>Purpose</td><td colspan="4">To minimize the impacts and consequences of risks and incidents during the project phases
To keep update the reliable and core information on Emergency Response Unit (ERU) to assist and inform all personnel involved on site to respond in accordance with the predetermined plan
To set the framework for reporting incidents during project phases
To describe the roles, responsibilities, and actions of the ERU
To collect and compile data and information to allow for reviewing potential causes of incidents and their prevention (including the review and revision of the management and monitoring plan)</td></tr>
<tr><td>Applicability</td><td colspan="4">The prescribed plan will apply throughout the overall project site area and management will be undertaken continuously through all project phases</td></tr>
<tr><td>Main Responsibility</td><td colspan="4">Transmission line contractor</td></tr>
<tr><td>Key Authority</td><td colspan="4">Department of Power Transmission and System Control (DPTSC), Ministry of Energy Power (MOEP)</td></tr>
<tr><td>Action Summary</td><td colspan="4">It is recognised unpredictable risks and hazards which may cause impacts and consequences and thereby allowing all responsible personnel to take action immediately minimizing the waiting time for guidance by senior management levels and enhancing performance of response and action because of identified roles and responsibilities of team members. When the incident occurs, Head of ERU and team members will be undertaken an initial assessment of the emergency and collect the following key information:
Incident nature;
Type of risks and hazards predicted;
Responsible personnel;
Location and extent of the incident;
Affected infrastructure and communities
Upon completion of the initial assessment, Head of ERU will define the severity of emergency events and consult with focal person of DPTSC to identify the need to notify related government agencies for further necessary support and advice for rehabilitation plans. Following completion of the emergency event, Head of ERU will record the event describing all the necessary data and information for monthly report preparation.</td></tr>
<tr><td rowspan="4">Reporting</td><td>Reporting Period</td><td>Reporting Type</td><td>Reporting Organization</td><td>Reviewing Department</td></tr>
<tr><td>Monthly</td><td>Internal</td><td>Transmission line contractor</td><td>DPTSC</td></tr>
<tr><td>Annually</td><td>External</td><td>Transmission line contractor</td><td>DPTSC, MONREC</td></tr>
<tr><td>After emergency event</td><td>Internal/External</td><td>Transmission line contractor</td><td>DPTSC, MONREC</td></tr>
</table>

8.7. Corporate Social Responsibility Plan

The project proponent will implement Corporate Social Responsibility (CSR) Plan together with Environmental Management Plan (EMP) throughout the project lifespan. The objective of this plan is to create social welfare for local community and to prove that implement of the proposed project is beneficial for not only the project proponent but also for local community. The community involvement and development porgramme will implement as follows Table 8.3.

Table 8.3: Community Involvement and Development Promme

No.	Aspect	CSR Programme
1.	**Community Involvement**	• Consult representative community groups • Consult and accommodate communities • Participate in local associations • Transparent relationships with local government officials and political representatives • Encourage and support people to be volunteers for community service • Contribute to policy formulation and the establishment, implementation, monitoring and evaluation of development programmes
2.	**Education**	• Promote and support education at all levels • Promote learning opportunities for vulnerable or discriminated groups • Encourage the improvement of the environment of children in formal education
3.	**Health**	• Eliminate negative health impacts of production • Promote good health • Increase awareness about health threats and major diseases • Support long lasting and universal access to essential health care service and clean water and appropriate sanitation
4	**Culture**	• Promote cultural activities for example local cultures and cultural traditions • Consider facilitating human rights education and awareness raising • Help conserve and protect cultural heritage • Promote the use of traditional knowledge and technologies of indigenous communities
5	**Employment creation and skills development**	• Analyze the impact of investment decisions on employment creation • Consider the impact of technology choice on employment • Consider the impact of outsourcing decisions on employment creation • Create direct employment rather than temporary work arrangements • Skills development programmes • Give special attention to vulnerable groups • Help to promote the framework conditions necessary to create employment
6.	**Technology development and access Wealth and income creation**	• Consider the economic and social impact of entering or leaving a community • Support appropriate initiatives to stimulate diversification of existing economic activity • Preference to local suppliers of products and services • Strengthen locally based suppliers • Contribute to durable programmes and partnerships to assist community members to establish business and co-operatives • Make procurement opportunities more easily accessible to community organizations • Support organizations and persons that bring needed products and services to the community • Help develop community-based associations of entrepreneurs • Fulfil tax responsibilities • Contribute to superannuation and pensions for employees
7.	**Social investment**	• Promotion of community development in social investment projects

No.	Aspect	CSR Programme
		• Avoid actions that perpetuate a community's dependence on philanthropic activities • Partnering with other organizations • Contributing to programmes that provide vulnerable/discriminated groups with value

The project proponent has a plan to use **20,000 USD** for the corporate social responsibility fund for the following subjects. If estimated fund is not enough, we will provide additional budget. Fund for the intended for CSR plan will be managed under the authorization of DPTSC, MOEE. The intended amount for CSR plan will have to be used in community developing plan for infrastructure such as electricity access, road construction, tube well construction and basic necessaries for schools and others. The estimated percentages for funded amount of each category are described in following Table 8.7.

Table 8.4: Allocation of CSR fund for Each Activity

No.	CSR Activity	Frequency	Total Budget (USD)	Percentage of CSR fund	Responsibility
1.	Education	2 Time	4,000	20%	DPTSC/ MOEP
2.	Health	2 Time	4,000	20%	DPTSC/ MOEP
3.	Local development Activities (Transportation, Electricity)	2 Time	4,000	20%	DPTSC/ MOEP
4.	Community Development	2 Time	4,000	20%	DPTSC/ MOEP
5.	Cultural Hertiage	2 Time	4,000	20%	DPTSC/ MOEP

8.8. Resettlement Plan

The route of the transmission line has been considered to avoid impacts on houses, irrigation canals, ponds, and other structures, so mainly land, crops and trees only will be affected.

The average distance between towers will vary between 120 and 400 m, depending on terrain. Tower footprints (including the foundations) can vary in area and are anticipated to range between 100 and 169 m^2 per tower. The transmission line will have a 150 feet wide so-called Right-of-Way (ROW), 75feet on each side of the mid-line of the alignment.

According to the site study during preconstruction and planning stages, there are no residential houses and only plantation fields and forest were found along the ROW. Land compensation will be carried out as directed by related governmental department. No structures or trees higher than 3m will be allowed within this zone. Productive trees within the ROW growing higher than 3m that need to be pruned or cut down will be compensated at their full value to the owners, based on the identified type and calculated number of trees.

A 1Km wide buffer zone, 0.5Km on each side of the transmission line mid-line will be a special area with impacts mainly during the transmission line construction.

During the construction of the transmission line, there may be temporary impacts such as increased noise and dust levels, vibration, traffic congestion, power cuts, disrupted or reduced access to agricultural lands, loss of vegetation and trees, and crop damage, as well as construction of temporary access roads for erection of power towers. When power towers are being erected and conductors being stringed it may be not safe to go too close to the construction site, since these are electrical works. In order to reduce such risks and avoid negative impacts, an Environmental Management Plan has been prepared, which all project construction contractors have to apply. During the transmission line construction, additional land may be needed on a short-term basis for temporary construction access roads and for construction material storage and work place, and for workers' camps.

There will be some work opportunities available for local unskilled workers in the transmission line construction.

According to the procedure, negative impacts on people and the environment have to be avoided to the greatest extent possible, and when not possible to avoid, the negative impacts have to be properly mitigated in a way that the affected people find appropriate and satisfactory.

All the impacts of the project and all the losses due to the project affecting people who are living and working in the project areas have to be assessed during the project planning phase. The persons to be affected by the project through loss of land, crops, trees, houses, other structures or assets will be compensated in an appropriate way.

According to the policy, if affected people are not satisfied with the compensation received, or if any people in the project area experience serious impacts from a project, they have a right to complain and have their case properly tested. There will be a Grievance Redress Mechanism put in place during the project planning, and people in the project areas will be informed of the complaint procedures.

Consultations with people in the project areas

Consultants of our team who are working with planning of the project are now undertaking consultations in the planned transmission line project areas. First there will be a district level public consultation meeting, inviting commune and village leaders from the areas identified to be impacted by the transmission line. In these public consultations the transmission line project is introduced, and its potential social and environmental impacts explained. Participants are welcome to ask questions, get clarifications and express their views and concerns regarding the project. The purpose of these meetings is for the consultants to get information from the villagers on some local social and environmental issues and to discuss potential project impacts and needed mitigation measures with the villagers.

8.9. Detail Budget Allocation Plan for Environmental Management Plan

In early-stage of construction, the budgeting for the EMP implementation and/or environmental monitoring is difficult to disaggregate from overall budgeting protocols due to the low-impact nature of the work. In short, there is little to implement and almost nothing that requires monitoring during the early stages of construction. Budget allocation for implementing environmental management plan will be increased significantly in construction stage, and the later stages will require more intensive and focused environmental management of the program. The total budgets will include provisions for baseline studies, site inspections and monitoring, environmental, safety and emergency response training programs, safety and emergency response plan, community engagement, corporate social responsibility, reporting and general administration. The total budget for Environmental Management plan is presented in Table (8.5). The project proponent (DPTSC) will allocate the estimation cost of EMP under the yearly budget of the department. If estimated budget is not enough, additional budget will be provided.

Table 8.5: Detail Budget Allocation for Environmental Management Plan

No.	Program	Implementing Organization	Responsible Organization	Budget (USD)
1.	Environmental Quality (Water, Air, Noise, Vibration, Wastes (Solid, Fluid, Hazardous Waste spill) Management Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 100,000
2.	Electricity	Construction Constructor	DPTSC MOEP	$ 30,000
3.	Emergency Response and Training Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 10,000
4.	Occupational Health and Safety Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 20,000
5.	Community Engagement (Public Consultation) Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 10,000
6.	Project Closure & Rehabilitation Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP P	$ 100,000
8.	Travel, Accommodation & Meal	Construction Constructor	DPTSC MOEP	$ 60,000
9.	Staffs and Labours	Environmental Consultant Construction Constructor	DPTSC MOEP	$ 100,000
10.	CSR Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 20,000
11.	Resettlement Plan	Environmental Consultant Construction Constructor	MONREC DPTSC MOEP	$ 50,000
	Total			**$ 500,000**

8.10. Inspection and Monitoring Program

An environmental and social inspection and monitoring program will be implemented to monitor the performance of the Project. Monitoring will be undertaken throughout construction with ongoing inspections during the operational phase of the Project. Monitoring will be conducted by trained individuals following appropriate procedures. Monitoring may be ongoing, at regular intervals or on an ad hoc basis, with the frequency of monitoring dependent on the aspect/parameter being monitored. Ad hoc monitoring will be undertaken in the case of an event of a leak or spill, in response to complaints/community grievances or following environmental incidents.

Monitoring will be undertaken corresponding to the risk of environmental or social impact associated with project activities. For example, air quality monitoring will not be undertaken as power transmission projects do not typically give rise to significant air emission or effluents (IFC 2007).

Monitoring and routine inspections will ensure the measures set out in this EMMP are complied with throughout the project. Records of monitoring activities will be maintained, with environmental performance reports complied and submitted to relevant regulatory authorities as required by the Project's environmental permit. If monitoring shows that a target has not been met, the reasoning will be investigated and appropriate measures will be implemented as required.

The Government will be notified should significant changes be made to the Project following the preparation of this EMMP, particularly regarding methods for construction. The monitoring program is designed to allow periodic reassessment of the Project's effects and subsequent review of mitigating measures and safeguards.

Table 8.6, Table 8.7 and Table 8.8 outlines the proposed monitoring program of pre-Construction & Construction Stage, Operation Stage and Decommissioning State to be implemented throughout the project. Figure (8.1) presents the Environmental Monitoring Points Location on Google Earth.

8.11. Incident Management

In the event of an incident, an incident report will be completed, and appropriate measures taken to ensure that similar incidents or accidents will not occur in the future.

8.12. Review

Monitoring will include the documentation and recording of incidents, inductions training, and results of the monitoring program.

In the event an aspect of the EMMP is not complied with or monitoring identifies issues with management/mitigation measures, applicable procedures within the EMMP will be reviewed to ensure they are effective and to address potential improvements.

Table 8.6: Environmental Monitoring Plan during Pre-Construction and Construction Stage

No.	Category	Parameter Monitor	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD) /Year
Pre-Construction and Construction Stage									
1.	Air Pollution	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, CO_2, Ozone, and micro climate (i.e. temperature, humidity, wind speed and direction and so on for reference),	National Environmental Quality (Emissions) Guideline (NEQEG)	One weekday for 24 consecutive hours per location	Locations along the project alignment AN 1: 19°14'21.09"N 96°34'13.88"E AN 2: 19°34'17.49" N 97°11'26.05"E AN 3: 18° 57' 5.898" N 96° 18' 17.093" E AN 4: 19° 32' 35.907" N 96° 56' 48.042" E AN 5: 19° 29' 18.599" N 96° 49' 42.694" E	Biannually (*once during dry season and once during rainy season)	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 4,000 (USD 400 * 5 points * 2 times)**
2.	Water Pollution (Surface water)	BOD, COD, pH, turbidity, temperature, colour, dissolved concentration, Total ammonia, and nitrate, free chlorine, total chlorine and dissolved chlorine, total hardness, total alkalinity, EC, total dissolved solids (TDS)	National Environmental Quality (Emissions) Guideline (NEQEG)	Sampling and measurement using field equipment and laboratory analyses	Locations along the project alignment SW 1: 18° 58' 07.72" N, 96° 18' 31.97" E SW 2: 19° 06' 19.61" N, 96° 25' 23.17" E SW 3: 19° 09' 53.10" N, 96° 32' 03.38" E	Biannually (*once during dry season and once during rainy season)	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 3,000 (USD 500 * 3 points * 2 times)**
3.	Landform and Soil Contamination	Soil acidity and sulphate content, soil metal concentration, total nitrogen, EC,	-	- Confirmation of voices and complaints - Visual	Construction site and surrounding area of project alignment S 1: 19° 05' 31.34" N,	Quarterly and when complaints are heard in this regard	• Environmental consultant	MONREC DPTSC MOEP	**USD 3,000 (USD 500 * 3 points * 2 times)**

No.	Category	Parameter Monitor	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD) /Year
		Organic Carbon, Exchangeable Cations, Available nutrients		observation	96° 21' 56.79" E S 2: 19° 18' 48.32" N, 96° 41' 49.32" E S 3: 19° 34' 17.71" N, 97° 11' 26.09" E		• Construction Contractor		Along the project alignment soil quality cost should be included in the construction cost.
4.	Sediment and erosion	Erosion and sediment controls installed	-	Visual inspection	Construction site and surrounding area of project alignment Appropriate stockpile locations.	Weekly during disturbance activities or in response to incidents	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 5,000**
5.	Noise and Vibration	- LAeq (noise) LV10 (vibration)	National Environmental Quality (Emissions) Guideline (NEQEG)	Confirmation of voices and complaints	Locations along the project alignment AN 1: 19°14'21.09"N 96°34'13.88"E AN 2: 19°34'17.49" N 97°11'26.05"E AN 3: 18° 57' 5.898" N 96° 18' 17.093" E AN 4: 19° 32' 35.907" N 96° 56' 48.042" E AN 5: 19° 29' 18.599" N 96° 49' 42.694" E	Biannually	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 2,000 (USD 200 * 5 points * 2 times)**
6.	Waste Disposal	- Volume of waste including soil, vegetation, existing railway structures and garbage - Voices and	-	- Confirmation of records of waste generated - Confirmation of voices and complaints - Visual	Construction site, labor camps and along the project alignment C1: 18°57'30.61"N 96°18'21.77"E C2: 19°13'46.13"N	Quarterly and when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 20,000** **(USD 1000 * 5 points * 4 times)**

No.	Category	Parameter Monitor	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD) /Year
		complaints from the local community		observation	96°35'5.57"E C3: 19°21'38.92"N 96°48'13.30"E C4: 19°34'32.76"N 97° 0'29.26"E C5: 19°37'35.11"N 97°15'27.36"E				
7.	Visual	- Number of Complaint	- Complaint from stakeholders	-		when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	
8.	Occupational and Community Health and Safety	- Number of cases that suffered from heat strokes and other occupational health problems - Voices and complaints from the workers	-	- Confirmation of health check list of workers - Confirmation of voices and complaints	Construction site and labor camps C1: 18°57'30.61"N 96°18'21.77"E C2: 19°13'46.13"N 96°35'5.57"E C3: 19°21'38.92"N 96°48'13.30"E C4: 19°34'32.76"N 97° 0'29.26"E C5: 19°37'35.11"N 97°15'27.36"E	Monthly	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 10,000** **(USD 2,000 * 5 points)** Cost should be included in the construction cost.
9.	Terrestrial and Aquatic	Habitat and estimated number of trees cut and other natural vegetation cleared	• Conservation Status (IUCN and Myanmar, 2016)	Terrestrial and Aquatic surveying using field equipment	Project-affected area 75' Each side of Transmission Route	Biannually (*once during dry season and once during rainy season) & Whenever works that involve	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 30,000** **(USD 15,000 * 2 times)**

No.	Category	Parameter Monitor	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD) /Year
		• Species & Family • Medicinal Plants • Keystone species • Conservation Status (IUCN and Myanmar, 2016)				vegetation clearance take place			
10.	Traffic and transport	• Traffic accidents. • Traffic related complaints.	Motor Vehicle Law and Rules	Visual observation	Construction site, labor camps and along the project alignment	Number of traffic related incidents. Number of complaints.	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 1,000**
11.	Cultural Heritage	Inspections of all known or found historical, cultural and archaeological artefacts and sites in accordance with relevant legislation.	relevant legislation and chance find procedure	Visual Confirmation	Project activity areas and construction workers' camp 75' Each side of Transmission Route	when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 1,000**
12.	Socio-economic	Local Content, Number of resolution and grievances, Livelihood	Number of local employees, complaints from local	Confirmation of voices and complaints	Project-affected area 75' Each side of Transmission Route	when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 20,000**
13.	Revegetation	• species density • species diversity	Relevant Law of Environmenta l	Revegetation corridors (~50m wide), tube stock is hand	Project-affected area Transmission Route	vegetation clearance take place	• Environmental consultant	MONREC DPTSC MOEP	**USD 1,000**

No.	Category	Parameter Monitor	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD) /Year
		• plant health weed coverage	Conservation Law	planted in rip lines at approximately 4-6m spacing.			• Construction Contractor DPTSC/ MOEP		
Total									**USD 100,000**

Table 8.7: Environmental Monitoring Plan during Operation Stage

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
Operation Stage									
1.	Water Pollution (Surface water)	BOD, COD, pH, turbidity, temperature, colour, dissolved concentration, Total ammonia, and nitrate, free chlorine, total chlorine and dissolved chlorine, total hardness, total alkalinity, EC, total dissolved solids (TDS)	National Environmental Quality (Emissions) Guideline (NEQEG)	Sampling and measurement using field equipment and laboratory analyses	Locations along the project alignment SW 1: 18° 58' 07.72" N, 96° 18' 31.97" E SW 2: 19° 06' 19.61" N, 96° 25' 23.17" E SW 3: 19° 09' 53.10" N, 96° 32' 03.38" E	Biannually for the first two years (*once during dry season and once during rainy season) and when complaints are heard in this regard	• Environmental consultant • DPTSC / MOEP	MONREC DPTSC MOEP	**USD 1,200 (USD 200 * 3 points * 2 times)**
2.	Landform and Soil Contamination	Soil Condition, Voices and complaints from the local community	-	- Confirmation of voices and complaints - Visual observation	along the project alignment S 1: 19° 05' 31.34" N, 96° 21' 56.79" E S 2: 19° 18' 48.32" N, 96° 41' 49.32" E S 3: 19° 34' 17.71" N, 97° 11' 26.09" E	Quarterly for the first two years and when complaints are heard in this regard	• Environmental consultant • DPTSC / MOEP	MONREC DPTSC MOEP	**USD 600 (USD 100 * 3 points * 2 times)**
3.	Sediment and erosion	Erosion and sediment controls installed	-	Visual inspection -	Appropriate stockpile locations.	Weekly during disturbance activities or in response to incidents	• Environmental consultant • DPTSC / MOEP	MONREC DPTSC MOEP	**USD 1,000**
4.	Noise and Vibration	- LAeq (noise) LV10 (vibration)	National Environmental Quality (Emissions) Guideline (NEQEG)	Confirmation of voices and complaints	along the project alignment during maintenance period	Quarterly for the first two years and when complaints are heard in this regard	• Environmental consultant • DPTSC / MOEP	MONREC DPTSC MOEP	**-**

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
5.	Waste Disposal	- Volume of waste including existing railway structures, oil and garbage - Voices and complaints from the local community	-	- Confirmation of voices and complaints - Visual observation	along the project alignment during maintenance period	Quarterly for the first two years and when complaints are heard in this regard	• Environmental consultant DPTSC / MOEP	MONREC DPTSC MOEP	**USD 500**
6.	Visual	- Number of Complaint	- Complaint from stakeholders	-		when complaints are heard in this regard	• Environmental consultant • Operation Contractor DPTSC / MOEP	MONREC DPTSC MOEP	**USD 200**
7.	Occupational and Community Health and Safety	- Number of cases that suffered from heat strokes and other occupational health problems - Voices and complaints from the workers	-	- Confirmation of health check list of workers - Confirmation of voices and complaints	Operation and Maintenance site	Monthly	• Operation Contractor DPTSC / MOEP	MONREC DPTSC MOEP	**USD 500**
8.	Terrestrial and Aquatic	Habitat and estimated number of trees cut and other natural vegetation cleared • Species & Family • Medicinal Plants • Keystone species • Conservation Status (IUCN	• Conservation Status (IUCN and Myanmar, 2016)	Terrestrial and Aquatic surveying using field equipment	Project-affected area	Whenever works that involve vegetation clearance take place	• Environmental consultant • Operation Contractor DPTSC / MOEP	MONREC DPTSC MOEP	**USD 4,000**

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
		and Myanmar, 2016)							
9.	Socio-economic	Local Content, Number of resolution and grievances, Livelihood	Number of local employees, complaints from local		Project-affected area	when complaints are heard in this regard	• Environmental consultant • Operation Contractor DPTSC / MOEP	MONREC DPTSC MOEP	**USD 1,000**
10.	Revegetation	• species density • species diversity • plant health weed coverage	Relevant Law of Environmenta l Conservation Law	Revegetation corridors (~50m wide), tube stock is hand planted in rip lines at approximately 4-6m spacing.	Project-affected area Transmission Route	vegetation clearance take place	• Environmental consultant • Construction Contractor DPTSC / MOEP	MONREC DPTSC MOEP	**USD 1,000**
	Total								**USD 10,000**

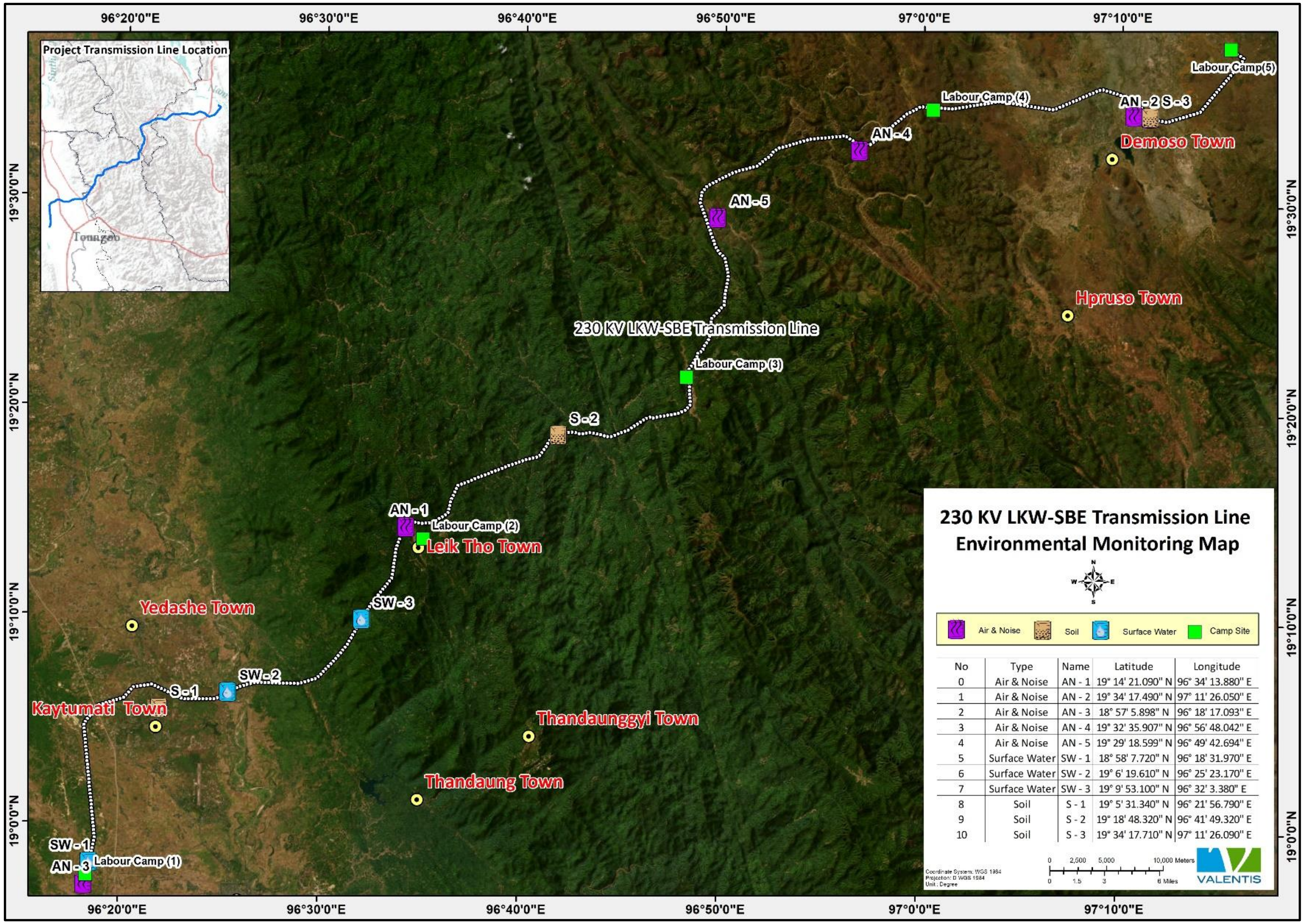
Table 8.8: Environmental Monitoring Plan during Decommissioning Stage

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
Decommissioning Stage									
1.	Air Pollution	NO2, SO2, PM10, PM2.5, ozone and micro climate (i.e. temperature, humidity, wind speed and direction and so on for reference), CO, CO2	National Environmental Quality (Emissions) Guideline (NEQEG)	One weekday for 24 consecutive hours per location	Locations along the project alignment AN 1: 19°14'21.09"N 96°34'13.88"E AN 2: 19°34'17.49" N 97°11'26.05"E AN 3: 18° 57' 5.898" N 96° 18' 17.093" E AN 4: 19° 32' 35.907" N 96° 56' 48.042" E AN 5: 19° 29' 18.599" N 96° 49' 42.694" E	Biannually (*once during dry season and once during rainy season)	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 4,000 (USD 400 * 5 points * 2 times)**
2.	Water Pollution (Surface water)	BOD, COD, pH, turbidity, temperature, colour, dissolved concentration, Total ammonia, and nitrate, free chlorine, total chlorine and dissolved chlorine, total hardness, total alkalinity, EC, total dissolved solids (TDS)	National Environmental Quality (Emissions) Guideline (NEQEG)	Sampling and measurement using field equipment and laboratory analyses	locations along the project alignment SW 1: 18° 58' 07.72" N, 96° 18' 31.97" E SW 2: 19° 06' 19.61" N, 96° 25' 23.17" E SW 3: 19° 09' 53.10" N, 96° 32' 03.38" E	Biannually (*once during dry season and once during rainy season)	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 3,000 (USD 500 * 3 points * 2 times)**
3.	Landform and Soil Contamination	Soil acidity and sulphate content, soil metal concentration, total nitrogen, EC,	-	- Confirmation of voices and complaints - Visual observation	Decommissioning site and surrounding area of project alignment S 1: 19° 05' 31.34" N,	Quarterly and when complaints are heard in this regard	• Environmental consultant	MONREC DPTSC MOEP	**USD 3,000 (USD 500 * 3 points * 2 times)**

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
		Organic Carbon, Exchangeable Cations, Available nutrients			96° 21' 56.79" E S 2: 19° 18' 48.32" N, 96° 41' 49.32" E S 3: 19° 34' 17.71" N, 97° 11' 26.09" E		• Construction Contractor		Along the project alignment soil quality cost should be included in the demolition cost.
4.	Sediment and erosion	Erosion and sediment controls installed	-	Visual inspection -	Construction site and surrounding area of project alignment Appropriate stockpile locations.	Weekly during disturbance activities or in response to incidents	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 5,000**
5.	Noise and Vibration	- LAeq (noise) LV10 (vibration)	National Environmental Quality (Emissions) Guideline (NEQEG)	Confirmation of voices and complaints	Decommissioning site and surrounding area of project alignment AN 1: 19°14'21.09"N 96°34'13.88"E AN 2: 19°34'17.49" N 97°11'26.05"E AN 3: 18° 57' 5.898" N 96° 18' 17.093" E AN 4: 19° 32' 35.907" N 96° 56' 48.042" E AN 5: 19° 29' 18.599" N 96° 49' 42.694" E	Biannually	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 2,000 (USD 200 * 5 points * 2 times)**
6.	Waste Disposal	- Volume of waste including soil, vegetation, existing railway structures and garbage - Voices and complaints from the local community	-	- Confirmation of records of waste generated - Confirmation of voices and complaints - Visual observation	Decommissioning site and labor camps along the project alignment C1: 18°57'30.61"N 96°18'21.77"E C2: 19°13'46.13"N 96°35'5.57"E	Quarterly and when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 10,000** **(USD 500 * 5 points * 4 times)**

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
					C3: 19°21'38.92"N 96°48'13.30"E C4: 19°34'32.76"N 97° 0'29.26"E C5: 19°37'35.11"N 97°15'27.36"E				
7.	Visual	- Number of Complaint	- Complaint from stakeholders	-		when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	-
8.	Occupational and Community Health and Safety	- Number of cases that suffered from heat strokes and other occupational health problems - Voices and complaints from the workers	-	- Confirmation of health check list of workers - Confirmation of voices and complaints	Construction site and labor camps	Monthly	• Construction Contractor	MONREC DPTSC MOEP	**USD 5,000**
9.	Terrestrial and Aquatic	Habitat and estimated number of trees cut and other natural vegetation cleared	-	Terrestrial and Aquatic surveying using field equipment	Project-affected area	Whenever works that involve vegetation clearance take place	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 10,000**
10.	Traffic and transport	• Traffic accidents. Traffic related complaints.	Motor Vehicle Law and Rules	Visual observation	Construction site, labor camps and along the project alignment	Number of traffic related incidents. Number of complaints.	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 1,000**

No.	Category	Item	Compared Standards	Method	Location	Frequency	Implementing Organization	Responsible Organization	Cost (USD)/Year
11.	Cultural Heritage			Visual Confirmation	Project activity areas and construction workers camp	when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 3,000**
12.	Socio-economic	Local Content, Number of resolution and grievances, Livelihood	Number of local employees, complaints from local		Project-affected area	when complaints are heard in this regard	• Environmental consultant • Construction Contractor	MONREC DPTSC MOEP	**USD 3,000**
13.	Revegetation	• species density • species diversity • plant health weed coverage	Relevant Law of Environmental Conservation Law	Revegetation corridors (~50m wide), tube stock is hand planted in rip lines at approximately 4-6m spacing.	Project-affected area Transmission Route	vegetation clearance take place	• Environmental consultant • Construction Contractor DPTSC/ MOEP	MONREC DPTSC MOEP	**USD 1,000**
	Total								**USD 50,000**



No	Type	Name	Latitude	Longitude
0	Air & Noise	AN - 1	19° 14' 21.090" N	96° 34' 13.880" E
1	Air & Noise	AN - 2	19° 34' 17.490" N	97° 11' 26.050" E
2	Air & Noise	AN - 3	18° 57' 5.898" N	96° 18' 17.093" E
3	Air & Noise	AN - 4	19° 32' 35.907" N	96° 56' 48.042" E
4	Air & Noise	AN - 5	19° 29' 18.599" N	96° 49' 42.694" E
5	Surface Water	SW - 1	18° 58' 7.720" N	96° 18' 31.970" E
6	Surface Water	SW - 2	19° 6' 19.610" N	96° 25' 23.170" E
7	Surface Water	SW - 3	19° 9' 53.100" N	96° 32' 3.380" E
8	Soil	S - 1	19° 5' 31.340" N	96° 21' 56.790" E
9	Soil	S - 2	19° 18' 48.320" N	96° 41' 49.320" E
10	Soil	S - 3	19° 34' 17.710" N	97° 11' 26.090" E

Figure 8.1: Environmental Monitoring Points Map

Chapter 9

9. Public Disclosure and Consultation

Public participation in the IEE process is critical to ensure potential environmental and socio-economic impacts of the Project are clearly understood and appropriately evaluated and considered through the IEE process. Public disclosure and consultation undertaken as part of the environmental and social impact assessment process has been guided by the Draft Guideline on Public Participation in Myanmar's IEE Processes (31 May 2017).

Public consultation was undertaken in accordance with MONREC's *Suitable guidelines for EMP, IEE and EIA projects that are to be carried out or currently being carried out during the Covid-19 Pandemic* and following Government advice and requirements, as well as additional safety measures.

9.1. Objectives

The objectives of public consultation and disclosure are to:

- Identify key stakeholders and their concerns.
- Provide information about the proposed project and its potential impacts to the identified stakeholders (in line with the principles of free, prior and informed consent).
- Provide stakeholders with the opportunity to comment or prepare submissions regarding the project.
- Understand perceptions and concerns associated with development of the transmission line.
- Identify the risks and opportunities for the Project.

Document and provide feedback to stakeholders on the outcomes of the public consultation process, and how the consultation has shaped the project design.

9.2. Public Consultation Plan and Approach

Critical to the success of the Project is timely disclosure of relevant information about the proposed Project and its potential impacts on environmental and socioeconomic values. Meetings will be arranged with national, regional, state, and local level governments, affected communities, government departments, community-based organisations and civil society organisations. A public consultation plan has been prepared to guide public disclosure and consultation for the Project IEE and has been based on the Public Participation Guidelines and International Finance Corporation (IFC) Performance Standards (IFC 2012). The plan has been developed based on the following principles:

- Integrity and accountability during engagement with stakeholders.
- Transparency with open communication and sharing of relevant information between all stakeholders in relation to the proposed project.
- Open communication and always providing feedback when a stakeholder provides comment, suggestions or grievances.
- Collaboration to cooperatively seek mutual beneficial outcomes.
- Inclusiveness, recognition and involvement of communities and other stakeholders early and throughout the IEE process.
- Timeliness with sufficient time for feedback and input into the IEE process.

The plan describes the consultation method, materials, schedule, reporting and monitoring elements of stakeholder engagement to support the project IEE. It is a 'live document' and is updated throughout the IEE process to capture stakeholders identified in the initial stakeholder mapping and stakeholders that are identified as the process progresses.

The Project will bring potential opportunities for benefits to stakeholders. A key aspect of the consultation approach will be to create opportunities for positive engagement with the project and to identify potential benefits to local communities and other stakeholders.

To successfully achieve stakeholder engagement objectives, the following factors will be considered when undertaking engagement activities:

- Language, format, materials and activities will be tailored to specific stakeholders.
- Interactions will take place in locations that maximise the sharing of information and opportunities for broad participation in the discussion of project issues.
- Support will be provided so that stakeholders understand technical concepts and are provided enough time to discuss project issues and develop informed responses to issues.
- Specific attention is paid to vulnerable and disadvantaged groups and individuals, and indigenous peoples and ethnic groups.

9.2.1. Stakeholders

Stakeholders were identified for the Project based on interrogation of available geospatial data on nearby communities, liaison with government and other interested groups, and information gathered during field surveys.

Stakeholders for the Project include, at a minimum, the following parties:

- Myanmar Government, ministries and departments
- Union Government.
- Environmental Conservation Department.
- Kayah, Shan and Kayin State governments.
- Bago Region Government.
- Local administration.
- Karen Environmental and Social Action Network.
- Local townships, villages and their communities. This includes Loikaw, Demoso, Yedashe and Kyun Kone, as well as numerous smaller settlements located close to the proposed transmission line route.
- Non-government and civil society organisations and individuals, including national and international NGOs e.g., Myanmar Centre for Responsible Business.
- Other local groups.

Additional stakeholders will be confirmed once socio-economic surveys and consultation have been completed.

9.2.2. Consultation

The key objective of the consultation is to ensure stakeholders and affected communities are aware of the Project and the approach to consultation. This involved:

- Contacting/visiting key stakeholders and community groups to describe the project and notify them of the baseline field activities and overarching consultation approach to stakeholders.
- Undertaking interviews with key informants to provide further detail on the project description and the approach to impact assessment.
- Seeking feedback on local sensitives, such as cultural heritage sites, land use and livelihoods, ecosystem services and potential concerns (e.g. in-migration of outside workers, potential for resettlement, and other environmental and social impacts).
- Maintaining records of consultation activities and feedback received from stakeholders.

9.3. Public Disclosure and Consultation Meetings and Attendees

The stakeholders and public were invited through the Myanma Alinn daily newspaper on 23rd January 2021. (Figure 9.1 & Appendix 14.9). Local government bureaucracy and village administrations were invited by personnel. The local community (Kyay Min, Ma Sa, Kaw Pat Chan, Yado Villages at Kayin State) were also informed via the local village chief/officers and announcement through villages representatives on 21st January, 2021 and the local community (Law Pi Ta San Pya and Saung Du Villages at Kayah State) were also informed on 10th February, 2021. The detail of Public consultation meeting list is presented in Table 9.1.

These meetings involved a presentation which included five parts:

- Introducing the project.
- Introducing the IEE, its purpose and the process of undertaking an IEE.
- Outlining the baseline studies undertaken so far and required prior to construction.
- Explaining potential positive and negative impacts, environmental and social management and priorities for management strategies.
- Outlining the benefits of the Project to local villages and Myanmar.

Table 9.1: Detail Public Disclosure and Consultation meetings

No.	Date	Time	Place	Total Attendees
1.	23rd Jan 2021	10:00 – 12:00	B.E.H.S (1), Thauk Yay Khat Village	22
2.	23rd Jan 2021	14:00-16:00	Church at Kyay Min Village	26
3.	24th Jan 2021	10:00 – 11:00	B.E.P.S at Upper Ma Sa Village	21*
4.	24th Jan 2021	14:00-16:00	House of Village Head, Kaw Pat Chan Village	20
5.	10th Feb 2021	10:00-12:00	Law Pi Ta San Pya Village	25*
6.	11th Feb 2021	10:00-12:00	Saung Du Village	6

ဖိတ်ကြားလွှာ

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန(Ministry of Electricity and Energy) မှ EDCF Loan(Korea)ဖြင့် တည်ဆောက်အကောင်အထည်ဖော်ဆောင်ရွက်သွားရန်ရှိသည့် ၂၃၀ ကေဗွီ၊ဘီလူးချောင်း (၂) (လွိုင်ကော်) တောင်ငူ (စပါးကြွယ်) မဟာဓာတ်အားလိုင်းစီမံကိန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းလုပ်ငန်း (Initial Environmental Examination) ကို တတိယအဖွဲ့အစည်းဖြစ်သော Valentis Environmental and Geotechnical Servicesနှင့် Coffey Myanamarတို့မှ ဥပဒေ၊ လုပ်ထုံးလုပ်နည်းများနှင့်အညီ အဆင့်ဆင့် ဆောင်ရွက်လျက်ရှိပါသည်။ ယခုအခါ အဆိုပါ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍ ရှင်လင်းတင်ပြခြင်း(Public Disclosure) နှင့် အများပြည်သူသဘောထားရယူခြင်း (Public Consultation)အခမ်းအနားကို အောက်ပါအစီအစဉ်များအတိုင်း ကျင်းပမည်ဖြစ်ပါသဖြင့် စိတ်ပါဝင်စားသူ မည်သူမဆို တက်ရောက်နိုင်ပါရန် လေးစားစွာဖိတ်ကြားအပ်ပါသည်။

(က) ၂၀၂၂ခုနှစ် ၊ ဇန်နဝါရီလ(၂၃) ရက် နံနက်(၁၀:၀၀)နာရီမှ (၁၂:၀၀) နာရီထိ ၊ ကရင်ပြည်နယ်၊ ဘားအံခရိုင်၊ သံတောင်ကြီးမြို့နယ်၊ လိပ်သိုမြို့၊ သောက်ရေခမ်းကျေးရွာ၊ အ.ထ.က(၁)ကျောင်းခန်းမ

(ခ) ၂၀၂၂ ခုနှစ်၊ ဇန်နဝါရီလ(၂၃)ရက် ၊ မွန်းလွဲ (၂:၀၀)နာရီမှ (၄:၀၀)နာရီထိ၊ ကရင်ပြည်နယ်၊ ဘားအံခရိုင်၊ သံတောင်ကြီးမြို့နယ်၊ လိပ်သိုမြို့၊ ဓစပ်ကျေးရွာအုပ်စု၊ အုပ်ချုပ်ရေးမှူးအိမ်

(ဂ) ၂၀၂၂ခုနှစ် ၊ဇန်နဝါရီလ(၂၄) ရက်နေ့ နံနက် (၁၀:၀၀)နာရီမှ (၁၂:၀၀)နာရီထိ၊ ကရင်ပြည်နယ်၊ ဘားအံခရိုင်၊ သံတောင်ကြီးမြို့နယ်၊ လိပ်သိုမြို့၊ ဇလဲကျေးရွာအုပ်စု၊ အုပ်ချုပ်ရေးမှူးအိမ်

Figure 9.1: Invitation on Myanmar Alinn Daily Newspaper

The detail presentation slides are attached in Appendix 14.10. A question and answer session was held at the completion of each presentation. A summary of these sessions is provided in Table 9.2, 9.3 and 9.4. Key issues and queries raised during the question-and-answer sessions included:

Whether the Project will have positive impacts for local villages, such as access to electricity and opportunities for income and/or employment during construction. Impacts to agricultural land, loss of land and associated compensation. The span between transmission towers. Whether local villages will need to provide security as for previous transmission line projects.

(1) Thauk Yay Khat Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Twenty-two attendees were participated and detailed participant list is presented in Table 9.2, Plate 9.1 and the original attendees list is presented in Appendix. 14.10.

Table 9.2: List of Attendees at the Public Consultation Meeting in Thauk Yay Khat Village

No.	Name	Position	Organization	Address
1.	U Saw Patrick	Villager	Thout Yay Khet	Ward(3), Thout Yay Khet Village
2.	U Saw Yaw Hla Po	Colour-sergfeant	Local Armed Force	Ward(3), Thout Yay Khet Village
3.	U Saw Thar Sar Kaur Lae	10 House group elder	Administration	Ward(3), Thout Yay Khet Village
4.	U Saw Su Pe Arr Noe	Villager	Thout Yay Khet	Ward(4), Thout Yay Khet Village
5.	U Phillip	Villager	Thout Yay Khet	Ward(3), Thout Yay Khet Village
6.	U Than Tee No	Villager	Thout Yay Khet	Ward(2), Thout Yay Khet Village
7.	U Htoo Htoo	Villager	Thout Yay Khet	Ward(1), Thout Yay Khet Village
8.	U Aeik Dee	Villager	Thout Yay Khet	Ward(3), Thout Yay Khet Village

No.	Name	Position	Organization	Address
9.	Daw Win Myint	Finance	Agricultural Department	Ward(2), Thout Yay Khet Village
10.	Daw Tin San Win	Villager	Thout Yay Khet	Ward(2), Thout Yay Khet Village
11.	U Ngine	Villager	Thout Yay Khet	Ward(2), Thout Yay Khet Village
12.	U Saw Wai Linn	Villager	Thout Yay Khet	Ward(2), Thout Yay Khet Village
13.	U Saw Khin Maung	10 House group elder	Administration	Ward(1), Thout Yay Khet Village
14.	U Tun Nay	Member	Kayan New Land Party	Ward(1), Thout Yay Khet Village
15.	U Si Daw Yo	Retired	Education	Ward(2), Thout Yay Khet Village
16.	U Lee Si	Villager	Administration	Ward(3), Thout Yay Khet Village
17.	U Paw Lu	Villager	Thout Yay Khet	Ward(2), Thout Yay Khet Village
18.	U Saw Ta Nar Htoo	Clerk	Education	Ward(2), Thout Yay Khet Village
19.	Daw Mu Lae Lae Win	Teacher	Education	Ward(1), Thout Yay Khet Village
20.	U Saw Al Tee Kaw	10 House group elder	Administration	Ward(2), Thout Yay Khet Village
21.	U Saw Bu Kyaw	Villager	Thout Yay Khet	Ward(3), Thout Yay Khet Village
22.	U Saw kyaw Tint	Village Head	Thout Yay Khet	Ward(3), Thout Yay Khet Village

Plate 9.1: Public Consultation at Thauk Yay Khat Village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in Table 9.3.

Table 9.3: Summary of Q&A Session (Public Consultation at Thauk Yay Khat Village)

No	Name/Organization	Question/Opinion	Answer
1.	U Ngine (Resident of Thauk Yay Khat Village)	Will there be a positive impact for the village?	More than 54 percent of Myanmar has access to electricity and is reaping the benefits of growth. In the near future, these villages will have a positive impact on the socio-economic situation due to such projects.
2.	U Lwee Si (Resident of Thauk Yay Khat Village)	How about our Agricultural land?	In the process of constructing the transmission line, passing not through the agricultural lands shall be concerned as a priority. But Inevitably, there would be land that the transmission might pass. In those cases, the government will solve it out in accordance with appropriate existing laws & regulations.
3.	U Htuu Htuu (Resident of Thauk Yay Khat Village)	We all have big concern for whether the old transmission line crossing over the village will fall apart.	In this project, technically the first priority consideration for where the transmission tower to be landed is to avoid passing through the villages. And there is no possibility that the transmission line falls apart unless the act of god.
4.	U Thar Di (Resident of Thauk Yay Khat Village)	In previous transmission line project, we had only losses, there was no positive impacts like access to electricity. Due to that, I suggest to do this project that bring opportunity for the region.	The village will soon be access to electricity, as the villages adjacent to transmission lines are priority to get electricity first.
5.	Daw Win Myint (Resident of Thauk Yay Khat Village)	In previous transmission line project, they just only gave hopes that we will get access to electricity. Due to that, is it the same siruation?	No, now the government is putting much effort for rural electrification and development. Due to that, now it is not just a hope, surely the village will access electricity in near future.
6.	U Saw Wai Lin (Resident of Thauk Yay Khat Village)	Most of the people living in village are farmers. Is there any opportunity in this project for those people?	Even there will be the technicians and workers from outside of the village, they still need to get services from villages like accommodation, food, consumables. During the construction period, the people living in villages will have income opportunities.
7.	U Toe Ni (Resident of Thauk Yay Khat Village)	We all have same destination, to access to electricity. Due to that, every meeting minute should be counted and submit in detail for related authority.	Yes, we will submit every detail discussed in this meeting.

(2) Kyay Min Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Twenty-Six attendees were participated and detailed participant list is presented in Table 9.4, Plate 9.2 and the original attendees list is presented in Appendix 14.10.

Table 9.4: List of Attendees at the Public Consultation Meeting in Kyay Min Village

No.	Name	Position	Organization	Address
1.	U Phillip	Finance	CBO	Kyay Min(Low) Village
2.	Daw May Nu	member	Religious organization	Kyay Min (Low) Village
3.	Daw Thida Oo	Villager	Kyay Min	Kyay Min(Low) Village
4.	U Khin Maung Toe	Villager	Kyay Min	Kyay Min (Low) Village
5.	U Ye Tun	Villager	Kyay Min	Kyay Min(Low) Village
6.	U Zaw Myo Win	member	Young Organization	Kyay Min (Low) Village
7.	U Lein Kyun	Villager	Kyay Min	Kyay Min(Low) Village
8.	U Soe Myint	Villager	Kyay Min	Kyay Min (Low) Village
9.	U Thein Tun Lin	member	Young Organization	Kyay Min(Low) Village
10.	U Maung Thein Oo	Villager	Kyay Min	Kyay Min (Low) Village
11.	U Toe Nee No	Villager	Kyay Min	Kyay Min(Low) Village
12.	U Poe Po	Villager	Kyay Min	Kyay Min (Low) Village
13.	U Myo Win Mg	Ecclesiastic	Kyay Min	Kyay Min(Low) Village
14.	Daw Ma Be	Villager	Kyay Min	Kyay Min (Low) Village
15.	Daw Sar Tin	Villager	Kyay Min	Kyay Min(Low) Village
16.	U Saw Khin Aung Win	10 House group elder	Kyay Min	Kyay Min (Low) Village
17.	U Aung Kyaw Soe	10 House group elder	Kyay Min	Kyay Min(Low) Village
18.	U Nal La Sin	Village Head	Ma Sa	Ma Sa (Upper) Village
19.	U Aung Naing	Village Head	Kyay Min	Kyay Min (Low) Village
20.	U Tun Tun	Village Head	Kyay Min	Kyay Min (Low) Village
21.	Daw Naw Faw	Member	C.B.O	Kyay Min (Low) Village
22.	Daw Khin May Than	secretary	women's affairs	Kyay Min (Low) Village
23.	Daw Khin Htwe	Member	women's affairs	Kyay Min (Low) Village
24.	Daw Al Ni Win	member	Women's affairs	Kyay Min (Low) Village
25.	Daw Khin Hla	Finance	women's affairs	Kyay Min (Low) Village
26.	U Si Nar Do	General worker	Education	Kyay Min (Low) Village

Plate 9.2: Public Consultation at Kyay Min village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in Table 9.5.

Table 9.5: Summary of Q&A Session (Public Consultation at Kyay Min Village)

No	Name/Organization	Question/Opinion	Answer
1.	U Pyit Htoo (Resident of Kyay Min Village)	Will the transmission line pass through their agricultural lands?	In the process of constructing the transmission line, passing not through the agricultural lands shall be concerned as a priority. But Inevitably, there would be land that the transmission might pass. In those cases, the government will solve it out in accordance with appropriate existing laws & regulations.
2.	U Zaw Myo Win (Resident of Kyay Min Village)	Do you know the span between transmission towers?	Spans (or distance) between structures range from 800 to 1000 feet.
3.	U Khin Aung Win (Resident of Kyay Min Village)	Does the transmission line end in Taungoo?	Yes, this transmission line is started in Loikaw and end in Taungoo.
		Can we do the agriculture under the transmission cable?	Only 50' x 50' area where the transmission tower concrete foundation will be placed shall be occupied. The other land has nothing to change.
4.	U Ye Htut (Resident of Kyay Min Village)	How about land compensation?	The government will solve it out in accordance with appropriate existing laws & regulations with full transparency.
5.	U Phillip (Resident of Kyay Min Village)	Do we still need to provide the security like we did for the previous transmission line project?	Not like a decade ago, this project will be funded by Korea with full of transparency and the region is peaceful and has a lot of potential for development. There will be no need to provide the security.
6.	U Aung Khine (Resident of Kyay Min Village)	When will the project be completed?	Roughly speaking, the project will be completed in 2023-2024 fiscal year.

(3) Upper Ma Sa Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Twenty- one attendees were participated. (Plate 6.3). Unfortunately, the attendees list couldn't record.

Plate 9.3: Public Consultation at Upper Ma Sa Village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in Table 9.6.

Table 9.6: Summary of Q&A Session (Public Consultation at Ma Sa Villages)

No	Name/Organization	Question/Opinion	Answer
1.	U Nel Lel Sin (Administrator of Ma Sa Village)	He simply encourages the people of the village to support the project, mentioned that this project will lead their generation to be lived better than theirs.	
2.	U Myo Min Maung (Resident of Ma Sa Village)	Is there any development for the village?	This transmission line itself is the major development not only for the village but also for the country. Stability in electricity will bring many direct and indirect opportunities to all the people living in the country.

(4) Kaw Bat Chan Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Twenty attendees were participated and detailed participant list is presented in (Table 9.7), (Plate 9.4) and the original attendees list is presented in Appendix 14.10.

Table 9.7: Attendees List at Kaw Pat Chan Village

No.	Name	Position	Organization	Address
1.	U Bo Pyar	Member	C.B.O	Kaw Phet Chan Village
2.	Daw Than Yin	Villager	Kaw Phet Chan	Kaw Phet Chan Village
3.	Daw Tin Shwe	Secretary	C.B.O	Kaw Phet Chan Village
4.	U Aung Ba Hla	Villager	Kaw Phet Chan	Kaw Phet Chan Village
5.	Daw Naw Jar Ni	ChairMan	C.B.O	Kaw Phet Chan Village
6.	U Maung Ba	Villager	Administration	Kaw Phet Chan Village
7.	U Saw Htay Lin	Village Head	Administration	Kaw Phet Chan Village
8.	U Arr Ge	Villager	Kaw Phet Chan	Kaw Phet Chan Village
9.	Daw May Yee Myint	Member	C.B.O	Kaw Phet Chan Village
10.	U Saw Tin Myint	Villager	Administration	Kaw Phet Chan Village
11.	Daw Myint Myint Aye	Villager	Kaw Phet Chan	Kaw Phet Chan Village
12.	Daw Mya Mya	Villager	Kaw Phet Chan	Kaw Phet Chan Village
13.	U Aung Gyi	Villager	Kaw Phet Chan	Kaw Phet Chan Village
14.	U win Myint	Villager	Kaw Phet Chan	Kaw Phet Chan Village
15.	Daw Cherry	Villager	Kaw Phet Chan	Kaw Phet Chan Village
16.	U Davide	Villager	Kaw Phet Chan	Kaw Phet Chan Village
17.	U Jane Htoo	Villager	Kaw Phet Chan	Kaw Phet Chan Village
18.	Daw Ni Ni Soe	Villager	Kaw Phet Chan	Kaw Phet Chan Village
19.	U Saw Hla Myint	Villager	Kaw Phet Chan	Kaw Phet Chan Village
20.	U Saw Kaung Htet Kyaw	Villager	Kaw Phet Chan	Kaw Phet Chan Village

Plate 9.4: Public Consultation at Kaw Bat Chan Village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in (Table 9.8).

Table 9.8: Summary of Q&A Session (Public Consultation at Kaw Pat Chan Village)

No.	Name/Organization	Question/Opinion	Answer
1	U Win Myint (Resident of Kaw Pat Chan Village)	Is there any impact for our agricultural land?	In the process of constructing the transmission line, passing not through the agricultural lands shall be concerned as a priority. But Inevitably, there would be land that the transmission might pass. In those cases, the government will solve it out in accordance with appropriate existing laws & regulations.
2	U Aung Kyi (Resident of Kaw Pat Chan Village)	If the transmission line needs to pass our agricultural land, we request to avoid as much as possible and earn proper compensation.	The government will perform fairly in accordance with existing law & regulation.
3	Daw Naw Gar Nu (Resident of Kaw Pat Chan Village)	Do you know the span between transmission towers?	Spans (or distance) between structures range from 800 to 1000 feet.
4	U Maung Ba (Resident of Kaw Pat Chan Village)	In my opinion, there will not be negative impacts caused by project.	Yes surely, the project will bring only positive impacts into region.
5	U Saw Tin Myint (Resident of Kaw Pat Chan Village)	Could there be a major impact or harmful to the people?	Technically, the government will follow all the safety measures not to harmful to the people.
6	U Myint Htoo (Administrator of village)	The project will succeed as it will follow not to impact much to our environment and it will follow the principles and procedures. And believe that all the implementation process will be smooth and the living standards of local people will change positively due to this project.	

(5) Law Pi Ta San Pya Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Twenty attendees were participated. (Plate 6.3). Unfortunately, the attendees list couldn't record.




Plate 9.5: Public Consultation at Law Pi Ta San Pya Village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in (Table 9.9).

Table 9.9: Summary of Q&A Session (Public Consultation at Law Pi Ta San Pya Village)

No	Name/Organization	Question/Opinion	Answer
1	U Hla Thein (Administrator of Law Pi Ta San Pya Village)	We welcome the project. It seen like completely transparency, fair. We only want to get proper land compensation if the transmission line will pass through our land.	In those cases, the government will solve it out in accordance with appropriate existing laws & regulations.
2	U Ohn Myint (Resident of Law Pi Ta San Pya Village)	We strongly request to negotiate with local people, communities and armed forces.	That is why the public consultation meetings are made to make sure complete transparency and smooth operations.
3	U Phel Khuu (Resident of Law Pi Ta San Pya Village)	This is not the first time in this region that the transmission line were constructed and there were no issue or problem. We will take care and explain if there are misunderstandings.	The help of the local community is need when the project is implementing.

(6) Saung Du Village

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in the meeting including stakeholders and public. Six attendees were participated and detailed participant list is presented in (Table 9.10), (Plate 9.6) and the original attendees list is presented in Appendix 14.10.

Table 9.10: Attendees list in Saung Du Village

No.	Name	Position	Organization	Address
1.	U Mo You	Villager	Soun Du	Soun Du Village
2.	U Bae Hto	Villager	Soun Du	Soun Du Village
3.	U Paw Lu	Village Head	Soun Du	Soun Du Village
4.	U Mar Hlar Do	Villager	Soun Du	Soun Du Village
5.	U Pay Thu Tuu	Villager	Soun Du	Soun Du Village
6.	U Joe Sat	Villager	Soun Du	Soun Du Village


Plate 9.6: Public consultation at Saung Du Village

The response and clarification reflecting all the issues and concerns raised by the attendees during the consultation meeting are provided in Table 9.11.

Table 9.11: Summary of Q&A Session (Public Consultation at Saung Du Village)

No.	Name/Organization	Question/Opinion	Answer
1.	U Paul Lu (Administator of Saung Du Village)	We have no objection upon the project. But we urge to bring job opportunities to the region.	Even there will be the technicians and workers from outside of the village, they still need to get services from villages like accommodation, food, consumables. During the construction period, the people living in villages will have income opportunities and job opportunities as well.
2.	U Joe Set (Resident of Saung Du Village)	When the telephone line was under construction, they only took one daily worker from the village, there was not much opportunity for the village.	Every development project will have positive impact to the region directly or alternatively. The government or awarded company will coordinate to get more man power from the villages.
3.	U Bay Tho (Resident of Saung Du Village)	How about land compensation?	The government will solve it out in accordance with appropriate existing laws & regulations with full transparency.

9.4. Conclusion

The accordance with COVID-19 period standards, the attendees of maximum 30 people were arranged to participate in each meeting including stakeholders and public. The total number of 120 attendees were participated from different six location during consultation. The results summary of the public disclosure and consultation, there is no objection the proposed project. However, some attendees would like to know more specifically the resettlement, relocation, time of construction and compensation process. Therefore, the proponent has to conduct and follow the rule, act and regulations for resettlement and compensation. After all consultation meetings, it is resulted in a clear indication that people are strongly supporting the project for more stabilizing and receive the electricity that will lead to better living standard of local people and develop the project area. Therefore, they express a positive willingness to implement the proposed project.

9.5. On-going Stakeholder Engagement

Stakeholder engagement will continue throughout the life of the Project. The frequency and nature of engagement will continue to be focussed and refined in response to stakeholder feedback and aligned with project stage and learnings from previous engagement activity.

The route of the transmission line will be affected mainly land, crops and trees only. According to the site study during preconstruction and planning stages, there are no residential houses and only plantation fields and forest were found along the ROW. Permanent Land Acquisition and Temporal Land Acquisition and compensation will be carried out as directed by the proponent and related governmental department.

Compensation is based on the market value of the land and also possible damage incurred by the private landowner, such as loss of crops and firewood or the cost of changing residence and place of business. Land in-kind can also be provided in place of monetary compensation. These losses should take place “in consideration of the compulsory nature of the acquisition”.

Consultants of our team who are working with planning of the project are now undertaking consultations in the planned transmission line project areas. The Local people welcome the project. Due to the completely transparency and fair, they have no objection upon the project. But we urge to bring job opportunities to the region. They are happy to get proper land compensation if the transmission line will pass through our land.

Chapter 10

10. Grievance Redress Mechanism

A Grievance Redress Mechanism (GRM) is a systematic process for receiving, validating and addressing affected people's project-related complaints. In general, MOEP will work proactively towards preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before these issues become grievances. Through the GRM, MOEP shall promptly address affected people's concerns, complaints, and grievances about the project's environmental performance without retribution. It is proposed that a joint grievance redress mechanism be instituted for both environmental and social related issues. Grievances associated with resettlement and compensation are addressed through a separate process described in the resettlement Plan.

10.1. Community and Employees Grievance Mechanism Plan

During the site preparation and construction phase of the project, there may be complaints related to the implementation of the project. Any affected person may raise and submit a grievance against MOEE or during public consultation meetings if the activity has a detrimental impact on the environment, working area, the community, or the quality of life of the people. Community and employees Grievance Mechanism Plan may include the following:

- Negative impacts on a person or a community that includes adverse changes on way of life and livelihood such as loss of trees, land, crops, business, water supply, power supply, telephone connection, and other nuisances;
- Hazards to community health and safety;
- Hazards to working area and employees
- Construction-related nuisances such as noise and dust and improper disposal of wastes;
- Failure to comply with environmental policies, safety clearance requirements and other legal obligations;
- Peace and order problems in the community due to presence of migrant construction workers.

10.2. Community Grievance Mechanism

Communities in areas affected by 230Kv Loikaw – Taungoo Transmission Line Project should be given the opportunity to raise issues and grievances with DPTSC arising from activities associated with site preparation and construction phase of the project. A defined process (a grievance mechanism) is frequently used to effectively and proactively manage a community's feedback, grievances or concerns.

A grievance mechanism is an important part of engaging with local communities as it creates opportunities for companies and communities to identify problems and discover solutions together. The mechanism also provides useful information to help evaluate the social and environmental performance of through the project.

All types of issues can be raised by the community and may include those related to financial loss, physical harm, damage to an asset, disrupted access to a resource such as drinking water, harassment by company representatives or other health, safety and environmental impacts that occur as a result of project activities. Criminal activity, bribery, corruption or fraud may be recorded as a grievance but resolution of these types of grievances should be referred to the law enforcement agencies. The community grievance mechanism describes the process for communities to raise complaints and grievances through the project.

10.2.1. Objectives

The objectives of this community grievance mechanism are to:

- Provide a process for communities to express their concerns related to 230Kv Loikaw – Taungoo Transmission Line Project, and for grievances to be addressed by DPTSC
- Provide for timely, effective and coordinated responses to complaints or grievances, including, if necessary, measures to avoid a recurrence of the action that led to the complaint.

10.2.2. Scopes

The scopes of this community grievance mechanism are:

- This procedure applies to management of issues, grievances or complaints raised by communities.
- Grievances or complaints raised by employees and workers are addressed by separate human resources procedures.
- Participation in the community grievance management process does not replace any existing Myanmar legal processes or negate an individual's right to pursue other remedies as provided for under Myanmar laws.

10.2.3. Grievance Redress Mechanism (GRM)

The project proponent established a functioning Grievance Redress Mechanism (GRM) that will receive, record, follow up, and resolve grievances received from community members and the project affected people (PAP) in project area. The GRM procedures create a platform where the PAP voice is heard and an amicable solution is agreed to resolve the complaint or grievance. The GRM defines the step-by-step process, procedures, roles and responsibilities, timeline, and channels of communication to raising the grievance, recording, and negotiating solution or agreement to resolve the complaint, demand, request, issue or concern. The PAP or members of the community in project area can raise grievance through the following channels:

- Social Team: Governmental and Liaison Manager, Community Liaison Officer
- Project Contractor: Project Managing Director, Environmental, Social, Health, and Safety (ESHS) Manager

In cases where the aggrieved individuals or group is not satisfied with the outcome of the amicable mechanism, they will always be able to resort to Justice at any stage in the resolution process.All grievances will be documented and each grievance resolution process and communication will be systematically tracked. DPTSC has to include the Grievance Redress Process for grievances pertaining to compensation, economic displacement and livelihood restoration.

10.2.4. Screening for Standing

The grievance will be received through these channels, grievance shall be recorded using standard form, and screened for standing (i.e. whether the grievance warrants further consideration as an acceptable complaint within the terms defined under the GRM). When the grievance is "standing", the matter is dealt according to the GRM Tiers described in the GRM Flowchart (see Figures 10.1 and 10.2).

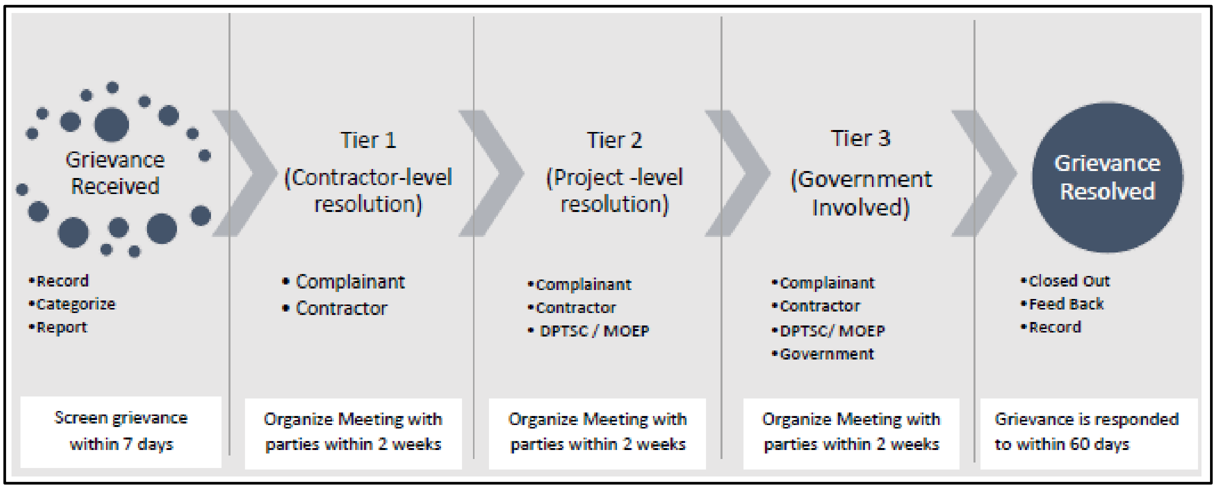


Figure 10.1: Grievance Redress Mechanism Tier Approach

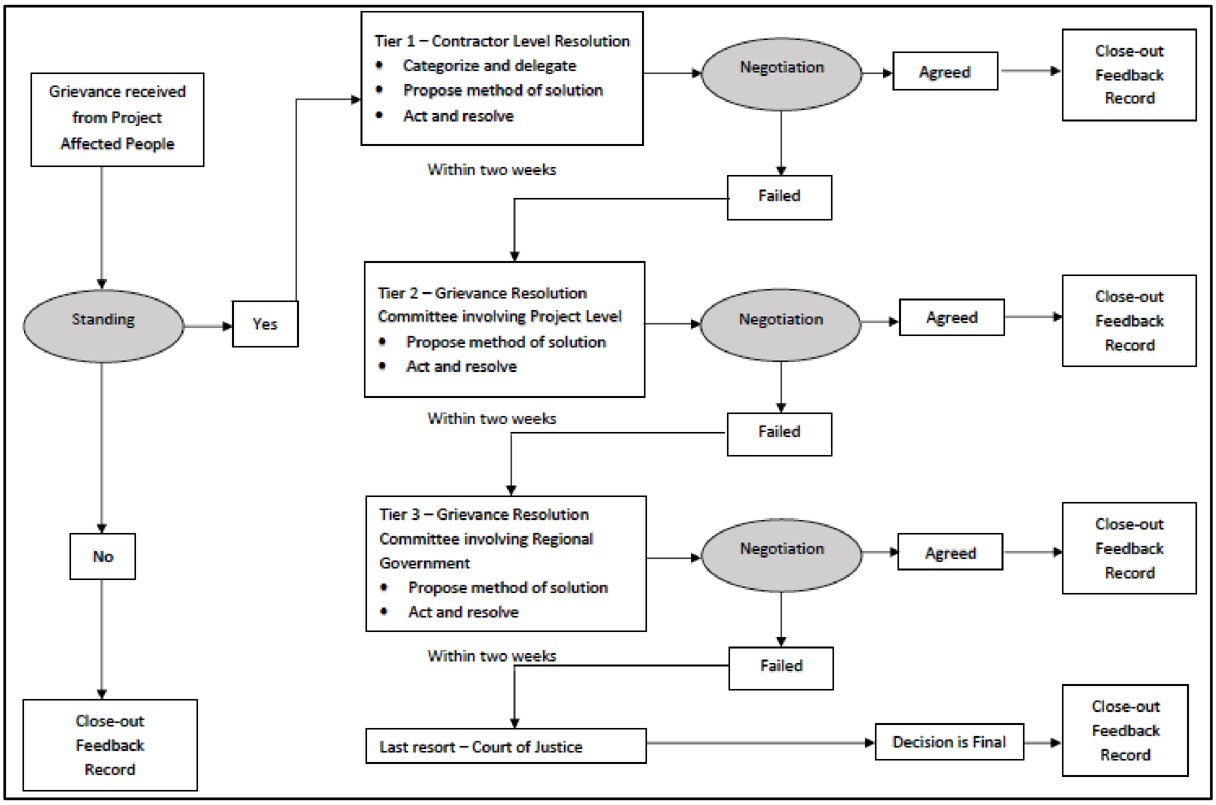


Figure 10.2: Grievance Redress Mechanism Flow chart

This Grievance Redress Mechanism (GRM) document establishes the procedures to address grievances that a rise from project-affected communities in project area. It includes three successive Tiers of amicable grievance review and resolution:

(i) Tier 1 - the Contractor-Level: Review of the grievance by Project Contractor and DPTSC
(ii) Tier 2 –Grievance Resolution Committee (GRC) that includes DPTSC and MOEP and
(iii) Tier 3 - Grievance Resolution Committee (GRC) that includes Regional Government in addition.

10.2.5. GRM Framework

- DPTSC implements the GRM to resolve the grievance amicably in coordination with relevant stakeholders and local residents in project area.
- If the grievance is not solved at Tier 1, DPTSC will escalate the grievance resolution to the next Tier 2 and/or 3 depending on the case.
- If grievance is not solved through Tier 1 ~ 3, the Complainants can appeal the case to the court and its decision shall be final and will be implemented accordingly.
- While DPTSC implements the GRM in accordance with its commitment, the Complainants shall not conduct any illegal actions, regardless of any conclusion through GRM or court decision. Any recourse to illegal action will be subjected to due process according to the Myanmar applicable laws and regulations.

10.2.6. Grievance Redress Mechanism Procedure

The detail of Grievance Redress Mechanism Procedure of DPTSC is presented in below:

(1) Internal Process

(A) Receive Grievance [Project Contractor, DPTSC, MOEP]

- Grievance shall be received through the following channels: (i) Project Contractor (ii) DPTSC and (iii) MOEP

(B) Register Grievance [Community Liaison Officer (CLO) / Daily]

- The CLO shall check the grievance receipt channels mentioned above on daily basis and register all the grievances received prior to the dose of business (5pm) of the day.

(C) Screening for Standing / No Standing [Community Liaison Manager / Weekly]

- The Community Liaison Manager shall screen all the grievances received within a week and determine the legitimacy, categorize the grievance, allocate responsible resources, and further prepare a Grievance Screening Report detailing the reasons of Standing or No Standing.

- After reporting to E&S Team Leader and Chief Operation Officer, standing grievances shall be included in the agenda for Tier 1.

- With regard to No Standing grievance, the Community Liaison Manager shall provide feedback to the Complainants, verbal and in writing, with the detailed reason of No Standing.

(2) Tier 1 Meeting (Contractor-Level Review) [Community Liaison Manager / within 2 weeks from Grievance Screening Report]

- The Community Liaison Manager shall organize internal discussion with Project Contractor responsible person according to the categories of the Standing grievance received within one week, discuss and determine the issues and possible solutions and report to DPTSC, MOEP every Friday.

- Community Liaison Manager shall report the conclusion of the meeting to EXCOM every Friday.

- For the grievances solved in Tier 1 meeting, Community Liaison Manager shall (i) finalize and sign the agreement with the Complainants, (ii) implement in accordance with the agreement and (iii) send the 'Complaint Close-Out Letter' to the applicable Complainants.

- For the grievances not solved in Tier 1 meeting, those shall move to Tier 2.

(3) Tier 2 (Project Level- Review/ Grievance Resolution Committee (GRC)) [COO/ within 2 weeks from Tier 1 Meeting]

- The COO and the Community Liaison Manager shall meet with DPTSC/ MOEP to update the meeting results of Tier 1 meeting.

- Community Liaison Manager shall report the conclusion of the meeting to EXCOM.

- For the grievances solved in Tier 2 meeting, Project Manager shall (i) finalize and sign the agreement with the Complainant, (ii) implement in accordance with the agreement and (iii) send the 'Complaint Close-Out Letter' to the applicable Complainants.

- For the grievances not solved in Tier 2 meeting, those shall move to Tier 3.

(4) Tier 3 (Regional Government Level Review/ Grievance Resolution Committee (GRC)) [COO/ within 2 weeks from Tier 2 Meeting]

- The CEO/COO/ Community Liaison Manager shall meet with Regional Government to update the meeting result in Tier 2 Meeting.

- The Community Liaison Manager shall report the conclusion of the meeting to EXCOM.

- For the grievances solved in Tier 3 meeting, Regional Government shall (i) finalize and sign the agreement with the Complainant, (ii) implement in accordance with the agreement and (iii) send the 'Complaint Close-Out Letter' to the applicable Complainants.

- For the grievances not solved in Tier 3 meeting, the Complainants can appeal the case to the court and its decision shall be final and will be implemented accordingly.

10.2.7. Closure of Grievances

A grievance will be considered "resolved" or "closed" when a solution is satisfied to both parties has been reached, and after corrective measures has been successfully implemented. When a propose solution to solve a grievance is agreed between the Project proponent and the complainant, the time needed to implement it will depend on the nature of the solution. However, the actions to implement this solution will be undertaken within one month at last. Once the solution is being implemented or is implemented, a complaint closes out form shall be signed by both parties (Project Community Liaison Officer and the complainant), stating that the complainant consider that its complaint is closed. This form will be archived in the Project Grievance database.

In certain situations, however, the project may "close" a grievance even if the complainant is not satisfied with the outcome. This could be the case, for example, if the complainant is unable to substantiate a grievance, or if there is an obvious speculative or fraudulent attempt. In such situations, the Project's efforts to investigate the complaint and to arrive at a conclusion will be well documented and the complainant advised of the situation. DPTSC will not dismiss grievances based on a cursory review and close them in their grievance record unless the complainant has been notified and had the opportunity to provide supplementary information or evidence.

10.2.8. Roles & Responsibilities

The roles and responsibilities of GRM are present in Table 13.1.

Table 10.1: Roles and Responsibilities of GRM

No.	Role	Responsibilities
1.	Project Proponent (DPTSC)	• Implement its commitments in accordance with ESIA particularly proper implementation of Land Acquisition Act • In case of grievance raised, proceed the Grievance Redress Mechanism Procedures in accordance with the framework
2.	Project Contractor	• Ensure Health and Safety of communities adjacent to worksites. • Ensure to coordinate with DPTSC to maximize the employment of local communities throughout the exploration period. • In case of grievance raised, cooperate with DPTSC to review and solve the grievance during Grievance Redress Mechanism Process.
3.	DPTSC / MOEP	• Participate in Tier 2 and/or 3 to solve the grievance. • In case of grievance raised, cooperate with DPTSC to review and solve the grievance during Grievance Redress Mechanism Process especially the grievance related to the infrastructure requests and disputes between the communities.
4.	Regional Government	• Participate to solve the grievance by making available capable resources from Regional Government level to deal with community grievances that cannot be resolved in Tier 1 and 2 Grievance resolution level.

10.2.9. Contact Information

The contact regarding the management of grievance is the project's director is presented in Table 10.2.

Table 10.2: The Detail Contact of the Project's Director

Name	U Thura Aung Bo
Position	Director General
Address	Department of Power Transmission and System Control Ministry of Electrical Power The Republic of the Union of Myanmar Office No. 27, Nay Pyi Taw
Phone	+95 (9) 428 601 619
Email	dgdptsc2021@gmail.com
Website	https://www.fortunaasia.com/contact

10.3. Employees or Labor Grievance Mechanism

Employees or Labor Grievance means any type of dissatisfaction or discontentment's arising out of factors related to an employee's job which he thinks are unfair. A grievance arises when an employee feels that something has happened or is happening to him which he thinks is unfair, unjust or inequitable. In an organization, a grievance may arise due to several factors such as: (1) Violation of management's responsibility such as poor working conditions (2) Violation of company's rules and regulations (3) Violation of labor laws (4) Violation of natural rules of justice such as unfair treatment in promotion, etc.

Grievance procedure is a step by step process an employee must follow to get his or her complaint addressed satisfactorily. In this process, the formal (written) complaint moves from one level of authority (of the firm and the union) to the next higher level. DPTSC will establish the Employee Grievance Procedure and follow up the process inevitably. The following Figure 10.3 presents the Employee Grievance Procedure of Project Contractor.

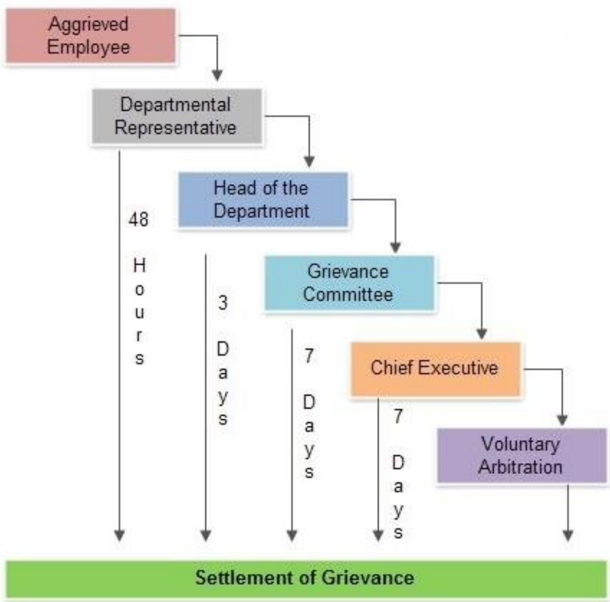


Figure 10.3: Employee Grievance Procedure

These are 4 steps in the Employee Grievance Procedure. There are

STEP 1: In the first step, the grievance is to be submitted to departmental representative, who is a representative of management. He has to give his answer within 48 hours.

STEP 2: If the departmental representative fails to provide a solution, the aggrieved employee can take his grievance to head of the department, who has to give his decision within 3 days.

STEP 3: If the aggrieved employee is not satisfied with the decision of departmental head, he can take the grievance-to-Grievance Committee. The Grievance Committee makes its recommendations to the manager within 7 days in the form of a report. The final decision of the management on the report of Grievance Committee must be communicated to the aggrieved employee within three days of the receipt of report. An appeal for revision of final decision can be made by the worker if he is not satisfied with it. The management must communicate its decision to the worker within 7 days.

STEP 4: If the grievance still remains unsettled, the case may be referred to voluntary arbitration.

Chapter 11

11. Decommissioning and Rehibition Plan

Decommissioning, reclamation, and restoration activities will adhere to the requirements of appropriate governing authorities. The reclamation and restoration process comprises removal of above ground structures; removal of below ground foundations and infrastructure; and restoration of topsoil, re-vegetation, and seeding. Appropriate temporary erosion and sedimentation control practices will be used during the reclamation phase of the Project. The control practices will be inspected on a regular basis to ensure their function.

The design life of transmission lines is generally from 50 to 60 years. At or before that time the proponent will need to take measures to upgrade (improve certain components to higher loads), refurbish (carry out extensive renovation to restore the design life of the system), or decommission the system (for example by replacing it with a parallel system). In the event of refurbishment or decommissioning it is expected that contractors will carry out the work and that this would result in certain construction-related impacts. Because the decommissioning would occur relatively far in the future it is difficult to forecast many environmental, social, or economic impacts since the baseline at that time will be unknown. It is recommended that at the time of decommissioning a detailed Decommissioning and Rehibition Plan be developed and implemented.

Chapter 12

12. Conclusion and Recommendations

The 160-km-long 230 kV transmission line from Baluchaung (2) Loikaw to Taungoo (Sabakywe) will contribute to upgrading the national electricity system by enabling increased transmission loads and strengthening the network.

Proposed Activity

Construction will involve site clearance and access road construction, grading and excavation of soils for foundation installation, transportation of materials to each tower site, and building of foundations and anchors prior to assembly and installation of towers. Once assembled and installed, the transmission line will be strung between the towers. Construction of the entire transmission line is expected to take about six months and is anticipated in 2022.

The route was selected taking into consideration physical constraints and environmental conditions and sensitivities within the project area, as well as social and economic constraints. Minor adjustments to the proposed route were then considered as part of the project feasibility study and environmental and social impact assessment process. Lattice steel towers were selected as the preferred choice to align with most of the existing network.

Regulatory Assessment and Stakeholders

The IEE has been undertaken in accordance with the EIA procedure (2015) and in accordance with the Environmental Conservation Law (2012).

Stakeholders include Myanmar Government, ministries and departments, Union Government, ECD, Kayah, Shan and Kayin State governments, Bago Region Government, local administration, local townships, villages and their communities, non-government and civil society organisations and individuals, and other local groups. A public consultation plan was prepared to guide public consultation and disclosure for the IEE. Consultation focussed on project awareness information and recording stakeholder concerns, expectations or opinions on the Project and its potential impacts.

Environmental and Social Impacts

The IEE identified a range of potential impacts relating to the Project:

Impacts on landform and soils through physical disturbance and contamination of soils. Physical disturbance may lead to reduced landform stability, direct loss of soil and changes to landform, and loss of topsoil/humus due to increases erosion and vegetation clearance. Contamination of soils may result in a reduced capacity to support plant growth. With implementation of standard management measures, the residual significance of impacts to landforms and soils ranges from very low to low.

Construction activities that may affect the surface water and groundwater values include physical disturbance to land features including vegetation clearing and earthworks, and accidental spills and leaks to land and inappropriate disposal of rubbish/waste. Increased sediment in watercourses may cause changes in the form and behaviour of the watercourse, resulting in changes to surface water flow. Project activities will be distanced from the banks of watercourses and spills are likely to be localised, small in quantity, and prevented from entering watercourses should they occur. Most impacts during construction will be short-term in nature and localised, with construction sites sited away from watercourses. With standard management measures in place, impacts associated with reduced water quality are of low residual significance. Impacts to water quality in watercourses and groundwater systems are also of a very low significance.

Habitat loss and degradation may occur as a result of vegetation clearance, edge effects, dust deposition, contamination, fire and introduction or spread of invasive species, pests and pathogens. The residual significance of these impacts is moderate for ecosystem health of the Kayah-Karen moist forests/montane rain forests ecoregion and low for the ecosystem health of Northern Indochina subtropical forest ecoregions and Irrawaddy moist deciduous forest ecoregions, reserved and public protected forests, and cleared, modified or degraded areas.

Disturbance or loss of flora and fauna may occur as a result of removal of individuals during vegetation clearance, vehicle strike, air, noise and light emission, introduction or spread of invasive species, posts and pathogens, or mortality due to collisions and electrocution. IUCN threatened fauna and/or flora species may be impacted by a range of these impacts. With the implementation of standard management measures the residual significance of these impact is low to moderate or moderate.

Aquatic biodiversity may be impacted by habitat degradation and disturbance or loss of flora and fauna through removal of fauna, contamination or introduction or spread of invasive species, pests and pathogens. The Project will be designed to avoid direct disturbance to aquatic biodiversity values, and potential impacts on aquatic ecosystems and species is of low residual significance.

Air quality is expected to be impacted to some extent by particulate matter generated during construction works, forest clearance and project vehicle movements, and exhaust gases from construction machinery and project vehicles. Project activities will also generate noise that may create nuisance to those sensitive receptors located close to construction areas. Dust generated during project activities is expected to have a short-term, localised impact and can be effectively addressed with standard management controls. A minor amount of exhaust gases will be released from construction machinery and vehicles transporting equipment to sites. Air quality guidelines for Myanmar are not expected to be exceeded during construction the Project and air quality impacts are expected to be negligible during operation of the transmission line and substations. The residual air quality impact significance at receptors is low.

Sensitive receptors closest to construction sites could experience elevated noise levels from construction-related traffic, site preparation and tower construction and conductor stringing. Negligible noise is likely to be emitted from the operational transmission line, while low level humming at substations will occur in an industrial setting. Construction noise is transient and as such, noise emissions are not expected to be continuous or constant. With standard management controls in place, the predicted significance of impacts from noise and vibration will be low.

Positive impacts will be experienced by power consumers in Myanmar who will benefit from more reliable energy from the Project. Potential negative impacts to social values, including capacity to support livelihoods, health and amenity of settlement areas, and social cohesion and stability, may arise from a number of factors including:

- Alienation of land and associated habitat required for project infrastructure.
- Impairment of stream water quality due to construction sediment runoff.
- Construction activity disruption to village/settlement/urban residential life through noise, dust, vehicle movements etc.
- Requirement to relocate people away from project facilities and infrastructure. This will be avoided where possible, through detailed route selection. If resettlement is required, a resettlement plan will need to be prepared to guide this.
- Proximity of power lines impacting visual amenity and perceived or actual health risks relating to electric and magnetic fields.
- Uncontrolled community interaction with construction vehicles and equipment including health and safety risk and dust annoyance.
- Adverse non-local worker interaction with local community.

- Impacts to culture, including shared beliefs, customs, values and connections to land and places.

Residual impact/risk summary

Most impacts have been identified as low or very low, with some moderate impacts. Moderate significance impacts are summarised as follows:

Risk associated with the requirement to relocate people away from project facilities and infrastructure for construction of infrastructure and maintenance of easement to the amenity and support of quality livelihoods of rural villages along the route (moderate). Whether or not relocation of resettlement will be required will be determined during micro siting of towers and micro alignment of the route, through the feasibility study process. A resettlement plan will be required if resettlement is required.

Risk of impacts associated with the proximity of power lines on the visual amenity of rural villages along the route (moderate).

Limited survey effort was undertaken for cultural heritage sites/archaeological features and biodiversity sensitivities, with the focus on characterising the area in general. Pre-construction surveys will be required for both cultural heritage and biodiversity features once the transmission line route is confirmed, ahead of construction. These surveys may identify additional sensitivities which require additional management measures to those included within this report.

EMMP

An EMMP has been prepared as part of this IEE to document the Project’s approach to environmental and social management, including the environmental management system, schedule for environmental and social management and organisational structure and responsibilities. The EMMP details a program to monitor, manage, audit and report on the Project’s impacts and its compliance with regulatory permits and licences.

Recommendations

The proposed Project will be able to reduce the significance of most of these to acceptable levels if they implement the mitigation measures outlined in EMP. It is therefore important the EMMP is audited to ensure compliance and that monitoring takes place as outlined therein otherwise the impacts identified will remain unacceptable. It is therefore recommended that the proposed project receive Environmental Clearance, provided that the Environmental Management Plan and Monitoring are implemented and followed the Monitoring Plan prescribed.

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14. Appendix

14.1. Company Registration

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

Certificate of Incorporation

VALENTIS ENVIRONMENTAL AND GEOTECHNICAL SERVICES LIMITED

Company Registration No. 105707185

မြန်မာနိုင်ငံကုမ္ပဏီများဥပဒေ၂၀၁၇ အရ

VALENTIS ENVIRONMENTAL AND GEOTECHNICAL SERVICES LIMITED

အား ၂၀၁၈ ခုနှစ် စက်တင်ဘာလ ၂၇ ရက်နေ့တွင်

အစုရှယ်ယာအားဖြင့် တာဝန်ကန့်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ

အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

This is to certify that

VALENTIS ENVIRONMENTAL AND GEOTECHNICAL SERVICES LIMITED

was incorporated under the Myanmar Companies Law 2017 on 27 September 2018 as a Private Company Limited by Shares.

ကုမ္ပဏီမှတ်ပုံတင်အရာရှိ

Registrar of Companies

ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

Directorate of Investment and Company Administration

DICA

Directorate of Investment and Company Administration

14.2. Certificate for Transitional Consultant Registration

(A) Valentis Environmental and Geotechnical Service

THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

Environmental Conservation Department

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 10069 Date 24 MAY 2019

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Valentis Environmental and Geotechnical Service
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏အမည်)	Dr. Soe Moe Kyaw Win
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Number of the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/Sa Kha Na (Naing) 057507
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No.(234), Central 9 Office Tower, Pyay Road, Mayangone, Yangon, Myanmar. Telephone (office): +95(0)12305383 Fax (office): 012305387 Mobile phone: +95(0) 9455309359 E mail: soemoe@valentisresources.com
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 December 2019

Director General

Environmental Conservation Department

Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted

(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Antimicrobial resistance (AMR),
2. Ecology and Biodiverisy,
3. Ecology and Biodiversity,
4. Geology and Soil,
5. Groundwater and Hydrology,
6. Noise and Vibration,
7. Waste Management,
8. Water Pollution Control

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး
ဦးစီးဌာန

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
ဤလက်မှတ်အား(၁-၁-၂၀၂၀) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၀)
ရက်နေ့အထိ တစ်နှစ် သက်တမ်းတိုးမြှင့်သည်။
Soe Naing 16-1-2020
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for six month from (1.1.2021) to (30.6.2021)
ဤလက်မှတ်အား(၁-၁-၂၀၂၁) ရက်နေ့မှ (၃၀-၆-၂၀၂၁)
ရက်နေ့အထိ (၆)လ သက်တမ်းတိုးမြှင့်သည်။
Soe Naing
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးမြှင့်ခြင်း)
The VALIDITY of this certificate is extended for one year from (1.1.2022) to (31.12.2022)
ဤလက်မှတ်အား(၁-၁-၂၀၂၂) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၂)
ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးမြှင့်သည်။
Soe Naing
For Director General
(Soe Naing, Director)
Environmental Conservation Department

(B) Coffey Myanmar Limited

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00027 Date 15 JUN 2017

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Coffey Myanmar Limited
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏အမည်)	Daw Khin Su Su Naing
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Number of the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/ KMY (Naing) 010767
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No. 36A, Room 7B, Grand Phoe Sein Condo, Phoe Sein Road, Tamwe Township, Yangon. khinsusu.naing@coffey.com , 09 25014 6944
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်အား (၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁-၃-၂၀၁၉) ရက်နေ့အထိ တစ်နှစ်သက်တမ်း တိုးမြှင့်သည်။
Soe Naing 17-10-2018
For Director General
(Soe Naing, Director)
Environmental Conservation Department

19.9.2019

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity
2. Facilitation of Meeting
3. Noise and Vibration
4. Risk Assessment and Hazard Management
5. Socio-Economy
6. Water Pollution Control
7. Waste Management
8. Environmental and Social Impact Assessment, Environmental Management and Audit Site and Route Selection, Stakeholder Engagement
9. Environmental and Social Impact Assessment, Public Health
10. Project Management, Environmental and Social Impact Assessment
11. Stakeholder Engagement, Grievance Mechanism, Workplace Health and Safety

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended
for one year from (1.1.2020) to (31.12.2020)
ဤလက်မှတ်အား(၁-၁-၂၀၂၀) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၀)
ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးမြှင့်သည်။
16.1.2020
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended
for nine months from (1.4.2019) to (31.12.2019)
5.7.2019
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
The VALIDITY of this certificate is extended
for six month from (1.1.2021) to (30.6.2021)
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးမြှင့်ခြင်း)
The VALIDITY of this certificate is extend
for one year from (1.1.2022) to (31.12.202
For Director General
(Soe Naing, Director)
Environmental Conservation Departmen

14.3. Tower Location Points

No.	Tower ID	Latitude	Longitude
1.	T1	97° 15' 28.752" E	19° 37' 32.528" N
2.	T2	97° 15' 38.051" E	19° 37' 26.930" N
3.	T3	97° 15' 47.349" E	19° 37' 21.331" N
4.	T4	97° 15' 56.562" E	19° 37' 15.610" N
5.	T5	97° 16' 5.613" E	19° 37' 9.660" N
6.	T6	97° 16' 1.671" E	19° 37' 1.796" N
7.	T7	97° 15' 54.953" E	19° 36' 53.523" N
8.	T8	97° 15' 48.101" E	19° 36' 45.350" N
9.	T9	97° 15' 41.153" E	19° 36' 37.250" N
10.	T10	97° 15' 34.205" E	19° 36' 29.149" N
11.	T11	97° 15' 27.257" E	19° 36' 21.048" N
12.	T12	97° 15' 20.309" E	19° 36' 12.948" N
13.	T13	97° 15' 13.361" E	19° 36' 4.847" N
14.	T14	97° 15' 6.414" E	19° 35' 56.746" N
15.	T15	97° 14' 59.467" E	19° 35' 48.645" N
16.	T16	97° 14' 52.520" E	19° 35' 40.544" N
17.	T17	97° 14' 45.573" E	19° 35' 32.443" N
18.	T18	97° 14' 38.627" E	19° 35' 24.342" N
19.	T19	97° 14' 31.680" E	19° 35' 16.241" N
20.	T20	97° 14' 24.734" E	19° 35' 8.140" N
21.	T21	97° 14' 17.788" E	19° 35' 0.039" N
22.	T22	97° 14' 10.842" E	19° 34' 51.937" N
23.	T23	97° 14' 3.897" E	19° 34' 43.836" N
24.	T24	97° 13' 56.951" E	19° 34' 35.735" N
25.	T25	97° 13' 46.960" E	19° 34' 31.881" N
26.	T26	97° 13' 36.456" E	19° 34' 28.743" N
27.	T27	97° 13' 25.952" E	19° 34' 25.605" N
28.	T28	97° 13' 15.449" E	19° 34' 22.467" N
29.	T29	97° 13' 4.945" E	19° 34' 19.328" N
30.	T30	97° 12' 54.442" E	19° 34' 16.190" N
31.	T31	97° 12' 43.939" E	19° 34' 13.051" N
32.	T32	97° 12' 33.436" E	19° 34' 9.912" N
33.	T33	97° 12' 22.933" E	19° 34' 6.773" N
34.	T34	97° 12' 12.327" E	19° 34' 5.314" N
35.	T35	97° 12' 1.512" E	19° 34' 7.282" N
36.	T36	97° 11' 50.696" E	19° 34' 9.250" N
37.	T37	97° 11' 39.881" E	19° 34' 11.217" N
38.	T38	97° 11' 30.135" E	19° 34' 15.087" N
39.	T39	97° 11' 22.381" E	19° 34' 22.500" N
40.	T40	97° 11' 14.628" E	19° 34' 29.913" N
41.	T41	97° 11' 6.873" E	19° 34' 37.325" N
42.	T42	97° 10' 59.119" E	19° 34' 44.738" N

No.	Tower ID	Latitude	Longitude
43.	T43	97° 10' 51.365" E	19° 34' 52.151" N
44.	T44	97° 10' 43.610" E	19° 34' 59.563" N
45.	T45	97° 10' 35.855" E	19° 35' 6.975" N
46.	T46	97° 10' 26.696" E	19° 35' 12.176" N
47.	T47	97° 10' 16.155" E	19° 35' 15.203" N
48.	T48	97° 10' 5.614" E	19° 35' 18.230" N
49.	T49	97° 9' 55.074" E	19° 35' 21.257" N
50.	T50	97° 9' 44.533" E	19° 35' 24.284" N
51.	T51	97° 9' 33.992" E	19° 35' 27.310" N
52.	T52	97° 9' 23.451" E	19° 35' 30.336" N
53.	T53	97° 9' 12.910" E	19° 35' 33.363" N
54.	T54	97° 9' 2.369" E	19° 35' 36.388" N
55.	T55	97° 8' 52.090" E	19° 35' 35.423" N
56.	T56	97° 8' 42.027" E	19° 35' 31.179" N
57.	T57	97° 8' 31.965" E	19° 35' 26.935" N
58.	T58	97° 8' 21.902" E	19° 35' 22.692" N
59.	T59	97° 8' 11.840" E	19° 35' 18.448" N
60.	T60	97° 8' 1.778" E	19° 35' 14.203" N
61.	T61	97° 7' 51.716" E	19° 35' 9.959" N
62.	T62	97° 7' 41.654" E	19° 35' 5.715" N
63.	T63	97° 7' 31.592" E	19° 35' 1.470" N
64.	T64	97° 7' 21.531" E	19° 34' 57.225" N
65.	T65	97° 7' 11.469" E	19° 34' 52.980" N
66.	T66	97° 7' 1.408" E	19° 34' 48.735" N
67.	T67	97° 6' 51.347" E	19° 34' 44.490" N
68.	T68	97° 6' 41.286" E	19° 34' 40.245" N
69.	T69	97° 6' 31.019" E	19° 34' 37.402" N
70.	T70	97° 6' 20.117" E	19° 34' 38.879" N
71.	T71	97° 6' 9.215" E	19° 34' 40.355" N
72.	T72	97° 5' 58.313" E	19° 34' 41.831" N
73.	T73	97° 5' 47.411" E	19° 34' 43.307" N
74.	T74	97° 5' 36.509" E	19° 34' 44.783" N
75.	T75	97° 5' 25.606" E	19° 34' 46.259" N
76.	T76	97° 5' 14.704" E	19° 34' 47.734" N
77.	T77	97° 5' 3.802" E	19° 34' 49.209" N
78.	T78	97° 4' 52.899" E	19° 34' 50.684" N
79.	T79	97° 4' 41.997" E	19° 34' 52.159" N
80.	T80	97° 4' 31.095" E	19° 34' 53.634" N
81.	T81	97° 4' 20.192" E	19° 34' 55.108" N
82.	T82	97° 4' 9.290" E	19° 34' 56.583" N
83.	T83	97° 3' 58.387" E	19° 34' 58.057" N
84.	T84	97° 3' 47.491" E	19° 34' 59.038" N
85.	T85	97° 3' 36.631" E	19° 34' 57.304" N
86.	T86	97° 3' 25.772" E	19° 34' 55.569" N

No.	Tower ID	Latitude	Longitude
87.	T87	97° 3' 14.912" E	19° 34' 53.835" N
88.	T88	97° 3' 4.052" E	19° 34' 52.100" N
89.	T89	97° 2' 53.193" E	19° 34' 50.366" N
90.	T90	97° 2' 42.333" E	19° 34' 48.630" N
91.	T91	97° 2' 31.474" E	19° 34' 46.895" N
92.	T92	97° 2' 20.615" E	19° 34' 45.160" N
93.	T93	97° 2' 9.756" E	19° 34' 43.424" N
94.	T94	97° 1' 58.897" E	19° 34' 41.689" N
95.	T95	97° 1' 48.038" E	19° 34' 39.953" N
96.	T96	97° 1' 37.179" E	19° 34' 38.217" N
97.	T97	97° 1' 26.320" E	19° 34' 36.481" N
98.	T98	97° 1' 15.339" E	19° 34' 37.006" N
99.	T99	97° 1' 4.350" E	19° 34' 37.683" N
100.	T100	97° 0' 53.361" E	19° 34' 38.359" N
101.	T101	97° 0' 42.372" E	19° 34' 39.036" N
102.	T102	97° 0' 31.382" E	19° 34' 39.712" N
103.	T103	97° 0' 20.393" E	19° 34' 40.388" N
104.	T104	97° 0' 9.404" E	19° 34' 41.063" N
105.	T105	96° 59' 58.415" E	19° 34' 41.739" N
106.	T106	96° 59' 48.002" E	19° 34' 39.878" N
107.	T107	96° 59' 38.280" E	19° 34' 34.976" N
108.	T108	96° 59' 28.559" E	19° 34' 30.073" N
109.	T109	96° 59' 18.838" E	19° 34' 25.170" N
110.	T110	96° 59' 9.117" E	19° 34' 20.267" N
111.	T111	96° 59' 0.640" E	19° 34' 13.648" N
112.	T112	96° 58' 52.330" E	19° 34' 6.799" N
113.	T113	96° 58' 44.021" E	19° 33' 59.951" N
114.	T114	96° 58' 35.711" E	19° 33' 53.102" N
115.	T115	96° 58' 27.402" E	19° 33' 46.254" N
116.	T116	96° 58' 19.093" E	19° 33' 39.405" N
117.	T117	96° 58' 10.784" E	19° 33' 32.556" N
118.	T118	96° 58' 2.476" E	19° 33' 25.707" N
119.	T119	96° 57' 54.167" E	19° 33' 18.858" N
120.	T120	96° 57' 45.859" E	19° 33' 12.009" N
121.	T121	96° 57' 37.551" E	19° 33' 5.160" N
122.	T122	96° 57' 29.243" E	19° 32' 58.311" N
123.	T123	96° 57' 20.693" E	19° 32' 52.173" N
124.	T124	96° 57' 9.727" E	19° 32' 53.104" N
125.	T125	96° 56' 58.761" E	19° 32' 54.036" N
126.	T126	96° 56' 47.795" E	19° 32' 54.967" N
127.	T127	96° 56' 37.195" E	19° 32' 56.966" N
128.	T128	96° 56' 27.744" E	19° 33' 2.321" N
129.	T129	96° 56' 18.294" E	19° 33' 7.676" N
130.	T130	96° 56' 8.843" E	19° 33' 13.031" N

No.	Tower ID	Latitude	Longitude
131.	T131	96° 55' 58.627" E	19° 33' 15.095" N
132.	T132	96° 55' 47.677" E	19° 33' 14.004" N
133.	T133	96° 55' 36.727" E	19° 33' 12.913" N
134.	T134	96° 55' 25.777" E	19° 33' 11.823" N
135.	T135	96° 55' 14.828" E	19° 33' 10.732" N
136.	T136	96° 55' 3.878" E	19° 33' 9.640" N
137.	T137	96° 54' 52.928" E	19° 33' 8.549" N
138.	T138	96° 54' 41.979" E	19° 33' 7.457" N
139.	T139	96° 54' 31.029" E	19° 33' 6.365" N
140.	T140	96° 54' 20.080" E	19° 33' 5.273" N
141.	T141	96° 54' 9.481" E	19° 33' 2.532" N
142.	T142	96° 53' 58.938" E	19° 32' 59.525" N
143.	T143	96° 53' 48.395" E	19° 32' 56.518" N
144.	T144	96° 53' 37.853" E	19° 32' 53.510" N
145.	T145	96° 53' 27.310" E	19° 32' 50.503" N
146.	T146	96° 53' 16.768" E	19° 32' 47.495" N
147.	T147	96° 53' 6.226" E	19° 32' 44.487" N
148.	T148	96° 52' 55.684" E	19° 32' 41.479" N
149.	T149	96° 52' 45.142" E	19° 32' 38.470" N
150.	T150	96° 52' 35.867" E	19° 32' 32.979" N
151.	T151	96° 52' 26.836" E	19° 32' 27.010" N
152.	T152	96° 52' 20.724" E	19° 32' 18.584" N
153.	T153	96° 52' 13.202" E	19° 32' 11.437" N
154.	T154	96° 52' 3.898" E	19° 32' 5.857" N
155.	T155	96° 51' 55.555" E	19° 31' 59.060" N
156.	T156	96° 51' 47.276" E	19° 31' 52.181" N
157.	T157	96° 51' 38.351" E	19° 31' 46.434" N
158.	T158	96° 51' 27.750" E	19° 31' 43.623" N
159.	T159	96° 51' 17.149" E	19° 31' 40.811" N
160.	T160	96° 51' 6.548" E	19° 31' 38.000" N
161.	T161	96° 50' 55.948" E	19° 31' 35.188" N
162.	T162	96° 50' 45.347" E	19° 31' 32.376" N
163.	T163	96° 50' 34.746" E	19° 31' 29.564" N
164.	T164	96° 50' 24.591" E	19° 31' 25.700" N
165.	T165	96° 50' 14.880" E	19° 31' 20.786" N
166.	T166	96° 50' 5.169" E	19° 31' 15.871" N
167.	T167	96° 49' 55.459" E	19° 31' 10.957" N
168.	T168	96° 49' 45.748" E	19° 31' 6.042" N
169.	T169	96° 49' 36.038" E	19° 31' 1.128" N
170.	T170	96° 49' 26.328" E	19° 30' 56.213" N
171.	T171	96° 49' 16.618" E	19° 30' 51.298" N
172.	T172	96° 49' 7.580" E	19° 30' 45.614" N
173.	T173	96° 49' 0.671" E	19° 30' 37.490" N
174.	T174	96° 48' 53.762" E	19° 30' 29.365" N

No.	Tower ID	Latitude	Longitude
175.	T175	96° 48' 51.585" E	19° 30' 19.266" N
176.	T176	96° 48' 49.933" E	19° 30' 8.948" N
177.	T177	96° 48' 49.335" E	19° 29' 58.727" N
178.	T178	96° 48' 53.062" E	19° 29' 48.907" N
179.	T179	96° 48' 56.789" E	19° 29' 39.087" N
180.	T180	96° 49' 0.515" E	19° 29' 29.267" N
181.	T181	96° 49' 4.242" E	19° 29' 19.447" N
182.	T182	96° 49' 7.968" E	19° 29' 9.627" N
183.	T183	96° 49' 11.694" E	19° 28' 59.807" N
184.	T184	96° 49' 15.420" E	19° 28' 49.987" N
185.	T185	96° 49' 19.146" E	19° 28' 40.166" N
186.	T186	96° 49' 22.872" E	19° 28' 30.346" N
187.	T187	96° 49' 26.598" E	19° 28' 20.526" N
188.	T188	96° 49' 30.323" E	19° 28' 10.705" N
189.	T189	96° 49' 34.048" E	19° 28' 0.885" N
190.	T190	96° 49' 38.707" E	19° 27' 51.473" N
191.	T191	96° 49' 44.163" E	19° 27' 42.410" N
192.	T192	96° 49' 51.110" E	19° 27' 34.491" N
193.	T193	96° 49' 59.321" E	19° 27' 27.545" N
194.	T194	96° 50' 6.416" E	19° 27' 19.995" N
195.	T195	96° 50' 8.520" E	19° 27' 9.750" N
196.	T196	96° 50' 10.623" E	19° 26' 59.506" N
197.	T197	96° 50' 12.727" E	19° 26' 49.262" N
198.	T198	96° 50' 15.433" E	19° 26' 39.174" N
199.	T199	96° 50' 16.519" E	19° 26' 29.136" N
200.	T200	96° 50' 14.580" E	19° 26' 18.862" N
201.	T201	96° 50' 12.642" E	19° 26' 8.589" N
202.	T202	96° 50' 10.704" E	19° 25' 58.315" N
203.	T203	96° 50' 8.890" E	19° 25' 48.025" N
204.	T204	96° 50' 7.738" E	19° 25' 37.645" N
205.	T205	96° 50' 6.587" E	19° 25' 27.266" N
206.	T206	96° 50' 5.435" E	19° 25' 16.886" N
207.	T207	96° 50' 4.284" E	19° 25' 6.507" N
208.	T208	96° 49' 57.134" E	19° 24' 58.653" N
209.	T209	96° 49' 49.794" E	19° 24' 50.880" N
210.	T210	96° 49' 42.454" E	19° 24' 43.107" N
211.	T211	96° 49' 35.114" E	19° 24' 35.333" N
212.	T212	96° 49' 27.775" E	19° 24' 27.559" N
213.	T213	96° 49' 25.640" E	19° 24' 17.663" N
214.	T214	96° 49' 24.744" E	19° 24' 7.260" N
215.	T215	96° 49' 23.848" E	19° 23' 56.858" N
216.	T216	96° 49' 22.952" E	19° 23' 46.456" N
217.	T217	96° 49' 22.057" E	19° 23' 36.054" N
218.	T218	96° 49' 18.571" E	19° 23' 26.493" N

No.	Tower ID	Latitude	Longitude
219.	T219	96° 49' 12.567" E	19° 23' 17.748" N
220.	T220	96° 49' 6.564" E	19° 23' 9.003" N
221.	T221	96° 49' 2.188" E	19° 22' 59.566" N
222.	T222	96° 48' 56.470" E	19° 22' 51.975" N
223.	T223	96° 48' 47.082" E	19° 22' 47.626" N
224.	T224	96° 48' 44.485" E	19° 22' 37.484" N
225.	T225	96° 48' 39.454" E	19° 22' 28.330" N
226.	T226	96° 48' 33.521" E	19° 22' 19.543" N
227.	T227	96° 48' 27.589" E	19° 22' 10.755" N
228.	T228	96° 48' 21.656" E	19° 22' 1.968" N
229.	T229	96° 48' 19.912" E	19° 21' 52.156" N
230.	T230	96° 48' 20.632" E	19° 21' 41.741" N
231.	T231	96° 48' 21.351" E	19° 21' 31.327" N
232.	T232	96° 48' 22.071" E	19° 21' 20.913" N
233.	T233	96° 48' 22.790" E	19° 21' 10.498" N
234.	T234	96° 48' 23.510" E	19° 21' 0.084" N
235.	T235	96° 48' 24.229" E	19° 20' 49.670" N
236.	T236	96° 48' 24.949" E	19° 20' 39.255" N
237.	T237	96° 48' 25.668" E	19° 20' 28.841" N
238.	T238	96° 48' 25.449" E	19° 20' 18.705" N
239.	T239	96° 48' 18.613" E	19° 20' 10.531" N
240.	T240	96° 48' 10.273" E	19° 20' 4.136" N
241.	T241	96° 48' 0.385" E	19° 19' 59.574" N
242.	T242	96° 47' 50.497" E	19° 19' 55.012" N
243.	T243	96° 47' 39.928" E	19° 19' 52.448" N
244.	T244	96° 47' 29.097" E	19° 19' 50.656" N
245.	T245	96° 47' 18.267" E	19° 19' 48.865" N
246.	T246	96° 47' 7.459" E	19° 19' 46.957" N
247.	T247	96° 46' 56.703" E	19° 19' 44.797" N
248.	T248	96° 46' 45.947" E	19° 19' 42.637" N
249.	T249	96° 46' 35.191" E	19° 19' 40.477" N
250.	T250	96° 46' 24.540" E	19° 19' 42.487" N
251.	T251	96° 46' 14.832" E	19° 19' 39.771" N
252.	T252	96° 46' 5.646" E	19° 19' 34.036" N
253.	T253	96° 45' 56.461" E	19° 19' 28.302" N
254.	T254	96° 45' 47.275" E	19° 19' 22.567" N
255.	T255	96° 45' 38.090" E	19° 19' 16.833" N
256.	T256	96° 45' 28.906" E	19° 19' 11.098" N
257.	T257	96° 45' 19.721" E	19° 19' 5.363" N
258.	T258	96° 45' 9.813" E	19° 19' 0.967" N
259.	T259	96° 44' 59.548" E	19° 18' 57.233" N
260.	T260	96° 44' 49.283" E	19° 18' 53.499" N
261.	T261	96° 44' 39.018" E	19° 18' 49.765" N
262.	T262	96° 44' 28.753" E	19° 18' 46.031" N

No.	Tower ID	Latitude	Longitude
263.	T263	96° 44' 18.185" E	19° 18' 45.980" N
264.	T264	96° 44' 7.435" E	19° 18' 48.158" N
265.	T265	96° 43' 56.684" E	19° 18' 50.336" N
266.	T266	96° 43' 45.933" E	19° 18' 52.514" N
267.	T267	96° 43' 35.182" E	19° 18' 54.691" N
268.	T268	96° 43' 24.423" E	19° 18' 56.415" N
269.	T269	96° 43' 13.601" E	19° 18' 54.584" N
270.	T270	96° 43' 2.779" E	19° 18' 52.753" N
271.	T271	96° 42' 52.030" E	19° 18' 52.694" N
272.	T272	96° 42' 41.391" E	19° 18' 55.319" N
273.	T273	96° 42' 30.692" E	19° 18' 57.245" N
274.	T274	96° 42' 19.748" E	19° 18' 56.270" N
275.	T275	96° 42' 8.803" E	19° 18' 55.294" N
276.	T276	96° 41' 57.859" E	19° 18' 54.319" N
277.	T277	96° 41' 46.914" E	19° 18' 53.344" N
278.	T278	96° 41' 37.205" E	19° 18' 48.650" N
279.	T279	96° 41' 30.335" E	19° 18' 40.786" N
280.	T280	96° 41' 24.348" E	19° 18' 32.034" N
281.	T281	96° 41' 18.361" E	19° 18' 23.282" N
282.	T282	96° 41' 12.373" E	19° 18' 14.530" N
283.	T283	96° 41' 6.386" E	19° 18' 5.778" N
284.	T284	96° 41' 0.400" E	19° 17' 57.026" N
285.	T285	96° 40' 54.118" E	19° 17' 48.468" N
286.	T286	96° 40' 44.953" E	19° 17' 43.892" N
287.	T287	96° 40' 34.244" E	19° 17' 41.544" N
288.	T288	96° 40' 23.534" E	19° 17' 39.196" N
289.	T289	96° 40' 12.926" E	19° 17' 36.527" N
290.	T290	96° 40' 2.595" E	19° 17' 32.964" N
291.	T291	96° 39' 52.265" E	19° 17' 29.401" N
292.	T292	96° 39' 41.935" E	19° 17' 25.837" N
293.	T293	96° 39' 31.605" E	19° 17' 22.274" N
294.	T294	96° 39' 21.275" E	19° 17' 18.710" N
295.	T295	96° 39' 11.073" E	19° 17' 14.831" N
296.	T296	96° 39' 0.899" E	19° 17' 10.886" N
297.	T297	96° 38' 50.725" E	19° 17' 6.940" N
298.	T298	96° 38' 40.550" E	19° 17' 2.993" N
299.	T299	96° 38' 30.377" E	19° 16' 59.047" N
300.	T300	96° 38' 20.203" E	19° 16' 55.101" N
301.	T301	96° 38' 10.029" E	19° 16' 51.154" N
302.	T302	96° 37' 59.856" E	19° 16' 47.207" N
303.	T303	96° 37' 49.682" E	19° 16' 43.261" N
304.	T304	96° 37' 39.509" E	19° 16' 39.314" N
305.	T305	96° 37' 29.336" E	19° 16' 35.366" N
306.	T306	96° 37' 19.163" E	19° 16' 31.419" N

No.	Tower ID	Latitude	Longitude
307.	T307	96° 37' 8.991" E	19° 16' 27.472" N
308.	T308	96° 36' 58.818" E	19° 16' 23.524" N
309.	T309	96° 36' 48.646" E	19° 16' 19.576" N
310.	T310	96° 36' 43.850" E	19° 16' 10.356" N
311.	T311	96° 36' 39.368" E	19° 16' 0.828" N
312.	T312	96° 36' 34.886" E	19° 15' 51.300" N
313.	T313	96° 36' 30.404" E	19° 15' 41.772" N
314.	T314	96° 36' 27.139" E	19° 15' 31.860" N
315.	T315	96° 36' 24.728" E	19° 15' 21.679" N
316.	T316	96° 36' 22.317" E	19° 15' 11.497" N
317.	T317	96° 36' 19.907" E	19° 15' 1.316" N
318.	T318	96° 36' 11.986" E	19° 14' 54.823" N
319.	T319	96° 36' 2.702" E	19° 14' 49.242" N
320.	T320	96° 35' 53.418" E	19° 14' 43.661" N
321.	T321	96° 35' 44.135" E	19° 14' 38.079" N
322.	T322	96° 35' 34.703" E	19° 14' 32.899" N
323.	T323	96° 35' 23.784" E	19° 14' 31.740" N
324.	T324	96° 35' 12.865" E	19° 14' 30.580" N
325.	T325	96° 35' 1.957" E	19° 14' 29.799" N
326.	T326	96° 34' 51.115" E	19° 14' 31.490" N
327.	T327	96° 34' 40.274" E	19° 14' 33.182" N
328.	T328	96° 34' 29.432" E	19° 14' 34.873" N
329.	T329	96° 34' 19.834" E	19° 14' 30.095" N
330.	T330	96° 34' 13.100" E	19° 14' 22.267" N
331.	T331	96° 34' 7.720" E	19° 14' 13.169" N
332.	T332	96° 34' 2.341" E	19° 14' 4.070" N
333.	T333	96° 33' 58.582" E	19° 13' 54.272" N
334.	T334	96° 33' 54.902" E	19° 13' 44.440" N
335.	T335	96° 33' 51.222" E	19° 13' 34.607" N
336.	T336	96° 33' 47.543" E	19° 13' 24.775" N
337.	T337	96° 33' 44.820" E	19° 13' 14.722" N
338.	T338	96° 33' 43.346" E	19° 13' 4.381" N
339.	T339	96° 33' 41.872" E	19° 12' 54.040" N
340.	T340	96° 33' 40.398" E	19° 12' 43.699" N
341.	T341	96° 33' 38.924" E	19° 12' 33.358" N
342.	T342	96° 33' 37.450" E	19° 12' 23.017" N
343.	T343	96° 33' 35.975" E	19° 12' 12.677" N
344.	T344	96° 33' 34.501" E	19° 12' 2.336" N
345.	T345	96° 33' 33.027" E	19° 11' 51.995" N
346.	T346	96° 33' 26.687" E	19° 11' 43.616" N
347.	T347	96° 33' 19.883" E	19° 11' 35.424" N
348.	T348	96° 33' 13.079" E	19° 11' 27.232" N
349.	T349	96° 33' 6.276" E	19° 11' 19.040" N
350.	T350	96° 32' 59.473" E	19° 11' 10.848" N

No.	Tower ID	Latitude	Longitude
351.	T351	96° 32' 52.669" E	19° 11' 2.656" N
352.	T352	96° 32' 45.866" E	19° 10' 54.464" N
353.	T353	96° 32' 39.064" E	19° 10' 46.272" N
354.	T354	96° 32' 32.704" E	19° 10' 37.795" N
355.	T355	96° 32' 27.242" E	19° 10' 28.742" N
356.	T356	96° 32' 21.780" E	19° 10' 19.689" N
357.	T357	96° 32' 16.319" E	19° 10' 10.636" N
358.	T358	96° 32' 10.858" E	19° 10' 1.583" N
359.	T359	96° 32' 5.396" E	19° 9' 52.530" N
360.	T360	96° 31' 59.935" E	19° 9' 43.476" N
361.	T361	96° 31' 54.475" E	19° 9' 34.423" N
362.	T362	96° 31' 48.861" E	19° 9' 25.454" N
363.	T363	96° 31' 43.248" E	19° 9' 16.486" N
364.	T364	96° 31' 37.635" E	19° 9' 7.517" N
365.	T365	96° 31' 32.262" E	19° 8' 58.422" N
366.	T366	96° 31' 27.228" E	19° 8' 49.149" N
367.	T367	96° 31' 21.793" E	19° 8' 40.119" N
368.	T368	96° 31' 15.036" E	19° 8' 31.894" N
369.	T369	96° 31' 8.279" E	19° 8' 23.669" N
370.	T370	96° 31' 1.522" E	19° 8' 15.444" N
371.	T371	96° 30' 54.765" E	19° 8' 7.219" N
372.	T372	96° 30' 48.008" E	19° 7' 58.994" N
373.	T373	96° 30' 40.572" E	19° 7' 51.321" N
374.	T374	96° 30' 33.087" E	19° 7' 43.687" N
375.	T375	96° 30' 25.601" E	19° 7' 36.054" N
376.	T376	96° 30' 18.116" E	19° 7' 28.420" N
377.	T377	96° 30' 10.631" E	19° 7' 20.787" N
378.	T378	96° 30' 3.146" E	19° 7' 13.153" N
379.	T379	96° 29' 55.661" E	19° 7' 5.520" N
380.	T380	96° 29' 46.728" E	19° 7' 0.074" N
381.	T381	96° 29' 36.250" E	19° 6' 56.962" N
382.	T382	96° 29' 25.772" E	19° 6' 53.851" N
383.	T383	96° 29' 15.294" E	19° 6' 50.738" N
384.	T384	96° 29' 4.816" E	19° 6' 47.626" N
385.	T385	96° 28' 54.156" E	19° 6' 45.719" N
386.	T386	96° 28' 43.180" E	19° 6' 45.905" N
387.	T387	96° 28' 32.204" E	19° 6' 46.090" N
388.	T388	96° 28' 21.229" E	19° 6' 46.276" N
389.	T389	96° 28' 10.253" E	19° 6' 46.461" N
390.	T390	96° 27' 59.277" E	19° 6' 46.646" N
391.	T391	96° 27' 48.302" E	19° 6' 46.830" N
392.	T392	96° 27' 37.326" E	19° 6' 47.015" N
393.	T393	96° 27' 26.350" E	19° 6' 47.199" N
394.	T394	96° 27' 15.375" E	19° 6' 47.383" N

No.	Tower ID	Latitude	Longitude
395.	T395	96° 27' 4.399" E	19° 6' 47.567" N
396.	T396	96° 26' 53.424" E	19° 6' 47.751" N
397.	T397	96° 26' 42.609" E	19° 6' 46.798" N
398.	T398	96° 26' 32.072" E	19° 6' 43.871" N
399.	T399	96° 26' 21.536" E	19° 6' 40.944" N
400.	T400	96° 26' 10.999" E	19° 6' 38.017" N
401.	T401	96° 26' 0.463" E	19° 6' 35.090" N
402.	T402	96° 25' 50.458" E	19° 6' 30.912" N
403.	T403	96° 25' 40.734" E	19° 6' 26.070" N
404.	T404	96° 25' 31.011" E	19° 6' 21.228" N
405.	T405	96° 25' 21.288" E	19° 6' 16.386" N
406.	T406	96° 25' 11.565" E	19° 6' 11.544" N
407.	T407	96° 25' 1.843" E	19° 6' 6.701" N
408.	T408	96° 24' 52.120" E	19° 6' 1.859" N
409.	T409	96° 24' 41.703" E	19° 5' 58.815" N
410.	T410	96° 24' 30.763" E	19° 5' 58.414" N
411.	T411	96° 24' 19.788" E	19° 5' 58.302" N
412.	T412	96° 24' 8.812" E	19° 5' 58.190" N
413.	T413	96° 23' 57.837" E	19° 5' 58.077" N
414.	T414	96° 23' 46.862" E	19° 5' 57.965" N
415.	T415	96° 23' 35.886" E	19° 5' 57.852" N
416.	T416	96° 23' 24.911" E	19° 5' 57.739" N
417.	T417	96° 23' 13.936" E	19° 5' 57.626" N
418.	T418	96° 23' 3.435" E	19° 5' 59.638" N
419.	T419	96° 22' 53.454" E	19° 6' 3.978" N
420.	T420	96° 22' 43.472" E	19° 6' 8.317" N
421.	T421	96° 22' 33.490" E	19° 6' 12.656" N
422.	T422	96° 22' 23.508" E	19° 6' 16.995" N
423.	T423	96° 22' 13.526" E	19° 6' 21.334" N
424.	T424	96° 22' 3.544" E	19° 6' 25.673" N
425.	T425	96° 21' 53.561" E	19° 6' 30.011" N
426.	T426	96° 21' 43.579" E	19° 6' 34.350" N
427.	T427	96° 21' 33.447" E	19° 6' 37.689" N
428.	T428	96° 21' 22.588" E	19° 6' 36.164" N
429.	T429	96° 21' 11.730" E	19° 6' 34.639" N
430.	T430	96° 21' 0.871" E	19° 6' 33.114" N
431.	T431	96° 20' 50.013" E	19° 6' 31.589" N
432.	T432	96° 20' 39.378" E	19° 6' 29.666" N
433.	T433	96° 20' 32.010" E	19° 6' 21.932" N
434.	T434	96° 20' 24.643" E	19° 6' 14.199" N
435.	T435	96° 20' 17.275" E	19° 6' 6.465" N
436.	T436	96° 20' 9.908" E	19° 5' 58.731" N
437.	T437	96° 19' 59.596" E	19° 5' 55.356" N
438.	T438	96° 19' 49.133" E	19° 5' 52.205" N

No.	Tower ID	Latitude	Longitude
439.	T439	96° 19' 38.671" E	19° 5' 49.053" N
440.	T440	96° 19' 28.208" E	19° 5' 45.902" N
441.	T441	96° 19' 17.746" E	19° 5' 42.750" N
442.	T442	96° 19' 7.284" E	19° 5' 39.598" N
443.	T443	96° 18' 56.822" E	19° 5' 36.446" N
444.	T444	96° 18' 49.431" E	19° 5' 29.086" N
445.	T445	96° 18' 42.664" E	19° 5' 20.872" N
446.	T446	96° 18' 35.897" E	19° 5' 12.658" N
447.	T447	96° 18' 29.130" E	19° 5' 4.444" N
448.	T448	96° 18' 22.363" E	19° 4' 56.230" N
449.	T449	96° 18' 15.597" E	19° 4' 48.016" N
450.	T450	96° 18' 11.802" E	19° 4' 38.994" N
451.	T451	96° 18' 12.979" E	19° 4' 28.620" N
452.	T452	96° 18' 14.156" E	19° 4' 18.247" N
453.	T453	96° 18' 15.333" E	19° 4' 7.874" N
454.	T454	96° 18' 16.510" E	19° 3' 57.501" N
455.	T455	96° 18' 17.687" E	19° 3' 47.127" N
456.	T456	96° 18' 18.863" E	19° 3' 36.754" N
457.	T457	96° 18' 20.040" E	19° 3' 26.381" N
458.	T458	96° 18' 21.216" E	19° 3' 16.007" N
459.	T459	96° 18' 22.393" E	19° 3' 5.634" N
460.	T460	96° 18' 23.569" E	19° 2' 55.260" N
461.	T461	96° 18' 24.746" E	19° 2' 44.887" N
462.	T462	96° 18' 25.922" E	19° 2' 34.514" N
463.	T463	96° 18' 27.098" E	19° 2' 24.140" N
464.	T464	96° 18' 28.274" E	19° 2' 13.767" N
465.	T465	96° 18' 29.450" E	19° 2' 3.393" N
466.	T466	96° 18' 30.626" E	19° 1' 53.020" N
467.	T467	96° 18' 31.802" E	19° 1' 42.647" N
468.	T468	96° 18' 32.978" E	19° 1' 32.273" N
469.	T469	96° 18' 34.154" E	19° 1' 21.900" N
470.	T470	96° 18' 35.330" E	19° 1' 11.526" N
471.	T471	96° 18' 36.506" E	19° 1' 1.153" N
472.	T472	96° 18' 37.681" E	19° 0' 50.779" N
473.	T473	96° 18' 38.857" E	19° 0' 40.406" N
474.	T474	96° 18' 40.032" E	19° 0' 30.032" N
475.	T475	96° 18' 41.208" E	19° 0' 19.659" N
476.	T476	96° 18' 42.383" E	19° 0' 9.285" N
477.	T477	96° 18' 43.559" E	18° 59' 58.912" N
478.	T478	96° 18' 44.734" E	18° 59' 48.538" N
479.	T479	96° 18' 45.909" E	18° 59' 38.164" N
480.	T480	96° 18' 47.084" E	18° 59' 27.791" N
481.	T481	96° 18' 48.259" E	18° 59' 17.417" N
482.	T482	96° 18' 46.715" E	18° 59' 7.155" N

No.	Tower ID	Latitude	Longitude
483.	T483	96° 18' 44.611" E	18° 58' 56.915" N
484.	T484	96° 18' 42.507" E	18° 58' 46.675" N
485.	T485	96° 18' 40.403" E	18° 58' 36.435" N
486.	T486	96° 18' 38.299" E	18° 58' 26.195" N
487.	T487	96° 18' 36.195" E	18° 58' 15.956" N
488.	T488	96° 18' 34.091" E	18° 58' 5.716" N
489.	T489	96° 18' 31.987" E	18° 57' 55.476" N
490.	T490	96° 18' 25.007" E	18° 57' 49.064" N

14.4. Tower Location Points at Forest Area

(1) Kan Kunesin PPF

Total Number of Towers = 4 (T 32 to T 35)

Estimated distance = 0.69 miles

No.	Tower ID	Latitude	Longitude
1.	T32	97° 12' 33.436" E	19° 34' 9.912" N
2.	T33	97° 12' 22.933" E	19° 34' 6.773" N
3.	T34	97° 12' 12.327" E	19° 34' 5.314" N
4.	T35	97° 12' 1.512" E	19° 34' 7.282" N

(2) Nam San Phoo PPF

Total Number of Towers = 20 (T 83 to T 102)

Estimated distance = 3.97 miles

No.	Tower ID	Latitude	Longitude
1.	T 83	97° 3' 58.387" E	19° 34' 58.057" N
2.	T 84	97° 3' 47.491" E	19° 34' 59.038" N
3.	T 85	97° 3' 36.631" E	19° 34' 57.304" N
4.	T 86	97° 3' 25.772" E	19° 34' 55.569" N
5.	T 87	97° 3' 14.912" E	19° 34' 53.835" N
6.	T 88	97° 3' 4.052" E	19° 34' 52.100" N
7.	T 89	97° 2' 53.193" E	19° 34' 50.366" N
8.	T 90	97° 2' 42.333" E	19° 34' 48.630" N
9.	T 91	97° 2' 31.474" E	19° 34' 46.895" N
10	T 92	97° 2' 20.615" E	19° 34' 45.160" N
11.	T 93	97° 2' 9.756" E	19° 34' 43.424" N
12.	T 94	97° 1' 58.897" E	19° 34' 41.689" N
13.	T 95	97° 1' 48.038" E	19° 34' 39.953" N
14.	T 96	97° 1' 37.179" E	19° 34' 38.217" N
15.	T 97	97° 1' 26.320" E	19° 34' 36.481" N
16.	T 98	97° 1' 15.339" E	19° 34' 37.006" N
17.	T 99	97° 1' 4.350" E	19° 34' 37.683" N
18.	T 100	97° 0' 53.361" E	19° 34' 38.359" N
19.	T 101	97° 0' 42.372" E	19° 34' 39.036" N
20.	T 102	97° 0' 31.382" E	19° 34' 39.712" N

(3) Karen Chaung RF

Total Number of Towers = 6 (T 353 to T 358)

Estimated distance = 1.23 miles

No.	Tower ID	Latitude	Longitude
1.	353	96° 32' 39.064" E	19° 10' 46.272" N
2.	354	96° 32' 32.704" E	19° 10' 37.795" N
3.	355	96° 32' 27.242" E	19° 10' 28.742" N
4.	356	96° 32' 21.780" E	19° 10' 19.689" N
5.	357	96° 32' 16.319" E	19° 10' 10.636" N
6.	358	96° 32' 10.858" E	19° 10' 1.583" N

(4) Pade RF

The Number of Towers = 9 (T 386 to T 394)

Estimated distance = 1.65 miles

No.	Tower ID	Latitude	Longitude
1.	386	96° 28' 43.180" E	19° 6' 45.905" N
2..	387	96° 28' 32.204" E	19° 6' 46.090" N
3.	388	96° 28' 21.229" E	19° 6' 46.276" N
4.	389	96° 28' 10.253" E	19° 6' 46.461" N
5.	390	96° 27' 59.277" E	19° 6' 46.646" N
6.	391	96° 27' 48.302" E	19° 6' 46.830" N
7.	392	96° 27' 37.326" E	19° 6' 47.015" N
8.	393	96° 27' 26.350" E	19° 6' 47.199" N
9.	394	96° 27' 15.375" E	19° 6' 47.383" N

14.5. informed Letter of Transmission Towers in the Forest Area

Valentis Environmental and Geotechnical Services Limited
No. ....
Date..
VALENTIS ENVIRONMENTAL

စာအမှတ်၊ ၀၁-၀၅/ VES (DPTSC-230KV-Taungoo)/ ၂၀၂၃
ရက်စွဲ၊ ၂၀၂၃ ခုနှစ်၊ မေလ ၂ ရက်

သို့

ဒုတိယညွှန်ကြားရေးမှူးချုပ်
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန
လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန

အကြောင်းအရာ။ **မဟာဓာတ်အားလိုင်းဖြတ်သန်းသွားမည့် သစ်တောကြိုးဝိုင်း(၄)ခု ကိစ္စတင်ပြခြင်း**

ရည်ညွှန်းချက်။ (၁) လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၏ ၁၉.၄.၂၀၂၃ ရက်စွဲပါ စာအမှတ် ၃၇၅/ ပေစ(လုပ်ငန်း)/ ၂၀၂၃

(၂) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ ၅.၄.၂၀၂၃ ရက်စွဲပါ စာအမှတ် EIA-၂/၉/ အတည်ပြု (ပြန်ကြား) (IEE) (၁၂၁၆/၂၀၂၃) စာပါ စာပိုဒ်(၄)၏ အပိုဒ်(စ)(၁)

၁။ အထက်အကြောင်းအရာပါကိစ္စနှင့် ပတ်သက်၍ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာနနှင့် Valentis Environmental and Geotechnical Services Limited တို့သည် "၂၃၀ကေဗွီ ဘီလူးချောင်း(၂) (လွိုင်ကော်)-တောင်ငူ(စပါးကြွယ်) မဟာဓာတ်အားလိုင်းစီမံကိန်းအတွက် Environmental and Social Impact Assessment (ESIA) လုပ်ငန်း" များဆောင်ရွက်ရန် စာချုပ်အမှတ် ၁၀၈/DPTSC (PTP)/၂၀၁၉-၂၀၂၀ ဖြင့်သဘောတူ စာချုပ်ချုပ်ဆိုခဲ့ပြီး လုပ်ငန်းများဆောင်ရွက်ခဲ့ပါသည်။

၂။ ကုမ္ပဏီအနေဖြင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ စိစစ်သုံးသပ်ချက်များအတိုင်း ဖြည့်စွက်၍ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာအား ပြန်လည်တင်ပြရန် အကြောင်းကြားခြင်းကို လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၏ ၁၅.၇.၂၀၂၂ ရက်စွဲပါ စာအမှတ် ၆၂၄၊ ပေစ(လုပ်ငန်း)/၂၀၂၂ ဖြင့်လက်ခံရရှိခဲ့ပါသည်။ ကုမ္ပဏီမှ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာအား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သဘောထားမှတ်ချက်များနှင့်အညီ ပြန်လည်ပြင်ဆင်ကာ ၁၅.၉.၂၀၂၂ ရက်နေ့တွင် လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာနသို့ တင်ပြခဲ့ပါသည်။

၃။ ကုမ္ပဏီမှ ထပ်မံပြင်ဆင်တင်ပြခဲ့သည့် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာအား လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနတို့မှ ရည်ညွှန်းချက်ပါစာအမှတ် (၁) နှင့် (၂) များဖြင့် အတည်ပြုပြန်ကြားပေးခဲ့ပြီးဖြစ်ပါသည်။ အချို့အတည်ပြုပြန်ကြားချက်များကို လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာနမှ သက်ဆိုင်ရာဌာနများထံသို့ အသီးသီးပြန်လည်ပေးပို့ရမည်ဖြစ်သဖြင့် အတည်ပြုပြန်ကြားချက်များအနက် ရည်ညွှန်းချက်(၂)စာပါ စာပိုဒ်(၄)၏အပိုဒ်(စ)(၁)အား ၃.၅.၂၀၂၃ ရက်နေ့တွင်

VALENTIS ENVIRONMENTAL AND GEOTECHNICAL SERVICES LIMITED
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Mayangone, Yangon, Myanmar

လည်းကောင်း စာပိုဒ်(၄)၏အပိုဒ်(စ)(၂၊ ၃၊ ၅ နှင့် ၆) တို့အား ၁၆.၆.၂၀၂၃ ရက်တွင်လည်းကောင်း ကုမ္ပဏီမှ ပြန်လည်တင်ပြသွားရန် ရည်ညွှန်းချက်(၁)ပါ စာဖြင့် အကြောင်းပြန်ကြားခဲ့ပါသည်။

၄။ ၂၃၀ကေဗွီ ဘီလူးချောင်း(၂) (လွိုင်ကော်)-တောင်ငူ(စပါးကြွယ်) မဟာဓာတ်အားလိုင်းသည် Pade Reserved Forest (၅၇၂၇.၉၂ ဧက) အတွင်း ၂.၅၅၅ ကီလိုမီတာခန့်လည်းကောင်း၊ Karenchaung Reserved Forest (၂၅၄၁၆.၇၃ ဧက) အတွင်း ၁.၉၇၁ ကီလိုမီတာခန့်လည်းကောင်း၊ Nam San Phoo Public Protected Forest (၂၁၉၂၉.၅၆ ဧက) အတွင်း ၆.၄၂၄ ကီလိုမီတာခန့်လည်းကောင်း၊ Kan Kunesin Public Protected Forest (၈၃၆၇.၁၆ ဧက) အတွင်း ၁.၁၃၁ ကီလိုမီတာခန့်လည်းကောင်း ဖြတ်သန်းသွားမည် ဖြစ်ပါသည်။

၅။ သို့ဖြစ်ပါသောကြောင့် ဖော်ပြပါ မဟာဓာတ်အားလိုင်းဖြတ်သန်းသွားမည့် သစ်တောကြိုးဝိုင်း(၄)ခုနှင့် ပတ်သက်၍ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာန၏ ရည်ညွှန်းချက်(၁)ပါ စာအရလည်းကောင်း၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ ရည်ညွှန်းချက်(၂)ပါစာ၏ စာပိုဒ်(၄)၊ အပိုဒ်(စ)(၁)အရ လည်းကောင်း လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့်ကွပ်ကဲရေးဦးစီးဌာနမှ သစ်တောဦးစီးဌာနနှင့် ညှိနှိုင်းဆောင်ရွက်သွားနိုင်ရန်အတွက် သစ်တောကြိုးဝိုင်းများ၏အချက်အလက်များနှင့် မဟာဓာတ်အားလိုင်း၏ အချက်အလက်များအား လိုအပ်သောမြေပုံနှင့်တကွ အစီရင်ခံတင်ပြအပ်ပါသည်။

လေးစားစွာဖြင့်

လမင်းဝင်း
Managing Director
Valentis Environmental and Geotechnical Services Limited

မိတ္တူကို -
- စီမံကိန်းညွှန်ကြားရေးမှူး (တောင်ပိုင်း)
- ရုံးလက်ခံ

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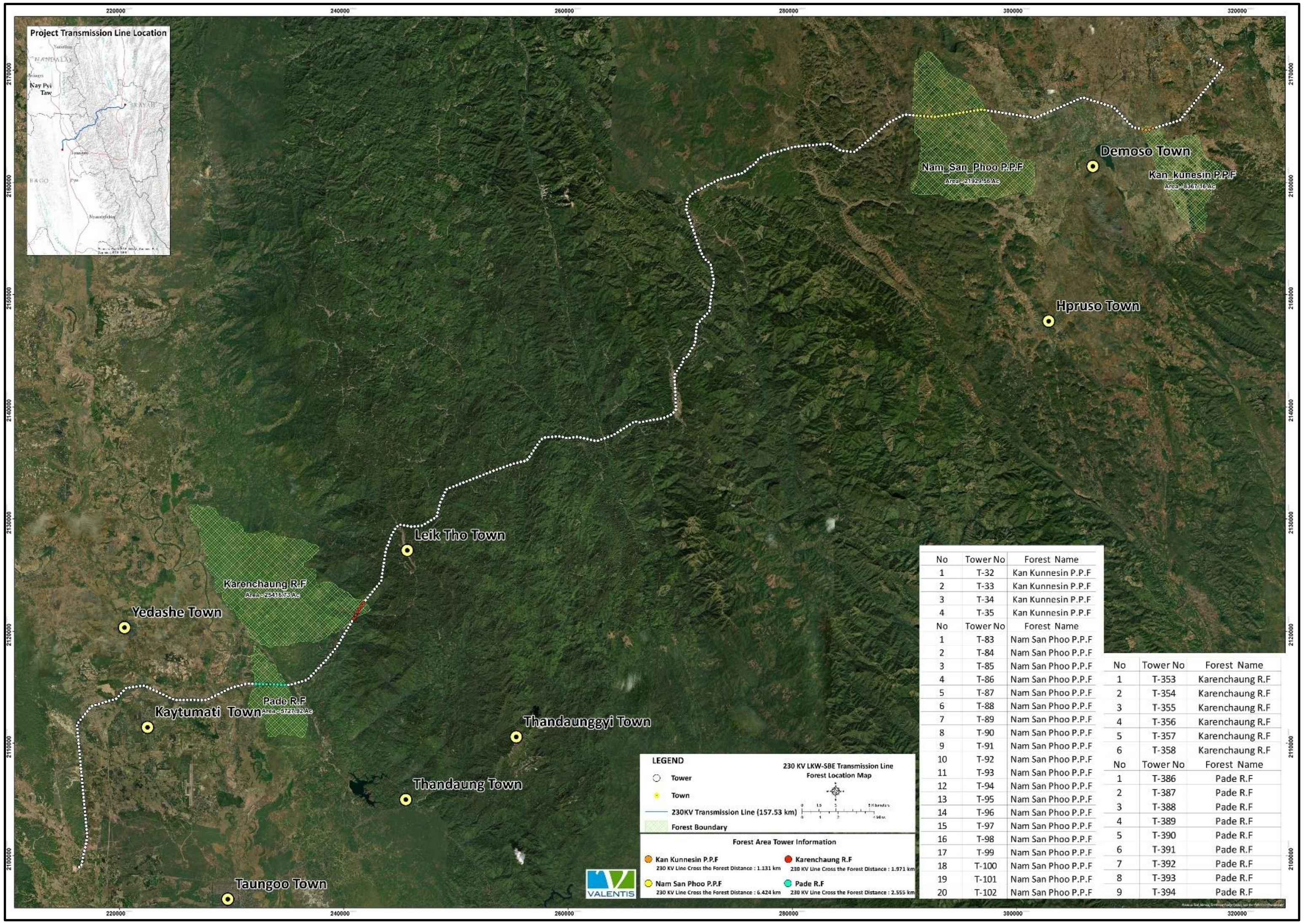

No	Tower No	Forest Name
1	T-32	Kan Kunnesin P.P.F
2	T-33	Kan Kunnesin P.P.F
3	T-34	Kan Kunnesin P.P.F
4	T-35	Kan Kunnesin P.P.F
No	Tower No	Forest Name
1	T-83	Nam San Phoo P.P.F
2	T-84	Nam San Phoo P.P.F
3	T-85	Nam San Phoo P.P.F
4	T-86	Nam San Phoo P.P.F
5	T-87	Nam San Phoo P.P.F
6	T-88	Nam San Phoo P.P.F
7	T-89	Nam San Phoo P.P.F
8	T-90	Nam San Phoo P.P.F
9	T-91	Nam San Phoo P.P.F
10	T-92	Nam San Phoo P.P.F
11	T-93	Nam San Phoo P.P.F
12	T-94	Nam San Phoo P.P.F
13	T-95	Nam San Phoo P.P.F
14	T-96	Nam San Phoo P.P.F
15	T-97	Nam San Phoo P.P.F
16	T-98	Nam San Phoo P.P.F
17	T-99	Nam San Phoo P.P.F
18	T-100	Nam San Phoo P.P.F
19	T-101	Nam San Phoo P.P.F
20	T-102	Nam San Phoo P.P.F

No	Tower No	Forest Name
1	T-353	Karenchaung R.F
2	T-354	Karenchaung R.F
3	T-355	Karenchaung R.F
4	T-356	Karenchaung R.F
5	T-357	Karenchaung R.F
6	T-358	Karenchaung R.F
No	Tower No	Forest Name
1	T-386	Pade R.F
2	T-387	Pade R.F
3	T-388	Pade R.F
4	T-389	Pade R.F
5	T-390	Pade R.F
6	T-391	Pade R.F
7	T-392	Pade R.F
8	T-393	Pade R.F
9	T-394	Pade R.F

14.6. Laboratory Results

(A) Water Quality Laboratory Results

ISO TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

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M0920 027

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Valentis Co.,Ltd.
Nature of Water: River Water (SW - 1)
Location: Taungoo
Date and Time of collection: 7.9.2020
Date and Time of arrival at Laboratory: 7.9.2020
Date and Time of commencing examination: 7.9.2020
Date and Time of completing: 8.9.2020

Results of Water Analysis — **WHO Drinking Water Guideline (Geneva - 1993)**

Total Coliform Count	80	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	30	CFU/100ml	Not detected
pH	7.7		6.5 - 8.5
Turbidity	480	NTU	5 NTU
Colour (True)	220	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

* Sample Collection Error.

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

ISO-TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
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M0920 028

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Valentis Co.,Ltd.
Nature of Water	River Water (SW - 2)
Location	Than Taung Gyi
Date and Time of collection	6.9.2020
Date and Time of arrival at Laboratory	7.9.2020
Date and Time of commencing examination	7.9.2020
Date and Time of completing	8.9.2020

Results of Water Analysis — **WHO Drinking Water Guideline (Geneva - 1993)**

Total Coliform Count	60	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	20	CFU/100ml	Not detected
pH	7.5		6.5 - 8.5
Turbidity	292	NTU	5 NTU
Colour (True)	180	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

* Sample Collection Error.

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

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Effective Date - 01-1-2016
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M0920 029

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Valentis Co.,Ltd.
Nature of Water: River Water (SW - 3)
Location: Than Taung Gyi
Date and Time of collection: 6.9.2020
Date and Time of arrival at Laboratory: 7.9.2020
Date and Time of commencing examination: 7.9.2020
Date and Time of completing: 8.9.2020

Results of Water Analysis | **WHO Drinking Water Guideline (Geneva - 1993)**

Total Coliform Count	40	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	7.4		6.5 - 8.5
Turbidity	28	NTU	5 NTU
Colour (True)	10	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

* Sample Collection Error.

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980
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Issue No - 1.0/Page 2 of 2

W0920 200

WATER QUALITY TEST RESULTS FORM

Client	Valentis Co.,Ltd.
Nature of Water	River Water (SW - 1)
Location	Taungoo
Date and Time of collection	7.9.2020
Date and Time of arrival at Laboratory	7.9.2020
Date and Time of commencing examination	8.9.2020
Date and Time of completing	13.9.2020

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)	0.4	mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia Nitrogen (NH_3)		mg/l	
Ammonium Nitrogen (NH_4)	Nil	mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)	96	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	30	mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (SiO_2)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
~~B.Sc (Chemistry)~~
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
~~B.E (Civil) 1980~~
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

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ISO 9001:2015 Cert. No. 688600

WTL-RE-001
Issue Date - 01-12-2012
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W0920 200

WATER QUALITY TEST RESULTS FORM

Client: Valentis Co.,Ltd.
Nature of Water: River Water (SW - 1)
Location: Taungoo
Date and Time of collection: 7.9.2020
Date and Time of arrival at Laboratory: 7.9.2020
Date and Time of commencing examination: 8.9.2020
Date and Time of completing: 13.9.2020

Results of Water Analysis | **WHO Drinking Water Guideline (Geneva - 1993)**

pH			6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	2	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Total Suspended Solids		mg/l	
Total Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
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Technical Officer
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No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
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ISO TECH LABORATORY

ISO-TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

W0920 201

WATER QUALITY TEST RESULTS FORM

Client	Valentis Co.,Ltd.
Nature of Water	River Water (SW - 2)
Location	Than Taung Gyi
Date and Time of collection	6.9.2020
Date and Time of arrival at Laboratory	7.9.2020
Date and Time of commencing examination	8.9.2020
Date and Time of completing	13.9.2020

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	0.025	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)	0.3	mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia Nitrogen (NH_3)		mg/l	
Ammonium Nitrogen (NH_4)	Nil	mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)	64	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	22	mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (SiO_2)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

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W0920 201

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Date and Time of commencing examination	8.9.2020
Date and Time of completing	13.9.2020

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

pH			6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	3	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Total Suspended Solids		mg/l	
Total Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

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W0920 202

WATER QUALITY TEST RESULTS FORM

Client	Valentis Co.,Ltd.
Nature of Water	River Water (SW - 3)
Location	Than Taung Gyi
Date and Time of collection	6.9.2020
Date and Time of arrival at Laboratory	7.9.2020
Date and Time of commencing examination	8.9.2020
Date and Time of completing	13.9.2020

Results of Water Analysis | **WHO Drinking Water Guideline (Geneva - 1993)**

Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)	0.2	mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia Nitrogen (NH_3)		mg/l	
Ammonium Nitrogen (NH_4)	Nil	mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)	64	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	20	mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (SiO_2)		mg/l	

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W0920 202

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Results of Water Analysis

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pH			6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	2	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Total Suspended Solids		mg/l	
Total Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

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DEPARTMENT OF AGRICULTURE (LAND USE)

WATER ANALYTICAL DATA SHEET

Valentis (8.9.2020)

Division -

Towship -

Sheet No. 1

Sr No. W 1-3 / 20-21

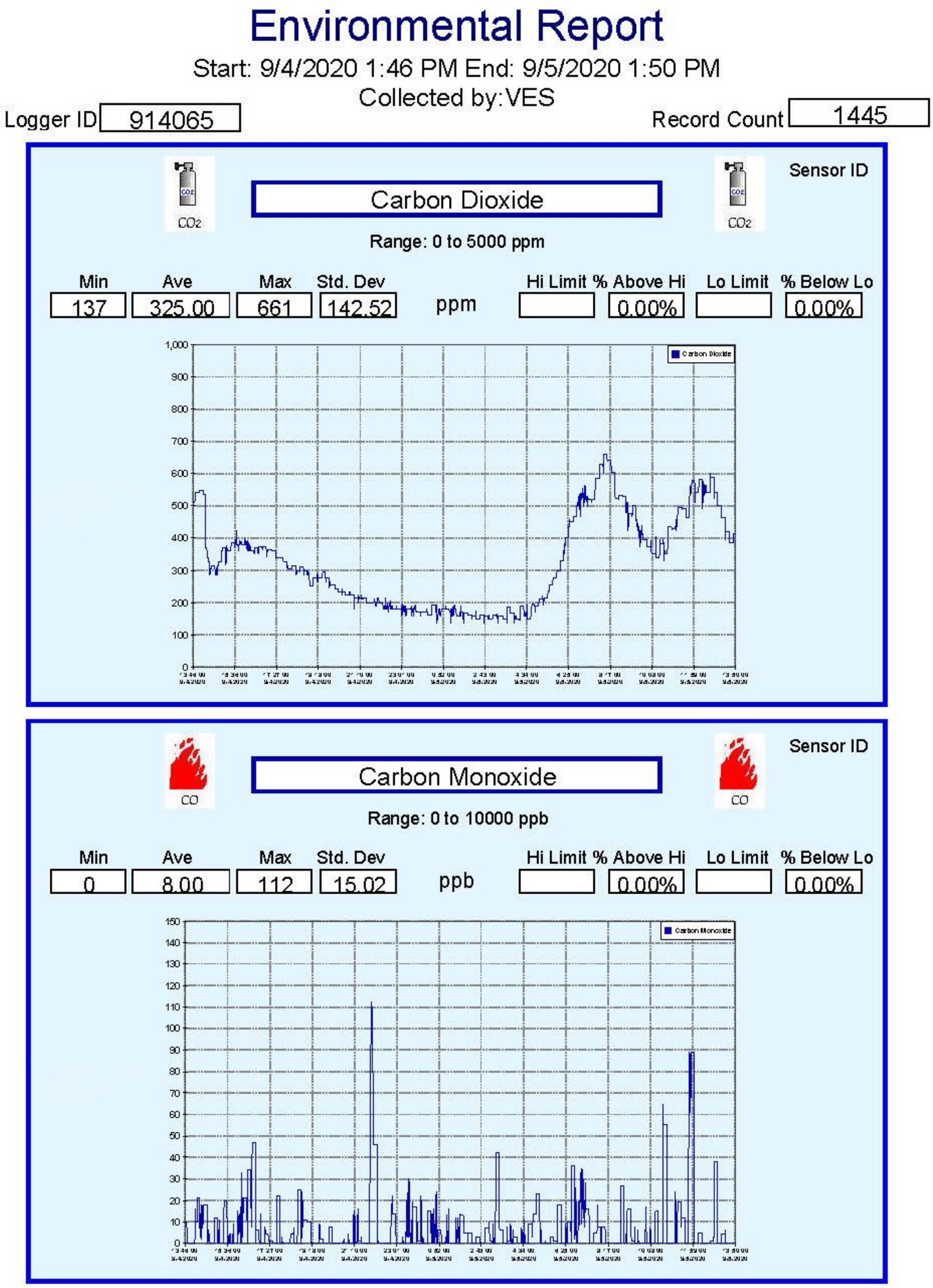
Sr No.	Sample	Cadmium (Cd) mg/kg	Nickel (Ni) mg/kg	Chromium (Cr) mg/kg	Mercury (Hg) mg/kg
1	W_1	0.004	0.004	Not detected	0.00082
2	W_2	0.004	0.003	Not detected	0.00091
3	W_3	0.004	0.008	Not detected	0.00081

မှတ်ချက်။ ။ ရေနမူနာ ဓာတ်ခွဲအဖြေများအရ Cadcium (Cd), Nickel (Ni), Mercury (Hg) ပါဝင်မှုသည် MPL (Maximum permissible Limit) ထက် မကျော်လွန်ပါ။ Maleki et.al (2014)

(ဒေါက်တာသန္တာညီ)
လက်ထောက်ညွှန်ကြားရေးမှူး
ဓာတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

(B) Air Quality Monitoring Results

AN-1



Environmental Report

Start: 9/4/2020 1:46 PM End: 9/5/2020 1:50 PM

Collected by:VES

Logger ID 914065

Record Count 1445

CH4

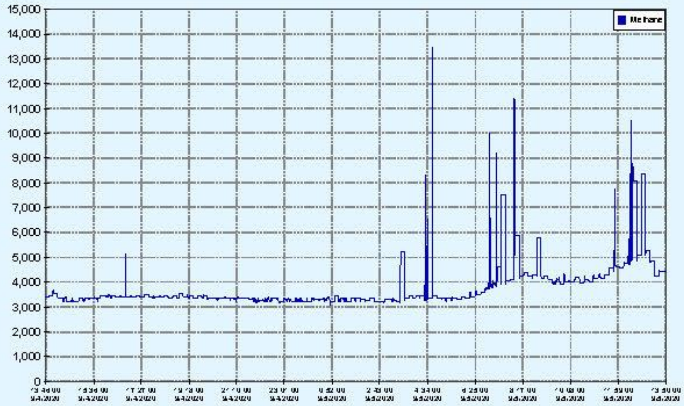
Methane

CH4

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
3071.1	3,765.70	?	928.12	ppm		0.00%		0.00%



NO2

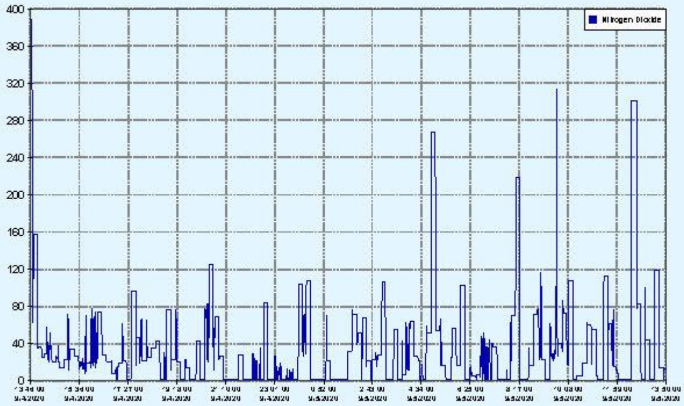
Nitrogen Dioxide

NO2

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	36.00	388	53.09	ppb		0.00%		0.00%



Page 2

Environmental Report

Start: 9/4/2020 1:46 PM End: 9/5/2020 1:50 PM

Collected by: VES

Logger ID 914065

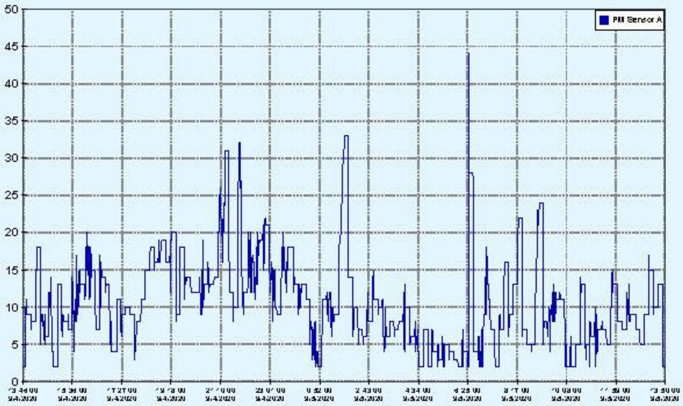
Record Count 1445

PM Sensor A

Sensor ID

Range: 0 to 5000 uG/m3

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	11.00	44	6.08	uG/m3		0.00%		0.00%

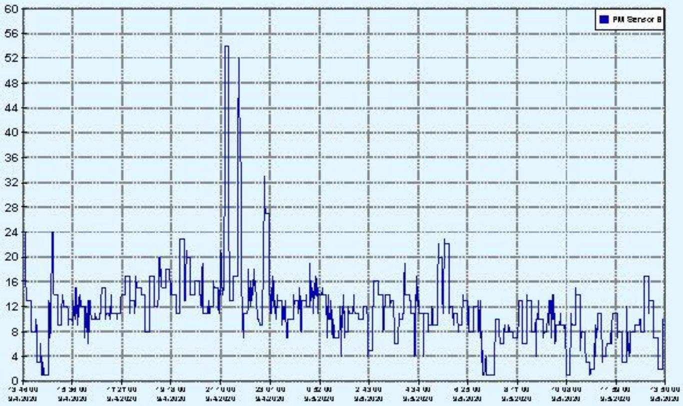


PM Sensor B

Sensor ID

Range: 0 to 5000 uG/m3

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	12.00	54	6.28	uG/m3		0.00%		0.00%



Page 3

Environmental Report

Start: 9/4/2020 1:46 PM End: 9/5/2020 1:50 PM

Collected by:VES

Logger ID 914065

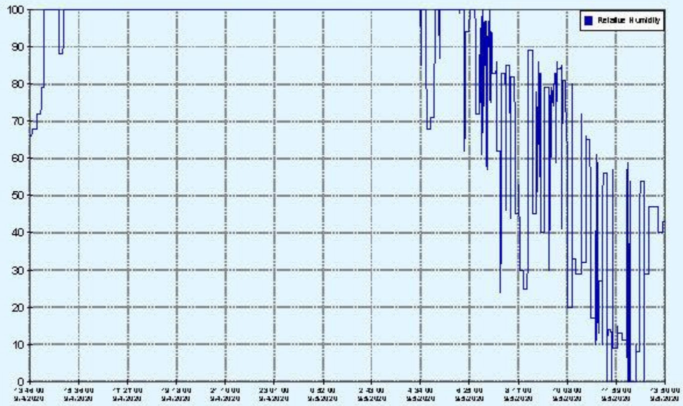
Record Count 1445

Sensor ID

Relative Humidity

Range: 0 to 100 %

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	83.00	100	27.98	%		0.00%		0.00%

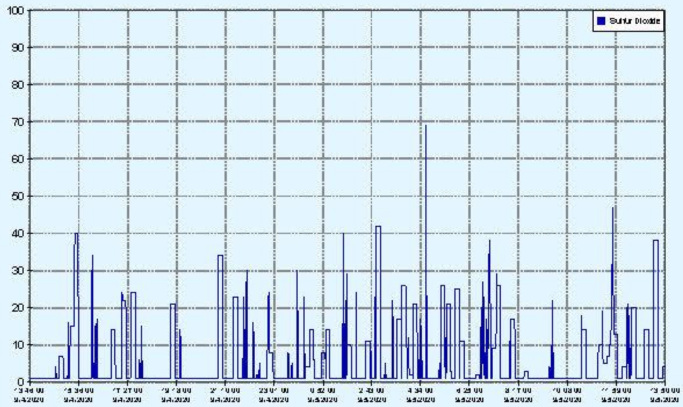


Sensor ID

Sulfur Dioxide

Range: 0 to 5000 ppb

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	6.00	69	9.36	ppb		0.00%		0.00%



Page 4

Environmental Report

Start: 9/4/2020 1:46 PM End: 9/5/2020 1:50 PM

Collected by:VES

Logger ID 914065

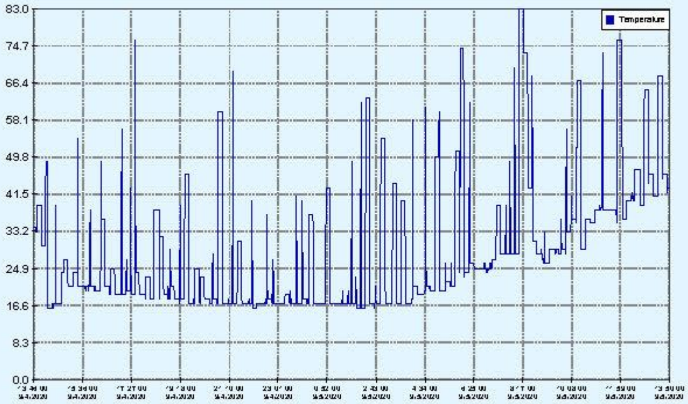
Record Count 1445

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
16	29.00	83	14.63	Deg. C		0.00%		0.00%

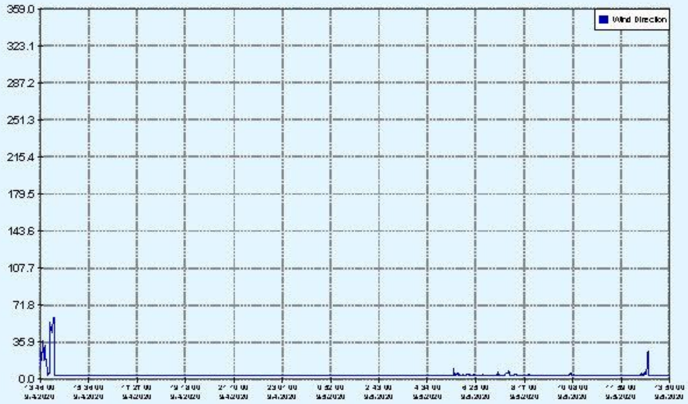


Wind Direction

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
4	5.00	60	4.40	Deg.		0.00%		0.00%



Page 5

Environmental Report

Start: 9/4/2020 1:46 PM End: 9/5/2020 1:50 PM

Collected by: VES

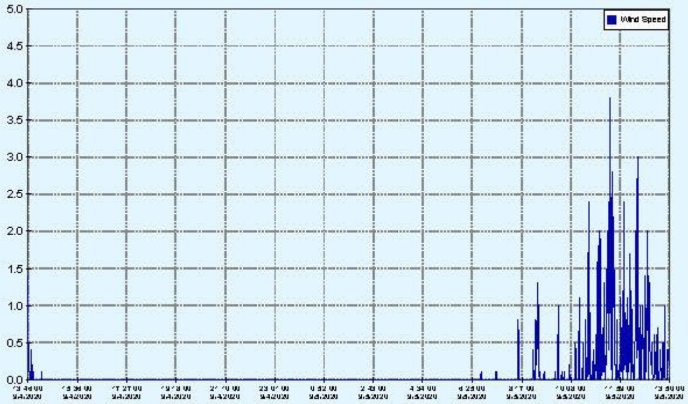
Logger ID 914065 Record Count 1445

Sensor ID

W. SPD. **Wind Speed** W. SPD.

Range: 0 to 160 kph

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0.10	3.8	0.32	kph		0.00%		0.00%



Page 6

AN-2

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by:VES

Logger ID 914065

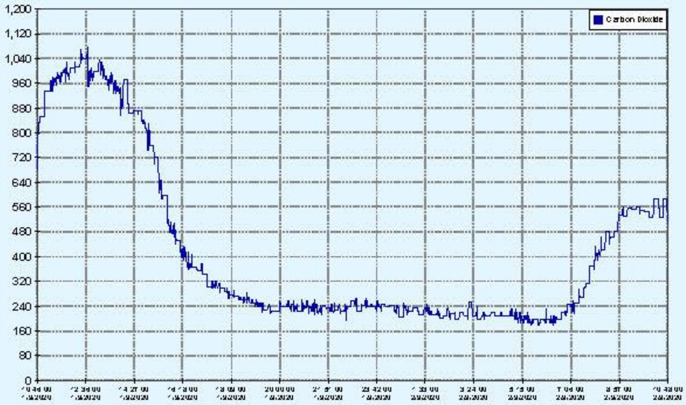
Record Count 1443

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
176	417.00	1076	275.12	ppm		0.00%		0.00%

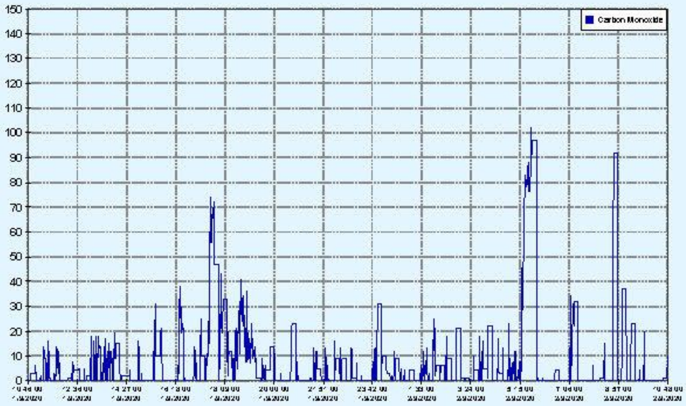


Carbon Monoxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	8.00	102	16.87	ppb		0.00%		0.00%



Page 1

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by:VES

Logger ID 914065

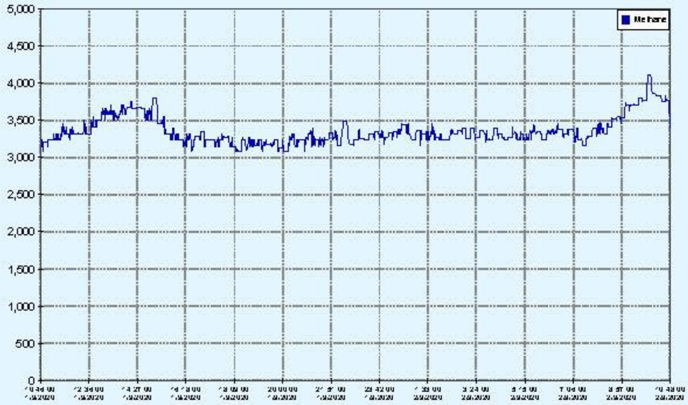
Record Count 1443

Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
3069.6	3,359.90	4111.2	182.06	ppm		0.00%		0.00%

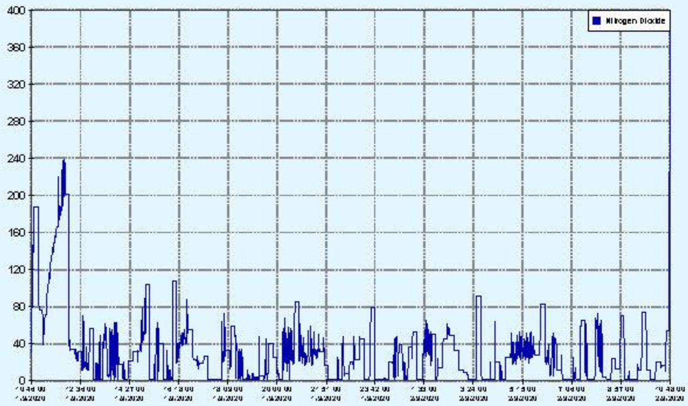


Nitrogen Dioxide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	32.00	388	39.78	ppb		0.00%		0.00%



Page 2

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by:VES

Logger ID 914065

Record Count 1443

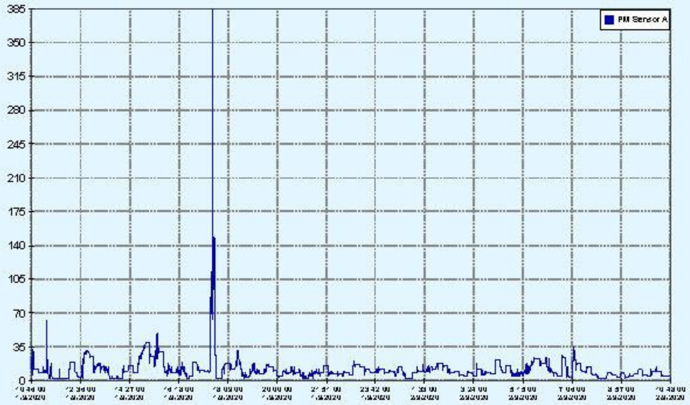
PM Sensor A

Sensor ID

Part

Range: 0 to 5000 uG/m3

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	11.00	385	13.96	uG/m3		0.00%		0.00%



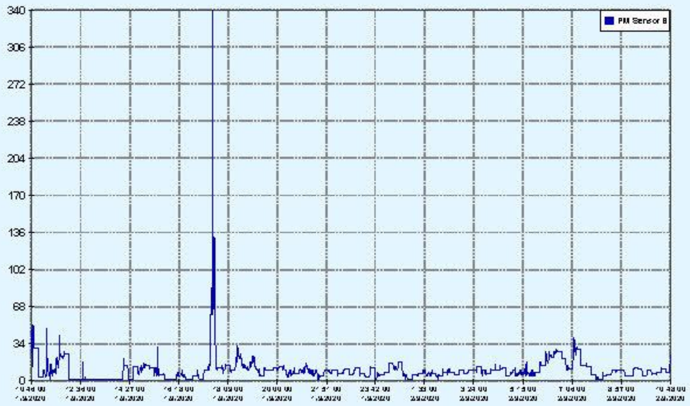
PM Sensor B

Sensor ID

Part

Range: 0 to 5000 uG/m3

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	10.00	340	12.48	uG/m3		0.00%		0.00%



Page 3

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by:VES

Logger ID 914065

Record Count 1443

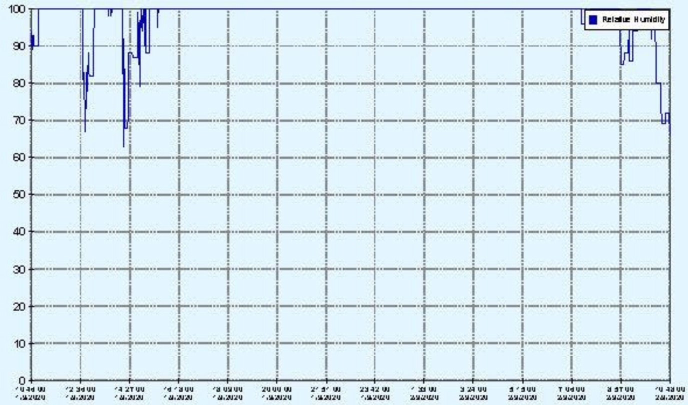
Relative Humidity

Sensor ID

R.H.

Range: 0 to 100 %

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
63	98.00	100	5.90	%		0.00%		0.00%



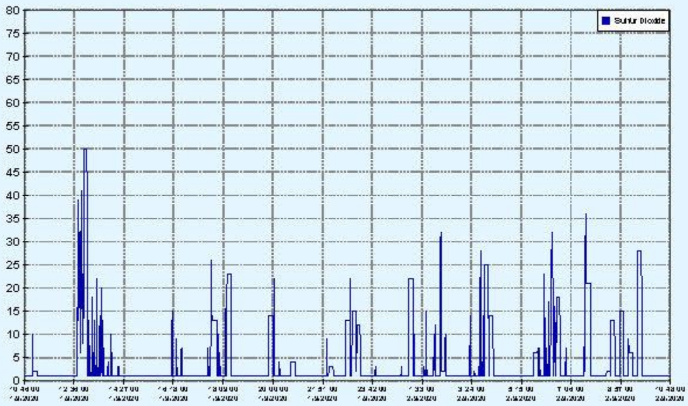
Sulfur Dioxide

Sensor ID

SO2

Range: 0 to 5000 ppb

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	4.00	50	7.07	ppb		0.00%		0.00%



Page 4

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by: VES

Logger ID 914065

Record Count 1443

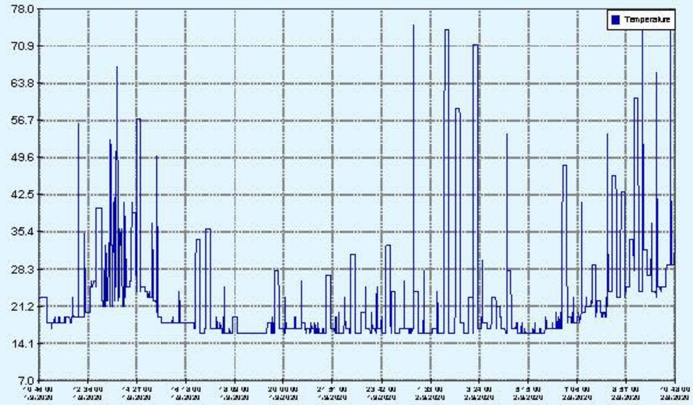
Temperature

Sensor ID

TEMP

Range: -20 to 60 Deg. C

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
16	23.00	78	10.81	Deg. C		0.00%		0.00%



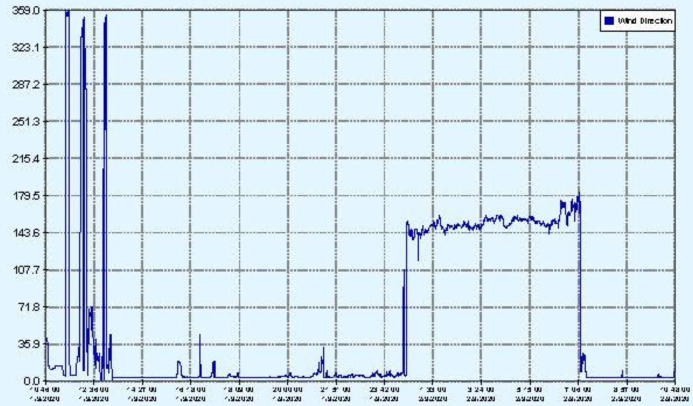
Wind Direction

Sensor ID

W. DIR.

Range: 0 to 359 Deg.

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	53.00	358	75.55	Deg.		0.00%		0.00%



Page 5

Environmental Report

Start: 1/9/2020 10:46 AM End: 2/9/2020 10:48 AM

Collected by:VES

Logger ID 914065

Record Count 1443

W. SPD.

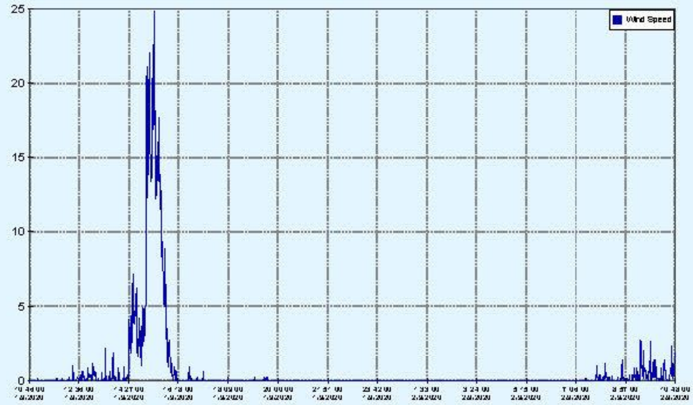
Wind Speed

W. SPD.

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0.60	24.9	2.60	kph		0.00%		0.00%



Page 6

(C) Noise Level Monitoring Result

AN-1

No.	Date	Time	Observed Value (LAeq)
1	9/4/2020	13:33	63.5
2	9/4/2020	14:33	57.6
3	9/4/2020	15:33	66.3
4	9/4/2020	16:33	60.5
5	9/4/2020	17:33	59.6
6	9/4/2020	18:33	60.6
7	9/4/2020	19:33	60.4
8	9/4/2020	20:33	58.9
9	9/4/2020	21:33	56.5
10	9/4/2020	22:33	53.8
11	9/4/2020	23:33	53.1
12	9/5/2020	0:33	52.8
13	9/5/2020	1:33	52.3
14	9/5/2020	2:33	54.4
15	9/5/2020	3:33	53.5
16	9/5/2020	4:33	52.5
17	9/5/2020	5:33	54.2
18	9/5/2020	6:33	54
19	9/5/2020	7:33	57.7
20	9/5/2020	8:33	58.6
21	9/5/2020	9:33	59.5
22	9/5/2020	10:33	52.1
23	9/5/2020	11:33	56.4
24	9/5/2020	12:33	60.3

AN-2

No.	Date	Time	Observed Value (Leq)
1	9/1/2020	10:14	63.4
2	9/1/2020	11:14	62.6
3	9/1/2020	12:14	63
4	9/1/2020	13:14	62.7
5	9/1/2020	14:14	63.8
6	9/1/2020	15:14	63.3
7	9/1/2020	16:14	65.3
8	9/1/2020	17:14	61.5
9	9/1/2020	18:14	60.7
10	9/1/2020	19:14	59.5
11	9/1/2020	20:14	59.2
12	9/1/2020	21:14	55.7
13	9/1/2020	22:14	57.3
14	9/1/2020	23:14	52.6
15	9/2/2020	0:14	53.6
16	9/2/2020	1:14	48.6
17	9/2/2020	2:14	51.1
18	9/2/2020	3:14	55.4
19	9/2/2020	4:14	62
20	9/2/2020	5:14	61.3
21	9/2/2020	6:14	60.6
22	9/2/2020	7:14	63.5
23	9/2/2020	8:14	63.6
24	9/2/2020	9:14	63.2

(D) Soil Quality Results

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL INTERPREATATION OF RESULTS

Valentis (8.9.2020)

Division –

Towship –

Sheet No. 1

Sr No. S 1-3/ 20-21

Sr No.	Sample	pH Soil:Water 1:2.5	EC	Texture	Organic Carbon	Total N	Exchangeable Cations		Available Nutrients	
							K^+	Na^+	P	K_2O
1	MOEE Soil 1	Strongly acid	Very low	Sandy clay loam	Low	Low	Low	Medium	Low	Low
2	MOEE Soil 2	Strongly acid	Very low	Sandy clay loam	Very low	Medium	Medium	Medium	Low	Medium
3	MOEE Soil 3	Strongly acid	Very low	Sandy clay loam	Low	Low	Low	Medium	Low	Low

(ဒေါက်တာသန္တာညီ)

လက်ထောက်ညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

Scanned with CamScanner

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Valentis (8.9.2020)

Division –

Towship –

Sheet No. 1

Sr No. S 1-3/ 20-21

Sr No.	Sample	Moisture %	pH Soil:Water 1:2.5	EC Soil:Water 1:5 mS/cm	Texture				Organic Carbon %	Humus %	Total N %	Exchangeable Cations meq/100gm		Available Nutrients	
					Sand %	Silt %	Clay %	Total %				K^+	Na^+	P ppm	K_2O mg/100gm
1	MOEE Soil 1	5.10	4.85	0.03	48.68	25.94	25.38	100.00	1.03	1.78	0.17	0.19	0.56	4.00 (B)	8.85
2	MOEE Soil 2	9.62	4.88	0.04	53.68	22.94	23.38	100.00	0.63	1.09	0.23	0.31	0.57	2.88 (B)	14.60
3	MOEE Soil 3	6.65	7.58	0.08	55.68	21.94	22.38	100.00	1.18	2.03	0.15	0.19	0.57	3.86 (O)	9.00

B= Bray & Kurtz Method

O= Olsen Method

(ဒေါက်တာသန္တာညီ)

လက်ထောက်ညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

Scanned with CamScanner

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Valentis (8.9.2020)

Division -

Towship -

Sheet No. 1

Sr No. S 1-3 / 20-21

Sr No.	Sample	Lead (Pb) mg/kg	Cadmium (Cd) mg/kg	Nickel (Ni) mg/kg	Chromium (Cr) mg/kg	Zinc (Zn) mg/kg	Copper (Cu) mg/kg	Arsenic (As) mg/kg	Mercury (Hg) mg/kg
1	MOEE Soil 1	0.80	Not detected	0.44	0.50	0.35	20.25	0.64	0.06
2	MOEE Soil 2	1.36	Not detected	0.05	0.11	0.16	0.75	4.97	0.15
3	MOEE Soil 3	1.04	0.002	0.06	0.12	0.26	0.63	7.43	0.02

မှတ်ချက်။ ။ မြေနမူနာ ဓာတ်ခွဲအဖြေများအရ Lead (Pb), Cadmium (Cd), Nickel (Ni), Chromium (Cr), Zinc (Zn), Copper (Cu), Arsenic (As), Mercury (Hg) ပါဝင်မှုသည် MPL (Maximum permissible Limit) ထက် မကျော်လွန်ပါ။ (ASEAN Soil & Nutrient Management Guidline (2017); Berson (2014); IRRI (2013))

(ဒေါက်တာသန္တာညီ)

လက်ထောက်ညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

(E) Landform Survey

(i) Soil Test Result

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Valentis (10.9.2020)

Division- Sheet No. 1

Township- Sr No. S 1-5/20-21

Sr No.	Sample plot	pH Soil : Water 1:2:5	Water Soluble Meq/100gm	INTERPRETATION OF RESULTS	
			SO_4^-	pH	SO_4^-
1	Point 1	7.43	0.21	Medium	Low
2	Point 3	4.88	0.10	Strongly acid	Low
3	Point 6	4.78	0.18	Strongly acid	Low
4	Point 7	4.30	0.14	Extremely acid	Low
5	Point 9	4.76	0.29	Strongly acid	Low

(ဒေါက်တာသန္တာညီ)
ဒုတိယညွှန်ကြားရေးမှူး
ဓာတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

(ii) Landform Survey Result

Project : **230 kV Balunchaung Transmission Line Project**

Client : **Coffey**

Survey By: **Sett Wai Aung**

Date : **1/9/2020**

Geotechnical Field Survey Form

Survey Point ID No : 1

GPS Coordinate Point	
X	Y
310205	2165068

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road.				The area is located at the side of Loikaw-Taungoo road.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamorphic	Alluvium/Residual	Sedimentary	Igneous	Metamorphic	Alluvium/Residual
Top Soil, Sandy CLAY				Top Soil, Sandy CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Condition on the slope face				Erosion Condition on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Flat Plain/Farms				Flat Plain/Farms			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with grass.				Coverage with grass.			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Demoso Town				Near Demoso Town			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
small drainage for Farms				small drainage for Farms			

Survey Point 1 Photos

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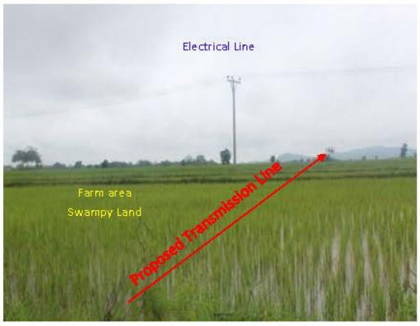
<tr><td>
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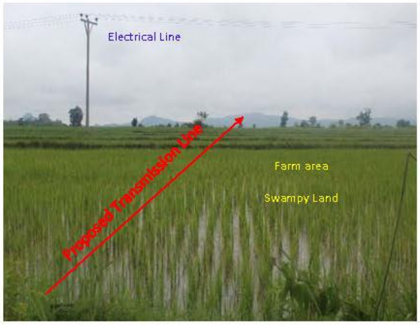
<tr><td>
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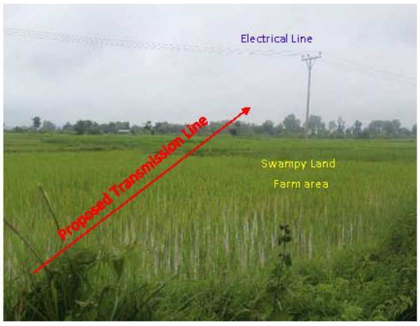
<tr><td>
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Project : 230 kV Baluchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 1/9/2020

Geotechnical Field Survey Form

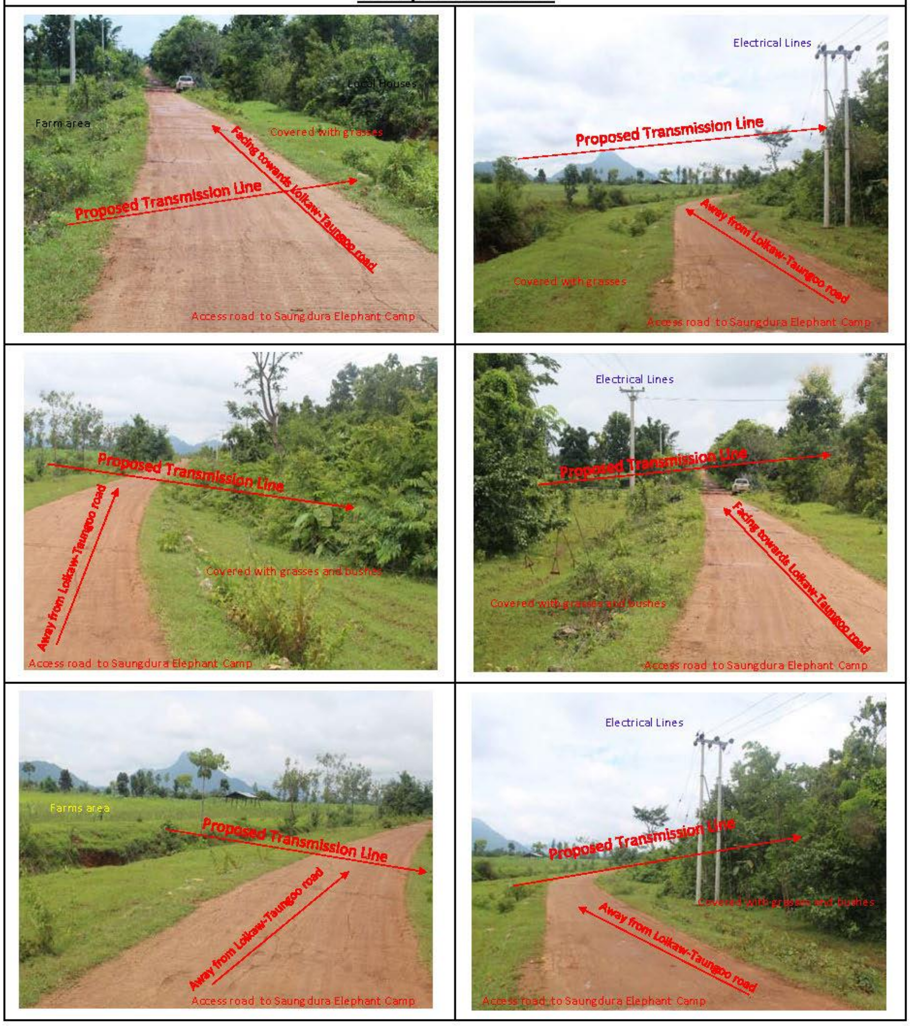
Survey Point ID No : 2

GPS Coordinate Point	
X	Y
297532	2166759

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
The road is dirt road and can damage easily by lorry crane.					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of access road which is estimated 5.8KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road to Saungdura Elephant Camp at Demoso Township).				The area is located at the side of access road which is estimated 5.8KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road to Saungdura Elephant Camp at Demoso Township).			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Flat Plane/Farms				small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with grass.				Coverage with grass.			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Myalae Village				Near Myalae Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
small drainage for Farms				One Electrical Line			

Survey Point 2 Photos



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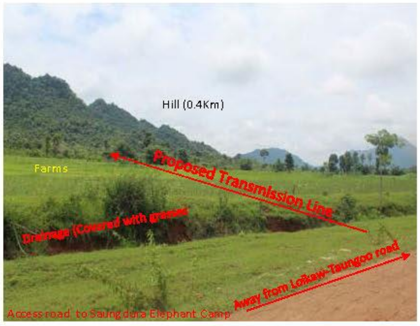
<td>
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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 1/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 2A

GPS Coordinate Point	
X	Y
289840	2166023

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road.				The area is located at the side of Loikaw-Taungoo road.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Flat Plane/Farms				Flat Plane with millet farm			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with grass.				Coverage with grass.			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Panpet Village, Found residentiial house and millet farm				Near Panpet Village, Found residentiial house and millet farm			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
One Electrical Line				One Electrical Line			

Survey Point 2A Photos

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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 1/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 3

GPS Coordinate Point	
X	Y
284843	2162775

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
The road is dirt road and can damage easily.					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of access road which is estimated 2KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road to Saungbadu Village at Demoso Township).				The area is located at the side of access road which is estimated 2KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road to Saungbadu Village at Demoso Township).			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Flat Plane with sugarcane farm.				Flat Plane with sugarcane farm.			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes				Coverage with bushes			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Saung Badu Village, Found sugarcane farm				Near Saung Badu Village, Found sugarcane farm			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 3 Photos

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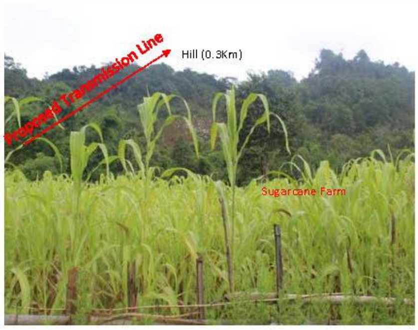
</td><td>
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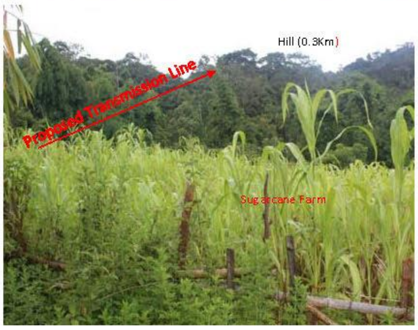
</td><td>
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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 2/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 3A

GPS Coordinate Point	
X	Y
276909	2161693

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.				The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				Found competely weathered limestone at exposed soil area.			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				Closely Joints.			
Slope Distant from Survey Point				Slope Distant from Survey Point			
Estimated 7m from road side				1.5m away from roadside			
Gorge		Valley		Gorge		Valley	
Estimated 7m from road side				1.5m away from roadside			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, No groundwater.				Found some exposed soil at the roadside and its became from road access. No groundwater.			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite side of the road, degree is est: 45'. Covered with bushes and no potential of slope failure.				Slope is stable and made with Silty CLAY and found completely weathered limestone at exposed area, No tension crack exist and direction is toward roadside, degree is est: 50'. No groundwater and erosion occured and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes				completely weathered limestone and exposed soil.			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near His Su Hku Village (1.5Km away from Survey points)				Near His Su Hku Village (1.5Km away from Survey points)			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 3A Photos

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<tr><th colspan="2"><u>Survey Point 3A Photos</u></th></tr>
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Project : **230 kV Balunchaung Transmission Line Project**

Client : **Coffey**

Survey By: **Sett Wai Aung**

Date : **2/9/2020**

Geotechnical Field Survey Form

Survey Point ID No : 3B

GPS Coordinate Point	
X	Y
272501	2160010

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.				The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
Found competely weathered limestone at exposed soil area.				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
Well jointed				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
Estimated 2m from road side				7m away from roadside			
Gorge		Valley		Gorge		Valley	
Estimated 2m from road side				7m away from roadside			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Found some exposed soil at the roadside and its became from road access. No groundwater.				Coverage with bushes and small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY and found completely weathered limestone at exposed area, No tension crack exist and direction is toward roadside, degree is est: 75'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite side of the road, degree is est: 60'. Covered with bushes and trees and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
completely weathered limestone and exposed soil.				Coverage with bushes and small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Khwee Ka Loke Village (2.4Km away from Survey points)				Khwee Ka Loke Village (2.4Km away from Survey points)			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 3B Photos

Survey Point 3B Photos

LEFT SIDE	RIGHT SIDE
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 2/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 4

GPS Coordinate Point	
X	Y
270897	2159332

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
The road can going by access road from Khwee Ka Loke to Naung Tong Village					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of access road which is estimated 1.3KM away from Loikaw-Taungoo road near Khwee Ka Loke Village. (Access location _Marked point can going by access road from Khwee Ka Loke Village				The area is located at the side of access road which is estimated 1.3KM away from Loikaw-Taungoo road near Khwee Ka Loke Village. (Access location _Marked point can going by access road to Khwee Ka Loke Village			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
Estimated 2.5m from road side				Estimated 2m from road side			
Gorge		Valley		Gorge		Valley	
Estimated 2.5m from road side				Estimated 2m from road side			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite roadside, degree is est: 30'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite side of the road, degree is est: 20'. Covered with bushes and trees and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Khwee Ka Loke Village (1Km away from Survey points)				Khwee Ka Loke Village (1Km away from Survey points)			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 4 Photos

Survey Point 4 Photos

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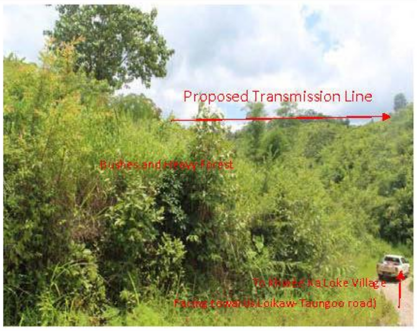
</td><td>
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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 3/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 4A

GPS Coordinate Point	
X	Y
269542	2143750

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through from lower valley (Undulation shape) and coverage with bushes and trees. No erosion occurred.				The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through from lower valley (Undulation shape) and coverage with bushes and trees. No erosion occurred.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
Estimated 9m from road side				Estimated 13m from road side			
Gorge		Valley		Gorge		Valley	
Estimated 9m from road side				Estimated 13m from road side			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite roadside, degree is est: 30'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite side of the road, degree is est: 40'. Covered with bushes and trees and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Yado Village (1Km away from Survey points)				Yado Village (1Km away from Survey points)			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 4A Photos

Survey Point 4A Photos

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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 3/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 5

GPS Coordinate Point	
X	Y
267716	2138668

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley. Heavy forest and No access road to go transmission line. Survey point is 2km away from transmission line.				The area is located at the side of Loikaw-Taungoo road and coordinate point is X-, Y-, The road passed through to the valley. Heavy forest and No access road to go transmission line. Survey point is 2km away from transmission line.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Gravelly Clay				Top Soil, Gravelly Clay			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
Estimated 6m from road side				Estimated 1m from road side			
Gorge		Valley		Gorge		Valley	
Estimated 6m from road side				Estimated 1m from road side			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, small to medium trees and streams				Coverage with bushes and small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite roadside, degree is est: 70'. No groundwater and erosion occured and no potential of slope failure. Found existing streams				Slope is stable and made with Silty CLAY, No tension crack exist and direction is opposite side of the road, degree is est: 70'. Covered with bushes and trees and no potential of slope failure. Found water flowing at the base of the hill (Rain water from forest to stream).			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
NA				NA			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
Stream				Stream			

Survey Point 5 Photos

Survey Point 5 Photos

LEFT SIDE	RIGHT SIDE
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 5/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 6

GPS Coordinate Point	
X	Y
257989	2137121

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
No Access road, Point located at valley.					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the gorge which is estimated 0.5KM away from Loikaw-Taungoo road and 2.2Km from Tha Kwe Pa Lo Village.				The area is located at the gorge which is estimated 0.5KM away from Loikaw-Taungoo road and 2.2Km from Tha Kwe Pa Lo Village.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
At the slope				At the slope			
Gorge		Valley		Gorge		Valley	
At the slope				At the slope			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is SE(119), degree is est: 75'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is SE(119), degree is est: 75'. No groundwater and erosion occured and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Tha Kwe Pa Lo Village				Near Tha Kwe Pa Lo Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 6 Photos

Survey Point 6 Photos

LEFT SIDE	RIGHT SIDE
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 5/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 6A

GPS Coordinate Point	
X	Y
254266	2134580

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
0.12Km from Loikaw-Taungoo road					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Bullock cart which is estimated 0.12Km from Loikaw-Taungoo road and access from Ba Hone/Mhae Thali Chaung Village.				The area is located at the side of Bullock cart which is estimated 0.12Km from Loikaw-Taungoo road and access from Ba Hone/Mhae Thali Chaung Village.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
At the side of Bullock cart				At the side of Bullock cart			
Gorge		Valley		Gorge		Valley	
At the side of Bullock cart				At the side of Bullock cart			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, trees				Coverage with bushes and trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is W(253), degree is est: 75'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is W(257), degree is est: 35'. No groundwater and erosion occured and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes and trees				Coverage with bushes and trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Ba Hone/Mhae Thali Chaung Village				Near Ba Hone/Mhae Thali Chaung Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 6A Photos

Survey Point 6A Photos

LEFT SIDE	RIGHT SIDE
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 6/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 6b

GPS Coordinate Point	
X	Y
249581	2132804

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
0.5Km from Loikaw-Taungoo road, The road is dirt road					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of access road (dirt road) which is estimated 0.5Km from Loikaw-Taungoo road and access from Lower Kyae Min Village.				The area is located at the side of access road (dirt road) which is estimated 0.5Km from Loikaw-Taungoo road and access from Lower Kyae Min Village.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
At the side of Bullock cart				At the side of Bullock cart			
Gorge		Valley		Gorge		Valley	
At the side of dirt road				At the side of dirt road			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Silty CLAY, No tension crack exist and direction is SW(220) degree is est: 75'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Silty CLAY, No tension crack exist and direction is SE(125), degree is est: 20'. No groundwater and erosion occured and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Lower Kyae Min Village				Near Lower Kyae Min Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 6B Photos

Survey Point 6B Photos

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Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 4/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 7

GPS Coordinate Point	
X	Y
244529	2128965

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
The area is located at the side of access road which is estimated 2.7KM away from Loikaw-Taungoo road.					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of access road which is estimated 2.7KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road (Bullock cart) to La Bet Inn Gyi Village from Late Khoe Township (Loikaw-Taungoo Road).				The area is located at the side of access road which is estimated 2.7KM away from Loikaw-Taungoo road. (Access location _Marked point can going by access road (Bullock cart) to La Bet Inn Gyi Village from Late Khoe Township (Loikaw-Taungoo Road).			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Clayey SILT				Top Soil, Clayey SILT			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
At the side of road				At the side of road			
Gorge		Valley		Gorge		Valley	
At the side of road				At the side of road			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope is stable and made with Clayey SILT, No tension crack exist and direction is opposite roadside, degree is est: 55'. No groundwater and erosion occured and no potential of slope failure.				Slope is stable and made with Clayey SILT, No tension crack exist and direction is toward road, degree is est: 30'. Covered with bushes and trees and no potential of slope failure.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes, small to medium trees				Coverage with bushes, small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near la Bet Inn Gyi Village				Near la Bet Inn Gyi Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 7 Photos

Survey Point 7 Photos

LEFT SIDE	**RIGHT SIDE**
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 6/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 7A

GPS Coordinate Point	
X	Y
240670	2120853

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at Loikaw-Taungoo Road which is estimated 0.8Km from Za Le (Lower) Village. The point located at the bottom of hill and found existing stream in nearby location.				The area is located at Loikaw-Taungoo Road which is estimated 0.8Km from Za Le (Lower) Village. The point located at the bottom of hill and found existing stream in nearby location.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				Strong, Moderately weathered, Granite (Mesozoic and Lower Tertiary), Granite boulder at stream.			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				Found as boulders in Stream.			
Slope Distant from Survey Point				Slope Distant from Survey Point			
15m away from roadside				15m away from roadside			
Gorge		Valley		Gorge		Valley	
The point located at the bottom of hill.				The point located at the bottom of hill.			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes, Supari palm				Coverage with bushes and Supari palm			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope distant is 15m away from roadside and Slope survey will be in next page.				Slope distant is 15m away from roadside and Slope survey will be in next page.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes, Supari palm				Coverage with bushes, Supari palm			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Za Le (Lower) Village				Near Za Le (Lower) Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
Found existing stream near by (8m away from survey point)				Found existing stream near by (8m away from survey point)			

Survey Point 7A Photos

Survey Point 7A Photos

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Project : 230 kV Balunchaung Transmission Line Project
Client : Coffey
Survey By: Sett Wai Aung
Date : 6/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 7B

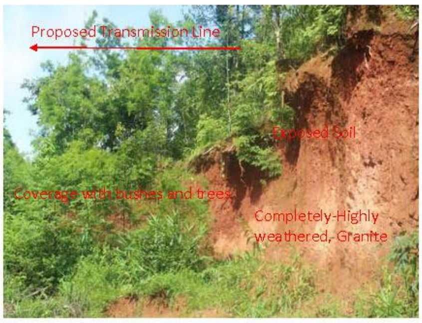
GPS Coordinate Point	
X	Y
238640	2117580

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Loikaw-Taungoo road					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at Loikaw-Taungoo Road which is estimated 0.25Km from Me Khat Chaung Village. The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.				The area is located at Loikaw-Taungoo Road which is estimated 0.25Km from Me Khat Chaung Village. The road passed through to the valley and found some exposed soil at the roadside and its became from road access. No erosion occurred.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Silty CLAY				Top Soil, Silty CLAY			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				Weak, Completely-Highly weathered, Granite (Mesozoic and Lower Tertiary), Weathered outcrop at exposed soil area.			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				Well Jointed.			
Slope Distant from Survey Point				Slope Distant from Survey Point			
3m away from roadside				5m away from roadside			
Gorge		Valley		Gorge		Valley	
The point located at the hill and road passed through the valley				The point located at the hill and road passed through the valley			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with bushes and small to medium trees, Found some exposed soil at cut slope area.				Coverage with bushes and small to medium trees, Found some exposed soil at cut slope area.			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
Slope distant is 3m away from roadside and Slope survey will be in next page.				Slope distant is 5m away from roadside and Slope survey will be in next page.			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with bushes and small to medium trees				Coverage with bushes and small to medium trees			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Me Khat Chaung Village				Near Me Khat Chaung Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 7B Photos

Survey Point 7B Photos

LEFT SIDE	**RIGHT SIDE**
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 6/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 8

GPS Coordinate Point	
X	Y
229026	2114537

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Near Kayin Chaung Village, The road is dirt road.					

LEFT side of the road Survey Point				RIGHT side of the road Survey Point			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of Sitt Taung River which is estimated 3km away from Kayin Chaung Village. The survey can going in from Laikaw-Taungoo Road to Kayin Chaung Village (7.5Km).				The area is located at the side of Sitt Taung River which is estimated 3km away from Kayin Chaung Village. The survey can going in from Laikaw-Taungoo Road to Kayin Chaung Village (7.5Km).			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Sandy SILT				Top Soil, Sandy SILT			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Paddy field and Coverage with grasses				Paddy field and Coverage with grasses			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Paddy field and Coverage with grasses				Paddy field and Coverage with grasses			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Kayin Chaung Village				Kayin Chaung Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
Sitt Taung River				Sitt Taung River			

Survey Point 8 Photos

Survey Point 8 Photos

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Project : 230 kV Baluchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 6/9/2020

Geotechnical Field Survey Form

Survey Point ID No : 9

GPS Coordinate Point	
X	Y
224304	2114117

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Near Yangon-Mandalay Highway, The road is dirt road.					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the access road to Baung Din Village which is estimated 2.3Km away from YGN-MDY Hightways. The survey can going in from YGN-MDY Highway to Baung Din Village.				The area is located at the access road to Baung Din Village which is estimated 2.3Km away from YGN-MDY Hightways. The survey can going in from YGN-MDY Highway to Baung Din Village.			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Sandy SILT with Gravel, (Found iron oxide in Soil)				Top Soil, Sandy SILT with Gravel, (Found iron oxide in Soil)			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with grasses and bushes				Coverage with grasses and bushes			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with grasses and bushes				Coverage with grasses and bushes			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Baung Din Village				Near Baung Din Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
NA				NA			

Survey Point 9 Photos

Survey Point 9 Photos

LEFT SIDE	**RIGHT SIDE**
	
	
	

Project : 230 kV Balunchaung Transmission Line Project

Client : Coffey

Survey By: Sett Wai Aung

Date : 7/9/2020

Geotechnical Field Survey Form

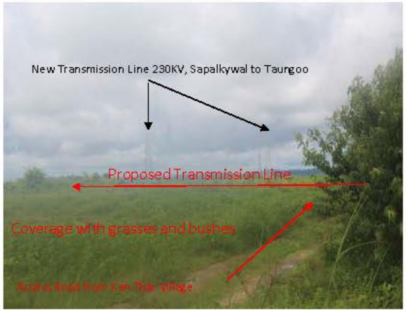
Survey Point ID No : 10

GPS Coordinate Point	
X	Y
216648	2099342

Exisitng Road Condtion for future Cable Tower construction					
4W drive access		Lorry Crane access		Bullock cart	
Yes	No	Yes	No	Yes	No
Near Kan Thar Village, The road is dirt road.					

LEFT side of the road Survey Point				**RIGHT side of the road Survey Point**			
Surface Topography and Landform				Surface Topography and Landform			
Terrain		Flat Plain	Others	Terrain		Flat Plain	Others
The area is located at the side of stream (Kabaung Chaung) which is estimated 700m away from Kan Thar village. The survey point can going in from YGN-MDY Expressway to Kan Thar Village (5km away from expressway).				The area is located at the side of stream (Kabaung River) which is estimated 700m away from Kan Thar village. The survey point can going in from YGN-MDY Expressway to Kan Thar Village (5km away from expressway).			
Rock Formations				Rock Formations			
Sedimentary	Igneous	Metamophic	Alluvium/Residual	Sedimentary	Igneous	Metamophic	Alluvium/Residual
Top Soil, Sandy SILT				Top Soil, Sandy SILT			
Weathering Grade at the exposed outcrop				Weathering Grade at the exposed outcrop			
Fresh	Moderately	Highly	Completely	Fresh	Moderately	Highly	Completely
NA				NA			
Joint/Bedding Condition				Joint/Bedding Condition			
NA				NA			
Slope Distant from Survey Point				Slope Distant from Survey Point			
NA				NA			
Gorge		Valley		Gorge		Valley	
NA				NA			
Erosion Conditon on the slope face				Erosion Conditon on the slope face			
Occurred		Non-Occurred		Occurred		Non-Occurred	
Coverage with grasses and bushes				Coverage with grasses and bushes			
Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure				Slope Condition (Soil type at the SLope Stable or Un-stable, Steepness and degree of slope, Tension crack exist or not Direction of slope towards the road, Potential of slope failure			
NA				NA			
Wetland/Swampy/Dry				Wetland/Swampy/Dry			
Coverage with grasses and bushes				Coverage with grasses and bushes			
Residential Condition				Residential Condition			
Village	Town	Farm	N/A	Village	Town	Farm	N/A
Near Kan Thar Village				Near Kan Thar Village			
General Resources				General Resources			
Stream	River	Pond	Other	Stream	River	Pond	Other
Near Kabaung Chaung				Near Kabaung Chaung			

Survey Point 10 Photos



Survey Point 10 Photos

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14.7. Biodiversity Survey Results

(A) Flora

(i) Recorded Plant Species in the Survey Area

No	Scientific Name	Family	Common Name	Habit
1	*Centella asiatica* (L.) Urb.	Apiaceae	Myin-hkwa	Herb
2	*Coriandrum sativum* L.	Apiaceae	Nannan	Herb
3	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	Wa-u-pin	Herb
4	*Alaonema sp.*	Araceae	Ywet-hla-pan	Herb
5	*Dieffenbachia daguensis* Engl.	Araceae	Maidawgyi-gamon-	Herb
6	*Colocasia sp*.	Araceae	Pein	Herb
7	*Alaonema sp.*	Araceae	Gamon	Herb
8	*Alocasia gageana* Engl. & K.Krause	Araceae	Pein-pan	Herb
9	*Colocasia esculenta* (L.) Schott	Araceae	Pein-u	Herb
10	*Borassus flabellifer* L.	Arecaceae	Htan	Tree
11	*Livistona rotundifolia* (Lam.) Mart.	Arecaceae	Taung-htan	Tree
12	*Cocos nucifera* L.	Arecaceae	Ohn-pin	Tree
13	*Mangifera sp.*	Anacardiaceae	Unknown	Tree
14	*Mangifera* sp.	Anacardiaceae	Unknown	Tree
15	*Mangifera longipes* Griff.	Anacardiaceae	Thayet-pya	Tree
16	*Mangifera indica* L.	Anacardiaceae	Thayet	Tree
17	*Bouea burmanica* Griff.	Anacardiaceae	Mayan	Tree
18	*Spondias mangifera* Willd.	Anacardiaceae	Gwe-thi-pin	Tree
19	*Lactuca sativa* L.	Asteraceae	Salat-ywet	Herb
20	*Tithonia diversifolia* A. Gray	Asteraceae	Nay-kyar	Shrub
21	*Chromolaena odorata* (L.) R.M.King & H.	Asteraceae	Bizat	Shrub
22	*Calamus sp.*	Asteraceae	Kyein	Climber
23	*Chromolaena sp.*	Asteraceae	Bizat	Shrub
24	*Agave sp.*	Agavaceae	Unknown	Shrub
25	*Aloe vera* L.	Aloaceae	Shazaung-let-pat	Herb
26	*Elaeis guineensis* Jacq.	Arecaceae	Si-ohn	Tree
27	*Amaranthus spinosus* L.	Amaranthaceae	Hin-nu-new-subauk	Herb
28	*Aerva javanica* Juss.	Amaranthaceae	On-hnye	Herb
29	*Allamanda cathartica* L.	Apocynaceae	Shwewa-pan	Climber
30	*Vinca rosea* (Bojer ex Hook.) Raf.	Apocynaceae	Thinbaw-ma-hnyo	Herb
31	*Diplazium tomentosum* Blume	Athyriaceae	Fern-pin	Herb
32	*Cardamine hirsuta* L.	Brassicaceae	Monnyin	Herb
33	*Brassica oleracea* L.	Brassicaceae	Kale	Herb
34	*Bombax ceiba* L.	Bombaceaeba	Letpan	Tree

35	*Ceiba pentandra* (L.) Gaertn.	Bombaceaeba	Le-moh-pin	Tree
36	*Durio zibethinus* Murray	Bombaceaeba	Duyin	Tree
37	*Oroxylum indicum* (L.) Kurz.	Bignoniaceae	Kyaung-sha	Tree
38	*Ananas comosus* (L.) Merr.	Bromeliaceae	Nanat	Tree
39	*Tamarindus indica* L.	Caesalpiniaceae	Magyi	Tree
40	*Bauhinia acuminata* L.	Caesalpiniaceae	Swe-daw	Small tree
41	*Senna siamea* (Lam.) Irvurn & Barneby	Caesalpiniaceae	Mezali	Tree
42	*Bauhinia vahlii* Wight & Arn.	Caesalpiniaceae	Seinban-gale	Small tree
43	*Canna indica* L.	Cannaceae	Budatharana	Herb
44	*Carica sp.*	Caricaceae	Thin-baw	Small tree
45	*Carica papaya* L.	Caricaceae	Thin-baw	Small tree
46	*Cycas pectinata* Bunch-Ham.	Cycadaceae	Mondaing	Small tree
47	*Ipomoea sp.*	Convolvulaceae	Kanzun	Herb
48	*Ipomoea turbinata*Lagasca	Convolvulaceae	Kazun-new	Climber
49	*Ipomoea sp.*	Convolvulaceae	Kazun	Climber
50	*Commelina benghalensis* L.	Commelinaceae	Myit-cho	Herb
51	*Carex pandanophylla* C.B. Clarke	Cyperaceae	Myet-monnyin	Herb
52	*Aerocarpus fraxinifolius* Wight & ex Arn.	Caesalpiniaceae	Ye-tama	Tree
53	*Luffa aegyptiaca* Mill.	Cucurbitaceae	Tha--but-new	Climber
54	*Momordica sp.*	Cucurbitaceae	Taw-kyet-hin-khar	Climber
55	*Momordica sp.*	Curcubitaaceae	Unknown	Climber
56	*Lagenaria siceraria* (Molina)Stand*l.*	Curcubitaceae	Bu	Climber
57	*Casuarina equisetifolia* Forst.	Casuarinaceae	Pin-le-kabwe	Tree
58	*Terminalia catappa* L.	Combretaceae	Banda	Tree
59	*Delonix regia* (Bojer ex Hook.) Raf.	Caesalpiniaceae	Sein ban	Tree
60	*Lophopetalum wallichii* Kurz	Caesalpiniaceae	Ye-thabye	Tree
61	*Kalanchoe sp.*	Crassulaceae	Ywetkya-pinpauk	Herb
62	*Kalanchoe sp.*	Crassulaceae	Ywetkya-pinpauk	Herb
63	*Opuntia sp.*	Cataceae	Sha-zaung- let-war	Herb
64	*Davallia solida* (G.Forst.) Sw.	Davalliaceae	Fern-pin	Herb
65	*Didymochlaena truncatula* (Sw.) J.Sm.	Didymochlaenaceae	Fern-pin	Herb
66	*Shorea obtusa* Wall.	Dipterocarpaceae	Thit-ya	Tree
67	*Dracaena fragrans* (L.) Ker Gawl.	Dracaenaceae	Zaw-gyi-taung-hmwe	Shrub
68	*Ricinus communis* L.	Euphorbiaceae	Kyetsu	Small tree
69	*Croton tiglium* L.	Euphorbiaceae	Kanakho	Small tree
70	*Baccaurea sapida* Muell. Arg.	Euphorbiaceae	Kanaso	Tree
71	*Euphorbia heterophylla* L.	Euphorbiaceae	Kywe-kyaung-myin-si	Shrub
72	*Euphorbia sp.*	Euphorbiaceae	Kiss-me-quick	Shrub
73	*Euphorbia sp.*	Euphorbiaceae	Kiss-me-quick	Shrub

74	*Euphorbia milii* Moutins.	Euphorbiaceae	Kiss-me-quick	Shrub
75	*Phyllanthus pomiferus* Hook.f.	Euphorbiaceae	Zinbyu	Small tree
76	*Plukenetia volubilis* L.	Euphorbiaceae	Kye- pe	Climber
77	*Cajanus cajan* (L.) Mills.	Fabaceae	Pe-si-ngon	Shrub
78	*Cyamopsis indicu*m L.	Fabaceae	Pe-pazum	Shrub
79	*Phaseolus mungo* L.	Fabaceae	Mat- pe	Climber
80	*Lablab niger* Medik	Fabaceae	Pe-pazum	Climber
81	*Phaseolus lunatu*s L.	Fabaceae	Htawbat-pe	Climber
82	*Pterocarpus sp.*	Fabaceae	Japan-padauk	Tree
83	*Pterocarpus sp.*	Fabaceae	Malaysaia-padauk	Tree
84	*Pterocarpus sp.*	Fabaceae	Unknown	Tree
85	*Pterocarpus marsupium* Roxb.	Fabaceae	Padauk	Tree
86	*Erythrina lithosperma* Blume ex Miq.	Fabaceae	Ye-kathit	Tree
87	*Erythrina stricta* Roxb.	Fabaceae	Kathit	Tree
88	*Parkia speciosa* Hassk.	Fabaceae	Myauk -ngo-thi	Small tree
89	*Sesbania grandiflora* (L.) Poir.	Fabaceae	Paukpan-byu	Small tree
90	*Gentiana kurroo* Royle	Gentianaceae	Sayga-gyi	Herb
91	*Calophyllum inophyllum* L.	Hypericaceae	Pon-nyet	Tree
92	*Irvingia oliveri* Pierre	Irvindiaceae	Taung-thayet	Tree
93	*Persea americana* Mill.	Lauraceae	Htawbat-thi-pin	Tree
94	*Lagerstroemia reginae* Roxb.	Lythraceae	Pyin-ma	Tree
95	*Duabanga sp.*	Lythraceae	Unknown	Tree
96	*Duabanga grandiflora* (Roxb.ex DC.) Walp.	Lythraceae	Thitkazaw	Tree
97	*Stephania rotundo* Lour.	Menispermaceae	Sin-don-ma-new	Climber
98	*Musa itinerans* E.E.Cheesm.	Musaceae	Taw-nget-pyaw	Herb
99	*Mussa sp*.	Musaceae	Rakhaing-nget-pyaw	Herb
100	*Musa sp.*	Musaceae	Phee-kyann-nget-pyaw	Herb
101	*Musa sp.*	Musaceae	Unknown	Herb
102	*Musa sp.*	Musaceae	Ngwe-nget-pyaw	Herb
103	*Ensete ventricosum* (Welw.) E.E.Cheesm.	Musaceae	Shwe-nget-pyaw	Herb
104	*Musa acuminata* Simmonds	Musaceae	Wet-ma-lut	Herb
105	*Moringa oleifera* Lam.	Moringaceae	Dan-da-lun	Tree
106	*Gossypium herbaceum* L.	Malvaceae	Wah	Shrub
107	*Hibiscus rosasinensis* L.	Malvaceae	Khaung-yan	Shrub
108	*Toona ciliata* M. Roemer	Meliaceae	Thit-kado	Tree
109	*Cedrela febrifuga* Blume	Meliaceae	Ye-tama	Tree
110	*Swietenia macrophylla* King	Meliaceae	Mahogany	Tree
111	*Azadirachta indica* A. Juss.	Mimosaceae	Tama	Tree
112	*Acacia megaladena* Desv.	Mimosaceae	Subok	Small tree

113	*Archidendron jiringo* (Jock) Nielsen	Mimosaceae	Danyin	Tree
114	*Acacia sp.*	Mimosaceae	Ye-suboke	Shrub
115	*Acacia concinna* DC.	Mimosaceae	Kinmun-gyin	Climber
116	*Acacia farnesiana* (L.) Willd.	Mimosaceae	Nan-lon-kyaing	Small tree
117	*Leucaena leucocephala* (Lam.) De Wit	Mimosaceae	Bawzagaing	Tree
118	*Artocarpus sp.*	Moraceae	Peinne	Tree
119	*Ficus glomerat*a Roxb.	Moraceae	Taung-thapgan	Tree
120	*Artocarpus lakoocha* Roxb.	Moraceae	Myauk-laung	Tree
121	*Artocarpus chaplasha* Roxb.	Moraceae	Taung-peinne	Tree
122	*Ficus sp.*	Moraceae	Unknown	Tree
123	*Ficus sp.*	Moraceae	Unknown	Tree
124	*Ficus sp.*	Moraceae	Unknown	Tree
125	*Ficus sp.*	Moraceae	Unknown	Tree
126	*Ficus religiosa* L.	Moraceae	Bawdi-nyaung	Tree
127	*Ficus cunia* Buch-Ham.	Moraceae	Ka-dut	Tree
128	*Ficus elastica* Roxb.	Moraceae	Nyaung-kyet-paung	Tree
129	Artocarpus sp.	Moraceae	Yotaya-peinne	Tree
130	*Artocarpus heterophyllus* Lam.	Moraceae	Peinne	Tree
131	*Eugenia sp.*	Myrtaceae	Unknown	Small tree
132	*Eugenia cuneata* Wall.	Myrtaceae	Ye-thabye	Shrub
133	*Psidium guajava* L.	Myrtaceae	Malaka	Small tree
134	*Eucalyptus camaldulensis* Dehnh.	Myrtaceae	U-ca-lit	Tree
135	*Syzygium cumini* (L.) Skeels	Myrtaceae	Thabye-phyu	Tree
136	*Bougainvillen sp.*	Nyctaginaceae	Sekku-pan	Climber
137	*Bougainvillen sp.*	Nyctaginaceae	Sekku-pan	Climber
138	*Bougainvillen glabra* Choisy	Nyctaginaceae	Sekku-pan	Climber
139	*Chionanthus macrocarpus* Blume	Olacaceae	Taw-sabe	Shrub
140	*Coelogyne sp.*	Orchidaceae	Unknown	Epiphyte
141	*Dendrobium chrysotoxum* Lindl.	Orchidaceae	Thitkhwa-ahwa	Epiphyte
142	*Eria sp.*	Orchidaceae	Unknown	Epiphyte
143	*Pholidota imbricata* Lindl.	Orchidaceae	Sin-mr-thitkwa	Epiphyte
144	*Piper betel* L.	Piperaceae	Kun-ywet-pin	Climber
145	*Dendrocalamus longispathus* (Kurz.) Kurz	Poaceae	Wanet	Bamboo
146	*Dendrocalamus giganteus Wall.ex Munro*	Poaceae	Unknown	Bamboo
147	*Bambusa sp.*	Poaceae	Unknown	Bamboo
148	*Bambusa sp.*	Poaceae	Unknow	Bamboo
149	*Bambusa teres* Buch-Ham. Ex Wall.	Poaceae	Ta-bin-daing-wa	Bamboo
150	*Bambusa vulgaris* Schrad. Ex J.C.Wendl	Poaceae	Shwe-wa	Bamboo

151	*Bambusa polymorpha* Munro	Poaceae	Kyathaung-wa	Bamboo
152	*Bambusa wamin* E.G.Camus	Poaceae	Wamin	Bamboo
153	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Sabalin	Grass
154	*Bambusa marginata* Munro	Poaceae	Wa-me	Bamboo
155	*Arundo donax* L.	Poaceae	Kyu	Grass
156	*Thysanolaena maxima* (Roxb.) Kunzt.	Poaceae	Tamyetse	Grass
157	*Dendrocalamus giganteus* Wall.ex Munro	Poaceae	Wabo-gyi	Bamboo
158	*Sacchaarum spontaneum* L.	Poaceae	Kaing	Grass
159	*Pinus khasya* Royle ex Parl.	Pinaceae	Tinshu	Tree
160	*Macadamia integrifolia* Maiden & Betche	Proteaceae	Macadamia	Small tree
161	*Malus pumila* Mill.	Rosaceae	Hnin-thi	Small tree
162	*Rosa gallica* L.	Rosaceae	Hnin-si	Shrub
163	*Rosa alba* L.	Rosaceae	Hnin-si-phyu	Shrub
164	*Prunus dulcis* (Mill) D.A Webb	Rosaceae	Met-man-thi	Tree
165	*Pyrus communis* L.	Rosaceae	Thit-taw	Tree
166	*Mussaenda erythrophylla* Schum. & Thonn.	Rubiaceae	Pwintu-ywettu-ani	Shrub
167	*Anthocephalus morindaefolius* Korth.	Rubiaceae	Ma-u	Tree
168	*Mussaenda luteola* Delile	Rubiaceae	Ywet-hla-pan	Shrub
169	*Coeffea liberica* Hiern	Rubiaceae	Ka-phi	Small tree
170	*Coffea sp.*	Rubiaceae	France-kaw-phi-pin	Small tree
171	*Coffea arabica* L.	Rubiaceae	Kaw-phi-pin	Small tree
172	*Coeffea sp.*	Rubiaceae	kaw-phi-pin	Small tree
173	*Citrus aurantiifolia* (Christm.) Sw.	Rutaceae	Thanbaya	Shrub
174	*Citrus limon* (L.) Burm.f.	Rutaceae	Than-bayo	Small tree
175	*Citrus maxima* (Burm.) Merr.	Rutaceae	Kywe-gaw	Small tree
185	*Lycopersicon esculentum* Mill.	Solanaceae	Khayan-gyin	Herb
186	*Capsicum annuum* L.	Solanaceae	Ngayok	Shrub
187	*Litchi chinensis* Sonn.	Sapindaceae	Kyet-mauk	Tree
188	*Mimusops elenngi* L.	Sapotaceae	Kha-yay	Tree
189	*Aquilaria agallocha* Roxb.	Thymelaeaceae	Thit-hmwe	Small tree
190	*Camellia caudata* Wall.	Theaceae	Laphet	Small tree
191	*Camellia drupifera* Lour.	Theaceae	Laphet	Shrub
192	*Camellia sinensis* (L.) Kuntze	Theaceae	Laphet	Small tree
193	*Microcos paniculata* L.	Tiliaceae	Mya-yar	Small tree
194	*Duranta repens*L.	Verbenaceae	Bokadaw-myet-hkon-siyopan	Shrub
195	*Gmelina arborea* Roxb.	Verbenaceae	Yemane	Tree
196	*Tectona grandis* L.f.	Verbenaceae	Kyun	Tree

197	*Zingiber panduratum* Roxb.	Zingiberaceaen	Hpala	Herb
198	*Amomum sericeum* Roxb.	Zingiberaceaen	Hpala	Herb
199	*Zingiber sp.*	Zingiberaceaen	Unknown	Herb
185	*Lycopersicon esculentum* Mill.	Solanaceae	Khayan-gyin	Herb
186	*Capsicum annuum* L.	Solanaceae	Ngayok	Shrub
187	*Litchi chinensis* Sonn.	Sapindaceae	Kyet-mauk	Tree
188	*Mimusops elenngi* L.	Sapotaceae	Kha-yay	Tree
189	*Aquilaria agallocha* Roxb.	Thymelaeaceae	Thit-hmwe	Small tree
190	*Camellia caudata* Wall.	Theaceae	Laphet	Small tree
191	*Camellia drupifera* Lour.	Theaceae	Laphet	Shrub
192	*Camellia sinensis* (L.) Kuntze	Theaceae	Laphet	Small tree
193	*Microcos paniculata* L.	Tiliaceae	Mya-yar	Small tree
194	*Duranta repens*L.	Verbenaceae	Bokadaw-myet-hkon-siyopan	Shrub
195	*Gmelina arborea* Roxb.	Verbenaceae	Yemane	Tree
195	*Gmelina arborea* Roxb.	Verbenaceae	Yemane	Tree
196	*Tectona grandis* L.f.	Verbenaceae	Kyun	Tree
197	*Zingiber panduratum* Roxb.	Zingiberaceaen	Hpala	Herb
198	*Amomum sericeum* Roxb.	Zingiberaceaen	Hpala	Herb
199	*Zingiber sp.*	Zingiberaceaen	Unknown	Herb

(ii) Recorded Edible Plant Species in the Survey Area

No.	Scientific Name	Family	Common Name	Habit
1	*Centella asiatica* (L.) Urb.	Apiaceae	Myin-hkwa	Herb
2	*Coriandrum sativum* L.	Apiaceae	Nannan	Herb
3	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	Wa-u-pin	Herb
4	*Borassus flabellifer* L.	Arecaceae	Htan	Tree
5	*Cocos nucifera* L.	Arecaceae	Ohn-pin	Tree
6	*Mangifera longipes* Griff.	Anacardiaceae	Thayet-pya	Tree
7	*Mangifera indica* L.	Anacardiaceae	Thayet	Tree
8	*Bouea burmanica* Griff.	Anacardiaceae	Mayan	Tree
9	*Spondias mangifera* Willd.	Anacardiaceae	Gwe-thi-pin	Tree
10	*Lactuca sativa* L.	Asteraceae	Salat-ywet	Herb
11	*Tithonia diversifolia* A. Gray	Asteraceae	Nay-kyar	Shrub
12	*Elaeis guineensis* Jacq.	Arecaceae	Si-ohn	Tree
13	*Cardamine hirsuta* L.	Brassicaceae	Monnyin	Herb
14	*Brassica oleracea* L.	Brassicaceae	Kale	Herb
15	*Bombax ceiba* L.	Bombaceaeba	Letpan	Tree
16	*Durio zibethinus* Murray	Bombaceaeba	Duyin	Tree
17	*Oroxylum indicum* (L.) Kurz.	Bignoniaceae	Kyaung-sha	Tree
18	*Ananas comosus* (L.) Merr.	Bromeliaceae	Nanat	Tree
19	*Tamarindus indica* L.	Caesalpiniaceae	Magyi	Tree
20	*Senna siamea* (Lam.) Irvurn & Barneby	Caesalpiniaceae	Mezali	Tree
21	*Carica sp.*	Caricaceae	Thin-baw	Small tree
22	*Carica papaya* L.	Caricaceae	Thin-baw	Small tree
23	*Luffa aegyptiaca* Mill.	Cucurbitaceae	Tha--but-new	Climber
24	*Lagenaria siceraria* (Molina)Stand*l.*	Curcubitaceae	Bu	Climber
25	*Terminalia catappa* L.	Combretaceae	Banda	Tree
26	*Baccaurea sapida* Muell. Arg.	Euphorbiaceae	Kanaso	Tree
27	*Phyllanthus pomiferus* Hook.f.	Euphorbiaceae	Zinbyu	Small tree
28	*Plukenetia volubilis* L.	Euphorbiaceae	Kye- pe	Climber
29	*Cajanus cajan* (L.) Mills	Fabaceae	Pe-si-ngon	Shrub
30	*Cyamopsis indicum* L.	Fabaceae	Pe-pazum	Shrub
31	*Phaseolus mungo* L	Fabaceae	Mat- pe	Climber
32	*Lablab niger* Medik	Fabaceae	Pe-pazum	Climber
33	*Phaseolus lunatus* L.	Fabaceae	Htawbat-pe	Climber
34	*Parkia speciosa* Hassk.	Fabaceae	Myauk -ngo-thi	Small tree
35	*Sesbania grandiflora* (L.) Poir.	Fabaceae	Paukpan-byu	Small tree
36	*Persea americana* Mill.	Lauraceae	Htawbat-thi-pin	Herb
37	*Musa itinerans* E.E.Cheesm.	Musaceae	Taw-nget-pyaw	Herb
38	*Mussa sp*.	Musaceae	Rakhaing-nget-pyaw	Herb

No.	Scientific Name	Family	Common Name	Habit
39	*Musa sp.*	Musaceae	Phee-kyann-nget-pyaw	Tree
40	*Musa sp.*	Musaceae	Ngwe-nget-pyaw	Tree
41	*Ensete ventricosum* (Welw.) E.E.Cheesm.	Musaceae	Shwe-nget-pyaw	Tree
42	*Musa acuminata* Simmonds	Musaceae	Wet-ma-lut	Tree
43	*Moringa oleifera* Lam.	Moringaceae	Dan-da-lun	Tree
44	*Acacia megaladena* Desv.	Mimosaceae	Subok	Tree
45	*Archidendron jiringo* (Jock) Nielsen	Mimosaceae	Danyin	Herb
46	*Acacia concinna* DC.	Mimosaceae	Kinmun-gyin	Shrub
47	*Artocarpus sp.*	Moraceae	Peinne	Tree
48	*Artocarpus chaplasha* Roxb.	Moraceae	Taung-peinne	Herb
49	*Ficus cunia* Buch-Ham.	Moraceae	Ka-dut	Herb
50	Artocarpus sp.	Moraceae	Yotaya-peinne	Tree
51	*Artocarpus heterophyllus* Lam.	Moraceae	Peinne	Tree
52	*Psidium guajava* L.	Myrtaceae	Malaka	Tree
53	*Piper betel* L.	Piperaceae	Kun-ywet-pin	Tree
54	*Dendrocalamus longispathus* (Kurz.) Kurz	Poaceae	Wanet	Tree
55	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Sabalin	Tree
56	*Bambusa marginata* Munro	Poaceae	Wa-me	Small tree
57	*Dendrocalamus giganteus* Wall.ex Munro	Poaceae	Wabo-gyi	Small tree
58	*Macadamia integrifolia* Maiden & Betche	Proteaceae	Macadamia	Climber
59	*Malus pumila* Mill.	Rosaceae	Hnin-thi	Climber
60	*Prunus dulcis* (Mill) D.A Webb	Rosaceae	Met-man-thi	Tree
61	*Pyrus communis* L.	Rosaceae	Thit-taw	Tree
62	*Coeffea liberica* Hiern	Rubiaceae	Ka-phi	Small tree
63	*Coffea sp.*	Rubiaceae	France-kaw-phi-pin	Climber
64	*Coffea arabica* L.	Rubiaceae	Kaw-phi-pin	Shrub
65	*Coeffea sp.*	Rubiaceae	kaw-phi-pin	Shrub
66	*Citrus aurantiifolia* (Christm.) Sw.	Rutaceae	Thanbaya	Climber
67	*Citrus limon* (L.) Burm.f.	Rutaceae	Than-bayo	Climber
68	*Citrus maxima* (Burm.) Merr.	Rutaceae	Kywe-gaw	Climber
69	*Citrus reticulata* Blanco	Rutaceae	Lein-hmaw	Small tree
70	*Citrus medica* L.	Rutaceae	Shauk-thakwa	Small tree
71	*Clausena koenigii*(L.) Spreng.	Rutaceae	Pyin-daw-thein	Small tree
72	*Ziziphus sp.*	Rhamnaceae	Zi	Small tree
73	*Ziziphus sp.*	Rhamnaceae	Zi	Small tree
74	*Ziziphus jujuba* Lam.	Rhamnaceae	Zi	Tree
75	*Solanum indicum* L.	Solanaceae	Khayan-kazaw	Shrub
76	*Solanum torvum* Sw.	Solanaceae	Kazaw-kha	Shrub
77	*Lycopersicon esculentum* Mill.	Solanaceae	Khayan-gyin	Herb

No.	Scientific Name	Family	Common Name	Habit
78	*Capsicum annuum* L.	Solanaceae	Ngayok	Shrub
79	*Litchi chinensis* Sonn.	Sapindaceae	Kyet-mauk	Tree
80	*Camellia caudata* Wall.	Theaceae	Laphet	Small tree
81	*Camellia drupifera* Lour.	Theaceae	Laphet	Shrub
82	*Camellia sinensis* (L.) Kuntze	Theaceae	Laphet	Small tree
83	*Zingiber panduratum* Roxb.	Zingiberaceaen	Hpala	Herb
84	*Amomum sericeum* Roxb.	Zingiberaceaen	Hpala	Herb

(iii) Recorded Medicinal Plant Species in Survey Site Area

No	Scientific Name	Family	Common Name	Habit
1	*Centella asiatica* (L.) Urb.	Apiaceae	Myin-hkwa	Herb
2	*Coriandrum sativum* L.	Apiaceae	Nannan	Herb
3	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	Wa-u-pin	Herb
4	*Borassus flabellifer* L.	Arecaceae	Htan	Tree
5	*Cocos nucifera* L.	Arecaceae	Ohn-pin	Tree
6	*Mangifera longipes* Griff.	Anacardiaceae	Thayet-pya	Tree
7	*Mangifera indica* L.	Anacardiaceae	Thayet	Tree
8	*Bouea burmanica* Griff.	Anacardiaceae	Mayan	Tree
9	*Spondias mangifera* Willd.	Anacardiaceae	Gwe-thi-pin	Tree
10	*Lactuca sativa* L.	Asteraceae	Salat-ywet	Herb
11	*Tithonia diversifolia* A. Gray	Asteraceae	Nay-kyar	Shrub
12	*Chromolaena odorata* (L.) R.M.King & H.	Asteraceae	Bizat	Shrub
13	*Chromolaena sp.*	Asteraceae	Bizat	Shrub
14	*Aloe vera* L.	Aloaceae	Shazaung-let-pat	Herb
15	*Elaeis guineensis* Jacq.	Arecaceae	Si-ohn	Tree
16	*Vinca rosea* (Bojer ex Hook.) Raf.	Apocynaceae	Thinbaw-ma-hnyo	Herb
17	*Cardamine hirsuta* L.	Brassicaceae	Monnyin	Herb
18	*Brassica oleracea* L.	Brassicaceae	Kale	Herb
19	*Bombax ceiba* L.	Bombaceaeba	Letpan	Tree
20	*Durio zibethinus* Murray	Bombaceaeba	Duyin	Tree
21	*Oroxylum indicum* (L.) Kurz.	Bignoniaceae	Kyaung-sha	Tree
22	*Ananas comosus* (L.) Merr.	Bromeliaceae	Nanat	Tree
23	*Tamarindus indica* L.	Caesalpiniaceae	Magyi	Tree
24	*Senna siamea* (Lam.) Irvurn & Barneby	Caesalpiniaceae	Mezali	Tree
25	*Carica sp.*	Caricaceae	Thin-baw	Small tree
26	*Carica papaya* L.	Caricaceae	Thin-baw	Small tree
27	*Luffa aegyptiaca* Mill.	Cucurbitaceae	Tha--but-new	Climber
28	*Lagenaria siceraria* (Molina)Stand*l.*	Curcubitaceae	Bu	Climber
29	*Terminalia catappa* L.	Combretaceae	Banda	Tree
30	*Opuntia sp.*	Cataceae	Sha-zaung- let-war	Herb
31	*Ricinus communis* L.	Euphorbiaceae	Kyetsu	Small tree
32	*Baccaurea sapida* Muell. Arg.	Euphorbiaceae	Kanaso	Tree
33	*Euphorbia heterophylla* L.	Euphorbiaceae	Kywe-kyaung-myin-si	Shrub
34	*Phyllanthus pomiferus* Hook.f.	Euphorbiaceae	Zinbyu	Small tree
35	*Plukenetia volubilis* L.	Euphorbiaceae	Kye- pe	Climber
36	*Cajanus cajan* (L.) Mills.	Fabaceae	Pe-si-ngon	Shrub
37	*Cyamopsis indicum* L.	Fabaceae	Pe-pazum	Shrub
38	*Phaseolus mungo* L.	Fabaceae	Mat- pe	Climber

No	Scientific Name	Family	Common Name	Habit
39	*Lablab niger* Medik	Fabaceae	Pe-pazum	Climber
40	*Phaseolus lunatus* L.	Fabaceae	Htawbat-pe	Climber
41	*Parkia speciosa* Hassk.	Fabaceae	Myauk -ngo-thi	Small tree
42	*Sesbania grandiflora* (L.) Poir.	Fabaceae	Paukpan-byu	Small tree
43	*Gentiana kurroo* Royle	Gentianaceae	Sayga-gyi	Herb
44	*Persea americana* Mill.	Lauraceae	Htawbat-thi-pin	Tree
45	*Stephania rotundo* Lour.	Menispermaceae	Sin-don-ma-new	Climber
46	*Musa itinerans* E.E.Cheesm.	Musaceae	Taw-nget-pyaw	Herb
47	*Mussa sp*.	Musaceae	Rakhaing-nget-pyaw	Herb
48	*Musa sp.*	Musaceae	Phee-kyann-nget-pyaw	Herb
49	*Musa sp.*	Musaceae	Ngwe-nget-pyaw	Herb
50	*Ensete ventricosum* (Welw.) E.E.Cheesm.	Musaceae	Shwe-nget-pyaw	Herb
51	*Musa acuminata* Simmonds	Musaceae	Wet-ma-lut	Herb
52	*Moringa oleifera* Lam.	Moringaceae	Dan-da-lun	Tree
53	*Azadirachta indica* A. Juss.	Mimosaceae	Tama	Tree
54	*Acacia megaladena* Desv.	Mimosaceae	Subok	Small tree
55	*Archidendron jiringo* (Jock) Nielsen	Mimosaceae	Danyin	Tree
56	*Acacia concinna* DC.	Mimosaceae	Kinmun-gyin	Climber
57	*Artocarpus sp.*	Moraceae	Peinne	Tree
58	*Ficus glomerata* Roxb.	Moraceae	Taung-thapgan	Tree
59	*Artocarpus chaplasha* Roxb.	Moraceae	Taung-peinne	Tree
60	*Ficus cunia* Buch-Ham.	Moraceae	Ka-dut	Tree
61	Artocarpus sp.	Moraceae	Yotaya-peinne	Tree
62	*Artocarpus heterophyllus* Lam.	Moraceae	Peinne	Tree
63	*Psidium guajava* L.	Myrtaceae	Malaka	Small tree
64	*Piper betel* L.	Piperaceae	Kun-ywet-pin	Climber
65	*Dendrocalamus longispathus* (Kurz.) Kurz	Poaceae	Wanet	Bamboo
66	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Sabalin	Grass
67	*Bambusa marginata* Munro	Poaceae	Wa-me	Bamboo
68	*Dendrocalamus giganteus* Wall.ex Munro	Poaceae	Wabo-gyi	Bamboo
69	*Pinus khasya* Royle ex Parl.	Pinaceae	Tinshu	Tree
70	*Macadamia integrifolia* Maiden & Betche	Proteaceae	Macadamia	Small tree
71	*Malus pumila* Mill.	Rosaceae	Hnin-thi	Small tree
72	*Prunus dulcis* (Mill) D.A Webb	Rosaceae	Met-man-thi	Tree
73	*Pyrus communis* L.	Rosaceae	Thit-taw	Tree
74	*Coeffea liberica* Hiern	Rubiaceae	Ka-phi	Small tree
75	*Coffea sp.*	Rubiaceae	France-kaw-phi-pin	Small tree
76	*Coffea arabica* L.	Rubiaceae	Kaw-phi-pin	Small tree
77	*Coeffea sp.*	Rubiaceae	kaw-phi-pin	Small tree
78	*Citrus aurantiifolia* (Christm.) Sw.	Rutaceae	Thanbaya	Shrub

No	Scientific Name	Family	Common Name	Habit
79	*Citrus limon* (L.) Burm.f.	Rutaceae	Than-bayo	Small tree
80	*Citrus maxima* (Burm.) Merr.	Rutaceae	Kywe-gaw	Small tree
81	*Citrus reticulata* Blanco	Rutaceae	Lein-hmaw	Small tree
82	*Citrus medica* L.	Rutaceae	Shauk-thakwa	Small tree
83	*Clausena koenigii(*L.) Spreng.	Rutaceae	Pyin-daw-thein	Small tree
84	*Ziziphus sp.*	Rhamnaceae	Zi	Small tree
85	*Ziziphus sp.*	Rhamnaceae	Zi	Small tree
86	*Ziziphus jujuba* Lam.	Rhamnaceae	Zi	Tree
87	*Solanum indicum* L.	Solanaceae	Khayan-kazaw	Shrub
88	*Datura suaveolens* Humb & Bonpl. Ex Willd	Solanaceae	Pa-daing	Shrub
89	*Solanum torvum* Sw.	Solanaceae	Kazaw-kha	Shrub
90	*Lycopersicon esculentum* Mill.	Solanaceae	Khayan-gyin	Herb
91	*Capsicum annuum* L.	Solanaceae	Ngayok	Shrub
92	*Litchi chinensis* Sonn.	Sapindaceae	Kyet-mauk	Tree
93	*Camellia caudata* Wall.	Theaceae	Laphet	Small tree
94	*Camellia drupifera* Lour.	Theaceae	Laphet	Shrub
95	*Camellia sinensis* (L.) Kuntze	Theaceae	Laphet	Small tree
96	*Zingiber panduratum* Roxb.	Zingiberaceaen	Hpala	Herb
97	*Amomum sericeum* Roxb.	Zingiberaceaen	Hpala	Herb
85	*Ziziphus sp.*	Rhamnaceae	Zi	Small tree
86	*Ziziphus jujuba* Lam.	Rhamnaceae	Zi	Tree
87	*Solanum indicum* L.	Solanaceae	Khayan-kazaw	Shrub
88	*Datura suaveolens* Humb & Bonpl. Ex Willd	Solanaceae	Pa-daing	Shrub
89	*Solanum torvum* Sw.	Solanaceae	Kazaw-kha	Shrub
90	*Lycopersicon esculentum* Mill.	Solanaceae	Khayan-gyin	Herb
91	*Capsicum annuum* L.	Solanaceae	Ngayok	Shrub
92	*Litchi chinensis* Sonn.	Sapindaceae	Kyet-mauk	Tree
93	*Camellia caudata* Wall.	Theaceae	Laphet	Small tree
94	*Camellia drupifera* Lour.	Theaceae	Laphet	Shrub
95	*Camellia sinensis* (L.) Kuntze	Theaceae	Laphet	Small tree
96	*Zingiber panduratum* Roxb.	Zingiberaceaen	Hpala	Herb
97	*Amomum sericeum* Roxb.	Zingiberaceaen	Hpala	Herb

(iv) Recorded Ornamental Plant Species in the Survey Site Area

No.	Scientific Name	Family	Common Name	Habit
1	*Alaonema sp.*	Araceae	Ywet-hla-pan	Herb
2	*Dieffenbachia daguensis* Engl.	Araceae	Maidawgyi-gamon-	Herb
3	*Alaonema sp.*	Araceae	Gamon	Herb
4	*Borassus flabellifer* L.	Arecaceae	Htan	Tree
5	*Livistona rotundifolia* (Lam.) Mart.	Arecaceae	Taung-htan	Tree
6	*Cocos nucifera* L.	Arecaceae	Ohn-pin	Tree
7	*Agave sp.*	Agavaceae	Unknown	Shrub
8	*Aloe vera* L.	Aloaceae	Shazaung-let-pat	Herb
9	*Elaeis guineensis* Jacq.	Arecaceae	Si-ohn	Tree
10	*Aerva javanica* Juss.	Amaranthaceae	On-hnye	Herb
11	*Allamanda cathartica* L.	Apocynaceae	Shwewa-pan	Climber
12	*Vinca rosea* (Bojer ex Hook.) Raf.	Apocynaceae	Thinbaw-ma-hnyo	Herb
13	*Diplazium tomentosum* Blume	Athyriaceae	Fern-pin	Herb
14	*Bauhinia acuminata* L.	Caesalpiniaceae	Swe-daw	Small tree
15	*Senna siamea* (Lam.) Irvurn & Barneby	Caesalpiniaceae	Mezali	Tree
16	*Bauhinia vahlii* Wight & Arn.	Caesalpiniaceae	Seinban-gale	Small tree
17	*Canna indica* L.	Cannaceae	Budatharana	Herb
18	*Cycas pectinata* Bunch-Ham.	Cycadaceae	Mondaing	Small tree
19	*Aerocarpus fraxinifolius* Wight & ex Arn.	Caesalpiniaceae	Ye-tama	Tree
20	*Terminalia catappa* L.	Combretaceae	Banda	Tree
21	*Delonix regia* (Bojer ex Hook.) Raf.	Caesalpiniaceae	Sein ban	Tree
22	*Lophopetalum wallichii* Kurz	Caesalpiniaceae	Ye-thabye	Tree
23	*Kalanchoe sp.*	Crassulaceae	Ywetkya-pinpauk	Herb
24	*Kalanchoe sp.*	Crassulaceae	Ywetkya-pinpauk	Herb
25	*Opuntia sp.*	Cataceae	Sha-zaung- let-war	Herb
26	*Davallia solida* (G.Forst.) Sw.	Davalliaceae	Fern-pin	Herb
27	*Didymochlaena truncatula* (Sw.) J.Sm.	Didymochlaenaceae	Fern-pin	Herb
28	*Dracaena fragrans* (L.) Ker Gawl.	Dracaenaceae	Zaw-gyi-taung-hmwe	Shrub
29	*Euphorbia sp.*	Euphorbiaceae	Kiss-me-quick	Shrub
30	*Euphorbia sp.*	Euphorbiaceae	Kiss-me-quick	Shrub
31	*Euphorbia milii* Moutins.	Euphorbiaceae	Kiss-me-quick	Shrub
32	*Pterocarpus sp.*	Fabaceae	Japan-padauk	Tree
33	*Pterocarpus sp.*	Fabaceae	Malaysaia-padauk	Tree
34	*Calophyllum inophyllum* L.	Hypericaceae	Pon-nyet	Tree
35	*Stephania rotundo* Lour.	Menispermaceae	Sin-don-ma-new	Climber
36	*Hibiscus rosasinensis* L.	Malvaceae	Khaung-yan	Shrub
37	*Cedrela febrifuga* Blume	Meliaceae	Ye-tama	Tree
38	*Azadirachta indica* A. Juss.	Mimosaceae	Tama	Tree

No.	Scientific Name	Family	Common Name	Habit
39	*Ficus elastica* Roxb.	Moraceae	Nyaung-kyet-paung	Tree
40	*Eucalyptus camaldulensis* Dehnh.	Myrtaceae	U-ca-lit	Tree
41	*Bougainvillen sp.*	Nyctaginaceae	Sekku-pan	Climber
42	*Bougainvillen sp.*	Nyctaginaceae	Sekku-pan	Climber
43	*Bougainvillen glabra* Choisy	Nyctaginaceae	Sekku-pan	Climber
44	*Coelogyne sp.*	Orchidaceae	Unknown	Epiphyte
45	*Dendrobium chrysotoxum* Lindl	Orchidaceae	Thitkhwa-ahwa	Epiphyte
46	*Eria sp.*	Orchidaceae	Unknown	Epiphyte
47	*Pholidota imbricata* Lindl.	Orchidaceae	Unknown	Epiphyte
48	*Piper betel* L.	Piperaceae	Kun-ywet-pin	Climber
49	*Dendrocalamuslongispathus* (Kurz.) Kurz	Poaceae	Wanet	Bamboo
50	*Bambusa teres* Buch-Ham. Ex Wall.	Poaceae	Ta-bin-daing-wa	Bamboo
51	*Bambusa vulgaris* Schrad. Ex J.C.Wendl	Poaceae	Shwe-wa	Bamboo
52	*Bambusa polymorpha* Munro	Poaceae	Kyathaung-wa	Bamboo
53	*Bambusa wamin* E.G.Camus	Poaceae	Wamin	Bamboo
54	*Bambusa marginata* Munro	Poaceae	Wa-me	Bamboo
55	*Dendrocalamus giganteus* Wall.ex Munro	Poaceae	Wabo-gyi	Bamboo
56	*Pinus khasya* Royle ex Parl	Pinaceae	Tinshu	Tree
57	*Rosa gallica* L	Rosaceae	Hnin-si	Shrub
58	*Rosa alba* L.	Rosaceae	Hnin-si-phyu	Shrub
59	*Mussaenda erythrophylla* Schum. & Thonn	Rubiaceae	Pwintu-ywettu-ani	Shrub
60	*Mussaenda luteola* Delile	Rubiaceae	Ywet-hla-pan	Shrub
61	*Datura suaveolens* Humb & Bonpl. Ex Willd	Solanaceae	Pa-daing	Shrub
62	*Mimusops elenngi* L	Sapotaceae	Kha-yay	Tree
63	*Duranta repens*L	Verbenaceae	Bokadaw-myet-hkon-siyopan	Shrub

(B) Fauna

(i) Recorded List of Mammals Species

No	Scientific Name	Common Name	Local Name	IUCN	Wildlife parts
1	*Macaca nemestrina*	Pig-tailed macaque	Myauk-padi	VU	Skull
2	*Trachypithecus obscurus*	Capped Langur	Myauk-Myet-Kwin-Phyu	EN	Meat
3	*Lepus peguensis*	Siamese Hare	Taw-Yone	LC	
4	*Callosciurus erythraeus*	Pallas's Squirrel	Shint Na Paw	LC	Tail
5	*Callosciurus phayrei*	Phayre's Squirrel	Phayre's Shint	LC	Tail
6	*Callosciurus quinquestriatus*	Anderson' Squirrel	Anderson Shint	LC	Tail
7	*Callosciurus pygerythrus*	Irrawaddy Squirrel	Irrawaddy Shint	LC	Tail
8	*Dremomys pernyii*	Perny's long-nose Squirrel	Hnar-Tan-She	LC	Tail
9	*Menetes berdmorei*	Indochinese Ground Squirrel	Myae-Shint	LC	Tail
10	*Petaurista philippensis*	Indian Giant Flyng Squirrel	Shwe-Pyan- Kyee	LC	Tail
11	*Hylopetes phayrei*	Phayre's Flying Squirrel	Phayaw -Shwe-Pyan	LC	Tail
12	*Hylopetes alboniger*	Parti-coloured Flying Squirrel	Shwe- Pyan-Phyu	LC	Tail
13	*Cannomyes badius*	Bay Bamboo Rat	War-Bo- Kyut	LC	Interview
14	*Rhizomys sumatrensis*	Large Bamboo Rat	War-Bo- Kyutgyi	LC	Interview
15	*Hystrix brachyura*	East-Asian Porcupine	Phyu-Kaung-Gyi	LC	Spine
16	*Atherurus macrourus*	Asiatic-Brush-tailed Porcupine	Phyu-Mi-Phwa	LC	Spine
17	*Canis lupus*	Grey Wolf	Won-Pa-Lway	LC	Interview
18	*Canis alpinus*	Dhole	Taw- Khwe	EN	Interview
19	*Ursus thibetanus*	Asiatic-Black Bear	Wat-Won-Gyi	VU	Interview
20	*Arctonyx collaris*	Hog Badger	Kyut-tu-Wat tu	VU	Interview
21	*Lutrogale perspicillata*	Smooth-coated-Otter	Hpan	VU	Interview
22	*Viverra megaspila*	Large-spotted Civet	Kyaung-Myin-Kyut	EN	Interview
23	*Prionodon pardicolor*	Spotted Linsang	Linsang Pyauk	LC	Interview
24	*Arctogalidia trivirgata*	Three-striped Plam Civet	Kyaung-Wun-Naryut-Phyu	LC	Interview
25	*Herpestes javanicus*	Small-Asian Mongoose	Mway-Hpar	LC	Interview
26	*Prionailurus bengalensis*	Leopard Cat	Thit-Kyaung	LC	Interview
27	*Pardofelis marmorata*	Marbled Cat	Kyaung-tha-lin	NT	Interview
28	*Sus scrofa*	Eurasian Wild Pig	Taw-Wat	LC	Interview
29	*Bos javannicus*	Banteng	Tsaing	EN	Interview
30	*Bos frantalis*	Gayal	Nwa-nauk	VU	Interview
31	*Muntiacus muntjak*	Red Muntjac	Chaye	LC	Bone
32	*Cervus unicolor*	Sambar deer	Satt	VU	Interview
33	*Capricornis sumatraensis*	Southern Serow	Taw Sake	VU	Foot

LC=Least Concern, VU=Vulnerable, EN=Endangered

(ii) Recorded Terrestrial Bird Species in Study Area

No	Order	Family	Scientific Name	Common Name	IUCN
1	Accipitriformes	Accipitridae	*Milvus migrans*	Black Kite	LC
2	Falconiformes	Falconidae	*Falco tinnunculus*	Common Kestrel	LC
3	Columbiformes	Columbidae	*Columba livia*	Rock Pigeon	LC
4			*Streptopelia tranquebarica*	Red-collared Dove	LC
5			*Spilopelia chinensis*	Spotted Dove	LC
6			*Treron curvirostra*	Thick-billed green pigeon	LC
7	Psittaciformes	Psittacidae	*Psittacula finschii*	Grey-headed Parakeet	NT
8			*Psittacula alexandri*	Red-breasted Parakeet	NT
9			*Psittacula krameri*	Rose-ringed Parakeet	LC
10	Cuculiformes	Cuculidae	*Eudynamys scolopaceus*	Asian Koel	LC
11			*Phaenicophaeus tristis*	Green-billed malkoha	LC
12			*Centropus sinensis*	Greater Coucal	LC
13	Strigiformes	Tytonidae	*Tyto alba*	Common Barn-owl	LC
14		Strigidae	*Glaucidium cuculoides*	Asian Barred Owlet	LC
15	Apodiformes	Apodiae	*Cypsiurus balasiensis*	Asian Palm-swift	LC
16	Coraciiformes	Coraciidae	*Coracias benghalensis*	Indian Roller	LC
17		Alcedinidae	*Halcyon smyrnensis*	White-throated Kingfisher	LC
18		Meropidae	*Merops orientalis*	Little Green Bee-eater	LC
19	Piciformes	Megalaimidae	*Psilopogon haemacephalus*	Coppersmith Barbet	LC
20			*Psilopogon virens*	Great Barbet	LC
21	Passeriformes	Campephagidae	*Coracina macei*	Large Cuckooshrike	LC
22		Oriolidae	*Oriolus xanthomus*	Black-hooded Oriole	LC
23		Artamidae	*Artamus fuscus*	Ashy Woodswallow	LC
24		Aegithinidae	*Aegithina tiphia*	Common lora	LC
25		Dicruridae	*Dicrurus macrocercus*	Black Drongo	LC
26			*Dicrurus leucophaeus*	Ashy Drongo	LC
27			*Dicrurus paradiseus*	Greater-Racket-tailed Drongo	LC
28		Monarchidae	*Hypothymis azurea*	Black-naped Monarch	LC
29		Corvidae	*Corvus macrorhynchos*	Jungle Crow	LC
30		Laniidae	*Lanius cristatus*	Brown Shrike	LC
31			*Lanius collurioides*	Burmese Shrike	LC
32			*Lanius schach*	Long-tailed Shrike	LC
33		Nectariniidae	*Cinnyris asiaticus*	Purple Sunbird	LC
34			*Cinnyris jugularis*	Olive-backed Sunbird	LC
35		Dicaeidae	*Dicaeum cruentatum*	Scarlet-backed Flowerpecker	LC
36		Estriididae	*Lonchura punctulata*	Scaly-breasted Munia	LC

No	Order	Family	Scientific Name	Common Name	IUCN
37		Passeridae	*Passer domesticus*	House Sparrow	LC
38			*Passer flaveolus*	Plain-backed Sparrow	LC
39			*Passer montanus*	Eurasian-Tree Sparrow	LC
40		Motacillidae	*Anthus trivialis*	Tree Pipit	LC
41			*Anthus rufulus*	Paddyfield Pipit	LC
42		Sturnidae	*Acridotheres grandis*	White-vented Myna	LC
43			*Acridotheres fuscus*	Jungle Myna	LC
44			*Acridotheres tristis*	Common Myna	LC
45			*Acridotheres burmannicus*	Vinous-breasted Myna	LC
46			*Sturnia malabarica*	Chestnut-tailed Starling	LC
47		Muscicapidae	*Calliope calliope*	Siberian Rubythroat	LC
48			*Monticola solitarius*	Blue Rock-thrush	LC
49			*Saxicola maurus*	Eastern Stonechat	-
50			*Saxicola caprata*	Pied Bushchat	LC
51			*Saxicola ferreus*	Grey Bushchat	LC
52			*Cyornis rubeculoides*	Blue-throated Flycatcher	LC
53			*Eumyias thalassinus*	Verditer Flycatcher	LC
54			*Ficedula albicilla*	Taiga Flycatcher	LC
55			*Copsychus saularis*	Oriental-Magpie-robin	LC
56			*Copsychus malabaricus*	White-runped Shama	LC
57		Stenostiridae	*Culicicapa ceylonensis*	Grey-headed Canary Flycatcher	LC
58		Pycnonotidae	*Pycnonotus flaviventris*	Black-crested Bulbul	LC
59			*Pycnonotus blanfordi*	Areyarwaddy Bulbul	LC
60			*Pycnonotus cafer*	Red-vented Bulbul	LC
61			*Pycnonotus jocosus*	Red-whiskered Bulbul	LC
62			*Pycnonotus flavescens*	Flavescent Bulbul	LC
63			*Pycnonotus xanthorrhous*	Brown-breasted Bulbul	LC
64			*Hemixos flavala*	Ashy Bulbul	LC
65		Hirundinidae	*Hirundo rustica*	Ashy Bulbul	LC
66		Vangidae	*Hemipus picatus*	Bar-winged Flycatcher	LC
67		Sittidae	*Sitta frontalis*	Velvet-fronted Nuthatch	LC
68		Campephagidae	*Pericrocotus divericatus*	Ashy Minivet	LC
69			*Pericrocotus speciosus*	Scarlet Minivet	LC
70		Phylloscopidae	*Phylloscopus fuscatus*	Dusky Warbler	LC
71		Acrocephalidae	*Arundinax aedon*	Ticked billed Warber	LC
72		Cisticolidae	*Orthomus sutorius*	Common Tailorbird	LC
73			*Prnia inornata*	Plain Prinia	LC
74		Fringillidae	*Carpodacus erythrinus*	Common Rosefinch	LC
75		Muscicapidae	*Cyornis unicolor*	PaleBlue Flycatcher	LC

No	Order	Family	Scientific Name	Common Name	IUCN
76		Nectariniidae	*Arachnothera longirostra*	Little Spiderhunter	LC
77		Pecidae	*Chrysocolaptes guttacristatus*	Greater Flameaback	LC

(iii) Recorded Water Bird Species

No	Order	Family	Scientific Name	Common name	(IUCN)
1	Pelecaniformes	Ardeidae	*Butorides striata*	Strirated Heron	LC
2			*Ardeola bacchus*	Chinese Pond Heron	LC
3			*Nycticorax nycticorax*	Black-crowned Night Heron	LC
4			*Egretta garzetta*	Little Egret	LC
5			*Bubulcus coromandus*	Eastern Cattle Egret	-
6			*Ardea intermedia*	Intermediate Egret	LC
7			*Ardea alba*	Great Egret	LC
8	Charadriformes	Charadriidae	*Charadrius dubius*	Little Ringed Plover	LC
9	Passeriformes	Motacillidae	*Motacilla alba*	White Wagtail	LC
10			*Motacilla cinerea*	Grey Wagtail	LC

Least Concern (LC)

(iv) Recorded Fish Species from Sittaung River and Small Creeks

No	Family	Scientific name	Common name	Local name	IUCN
1	Cyprinidae	*Osteobarma alfredianus*	Carplet	Nga-phan-ma	LC
2		*Labeo angra*	Angra labeo	Nga-lu	LC
3		*Labeo rohita*	Roho labeo	Nga-myit-chin	LC
4		*Gibelion catla*	Catla	Nga-khaung-pwa	LC
5		*Garra notate*	Garra notate	Kat-tha-poe	LC
6		*Cirrhinus mrigala*	Mrigal crap	Nga- chin-phyu	LC
7		*Devario browni*	Danio Brownovo	Nga-zin-nhun	VU
8		*Systomas sphore*	Pool barb	Nga-khone-ma-mhini	LC
9		*Barbonymus gonionotus*	Java barb	Nga-khone-ma-gyi	LC
10	Cobitidae	*Lepidocephalichthys guntea*	Guntea loach	Nga-the-le-doe	LC
11	Channidae	*Channa striatus*	Snakehead	Nga-yant	LC
12		*Channa marulius*	Great snakehead	Nga-yant-dyne	LC
13	Ambassidae	*Parambasis ranga*	Glassy fish	Nga-zin-zup	LC
14	Osphronermidae	*Colisa Lobisa*	Thick lipped gourami	Nga-pyin-tha-let	LC
15	Silurinidae	*Wallago attu*	Boal fish	Nga-bat	VU
16	Bagridae	*Mystus pulcher*	Gangetic mystus	Nga-zin-yaing	LC
17		*Ompok pabo*	Pabda catfish	Nga-nu-than	NT
18	Clarridae	*Clarias batrachus*	Clarias catfish	Nga-khu	LC
19	Mastacembelidae	*Macrognathus zebrinus*	Zebra Spiny Eel	Nga-mway –doe	LC
20		*Mastacembleus armatus*	Zig-zag-eel	Mway-nagar	LC
21	Notopteridae	*Notopterus notopterus*	Featherback , knife fish	Nga-phae	LC
22	Belonidae	*Xenentodon cancila*	Needlefish	Nga-phaung-yoe	LC
23	Cichlidae	*Oreochromis niloticus*	Nile tilapia	Ti-la-pi-a	exotic

14.8. Socio Economic Survey Form

Socio Economic Survey (Household Level)

Project: 230kV Transmission Line

Location: Baluchaung (2) Loikaw–– Taungoo (Sabakywe)

Client: DPTSC, MoEE

I. General Information

House ID	
Village	……………………Village Tract ……………………Village
Agree to Participate	

II. Demography

Name of Respondent	
Gender	Male · Female
Age	
Nationality (Ethnicity)	
Religion	
Language Spoken / Specific Other Language Spoken	

1. How many household members are there in your family?

Number of persons	

1

2. Basic information of each family member

No	Male or Female	Age	Marital Status	Relationship to the Household Head	Education Level	Literacy (Literate / Illiterate)	Is he/she working?
1	Male · Female		S /M /D			L / I	Yes/No
2	Male · Female		S /M /D			L / I	Yes/No
3	Male · Female		S /M /D			L / I	Yes/No
4	Male · Female		S /M /D			L / I	Yes/No
5	Male · Female		S /M /D			L / I	Yes/No
6	Male · Female		S /M /D			L / I	Yes/No
7	Male · Female		S /M /D			L / I	Yes/No
8	Male · Female		S /M /D			L / I	Yes/No
9	Male · Female		S /M /D			L / I	Yes/No
10	Male · Female		S /M /D			L / I	Yes/No

III. Economy

1. Employment status of Household? Multiple answers are ok.

(a) Self–employed (business owner)	(b) Employee	(c) Wage worker	(c) Seasonal worker away from home

2. What is major work engaged by Household? Multiple answers are ok.

(a) Crop Farming	(b) Animal Husbandry	(c) Fishery	(d) Forestry
(e) Construction	(f) Mining	(g) Manufacture	(h) Sales
(i) Service (Private Sector)	(j) Government Service	(k) Others	

3. Working Hours / Day

Working Hours / day	(A) <4 hr (B) 6 hr (C) 8 hr (D) 10 hr (E) > 10 hr
Day	(A) 3 days (B) 5 days (C) 7 days (D) Others

2

4. Income From (MMK)

	Agriculture			Livestock			Handicraft	Other
	Garden	Forest	Crop	Pig	Chicken/ Duck/Eggs	Others		
In Past 2 weeks								
Past Year								

5. Expenditure (MMK)

	Food	Clothing/ shoes	Fuel	Others (Tobacco/ Cigarette/Betel)	Health	Capital Item
In Past 2 weeks						
Past Year						

	Education / School Fee				
	Elementary & Primary (3–8 years Old)	Secondary School (9–12 years Old)	College / University	Vocational Training/ Technical College	Other
Past Year					

IV. Land

How long have in been here?	(Year/Month)
Own land	(Yes / No) Land Area (Acre)……………………
Land ownership document	Type:
Usage	(A) Residential area (B) Agricultural activity (C) Animal Raising (D) Others

3

V. Infrastructure– Physical and Social

A. Physical Infrastructure (Household)

Type of Housing	(A) Pucca house (B) Semi Pucca House (C) Wooden House (D) Mixed Timber & Bamboo (E) Mixed Bamboo & Thatch House (F) Other
Floor coverings	(A) 1 floor (B) 2 floor (C) Others
Bedroom	
Toilet	(A) Open Pit (B) Communal (C) Septic Tank (D) Others
Main Energy for Lighting	(A) Electricity (B) Generator (C) Solar Panels (D) Battery (E) Biomass (F) Candle (G) Others
Source of Energy for Cooking	(A) Electricity (B) LPG (C) Kerosene (D) Biomass (E) Coal (F) Charcoal (G) Firewood (F) Others
Water Sources	(A) Surface Water River Water (B) Piped Water (C) Tank Water (D) Well Water
Water Quality	(A) Good (B) Average (C) Poor
Water Usages	(A) Bathing (B) Washing (C) Consumption (D) Others
Water Withdraw / day	(A) 1 time (B) 2 times (C) 3 times (D) Others
Drainage System	(A) Yes (B) No (C) Other
Transportation Vehicles	(A) Motor Car (B) Motor Bike (C) Bicycle (D) Truck (F) Cart (Cow/Bullock) (G) Others
Health (Suffering Diseases)	(A) Diarrhoea (B) Dysentery (C) Eye Infection (D) Typhoid (E) Gastroenteritis (F) Cough (G) Allergy/ Skin Infection (H) Malaria (I) Respiratory Tract Infection (J) Dengue (K) TB (L) Others

4

VALENTIS ENVIRONMENTAL

B. Physical Infrastructure (Village)

No. of Population	
No. of House	
Type of Housing	(A) Pucca house (B) Semi Pucca House (C) Wooden House (D) Mixed Timber & Bamboo (E) Mixed Bamboo & Thatch House (F) Other
Floor coverings	(A) 1 floor (B) 2 floor (C) Others
Road	(A) Asphalt (B) Concrete (C) Gravel (D) Drit (E) Other
Main Energy for Lighting	(A) Electricity (B) Generator (C) Solar Panels (D) Battery (E) Biomass (F) Candle (G) Others
Source of Energy for Cooking	(A) Electricity (B) LPG (C) Kerosene (D) Biomass (E) Coal (F) Charcoal (G) Firewood (F) Others
Water Sources	(A) Surface Water (B) Piped Water (C) Tank Water (D) Well Water River Water
Water Quality	(A) Good (B) Average (C) Poor
Water Usages	(A) Bathing (B) Washing (C) Consumption (D) Others
Water Treatment	(A) Boiled (B) Sand and Gravels (C) Machine (D) Cloth Filters (E) Others
Drainage System	(A) Yes (B) No (C) Others
Toilet	(A) Open Pit (B) Communal (C) Septic Tank (D) Others
Solid waste Management System	(A) Regular collection system (B) Burn system (C) Digging system (D) Recycling system (E) Allocate System (F) Others
Communication (TV / Radio/ Mobile)	Channel ... Service Net Work...
Emergency services	(A)Yes (B) No (C) Others
Government services	(A)Yes (B) No (C) Others
Social society	(A) Faith based committee (B) Social welfare committee (C) Others
vulnerable persons	(A)Blind (B) Deaf & dumb (C) Disable (D) Polio (D) Others

5

VALENTIS ENVIRONMENTAL

What is your household priority need?
Priority village development needs (don't prompt by suggesting school, health centre etc, let them elaborate)
Strategies for helping the community develop and improve villager well-being
Awareness of the potential for a major transmission line development and of the type of social impacts that may ensue

6

VALENTIS ENVIRONMENTAL

I. Awareness about the project

1. Did you have any knowledge/information about this project? (Yes / No)

If Yes, how did you know about this project?

a) Information from friends/colleagues_____

(b) Respective Department _____

(c) Can't remember____

2. What is your expectation of the project?

3. If the transmission line project will be developed, it will be impact to your area whether it is negatively or positively to you and your family?

....

....

THANK YOU VERY MUCH

Name of Interviewer: Date:

7

14.9. Invitation of Public Disclosure and Consultation on Newspaper


ကြော်ငြာ

အထူးကျေးဇူးတင် ဂုဏ်ယူဝမ်းမြောက်ခြင်း

14.10. Stakeholder Engagement Attendees' List

(1)Thauk Yay Khat Village

Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:
Venue: [illegible]

Date: 23.1.2021
Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	[illegible]	–	–	[illegible]	09-968736019	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	09- –	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	09- –	[illegible]
4	[illegible]	[illegible]	–	[illegible]	09-	[illegible]
5	[illegible]	[illegible]	–	[illegible]	09-	[illegible]
6	[illegible]	[illegible]	–	[illegible]	99-969171599	[illegible]
7	[illegible]	[illegible]	–	[illegible]	09-966434547	[illegible]
8	[illegible]	[illegible]	–	[illegible]	09-	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	09-977930897	[illegible]
10	[illegible]	–	–	[illegible]	09-971335547	[illegible]
11	[illegible]	–	–	[illegible]	09-	[illegible]

Valentis Enviornmental Services (VES)

Sheet Number: 1

Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:
Venue: [illegible]

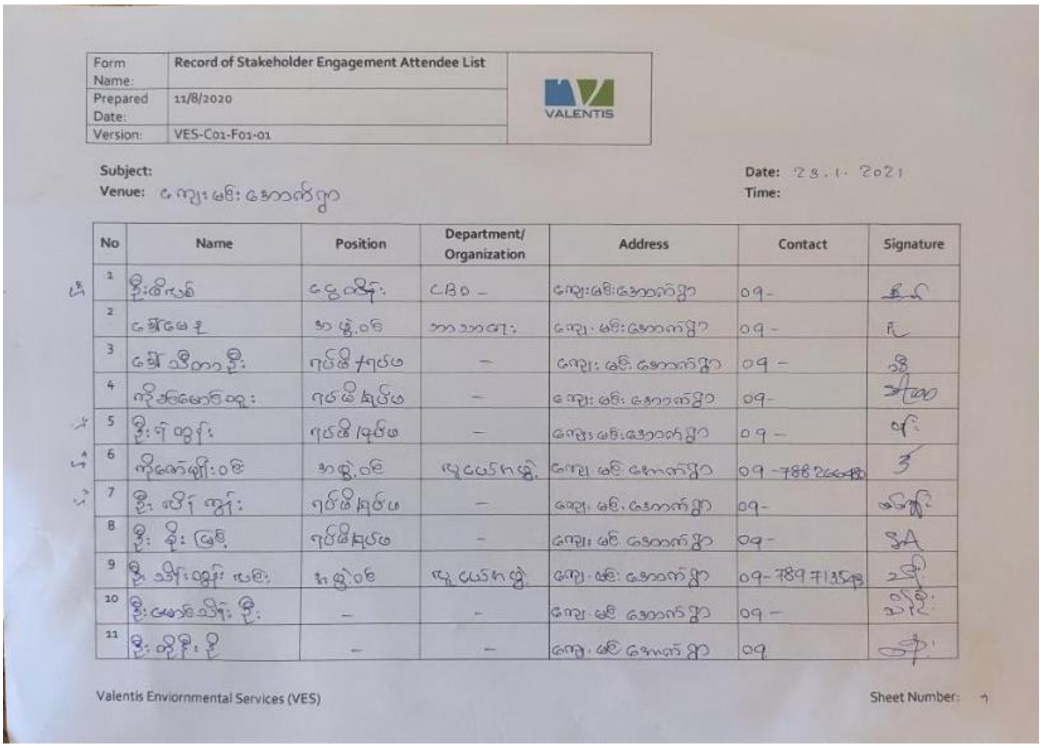
Date: 23.1.2021
Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	[illegible]	[illegible]	[illegible]	[illegible]	09-966621118	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	09-762600023	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	09-960022257	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	09-	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	09-	[illegible]
6	[illegible]	–	–	[illegible]	09 -	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	09-750523599	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	09-769770399	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	09-965592756	[illegible]
10	[illegible]	–	–	[illegible]	09-	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	09-978491053	[illegible]

Valentis Enviornmental Services (VES)

Sheet Number: 2

(2)Kyay Min Village



Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:

Venue: ကျေးမင်းဆောက်ရွာ

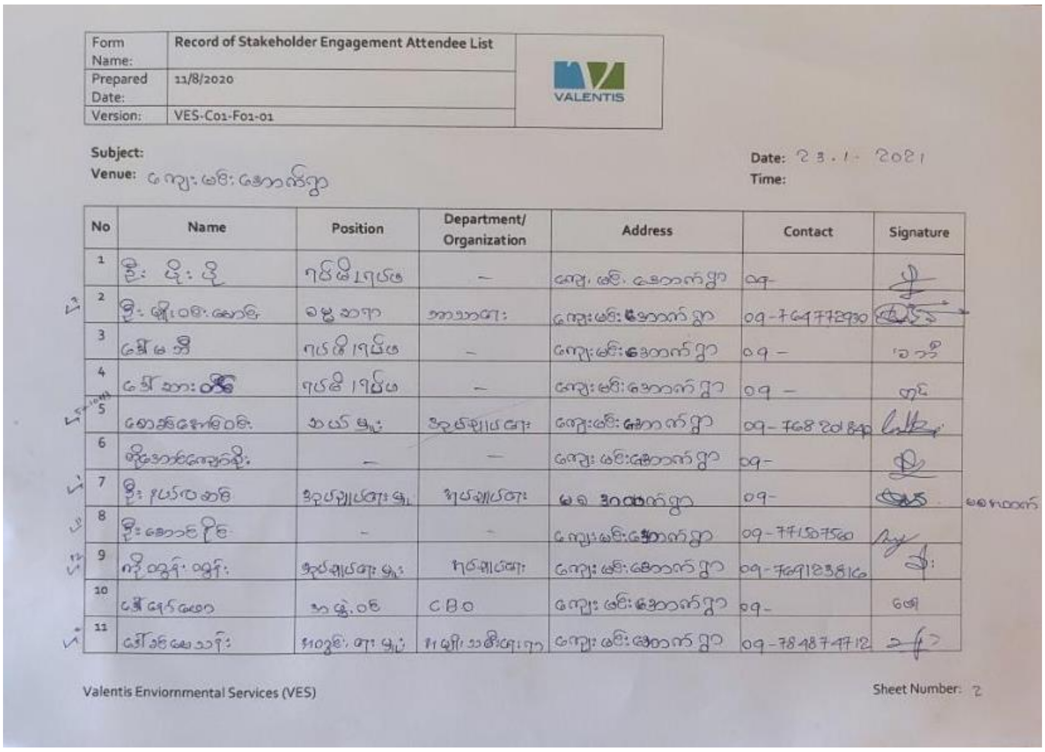
Date: 23.1.2021

Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	[illegible]	ငွေထိန်း	CBO –	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
2	[illegible]	အဖွဲ့ဝင်	သာသနာရေး	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
3	[illegible]	ရပ်မိ/ရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
4	[illegible]	ရပ်မိရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
5	[illegible]	ရပ်မိ/ရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
6	[illegible]	အဖွဲ့ဝင်	လူငယ်အဖွဲ့	ကျေးမင်းဆောက်ရွာ	09-788266480	[illegible]
7	[illegible]	ရပ်မိရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
8	[illegible]	ရပ်မိရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
9	[illegible]	အဖွဲ့ဝင်	လူငယ်အဖွဲ့	ကျေးမင်းဆောက်ရွာ	09-789713593	[illegible]
10	[illegible]	–	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
11	[illegible]	–	–	ကျေးမင်းဆောက်ရွာ	09	[illegible]

Valentis Enviornmental Services (VES)

Sheet Number: 1



Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:

Venue: ကျေးမင်းဆောက်ရွာ

Date: 23.1.2021

Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	[illegible]	ရပ်မိ/ရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
2	[illegible]	ဓမ္မဆရာ	သာသနာရေး	ကျေးမင်းဆောက်ရွာ	09-764772930	[illegible]
3	[illegible]	ရပ်မိ/ရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
4	[illegible]	ရပ်မိ/ရပ်ဖ	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
5	[illegible]	[illegible]	အုပ်ချုပ်ရေး	ကျေးမင်းဆောက်ရွာ	09-768201840	[illegible]
6	[illegible]	–	–	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
7	[illegible]	အုပ်ချုပ်ရေးမှူး	အုပ်ချုပ်ရေး	[illegible]	09-	[illegible]
8	[illegible]	–	–	ကျေးမင်းဆောက်ရွာ	09-771507560	[illegible]
9	[illegible]	အုပ်ချုပ်ရေးမှူး	အုပ်ချုပ်ရေး	ကျေးမင်းဆောက်ရွာ	09-769123816	[illegible]
10	[illegible]	အဖွဲ့ဝင်	CBO	ကျေးမင်းဆောက်ရွာ	09-	[illegible]
11	[illegible]	အတွင်းရေးမှူး	အမျိုးသမီးရေးရာ	ကျေးမင်းဆောက်ရွာ	09-784874712	[illegible]

Valentis Enviornmental Services (VES)

Sheet Number: 2

Form Name:	Record of Stakeholder Engagement Attendee List	VALENTIS
Prepared Date:	11/8/2020	
Version:	VES-C01-F01-01	

Subject:

Venue: [illegible]အောက်ရွာ

Date: 23. 1. 2021

Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	[illegible]	အဖွဲ့ဝင်	အမျိုးသမီးရေးရာ	[illegible]အောက်ရွာ	09-	[illegible]
2	[illegible]	အဖွဲ့ဝင်	အမျိုးသမီးရေးရာ	[illegible]အောက်ရွာ	09-	[illegible]
3	[illegible]	[illegible]	အမျိုးသမီးရေးရာ	[illegible]အောက်ရွာ	09-	[illegible]
4	[illegible]	[illegible]	ပညာရေး	[illegible]အောက်ရွာ	09-	[illegible]
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Valentis Enviornmental Services (VES)

Sheet Number: 1

(3)Kaw Pat Chan Village

Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:
Venue: ကော်ပတ်ခြံကျေးရွာ

Date: 24.1.2021
Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	ဦးသိုက်ပြား	အဖွဲ့ဝင်	CBO	ကော်ပတ်ခြံ ရွာ	09-	
2	ဒေါ်သင်းရင်	–	–	ကော်ပတ်ခြံ ရွာ	09-776464988	
3	ဒေါ်တင်မေ	အတွင်းရေးမှူး	CBO	ကော်ပတ်ခြံ ရွာ	09-	
4	ဦးအောင်မြသာ	–	–	ကော်ပတ်ခြံ ရွာ	09-	
5	ဦးအောင်သာ	ရပ်မိရပ်ဖ	အုပ်ချုပ်ရေး	ကော်ပတ်ခြံ ရွာ	09-77858104	
6	ဒေါ်ကျာမိုး	ဥက္ကဋ္ဌ	CBO	ကော်ပတ်ခြံ ရွာ	09-795449251	
7	ဦးအောင်မွေးလင်း	အုပ်ချုပ်ရေးမှူး	အုပ်ချုပ်ရေး	ကော်ပတ်ခြံ ရွာ	09-775197462	
8	ဦးဒီသာ ရွှေ	–	-	ကော်ပတ်ခြံ ရွာ	09–	
9	ဒေါ်မေရီဖြိုး	အဖွဲ့ဝင်	CBO	ကော်ပတ်ခြံ ရွာ	09-	
10	ဦးအောင်တင်ဖြိုး	ရပ်မိရပ်ဖ	အုပ်ချုပ်ရေး	ကော်ပတ်ခြံ ရွာ	09 –	
11	ဒေါ်ဖြိုးဖြိုးအောင်	–	–	ကော်ပတ်ခြံ ရွာ	09-761074795	

Valentis Enviornmental Services (VES)

Sheet Number: 1

Form Name:	Record of Stakeholder Engagement Attendee List
Prepared Date:	11/8/2020
Version:	VES-C01-F01-01

VALENTIS

Subject:
Venue: ကော်ပတ်ခြံကျေးရွာ

Date: 24.1.2021
Time:

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	ဒေါ်မြမြ	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09-	
2	ဦးအောင်မကြီး	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09-	
3	ဦးဝင်းမြင့်	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09-788878048	
4	ဒေါ်ဆုယဉ်ငြိ	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09 –	
5	ဦး ဇေမင်း	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09-763173414	
6	ဦး လှိုင်းထွေး	ရပ်မိရပ်ဖ	–	ကော်ပတ်ခြံ ရွာ	09-798010220	
7	ဒေါ်စိုစိုဦး	ရပ်မိရပ်ဖ	–	ကောက်ခရဲ ရွာ	09-765598511	Soe
8	ဦးကောင်းမြင့်	ရပ်မိရပ်ဖ	–	ကောက်ခရဲ ရွာ	09 –	
9	ခေါ်ကေကောင်းထက်ကျော်	–	–	ကော်ပတ်ခြံ ရွာ	09 –	Kyaw
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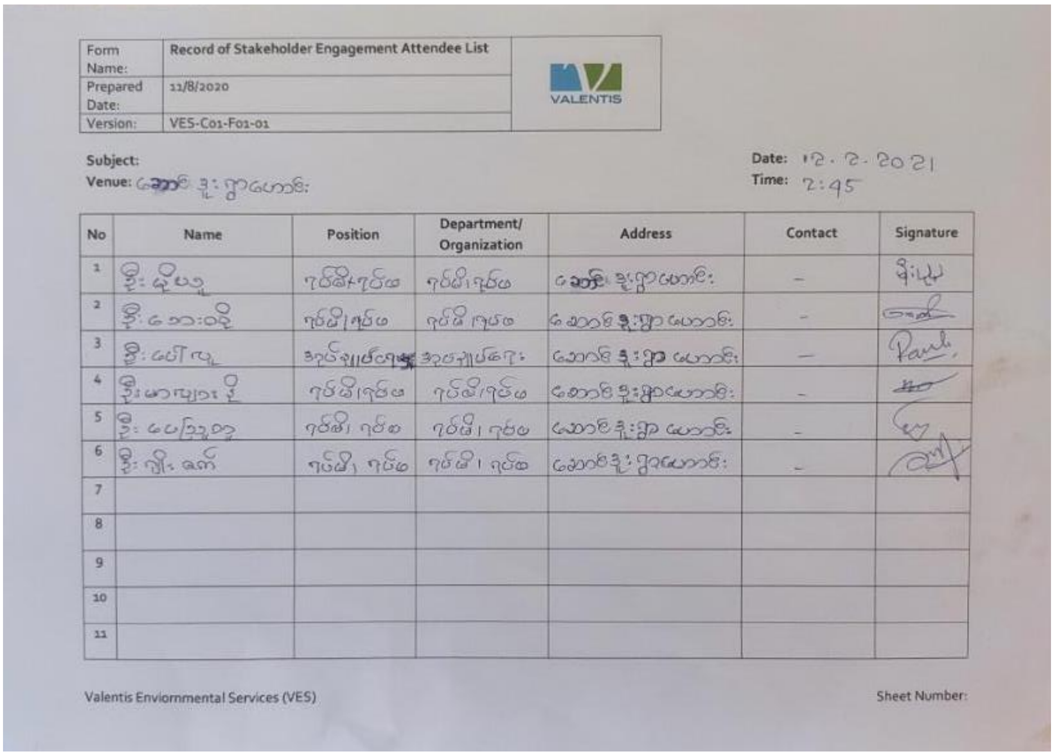
Valentis Enviornmental Services (VES)

Sheet Number: 2

(4)Saung Du Village



Form Name:	Record of Stakeholder Engagement Attendee List	VALENTIS
Prepared Date:	11/8/2020	
Version:	VES-C01-F01-01	

Subject:

Venue: ဆောင်ဒူးရွာဟောင်း

Date: 12. 2. 2021

Time: 2:45

No	Name	Position	Department/ Organization	Address	Contact	Signature
1	ဦး [illegible]	ရပ်မိရပ်ဖ	ရပ်မိ၊ရပ်ဖ	ဆောင်ဒူးရွာဟောင်း	–	[illegible]
2	ဦး [illegible]	ရပ်မိ၊ရပ်ဖ	ရပ်မိ၊ရပ်ဖ	ဆောင်ဒူးရွာဟောင်း	–	[illegible]
3	ဦး [illegible]	အုပ်ချုပ်ရေးမှူး	အုပ်ချုပ်ရေး	ဆောင်ဒူးရွာဟောင်း	–	Paul
4	ဦး [illegible]	ရပ်မိ၊ရပ်ဖ	ရပ်မိ၊ရပ်ဖ	ဆောင်ဒူးရွာဟောင်း	–	[illegible]
5	ဦး [illegible]	ရပ်မိ၊ ရပ်ဖ	ရပ်မိ၊ ရပ်ဖ	ဆောင်ဒူးရွာဟောင်း	–	[illegible]
6	ဦး [illegible]	ရပ်မိ၊ ရပ်ဖ	ရပ်မိ၊ ရပ်ဖ	ဆောင်ဒူးရွာဟောင်း	–	[illegible]
7						
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Valentis Enviornmental Services (VES)

Sheet Number:

14.11. Presentation Materials

24/02/64

MOEE (DPTSC)၏ ၂၃၀ ကေဗွီ ဘီလူးချောင်း (၂) လွိုင်ကော် - တောင်ငူ (စပါးကြွယ်) လျှပ်စစ်ဓာတ်အားလိုင်း စီမံကိန်း လုပ်ငန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းလုပ်ငန်းနှင့် ပတ်သက်၍ ရှင်းလင်းတင်ပြခြင်းနှင့် အများပြည်သူသဘောထား ရယူခြင်း အခမ်းအနား

VALENTIS

coffey

A TETRA TECH COMPANY

တင်ပြဆွေးနွေးမည့် အကြောင်းအရာများ

- စီမံကိန်းအကြောင်းအရာ
- ကနဦးပတ်ဝန်းကျင် လုပ်ငန်းစဉ်
- စီမံကိန်း၏ လက်ရှိပတ်ဝန်းကျင် အနေအထား
- ပတ်ဝန်းကျင်ထိခိုက်နိုင်မှုဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်
- စီမံကိန်းကြောင့် ဒေသခံပြည်သူများရရှိနိုင်သော အကျိုးကျေးဇူးများ
- အကြံပြုဆွေးနွေးချက် နှင့် အမေးအဖြေ ကဏ္ဍ

230 Kv Transmission Line

2

1

24/02/64

စီမံကိန်း အကြောင်းအရာ

- လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန (MoEE) သည် ကိုရီးယားသမ္မတနိုင်ငံ၊ သွင်းကုန်ထုတ်ကုန်ဘဏ် (Korean EXIM Bank) ထံမှ ချေးငွေရယူ၍ ၂၃၀ ကေဗွီ၊ ဘီလူးချောင်း (၂) (လွိုင်ကော်) - တောင်ငူ (စပါးကြွယ်) မဟာဓာတ်အားလိုင်း စီမံကိန်းကို တည်ဆောက် အကောင်အထည် ဖော်ရန် အဆိုပြုထားပါသည်။
- ထိုစီမံကိန်းသည် လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန (MOEE) အောက်ရှိ လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန (DPTSC) တာဝန်ယူ အကောင်အထည်ဖော် ဆောင်ရွက် သွားမည် ဖြစ်ပါသည်။
- DPTSC သည် ဗို့အား အဆင့် ၆၆ ကေဗွီ (၆၆,၀၀၀)နှင့် အထက် မဟာဓာတ်အားလိုင်းနှင့် ပင်မဓာတ်အားခွဲရုံများအား တည်ဆောက်အကောင်အထည် ဖော်ခြင်း၊ နိုင်ငံ ဓာတ်အား စနစ်အား ကွပ်ကဲမောင်းနှင်ခြင်းနှင့် ထိန်းသိမ်းပြုပြင်ခြင်းလုပ်ငန်းအတွက် အဓိက တာဝန်ရှိသော ဌာနတခုဖြစ်ပါသည်။

230 Kv Transmission Line 3

စီမံကိန်း အကြောင်းအရာ

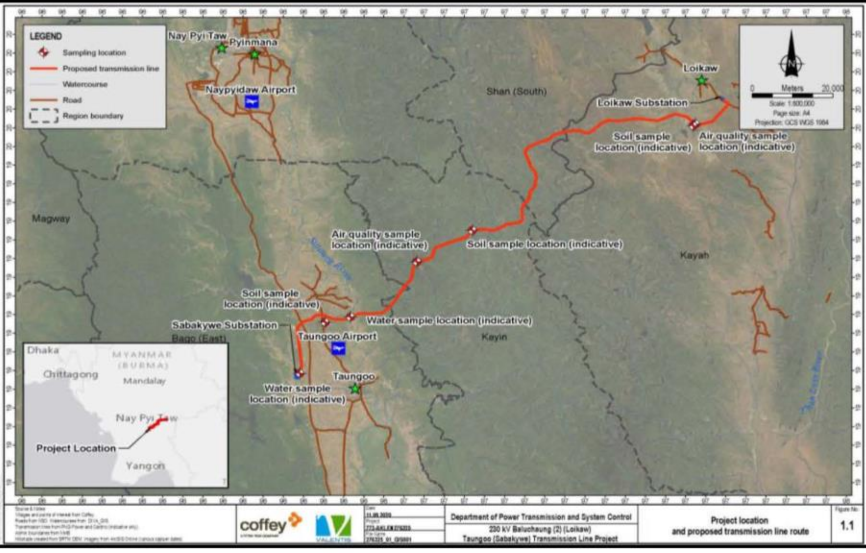
- စီမံကိန်းသည် ကယားပြည်နယ်၊ လွိုင်ကော်မြို့နယ် ဘီလူးချောင်းအမှတ်(၂) ရေအားလျှပ်စစ်စက်ရုံမှ ပဲခူးတိုင်းဒေသကြီး၊ တောင်ငူမြို့နယ် စပါးကြွယ်ပင်မဓာတ်အားခွဲရုံသို့ ၂၃၀ကေဗွီ မဟာဓာတ်အားလိုင်းသည် ခန့်မှန်းခြေအားဖြင့် ၁၆၀ ကီလိုမီတာရှည်ပြီး သံမဏိရာဇမတ်တာဝါတိုင်များပေါ်တွင် ကေဗယ်ကြိုးများဖြင့် ဆက်သွယ်သွားပါမည်။
- **အဓိက ရည်ရွယ်ချက်**
  - ရှမ်းပြည်နယ်နှင့် ကယားပြည်နယ်တို့မှထွက်ရှိလာသော ဓာတ်အားများကို ယခင်က ဘီလူးချောင်း(၂)-တောင်ငူ ၂၃၀ ကေဗွီ ဓာတ်အားလိုင်းနှင့် ဘီလူးချောင်း (၂)- ရွှေမြို့ ၂၃၀ ကေဗွီ ဓာတ်အားလိုင်းတို့မှ တဆင့် နိုင်ငံတော်ဓာတ်အားစနစ်သို့ ချိတ်ဆက်ခဲ့ရာ ဝန်အား စီးဆင်းမှု ကန့်သတ်ချက် မရှိစေရန် နှင့်
  - ဓာတ်အားစနစ် ပိုမိုခိုင်မာ တောင်းတင်းမှုရှိစေရန်
- အဆိုပြုစီမံကိန်းသည် ပို့လွှတ်မှုဝန်အားတိုးမြှင့်ခြင်းနှင့် ဓာတ်အားစနစ် ပိုမိုခိုင်မာ တောင့်တင်းစေရေး အတွက် နိုင်ငံတော်ဓာတ်အားစနစ် အဆင့်မြှင့်တင်ရာ၌ အထောက်အကူ ဖြစ်စေမည် ဖြစ်ပါသည်။

230 Kv Transmission Line 4

2

24/02/64

စီမံကိန်း လမ်းကြောင်း



230 Kv Transmission Line

ကနဦး ပတ်ဝန်းကျင် လုပ်ငန်းစဉ်

စီမံကိန်း၏ ဖြစ်နိုင်ခြေ ရှိသော အကျိုးသက်ရောက်မှုများ

စစ်ဆေးခြင်း

- သိသာထင်ရှားမှု ရှိ/မရှိ
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆောင်ရွက်ရန် လိုအပ်ခြင်း ရှိ/မရှိ
- သတ်မှတ်ထားသောအထောက်အထားများ
- ပြုစုတင်ပြရန်လိုအပ်ခြင်း ရှိ/မရှိ

စိစစ်ခွင့်ပြုမည့်အဖွဲ့အစည်း - သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

230 Kv Transmission Line

6

3

ကနဦး ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း ရည်ရွယ်ချက်

- စီမံကိန်းဆောင်ရွက်မှုကြောင့်ဖြစ်ပေါ်လာနိုင်သည့် ပြဿနာရပ်များကို ဖော်ထုတ်ခြင်း
- ထိခိုက်လာနိုင်မှုများကိုလျှော့ချပေးနိုင်မည့်အစီအစဉ်များကို အကြံပြုတင်ပြခြင်း
- စောင့်ကြပ်ကြည့်ရှုမည့်အစီအစဉ်များ ကြိုတင် ပြင်ဆင်ပြီး အကောင်ထည်ဖော် ဆောင်ရွက်ခြင်း
- ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းလုပ်ငန်း လုံလောက်မှု ရှိ/မရှိဆန်းစစ်ခြင်း။

230 Kv Transmission Line 7

စီမံကိန်း လက်ရှိ ပတ်ဝန်းကျင် အနေအထားကို လေ့လာခြင်း

ရေထုအရည်အသွေး ကောက်ယူစမ်းသပ်လေ့လာခြင်း

230 Kv Transmission Line 8

4

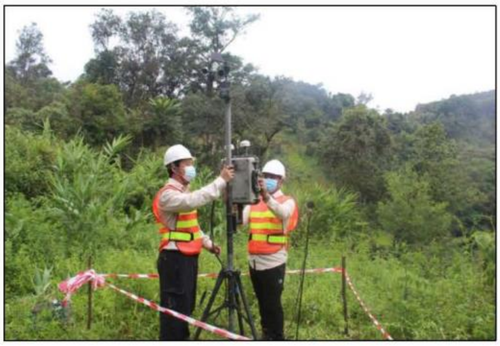
24/02/64

MOEE

စီမံကိန်း လက်ရှိ ပတ်ဝန်းကျင်အနေအထားကို လေ့လာခြင်း

VALENTIS coffey

လေထုအရည်အသွေး နှင့် ဆူညံသံပမာဏ လေ့လာ တိုင်းတာခြင်း



230 Kv Transmission Line 9

MOEE

စီမံကိန်း လက်ရှိ ပတ်ဝန်းကျင်အနေအထားကို လေ့လာခြင်း

VALENTIS coffey

မြေအရည်အသွေး နှင့် ဘူမိဗေဒ ဆိုင်ရာလေ့လာတိုင်းတာခြင်း

230 Kv Transmission Line 10

5

24/02/64

စီမံကိန်း လက်ရှိ ပတ်ဝန်းကျင်အနေအထားကို လေ့လာခြင်း

ဇီဝမျိုးစုံ မျိုးကွဲနှင့် ဂေဟစနစ် လေ့လာခြင်း

230 Kv Transmission Line 11

စီမံကိန်း လက်ရှိ ပတ်ဝန်းကျင်အနေအထားကို လေ့လာခြင်း

လူမှု စီးပွားရေး ဆန်းစစ်ခြင်း

230 Kv Transmission Line 12

6

အများပြည်သူနှင့် ဆွေးနွေးညှိနှိုင်း သဘောထားရယူခြင်း၏ရည်ရွယ်ချက်များ

- ဖြစ်ပေါ်လာနိုင်သည့် ကောင်းကျိုး/ဆိုးကျိုးများကိုတင်ပြခြင်း
- ပါဝင်ပတ်သက်သူများ၏အမြင်နှင့်အကြံပြုချက်များ၊ထိခိုက်သက်ရောက်လာနိုင်မှုများကိုလျှော့ချပေးနိုင်မည့် အစီအစဉ်များ၊ စောင့်ကြပ်ကြည့်ရှုမည့်အစီအစဉ်များတွင် ထည့်သွင်း စဉ်စားပေးခြင်း
- စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းနှင့် လည်ပတ်ခြင်း၏ ပွင့်လင်းမြင်သာမှုနှင့် တာဝန်ယူနိုင်မှု တိုးတက် စေခြင်း
- အငြင်းပွားမှုလျှော့ချခြင်းနှင့် စီမံကိန်းအကောင်အထည်ဖော်ရာတွင် ချောမွေ့မှုရှိရန် ဆောင်ရွက်ခြင်း

230 Kv Transmission Line 13

စီမံကိန်း၏ သက်ရောက်မှုများ

- စီမံကိန်း၏ အကျိုးဆက်အဖြစ် အဓိကဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုအချို့ကို ဖော်ထုတ်ပြီး သက်ရောက်မှုအဆင့်ကို လျှော့ချရမည်။
- စီမံကိန်း၏ ဆောက်လုပ်ရေးလုပ်ငန်းနှင့် လည်ပတ်မှု လုပ်ငန်းနှင့်ဆက်စပ်သော ဖြစ်ပေါ်နိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက် သက်ရောက်မှုများမှာ-
  - သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ
  - လူမှုစီးပွားဆိုင်ရာ ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ

230 Kv Transmission Line 14

7

MOEE

သဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာ ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှုများ

VALENTIS coffey A TETRA TECH COMPANY

- အပြည်ပြည်ဆိုင်ရာ သဘာဝ သယံဇာတထိန်းသိမ်းရေးသမဂ္ဂ (IUCN) အနီရောင်စာရင်း တို့ပါဝင်သော ကျက်စားရာ နယ်မြေ၊ ဒေသရင်းအပင်များနှင့် တိရိစ္ဆာန်များ၏ ထိန်းသိမ်းစောင့်ရှောက်ရေး လုပ်ငန်းများအပေါ် အလားအလာရှိသော သက်ရောက်မှု။
- တည်ဆောက်လုပ်ရေးကာလအတွင်း အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲခြင်း။
- တည်ဆောက်လုပ်ပြီးစီးပြီးနောက် ဆက်လက် ဖြစ်ပွားမည့် မြေဆီလွှာတိုက်စားမှု၏ အကျိုးသက်ရောက်မှုများနှင့် ရေစီးဆင်းအပေါ် အကျိုးသက်ရောက်မှုများအပါအဝင်၊ မြေပုံစံနှင့် မြေဆီလွှာ တည်ငြိမ်မှုကို စီမံခန့်ခွဲခြင်း။
- တည်ဆောက်လုပ်ရေးကာလအတွင်း လေထုနှင့် ဆူညံသံ အရည်အသွေး စီမံခန့်ခွဲခြင်း။

230 Kv Transmission Line 15

MOEE

လူမှု စီးပွားရေးဆိုင်ရာ ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှုများ

VALENTIS coffey A TETRA TECH COMPANY

- **အလုပ်အကိုင်နှင့်ဝင်ငွေရရှိမှု** - စီမံကိန်းဆိုင်ရာ အဓိကလူမှုစီးပွားကောင်းကျိုးအနေဖြင့် စီမံကိန်း တည်ဆောက်စဥ်ကာလအတွင်း ဒေသခံများအတွက် အလုပ်အကိုင်နှင့် ဝင်ငွေများ ဖန်တီးပေးနိုင်မည် ဖြစ်သည်။
- ပိုမိုကောင်းမွန်သော လျှပ်စစ်မီး ဝန်ဆောင်မှုရရှိနိုင်ခြင်း။
- စီမံကိန်းတည်ဆောက်မှုကာလအတွင်း အခြားဒေသများမှ လာရောက်လုပ်ကိုင်ကြသော အလုပ်သမားများကြောင့် ဒေသတွင်းရှိ လူမှုပတ်ဝန်းကျင်ဆိုင်ရာ အပြောင်းအလဲ ဖြစ်လာနိုင်ခြင်း။
- မြေအသုံးချမှု၊ သဘာဝအရင်းအမြစ်များရရှိမှု၊ ရှေးဟောင်းနှင့် ယဥ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်များအပေါ်သက်ရောက်ပြောင်းလဲနိုင်မှု။

230 Kv Transmission Line 16

8

MOEE

လူမှု စီးပွားရေးဆိုင်ရာ ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှုများ

VALENTIS

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- ပုဂ္ဂလိက နှင့် ပစ္စည်းဥစ္စာဆိုင်ရာ ရပိုင်ခွင့်များ - စီမံကိန်းကြောင့်စီးပွားရေး၊ အသက်မွေးမှု နှင့် နိုင်ငံသားရပိုင်ခွင့်ဆိုင်ရာ သက်ရောက်စေနိုင်မှုများပါဝင်ပါသည်။
- ဒေသခံလူထု၏စီမံကိန်းအပေါ်အမြင်များ၊ စိုးရိမ်မှုများနှင့် ဆန္ဒများ - ထိခိုက်လွယ်သော အုပ်စုများ၏ စီမံကိန်းအပေါ်အမြင်များနှင့် လူမှုအဖွဲ့အစည်းအမျိုးမျိုး၏ မတူညီသော အမြင်များကိုရယူရန် အရေးကြီးပါသည်။
- ဒေသခံလူထု၏ ကျန်းမာရေးနှင့် အဆင်ပြေနေနိုင်ရေး အပေါ်သက်ရောက်နိုင်မှုများ ပါဝင်ပါသည်။

230 Kv Transmission Line 17

MOEE

ပတ်ဝန်းကျင်နှင့် လူမှု စီးပွားရေးဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဥ်များ

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coffey
A TETRA TECH COMPANY

- ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ သက်ရောက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းစဥ်အား အထောက်အကူပြုနိုင်ရန် ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဥ်များ ရေးဆွဲသွားမည်ဖြစ်သည်။
- စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုများ လျှော့ကျရေးနှင့် ကောင်းကျိုး ဖြစ်ထွန်းမှု အမြင့်မားဆုံးဖြစ်စေရေးဆိုင်ရာ အစီအမံများ ပါဝင်မည် ဖြစ်သည်။
- စီမံခန့်ခွဲမှုနည်းလမ်းများကို အဆင့်လိုက်ဦးစားပေးနည်းလမ်းများ (ရှောင်ရှားခြင်း၊ အနည်းဆုံးဖြစ်အောင်သုံးစွဲခြင်း၊ လျှော့ချခြင်း၊ အစားထိုးခြင်း)ဖြင့် သက်ရောက်မှုများကို လျှော့ချသွားမည်ဖြစ်သည်။

230 Kv Transmission Line 18

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ပတ်ဝန်းကျင်နှင့် လူမှု စီးပွားရေးဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်များ

- လုပ်ဆောင်မှုစံနှုန်းများ၊ စစ်ဆေးခြင်းနှင့် စောင့်ကြပ်ခြင်းဆိုင်ရာ သက်မှတ်ချက်များကို အစီအစဉ်တွင် ရေးဆွဲဖော်ပြသွားမည် ဖြစ်သည်။
- စီမံခန့်ခွဲမှုအစီအစဉ်များတွင် သက်ဆိုင်ရာဥပဒေမူဘောင်များ၊ နိုင်ငံတကာ လုပ်ထုံးလုပ်နည်းများနှင့် လမ်းညွှန်ချက်များမှ အသေးစိတ်လမ်းညွှန်ချက်များ ပါဝင်မည် ဖြစ်သည်။
- စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုများကို သက်ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ်များတွင် ပါရှိသည့် လျော့ချရေးနည်းလမ်းများဖြင့် စီမံထိန်းချုပ်သွားမည်ဖြစ်သည်။

230 Kv Transmission Line 19

ပတ်ဝန်းကျင်နှင့် လူမှု စီးပွားရေးဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်များ

- **ကျန်းမာရေး** - စီမံကိန်းလုပ်သားများ နှင့် ဒေသခံလူထုများ၏ ကျန်းမာရေးနှင့် တကိုယ်ရည် ကျန်းမာရေးဆိုင်ရာအလေ့အထများ တိုးတက်ကောင်းမွန်စေရန်၊
- **ဘေးအန္တရာယ်ကင်းရှင်းရေး** - လုပ်ငန်းခွင်နှင့် ပတ်ဝန်းကျင်ဒေသခံလူထုအပေါ် ဘေးအန္တရာယ် သက်ရောက်နိုင်မှုလျော့နည်းစေရန်၊
- **သဘာဝပတ်ဝန်းကျင်** - ပတ်ဝန်းကျင်ညစ်ညမ်းမှု လျော့ချကာကွယ်ရန်၊ သဘာဝအရင်းအမြစ်များ စနစ်တကျ သုံးစွဲမှုရှိစေရန်နှင့် ထိခိုက်သွားသော ပတ်ဝန်းကျင်များ ပြန်လည်ပျိုးထောင်ရန်၊
- **လူမှုစီးပွား** - လုပ်သားများနှင့်ဒေသခံလူထု၏ အခွင့်အရေးနှင့် ရပိုင်ခွင့်များကို မထိခိုက်စေပဲ မျှတ၍ သမာသမတ်ကျသော စီမံကိန်းလုပ်ဆောင်မှု ဖြစ်စေရန်နှင့် ဒေသဖွံ့ဖြိုးရေးနှင့် စီးပွားရေးဆိုင်ရာ ကောင်းကျိုးများ ဖြစ်ထွန်းစေရန် တို့ဖြစ်ပါသည်။

230 Kv Transmission Line 20

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နိဂုံးချုပ်

- ဤအဆိုပြုစီမံကိန်းသည်
- သင့်လျော်သော စီမံခန့်ခွဲမှုများ မပြုလုပ်ခဲ့လျှင် သိသာထင်ရှားသော ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ ထိခိုက်မှုများဖြစ်ပေါ်စေနိုင်သည့် စီမံကိန်းအမျိုးအစားဖြစ်ပြီး၊
- သင့်လျော်သော စီမံခန့်ခွဲမှုများ ပြုလုပ်ခဲ့လျှင် သိသာထင်ရှားသော ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ အကျိုးကျေးဇူး အထူးရရှိနိုင်သော စီမံကိန်းအမျိုးအစားဖြစ်ပါသည်။

230 Kv Transmission Line 21

အကြံပြုချက် နှင့် အမေးအဖြေ ကဏ္ဍ

အကြံပြု ဆွေးနွေးချက်

နှင့်

အမေးအဖြေ ကဏ္ဍ

230 Kv Transmission Line 22

ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ ထုတ်ပြန်ကြေငြာချက်

ဤပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာကို လူမှု အဖွဲ့အစည်းများ၊ စီမံကိန်းကြောင့် ထိခိုက် ခံစားရသူများ၊ ဒေသဆိုင်ရာ လူ့အဖွဲ့အစည်းနှင့် အခြားအကျိုးသက်ဆိုင်သူများနှင့် အများပြည်သူများ သိရှိနိုင်စေရန်အတွက် အောက်ဖော်ပြပါ နေရာများ၌ ဖတ်ရှုလေ့လာနိုင်ပါသည်။

၁) စီမံကိန်း အဆိုပြုသူ၏ ရုံးခန်းနှင့် ဝက်ဘ်ဆိုဒ်

ညွှန်ကြားရေးမှူးရုံး
လျှပ်စစ်ဓာတ်အားပို့လွှတ်ရေးနှင့် ကွပ်ကဲရေးဦးစီးဌာန
လျှပ်စစ်နှင့်စွမ်းအားဝန်ကြီးဌာန
ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
ရုံးအမှတ် ၂၇၊ နေပြည်တော်
https://www.moee.gov.mm/

၂)အစီရင်ခံစာ ရေးသားသောအဖွဲ့အစည်း၏ ရုံးခန်းနှင့် ဖုန်းနံပါတ် နှင့် ဝက်ဘ်ဆိုဒ်

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၃) မြို့နယ်အုပ်ချုပ်ရေးမှူးရုံးများ

(က) လွိုင်ကော် မြို့နယ် အုပ်ချုပ်ရေးမှူး
(ခ) ဒီမောဆိုး မြို့နယ် အုပ်ချုပ်ရေးမှူး ရုံးခန်း
(ဂ) ဖယ်ခုံ မြို့နယ် အုပ်ချုပ်ရေးမှူး ရုံးခန်း
(ဃ) သံတောင်ကြီး မြို့နယ် အုပ်ချုပ်ရေးမှူး ရုံးခန်း
(င) လိပ်သို မြို့နယ်ခွဲ အုပ်ချုပ်ရေးမှူး ရုံးခန်း

၄) လျှပ်စစ်ဓာတ်အားခွဲ စက်ရုံ

(က) လွိုင်ကော် လျှပ်စစ်ဓာတ်အားခွဲ စက်ရုံမှူး ရုံးခန်း
(ခ) စပါးကြွယ် လျှပ်စစ်ဓာတ်အားခွဲ စက်ရုံမှူး ရုံးခန်း